

# Visiting Naturalist in the Schools

## 2018 Program Evaluation



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Montana Natural History Center





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## SUMMARY

This report summarizes research conducted in 2018 to evaluate the *Visiting Naturalist in the Schools* program. Findings, based on surveys of participating teachers, naturalists, and volunteers and on teacher interviews, are provided with varying levels of detail, along with data from a preliminary pilot test of newly developed student surveys. Adult participants consistently report strongly positive views of the program design and components, the organization and management of program activities, and the perceived results for students, teachers, and schools. They believe the program both supports and extends the curriculum and instruction of Montana schools in important ways. These include successfully engaging students in developing their sense of place in Montana, their appreciation and study of nature, their skills and knowledge in the natural sciences, and their interdisciplinary integration of these topics with other academic subjects such as writing and the arts. Program naturalists and volunteers are seen as valuable educational partners for teachers, and as valuable role models for students. The program is well positioned for continued refinement and expansion as Montana science standards and school curricula are updated in response to the Next Generation Science Standards.

The mission of the Montana Natural History Center is “to promote and cultivate the appreciation, understanding, and stewardship of nature through education.” The *Visiting Naturalist in the Schools* program serves this mission by providing elementary school students with a cumulative year-long sequence of classroom-based and outdoor activities. These activities use observation of nature along with scientific inquiry practices and written and artistic expression to develop student interest in the natural world and to build student knowledge and appreciation of local natural history and natural resources.

This report contains findings from program evaluation research conducted in 2018. The study did not use an experimental design – no comparison group was measured – instead, the findings are based on analysis of detailed responses from participating teachers, program naturalists, and program volunteers from Missoula and surrounding school districts. Surveys and interviews were carefully constructed and confidentially administered by an independent researcher in order to ensure that respondents would have many opportunities to offer observations or opinions about program weaknesses as well as strengths, and to suggest recommended improvements in the program.

A sample of students from one school also pilot-tested a new survey about their program experiences; their responses are integrated into the report as a supplement to the data from teachers, naturalists, and volunteers, but the student data should be considered preliminary and more tentative, given that the student survey is still in development and the student sample was limited.

A total of 43 teachers, 10 program naturalists, 26 program volunteers, and more than 100 students participated in the survey research. Each group answered similar sets of questions about key elements and goals of the VNS program, allowing analysis of the extent to which their different experiences and perspectives might (or might not) converge on similar judgments of program value, or similar perceptions of program outcomes. These survey instruments are now available for routine use in gathering feedback from program participants in future years. In addition, a random sample of eight teachers participated in interviews with the researcher, based on a consistent, structured interview protocol. In addition to continuing to refine the program based on this feedback, options are outlined below for continued development of research tools and designs for improved student outcome evaluation and for more complex formal evaluation research studies.

The summary below includes brief, general highlights from the research findings. In the full report, the final chapter on “Findings by Topic” follows the same general structure as this summary, but provides greater detail about how the responses from different groups were blended into an overall perspective on each topic of the research. Much more detail about the perspectives of each group (teachers, naturalists, volunteers, students), including a wealth of verbatim comments from individuals, is available in separate chapters covering each of these groups.

## **General Perspectives on the *Visiting Naturalist in the Schools* Program**

**Program Enjoyment.** Nearly all teachers, volunteers, program naturalists and students reported enjoying the program. Many gave the highest possible ratings to the program or wrote detailed comments about their general appreciation for the program as a whole and for specific program activities.

**Value of Program Components.** Participants value all aspects of the program. Teachers, volunteers, program naturalists and students endorsed all three major activity formats — field trips, in-class lessons, and outdoor school yard activities. Educators valued the addition of inquiry, science learning and interdisciplinary study of local natural history to school curriculum, and the use of program naturalists and volunteers as additional role models for students. Student journals were endorsed by a majority of teachers and students, though not all teachers make use of these tools for student assessment or grading, and some students dislike the journaling.

**Overall Program Value.** Teachers, students, volunteers, and program naturalists believe the program as a whole is well organized and facilitated, a valuable use of their time, and worth recommending to others. Their views on the value of the program are evident in responses to specific rating-scale questions on these topics as well as in their free-response comments to specific and general questions about the program, which generated many “testimonials” to their positive experiences with the VNS program.

**Program Impact on Students, Schools, and Educators.** Teachers, volunteers, and program naturalists offered almost unanimously positive views of program impact on students, schools, and educators. Asked for their general views of the program, teachers, naturalists and volunteers were unanimous in reporting positive program effects on students, especially with regard to student engagement in nature and science; increased appreciation for the natural world and for approaching the world with the skills and attitudes of a naturalist; and increased knowledge, skills, and experience in science, observation, and inquiry. Teachers appreciated that the program provides opportunities for all students to participate and succeed; several were surprised that the program appeared to foster active and successful participation by particular students who were typically less interested, active or successful in school activities. Several volunteers reported surprise at how engaged students become in scientific observation and investigation of nature, and several commented about the level of knowledge and creative insights about nature that students exhibit and the amount of growth and learning that they observed in students over the course of the program year. Naturalists were surprised at how program effects extend into the community, and extend over time, through ongoing relationships, observations and discussions of natural phenomena involving students, teachers, naturalists, and their friends and family.

Teachers, naturalists and volunteers also reported positive program effects on schools and on themselves as educators. Themes included supporting and enhancing school science curriculum; connecting school science curriculum and instruction to the local community and natural world; extending school curriculum and learning activities beyond what would otherwise be available; increased opportunities for interdisciplinary learning that integrates, science, mathematics, language arts, and visual arts; improved educator content knowledge in science and natural history; improved teaching skills and connections with students; and enhanced ongoing curiosity and lifelong learning for adult educators.

## Student Engagement in the Natural World

**Youth come to school with an innate curiosity about the natural world.** The VNS program is based on the premise that youth are inherently interested in nature, and this curiosity can be cultivated with inquiry-based scientific investigation of natural features of their local community. Teachers, volunteers, and naturalists strongly endorsed this premise as fitting with their observations of Montana students.

**The VNS program builds on students' existing curiosity about the natural world.** More specifically, teachers, naturalists and volunteers reported that the VNS program builds on students' existing curiosity about nature, helps extend their awareness and interests into new aspects of the natural world, and helps students learn to use scientific tools to explore and extend their engagement in nature. This perception held for students who already have a strong and positive history of experiences in nature as well as for students with limited or negative prior experiences in nature. Students reported that their engagement in nature after their participation in the VNS program was significantly greater than it had been before their participation in the program, including greater interest and curiosity in animals, plants, weather, and other parts of nature; more frequent observation of nature; more interest in learning how to use scientific tools to study nature; and more interest in taking classes or getting a job as a naturalist.

**The VNS program supports the development of natural resource stewardship.** Although many of the program naturalists and some teachers and volunteers expressed opinions that the program could do more to promote conservation and stewardship, most agreed that the program does help students develop connections and attachment to their local natural areas and appreciation of the importance of thoughtful management, conservation, and stewardship of natural resources. Students supported this view, reporting more interest in helping take care of animals, plants, and nature after participating in the program.

## Student Engagement in the Sciences

**The VNS program makes school science curriculum more engaging for students.** Teachers and naturalists concurred that the Visiting Naturalist in the Schools program makes school science curriculum more interesting and accessible for students, and that the major components of the program (in-class lessons, school-yard activities, and field trips) each help to develop and strengthen student interest and engagement in the natural sciences.

*(Usage note: throughout this report, "the sciences" are often referred to in plural form, to remind us that various scientific disciplines use very different methods in very different contexts, complexity that is too often obscured by science education approaches that seek to boil everything down to a generic, one-size-fits-all "scientific method.")*

**Relationships with VNS adult role models increase student interest in science.** Teachers and naturalists also agreed that student interest in science is increased by their experiences and relationships with the visiting naturalists and program volunteers.

**The VNS program increases student interest in further education and careers in science.** Although several naturalists noted that these questions require long-term studies, the consensus perception among teachers, naturalists and students was that through their experiences in the VNS program, students become more aware of and interested in opportunities for further learning and careers in science. Students also reported that their engagement in the sciences after their participation in the VNS program was significantly greater than it had been before their participation in the program, including greater interest in learning more about science, greater curiosity to find out how scientists figure out how things work in nature, and greater interest in finding out how to take more classes or get a job as a scientist.

## Student Learning in the Sciences

**The VNS program enhances school science curriculum and supports student learning of science content and practices.** All teachers and naturalists agreed that the VNS program greatly enhances school science curriculum, strengthens and supports student learning of natural science content, and helps students learn to use tools and practices of scientific investigation. Themes in their open-ended comments emphasized the value of linkages between VNS program content and school science curriculum and learning activities, ways that VNS extends learning beyond school curriculum, student observation skills and ability to focus attention on extended tasks, and the cumulative nature of what students learn about science through their year-long VNS program experience.

**The VNS program builds student confidence with science content and practices.** All teachers and naturalists also agreed that students become more confident with science topics and activities through their VNS experiences. Students reported that their confidence in doing scientific work after their participation in the VNS program was significantly greater than it had been before their participation in the program, including their ability to study nature the way scientists do and their ability to do the kind of work that scientists do.

## Educator Learning in the Sciences

**The VNS program enhances educator knowledge and confidence in science content, practices and curriculum.** Teachers, volunteers, and naturalists reported that the VNS program enhances their connection with school science curriculum, their own learning of science content and practices, and their skill, knowledge and confidence as educators with science topics and activities.

## School Capacity to Provide Engaging Science and Interdisciplinary Education

**The VNS program enhances the capacity of schools to engage students in their science curriculum and in other disciplines.** Teachers reported that the VNS program:

- Enhances their school's capacity to address Montana state standards in science education
- Enables their students to go deeper than they would otherwise go into science topics in the school curriculum
- Enhances their school's science curriculum with additional content beyond the topics they would otherwise be able to cover
- Enables their school to provide engaging science activities to students beyond the kinds of experiences they would otherwise be able to provide
- Provides students with access to a greater number and variety of science learning activities than they would otherwise have
- Provides students with additional experiences with science-oriented role models
- Enables teachers to learn more about science content and practices, and do a better job helping students learn about the sciences
- Offers students well-rounded, project-based, interdisciplinary activities in which they learn and apply many different academic subjects at once through real-life, authentic experiences.

## Program Strengths, Weaknesses, and Recommendations

All major components of the program were viewed by teachers, naturalists, and volunteers as strengths, including engaging hands-on science, writing and art activities; field trips and other outdoor activities; consistency and organization over time of lessons and activities; and skilled and knowledgeable role models (the program naturalists and volunteers) and their relationships with students and teachers. In interviews, teachers commended the VNS program staff for communicating well with schools to prevent or solve logistics problems and to ensure a clear understanding of program requirements and expectations, as well as for being flexible and accommodating in scheduling activities. They emphasized the importance to many schools of scholarship support to mitigate tight school budgets, and noted that their administrators were supportive of the program.

In addition to having many opportunities to give low ratings to specific program components or on specific questions about the program, teachers, naturalists and volunteers were also asked to list the “least important or least effective parts of the VNS program,” and to recommend changes to improve the program. Very few weaknesses or recommendations for change were nominated; these included recommendations to:

- work with schools to find more class time for the program, e.g. offer optional ways to expand the time devoted to the program, such as an option for longer class sessions, or programming for additional grade levels
- Encourage more teachers to be actively involved in their students’ VNS activities
- Provide more “add-on” extensions to help teachers leverage the VNS lessons into additional units, lessons, activities, or interdisciplinary connections across the curriculum
- Continue refining the VNS lessons to update and expand the program’s linkage to Montana science education standards, which have recently changed in response to the Next Generation Science Standards (NGSS)
- improve certain VNS lessons in specific ways detailed in the report

Volunteers reported great satisfaction with their role, especially the opportunity to build meaningful connections with students and naturalists and to increase their own natural history content knowledge; many affirmed that they recommend the VNS volunteer role to others.

When asked about their recommendations on three specific issues regarding program focus and priorities, teachers, naturalists and volunteers strongly supported views that:

- it is important and useful for students to have the same Visiting Naturalist all year, rather than different Visiting Naturalists throughout the year,
- having positive experiences to develop interest in nature, science and learning is more important for students than efficiently “covering” a lot of specific content from curriculum or standards, and
- outdoor activities are an essential, irreplaceable part of the VNS program.

The highlights presented in this summary are distilled from quantitative responses to rating scales as well as responses to open-ended survey and interview questions, all of which are presented in detail in the full report.

## Recommendations for Further Program Evaluation Research

Some recommended options for continuing program evaluation research include:

- Further development of student surveys as a basis for ongoing program development and improvement and for potential use in more formal research designs for program evaluation. Another round of survey revision and pilot testing in Spring 2019 would be an efficient next step.
- Exploration of options for research study designs that could include an experimental or quasi-experimental comparison group. This would require appropriate logistical circumstances (primarily the availability of a participating comparison group) as well as funding considerations (e.g., dedicated research grant funding).
- An alternative (or additional) approach would be to convene and fund an advisory panel of experienced environmental educators and provide them with program materials, structured questions to address, and opportunities to observe program activities. The panel would then be charged with writing a report and recommendations based on their expert opinions and observations.



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# Visiting Naturalist in the Schools: Program Evaluation Overview

## Context and Purpose

The mission of the Montana Natural History Center (MNHC) is “to promote and cultivate the appreciation, understanding, and stewardship of nature through education.” The *Visiting Naturalist in the Schools* program (VNS) provides elementary school students with a cumulative year-long sequence of classroom-based and outdoor activities, using observation of nature and scientific inquiry practices to develop student interest in the natural world and to build student knowledge and appreciation of local natural history. More details about the VNS program are provided in Exhibits 1 and 2.

Between April 2016 and April 2017, representatives of MNHC and Cedar Lake Research Group, LLC explored the history of the VNS program and MNHC’s interest in pursuing formal evaluation research to support program improvement and to better understand and articulate the outcomes associated with the program – outcomes for students, teachers, and schools, as well as for the naturalists and volunteers who deliver the program to schools. Beginning in June, 2017, Michael Coe of Cedar Lake Research Group began meeting with MNHC staff to review program descriptions and goals, previous evaluation data, and guidance from the MNHC board. These planning discussions culminated in a set of evaluation questions and a data collection framework that would be initially implemented during the 2017-2018 school year. An overarching goal of the project was to develop a set of survey tools that could be used in future years by program staff with little or no ongoing expenditure on outside consultants – an “evaluation toolkit” to facilitate ongoing feedback, guidance, and documentation of outcomes for the VNS program. This report includes the survey instruments that were developed, as well as a summary of findings from their initial use with teachers, students, program naturalists, and program volunteers.

## Research Design Considerations

The research design for the project was influenced by several constraints. In order to keep the project budget manageable for the organization during the initial development period, and especially in future years, the data collection methods were based primarily on easy-to-administer surveys of teachers, students, naturalists, and volunteers, using survey instruments designed for re-use by staff in future years with minimal assistance from professional researchers. Student surveys in particular were designed for minimum invasiveness and burden on students, teachers, and program staff, relying on a single anonymous survey administration in which students would estimate their responses to key questions before and after their program experiences. This format avoids the need to collect personally identifiable data from students in order to match their individual pre- and post-surveys. Because of the small student sample size and potential limitations of this preliminary measurement format, student surveys are given less emphasis in the findings than the combined perspectives of teachers, volunteers, and naturalists.

Although it would also be useful to measure outcomes in a well-matched comparison group of students and teachers who did not participate in the program, an experimental study design was well outside the available budget as well as the practical and logistical opportunities currently available for conducting a study of the program. The lack of a comparison group limits the strength of inferences or conclusions that can be drawn from this study. The focus here was on “triangulation” to determine whether the experiences and perspectives of different program observer/participants converged on similar judgments of the program outcomes. These findings, and the survey instruments that were developed for the program, may provide an expanded foundation for additional research studies.

## Exhibit 1. Visiting Naturalists in the Schools: Purpose, Goals, and Structure

### PURPOSE AND GOALS

- The purpose of the Visiting Naturalist in the Schools program is to engage and encourage student's innate curiosity about the natural world through exploration and scientific inquiry.
- We work towards four broad goals in the program – to help students:
  - Develop the skills of an artist, writer and scientist to explore the natural world.
  - Become familiar with the process of scientific inquiry.
  - Understand how form relates function in the natural world by studying the adaptations of Montana flora and fauna.
  - Develop a relationship with a Naturalist mentor.

### HOW WE REACH FOR THESE GOALS

- **Structure:** we commit to a full year of monthly naturalist visits for each classroom, which enables us to not only reinforce and build on key concepts like structure & function and scientific inquiry over time, but also develop a strong, growing mentor relationship with students. This year-long relationship is a core strength of the program.
- **Quality Field Trips:** in October and May, we take kids on *quality, full day field trips*, that run from 9:30-1:30. To provide an authentic, meaningful naturalist experience for the children, these field trips include:
  - A visit to a rich, diverse riparian habitat close to students' schools where they can: 1) observe abundant plant and animal life and 2) return to these natural areas later with their parents (which many students do).
  - Quality naturalist tools for good exploration – kids use high quality binoculars, spotting scopes, field microscopes, insect nets and more to explore the natural world.
  - Exploration in small groups (usually 7-9/group) and long learning stations (1-1.25 hours each) to promote meaningful engagement with nature.
- **Strong Classroom Instruction:** we provide strong, science based lessons in the classroom and in the schoolyard.
  - Lessons are designed to meet Montana state science standards that support the instruction teachers already provide – particularly science inquiry, and form and function standards
  - Through a partnership with the University of Montana Zoological Museum, we have access to many specimens (wings, beaks, skulls, etc.) that we use to bring the study of the natural world indoors.

Source: Excerpted from the "VNS Overview" program document, 2018, Montana Natural History Center.

## Exhibit 2. Visiting Naturalists in the Schools: Year at a Glance

YEAR AT A GLANCE			
MONTH	LESSON	LOCATION	GOALS/ACTIVITIES
September	What is a Naturalist?	Classroom and School Yard	<ul style="list-style-type: none"> <li>• Naturalist as scientist, artist, writer</li> <li>• Field journaling</li> </ul>
October	Fall Field Trip (9:30- 1:30)	Field Site chosen in collaboration with classroom teachers	<ul style="list-style-type: none"> <li>• Nature Hike</li> <li>• Adaptation Olympics (Introduction to Structure and Function)</li> <li>• Professor Walk</li> </ul>
November	Flower Dissection	Classroom	<ul style="list-style-type: none"> <li>• Structure and function in flowers (sepals, petals, stamens, pistil)</li> <li>• Journaling</li> </ul>
December	Fruit Study	Classroom and School Yard	<ul style="list-style-type: none"> <li>• Structure and function in fruits (berries, burrs, winged fruits)</li> <li>• Journaling</li> </ul>
January	Bone Detective	Classroom	<ul style="list-style-type: none"> <li>• Structure and function in teeth (incisors, canines, molars)</li> <li>• Classifying carnivore, herbivore, and omnivore by tooth patterns</li> <li>• Journaling</li> </ul>
February	Bergman's Rule Experiment	Classroom and School Yard	<ul style="list-style-type: none"> <li>• Scientific method – including making hypotheses, conducting experiment, collecting data, graphing results to interpret data, and making conclusions</li> <li>• Winter adaptations</li> </ul>
March	Feather Functions	Classroom	<ul style="list-style-type: none"> <li>• Structure and function in bird feathers</li> <li>• Journaling</li> </ul>
April	Fill the Bill	Classroom and School Yard	<ul style="list-style-type: none"> <li>• Scientific method – experiment on beak shape</li> <li>• Form and function in bird beaks</li> <li>• Journaling</li> </ul>
May	Spring Field Trip (9:30-1:30)	Field Site chosen in collaboration with classroom teachers	<ul style="list-style-type: none"> <li>• Nature hike</li> <li>• Arthropod and habitat survey and study</li> <li>• Solo Hike</li> </ul>

Source: "VNS Overview" program document, 2018, Montana Natural History Center.

## Participants

The study was designed to include feedback from all participating teachers, program naturalists, and program volunteers, as well as a sample of students from several classrooms. The student data was largely intended to serve as a pilot test of the newly developed student survey format, which will be further revised for use in future years. Ultimately, 43 teachers from Missoula and surrounding school districts, 10 program naturalists, 26 program volunteers, and more than 100 students from one school participated in the research. This represents all the program naturalists, nearly all of the volunteers, 69 percent of the 62 teachers who participated in the program during the 2017-2018 school year, and a small sample of students from participating classrooms.

## Data Collection Framework and Methods

Table 1 displays the general evaluation research topics and broad research questions that were developed during the planning period for the study, with notes on which groups were to be asked about each topic. This framework was used to develop specific survey questions for each group, as well as interview questions for teachers. These data collection instruments are included as appendices to this report.

Once the survey questions were developed collaboratively by the researcher and program staff, with input from MNHC board members, online survey tools were developed for teachers, naturalists, and volunteers, and paper surveys were prepared for students. The online data collection sites were built in the popular Survey Monkey system, using an account owned by MNHC and available for ongoing use in future years. Initial data were collected in spring, 2018, near the end of the 2017-2018 school year. All data analyses in this report were conducted by Dr. Coe of Cedar Lake Research Group during summer 2018.

The project design included an additional component that would be dependent upon an external researcher: confidential interviews of a sample of teachers, conducted by Dr. Coe and reported without disclosing the identities of teachers who participated in the interviews. These were to be included in the initial evaluation research, with an option to repeat them in future years depending on their usefulness and the budget available for ongoing program evaluation. Initial plans to conduct teacher interviews during summer 2018 were delayed; these interviews are being conducted in fall, 2018 and will be summarized in a future update to this report.

## How to Read this Report

The chapters containing Teacher Perspectives, Student Perspectives, Program Naturalist Perspectives, and Volunteer Perspectives are very detailed and include the specific wording of survey questions, the frequency of responses for each rating-scale question, and all verbatim comments that were offered in response to open-ended questions. Analytic summaries and key highlights are also presented. These chapters contain much more detail than some readers will want, but much of this detail, especially the verbatim comments, is quite interesting and potentially useful for understanding and further developing the program. These chapters are intended for those who are interested in a deeper dive, especially those who may want to pursue a more in-depth analysis of particular questions and how these were addressed by teachers, students, naturalists, and/or volunteers.

An integrated “mid-level” summary is then provided in the “Findings by Topic” chapter, beginning on page 65. This is for those who want some detail, but not the exhaustive detail provided in the earlier chapters – and to show how the findings from different groups were blended into an overall perspective on each key research question. These integrated findings from the four groups of participants were then further distilled into the “Summary” statement that appears at the beginning of the report.



**Table 1. Overview of VNS Evaluation Research Topics by Participant Group**

Survey Module	Topic	Initial Broad Research Questions	Teachers	Students	Naturalists	Volunteers
A	<b>General reactions to VNS program</b>	<ul style="list-style-type: none"> <li>Did you enjoy participating?</li> <li>What parts of the program were most and least enjoyable for students?</li> <li>What parts of the program were most and least valuable for you?</li> <li>Is the overall VNS program valuable for schools?</li> </ul>	√	√	√	√
B	<b>Perceived impact on student engagement in the natural world</b>	<ul style="list-style-type: none"> <li>To what extent did program participation engage or connect with students' pre-existing, innate curiosity about the natural world?</li> <li>To what extent did participation encourage, support and extend students' curiosity about the natural world?</li> <li>To what extent did program participation encourage and extend students' interest in natural resource management, conservation, and stewardship?</li> </ul>	√	√	√	√
C	<b>Perceived impact on student engagement in the sciences</b>	<ul style="list-style-type: none"> <li>To what extent did participation enhance student interest &amp; engagement in learning about the sciences?</li> <li>To what extent did program participation increase student interest in pursuing further learning or career paths in the sciences?</li> </ul>	√	√	√	
D	<b>Perceived impact on student learning in the sciences</b>	<ul style="list-style-type: none"> <li>To what extent did program participation improve student awareness, skills, content knowledge, and confidence in the sciences?</li> </ul>	√	√	√	
E	<b>Perceived impact on educator learning in the sciences</b>	<ul style="list-style-type: none"> <li>To what extent did program participation improve teacher/volunteer awareness, skills, content knowledge, and confidence in the sciences?</li> </ul>	√		√	√
F	<b>Improved capacity for teachers and schools to provide engaging science education</b>	<ul style="list-style-type: none"> <li>To what extent did the program increase the capacity of teachers and schools to provide engaging science curriculum and activities beyond what they would otherwise have been able to provide?</li> <li>Did the program allow your school to offer important learning experiences that are otherwise not available?</li> </ul>	√			
G	<b>Improved capacity for teachers and schools to provide engaging education in other (non-science) subjects?</b>	<ul style="list-style-type: none"> <li>To what extent did the program increase the capacity of schools to provide engaging curriculum and activities in other core subjects such as mathematics, reading, writing, technology, and visual arts?</li> <li>To what extent did the program increase the capacity of schools to provide interdisciplinary, project-based learning that integrates multiple academic subjects in engaging ways?</li> </ul>	√			
H	<b>Overall program observations; unexpected outcomes; strengths and weaknesses; recommendations</b>	<ul style="list-style-type: none"> <li>What impact did the VNS program have on students? On your school? On yourself?</li> <li>What other changes did the program seem to cause or support in students, adults, or schools?</li> <li>What are the strengths &amp; weaknesses of the program?</li> <li>What recommendations do you have for program improvement?</li> <li>Would it be better to keep assigning a single naturalist to a school for an entire year, or to have multiple naturalists visit during the year?</li> </ul>	√		√	√
I	<b>Other MNHC resources for educators</b>	<ul style="list-style-type: none"> <li>Have you tried other MNHC resources for educators?</li> <li>If so, how helpful have they been?</li> <li>If not, how interested are you in trying them?</li> </ul>	√			

Note. For each survey module, parallel survey forms were developed for each participant group, based on the initial broad survey questions listed here. Final survey questions are displayed in appendices to this report and discussed in the report body; the wording of some questions was slightly modified as needed to make them appropriate for specific participant groups.



## Teacher Perspectives

Teacher reports of their observations, ratings, comments and recommendations about the VNS program were collected using a modular survey that included blocks of questions on each of the topics listed above in Table 1. Their survey responses are detailed in this section. (Teacher interviews are still in process and will be added to a later version of this report.) A total of 43 teachers responded to the survey – 69 percent of the 62 teachers who participated in the program during the 2017-2018 school year and were invited to participate in the survey. Of these, 33 completed the entire survey; sample sizes for each question are included in the table notes for each set of questions.

Teachers were asked to report the length of their experiences as teachers as well as how many years they had been involved with the VNS program. The average number of years teaching was 15 ( $SD = 10$ ; the median years of teaching was 13) while the average number of years working with the VNS program was 5 ( $SD = 4$ ; median = 4).

### General Perspectives on the *Visiting Naturalist in the Schools* Program

Teachers were first asked to rate their level of agreement with a set of general, overall statements about the VNS program, using a six-point scale that ranged from “strongly disagree” to “strongly agree.” These statements, response options, and a summary of teacher ratings are displayed in Table 2. Highlights of these findings are listed below:

**Program Enjoyment.** More than 90 percent of teachers “strongly” agreed that they enjoyed participating the program and that their students greatly enjoy the outdoor VNS activities at their schools. More than 85 percent strongly agreed that their students greatly enjoy the in-class VNS activities and the day-long VNS field trips. Remaining teachers “moderately” agreed (or in one case, “slightly” agreed).

**Value of Program Components.** More than 80 percent of teachers “strongly” agreed that each of the major activity formats of the program were “especially valuable,” including the in-class activities, the outdoor activities at the school, and the field trips. More than 90 percent of teachers strongly agreed that the core focus of the program (observing and learning about nature) is an important addition to the school curriculum and that the visiting naturalists and volunteers provide important role models for students. Remaining teachers “moderately” agreed (or in one case, “slightly” agreed).

When asked whether observation and study of local natural history through the program provides students an opportunity for interdisciplinary learning of science, math, reading, writing, and art, 81 percent of teachers strongly agreed, and the remainder moderately agreed.

More than three quarters of teachers (77 percent) reported using the VNS student journal as an assessment or grading tool in their classrooms, with 58 percent “strongly” or “moderately” agreeing that they use the student journals in this way. Almost a quarter disagreed with this statement and reported not using the VNS student journals in their assessment of students.

**Overall Program Value.** All teachers “strongly” agreed that the naturalists they have worked with have been very knowledgeable about natural history and natural science topics and skills. More than 90 percent “strongly” agreed that the visiting naturalists were very skilled at effectively communicating and at managing student activities, the program is well organized and facilitated, the program is a valuable use of their time, and they would recommend the VNS program to other teachers, schools and communities. Remaining teachers “moderately” agreed with these statements.

**Table 2. Teacher Ratings of the VNS Program**

General reactions to the VNS program:							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
A1	I enjoy participating in the Visiting Naturalist in the Schools program.	-	-	-	-	5 %	95
A2	My students greatly enjoy the in-class VNS activities.	-	-	-	-	12	88
A3	My students greatly enjoy the outdoor VNS activities here at the school.	-	-	-	-	7	93
A4	My students greatly enjoy the day-long VNS field trips.	-	-	-	2	12	86
A5	For me as a teacher, the in-class VNS activities are especially valuable.	-	-	-	-	16	84
A6	For me as a teacher, the outdoor VNS activities here at the school are especially valuable.	-	-	-	2	16	81
A7	For me as a teacher, the day-long VNS field trips are especially valuable.	-	-	-	-	16	84
A8	Learning to be a "naturalist" – observing and learning about nature, natural resources, natural history, natural cycles – is very useful and important for students, a very good addition to our school curriculum.	-	-	-	-	5	95
A9	The visiting naturalists and program volunteers provide important role models for students as adults with interest, expertise and careers in natural science and natural history education.	-	-	-	-	7	93
A10	The observation and study of local natural history gives students a great opportunity for integrated learning of science, math, reading, writing, and art – engaging students in many core subjects at once.	-	-	-	-	19	81
A11	I use the VNS student journal as an assessment/grading tool in my classroom.	9	12	2	19	16	42
A12	The VNS program overall is well organized and facilitated.	-	-	-	-	7	93
A13	The individual visiting naturalists I have worked with have been very knowledgeable about natural history and natural science topics and skills.	-	-	-	-		100
A14	The individual visiting naturalists I have worked with have been very skilled at effectively communicating and at managing student activities.	-	-	-	-	9	91
A15	Participating in the VNS program has been a valuable use of my time.	-	-	-	-	5	95
A16	I would recommend the VNS program to other teachers.	-	-	-	-	2	98
A17	I would recommend the VNS program to other schools and communities in Montana.	-	-	-	-	2	98

Note. N=43. Each row contains the proportion (percentage) of teachers who gave each response to the question. Row percentages may not add to exactly 100% due to rounding.



## Student Engagement in the Natural World

Teachers were asked eight questions about the impact of the VNS program on student engagement in the natural world. Table 3 displays the pattern of their responses when asked to rate their agreement with seven statements about the program; Table 4 displays their free-response comments about this topic.

All teachers agreed that “most students come to school already interested in learning about animals, plants, weather, and other parts of nature,” with almost 80 percent “moderately” or “strongly” agreeing. This question addressed a key assumption of the program, that students have innate interest in nature that can be leveraged by program activities designed to amplify and extend this pre-existing interest.

All teachers “moderately” or “strongly” agreed that the VNS program builds on students’ existing curiosity about nature, helps extend their awareness and interests into new aspects of the natural world, and helps students learn to use scientific tools to explore and extend their engagement in nature. All teachers also “moderately” or “strongly” agreed that the program supports engagement in the natural world for students who already have a strong and positive history of experiences in nature and also those with limited or negative prior experiences. More than 75 percent “strongly” agreed with all these statements.

All teachers agreed that the program helps students appreciate the importance of thoughtful management, conservation, and stewardship of natural resources, with 27 percent “moderately” agreeing and 61 percent “strongly” agreeing.

**Table 3. Teacher Ratings of Impact on Student Engagement in the Natural World**

Perceived impact on <b>student engagement in the natural world:</b>							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
B1	Most students come to school already interested in learning about animals, plants, weather, and other parts of nature.	-	-	-	22 %	39	39
B2	The VNS program builds on students’ curiosity about the natural world by encouraging and supporting their interest in learning about the nature around them.	-	-	-	-	24	76
B3	The VNS program helps students extend their awareness and interests into new aspects of the natural world they may not have noticed or thought about.	-	-	-	-	20	80
B4	The VNS program helps students learn how to use tools to explore and extend their engagement in the natural world (e.g. journals, microscopes, field guides, binoculars, etc.)	-	-	-	-	12	88
B5	The VNS program helps students appreciate the importance of thoughtful management, conservation, and stewardship of natural resources.	-	-	-	12	27	61
B6	For students with a strong interest in nature, the VNS program offers role models and pathways that support their continued pursuit of these interests.	-	-	-	-	15	85
B7	For students with limited or negative experiences in nature, the VNS program offers gentle and inviting pathways into discovering and developing their interest in the natural world.	-	-	-	-	24	76

Note. N=41. Each row contains the proportion (percentage) of teachers who gave each response to the question. Row percentages may not add to exactly 100% due to rounding.

Teachers were asked to share thoughts about the extent to which the VNS program builds on student curiosity and enhances student engagement in the natural world. Their verbatim comments are listed in Table 4. All comments expressed positive views of the program; those that are clearly and directly related to program impact on student engagement in the natural world have been color coded for easy reference.

**Table 4. Teacher Comments: Program Impact on Student Engagement in the Natural World**

B8	Please share any other thoughts you have on the extent to which the VNS program builds on student curiosity and enhances student engagement in the natural world:
<ul style="list-style-type: none"> <li>▪ <i>I feel students are very inquisitive and this added program allows them to experience nature in a structured learning environment. Students are having fun while learning! It cannot get any better.</i></li> <li>▪ <i>The VNS program allows time for my students to go out in the natural world, time which is so valuable, and learn about and question all the things around them. This builds as the year progresses. I do not have a Monday that one or two do not come in and tell me what they observed over the weekend.</i></li> <li>▪ <i>The naturalist plans excellent lessons that structure the students in a way that is relevant and engaging.</i></li> <li>▪ <i>Our students live in rural areas and many already have a great appreciation for nature. Conservation and observation are important components of the VNS program and I think they help my students look at nature differently and with more respect.</i></li> <li>▪ <i>The program gave my students the opportunity to explore the natural world and feel like scientists and naturalists! They loved that feeling of ownership.</i></li> <li>▪ <i>The VNS program allows students to see another part of the school curriculum in a fun way that makes connections that we can't always make ourselves. Some students have questions that they didn't even know they had until they are exposed to some of the experiences in the classroom.</i></li> <li>▪ <i>Science is a naturally engaging subject area for most students. That goes up when they get to participate in the subject just like a practicing scientist. I appreciate that students are allowed to work with high quality materials and specimens. They are encouraged to think critically about what they are studying. Most of the lessons are set up in a way that students are allowed to work like a practicing scientist. I would love to see more avenues for students to pose their own questions, and further alignment with NGSS.</i></li> <li>▪ <i>Great to have positive role models of female scientists in the classroom.</i></li> <li>▪ <i>Most of the students in my class have limited exposure to the outside world, even though we live in a rural area. I think for them to learn about the outdoors prompted them to want to go outside more.</i></li> <li>▪ <i>The naturalist sightings is a very nice way to start each lesson.</i></li> <li>▪ <i>It is great to see students make connections they have gained from the VNS in other areas of our curriculum.</i></li> <li>▪ <i>The VNS program gives them opportunities to look closely at everyday things such as tree bark and leaves under a microscope. Suddenly things kids wouldn't think about become very interesting to them.</i></li> <li>▪ <i>Even though we are in a rural school, I have noticed students seem to have less hands-on knowledge about the natural world. They know a lot of trivia from watching programs. The Visiting Naturalist in the Classroom truly brings experiences TO the students, as well as taking them on amazing field trips. Even though the students at our school have access to a local wildlife refuge, they experience it in a whole new way.</i></li> <li>▪ <i>Many of our students have no knowledge of what surrounds us in Missoula. Their curiosity deepens when they learn about the nature that is all around us.</i></li> <li>▪ <i>The place-based education VNS provides is vital to our students; they are so much more engaged when they connect to what they are learning. It is really exciting for them to learn about places they go with their families and learn more about our native flora and fauna.</i></li> <li>▪ <i>Many students come into the program with little background knowledge and experiences. The classroom and field trip activities give them amazing and meaningful experiences with the natural world. The program ignites curiosity in all of my students.</i></li> <li>▪ <i>Awesome teacher, helpers, and curriculum!</i></li> <li>▪ <i>Our school is in a small, rural community, and most students are already pretty knowledgeable of the outdoors. However, my students are always able to build on that existing background knowledge. Because of this, they are always excited for VNS days; they excited to apply what they know, which then leads to a deeper learning of new ideas. The engagement is incredible.</i></li> <li>▪ <i>It's interesting to listen to students' share their observations, especially after the weekend. The visiting Naturalist gives students ideas of what they could look for when outside. I remind them each day as well. Students will share observations they made while out camping, off to the river, at the park, playing outside sports, driving down the valley, or in their own backyard. They get very in tune to nature as the year progresses.</i></li> </ul>	

## Student Engagement in the Sciences

Teachers were asked nine questions about the impact of the VNS program on student engagement in the sciences. Table 5 displays the pattern of their responses when asked to rate their agreement with eight statements about the program; Table 6 displays their free-response comments about this topic.

*(Usage note: throughout this report, “the sciences” are often referred to in plural form, to remind us that various scientific disciplines use very different methods in very different contexts, complexity that is too often obscured by science education approaches that seek to boil everything down to a generic, one-size-fits-all “scientific method.”)*

All teachers agreed that “The VNS program makes our school science curriculum more interesting and accessible for students,” with 98 percent “moderately” or “strongly” agreeing and 85 percent “strongly” agreeing.

All teachers “moderately” or “strongly” agreed that the VNS program is very helpful for developing and strengthening student interest and engagement in the natural sciences, and the in-class and outdoor VNS activities at schools and the VNS field trips increase student interest in science. Eighty percent or more “strongly” agreed with all these statements.

All teachers agreed that student interest in science is increased by their experiences and relationships with the visiting naturalists and program volunteers, with 10 percent “moderately” agreeing and 88 percent “strongly” agreeing.

All teachers agreed that through their VNS experiences, students become more aware of learning and career options involving the sciences, with 24 percent “moderately” agreeing and 61 percent “strongly” agreeing. All but one teacher (98 percent) agreed that many students become more interested in learning and careers in science as a result of their VNS experiences, with 22 percent “moderately” agreeing and 56 percent “strongly” agreeing.

**Table 5. Teacher Ratings of Impact on Student Engagement in the Sciences**

Perceived impact on <b>student engagement in the sciences</b> :							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
C1	The VNS program makes our school science curriculum more interesting and accessible for students.	-	-	-	2 %	12	85
C2	The VNS program is very helpful for developing and strengthening student interest and engagement in the natural sciences.	-	-	-	-	7	93
C3	The in-class VNS activities increase student interest in science.	-	-	-	-	15	85
C4	The outdoor VNS activities at schools increase student interest in science.	-	-	-	-	15	85
C5	The day-long VNS field trips increase student interest in science.	-	-	-	-	20	80
C6	Student interest in science is increased by their experiences and relationships with the visiting naturalists and program volunteers.	-	-	-	3	10	88
C7	Through their VNS experiences, students become more aware of learning and career options involving the sciences.	-	-	-	15	24	61
C8	Many students become more interested in learning and careers in science as a result of their VNS experiences.	-	2	-	20	22	56

Note. N=41, except 40 for questions C5 and C6. Each row contains the proportion (percentage) of teachers who gave each response to the question. Row percentages may not add to exactly 100% due to rounding.

Teachers were also asked to share thoughts about the extent to which the VNS program influences student engagement in learning about the sciences. Their verbatim comments are listed in Table 6. Most comments expressed positive views of the program; some addressed other specific topics such as career awareness or recommendations for additional program content. Those that are clearly and directly related to **program impact on student engagement in the sciences** have been color coded in Table 6 for easy reference.

**Table 6. Teacher Comments: Program Impact on Student Engagement in the Sciences**

C9	Please share any other thoughts you have on the extent to which the VNS program increases student engagement in learning about the sciences:
	<ul style="list-style-type: none"> <li>▪ <i>Please continue this valuable teaching tool for our schools. I look forward to each monthly thought-out teaching experience that is brought into my classroom. Students shout out and are excited that it is our Naturalist coming into teach them a worthwhile hands-on science lesson!</i></li> <li>▪ <i>The activities/investigations are short yet powerful examples of how real scientists think and act when doing real science.</i></li> <li>▪ <i>I wonder what kind of partnerships there are with the University? Bringing in practicing paleontologists, botanists, geologists? Not sure if it is the type of thing that the organization could do. Could make it even more powerful. Also wonder about bringing in some more STEM. All the avenues that the program could steer with just bio-mimicry as the core could be really cool.</i></li> <li>▪ <i>This program engaged our students and really captured their attention in detail for science. This program went deeper than our science program.</i></li> <li>▪ <i>I don't remember the naturalist specifically talking about careers. For 4th graders, I'm not sure who much specifics they need about careers. I personally believe the experience is the most important part.</i></li> <li>▪ <i>Just being outdoors and using the VNS skills builds on that inquisitive nature of humans, and showing how to enjoy the little things around us.</i></li> <li>▪ <i>The VNS program does a lot of hands-on activities which are very engaging to students.</i></li> <li>▪ <i>I'm not sure my students fully understand the career path aspects. Perhaps that can be covered in more depth?</i></li> <li>▪ <i>They get so excited when I tell them that the Naturalist is coming. Their questioning strategies improve as they use specific terminology coinciding with each lesson.</i></li> <li>▪ <i>Due to the VNS program being so hands-on the students really engage and immerse more into the content.</i></li> <li>▪ <i>All activities are meaningful and are aligned to the NGSS natural science standards. Students are engaged in all lessons and learn valuable skills and information.</i></li> <li>▪ <i>I think using the naturalists as a tool to help students explore jobs and career skills in science, making it applicable would help. 4th graders don't understand how many jobs there are that let you be a "scientist" so to help, give them examples.</i></li> <li>▪ <i>Students who struggle with the regular curriculum love this program. They are successful and very interested. I've watched how proud they become. The above-level students are also able to extend their learning by including more in-depth ideas in their journal and/or activities. The average student is also able to be successful and encouraged to be more complete in their activities verses just doing it to get done. I've seen students who don't usually provide their thoughts in science feel very comfortable. This program grants them confidence and it's wonderful to watch another teacher interact with my students and getting them focused and involved.</i></li> </ul>



## Student Learning in the Sciences

Teachers were asked eight questions about the impact of the VNS program on student learning in the sciences. Table 7 displays the pattern of their responses when asked to rate their agreement with seven statements about the program; Table 8 displays their free-response comments about this topic.

All teachers agreed that “The VNS program greatly enhances our school science curriculum,” with 95 percent “moderately” or “strongly” agreeing and 67 percent “strongly” agreeing.

All teachers “moderately” or “strongly” agreed that the VNS program is very helpful for strengthening and supporting student learning in the natural sciences, the VNS program helps students learn to use tools for scientific investigation, and students become more confident with science topics and activities through their VNS experiences. Seventy-eight percent or more “strongly” agreed with these statements.

All teachers agreed that students learn a lot of science content through their VNS experiences, with 15 percent “moderately” agreeing and 83 percent “strongly” agreeing (one teacher “slightly” agreed).

All teachers agreed that the VNS program gives students valuable practice in the skills and activities that scientists perform, with 10 percent “moderately” agreeing and 88 percent “strongly” agreeing (one teacher “slightly” agreed).

Ninety-seven percent of teachers “moderately” or “strongly” agreed that the VNS program helps students learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting (one teacher “slightly” disagreed).

**Table 7. Teacher Ratings of Impact on Student Learning in the Sciences**

Perceived impact on <b>student learning in the sciences</b> :							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
D1	The VNS program greatly enhances school science curriculum.	-	-	-	5 %	28	67
D2	The VNS program is very helpful for strengthening and supporting student learning in the natural sciences.	-	-	-	-	13	87
D3	Students learn a lot of science content through their VNS experiences – ideas and knowledge about how nature works.	-	-	-	3	15	83
D4	The VNS program helps students learn to use tools for scientific investigation (e.g. journals, microscopes, field guides, binoculars, etc.)	-	-	-	-	10	90
D5	VNS helps students learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	-	-	3	-	23	75
D6	VNS gives students valuable practice in the skills and activities that scientists perform.	-	-	-	3	10	88
D7	Students become more confident with science topics and activities through their VNS experiences.	-	-	-	-	23	78

Note. N=40, except 39 for questions D1 and D2. Each row contains the proportion (percentage) of teachers who gave each response to the question. Row percentages may not add to exactly 100% due to rounding.

In addition to student engagement in science learning, teachers were asked to share thoughts about the extent to which the VNS program increases actual student learning in the sciences. Their verbatim comments are listed in Table 8. Most comments expressed positive views of the program; some addressed other specific topics such as interdisciplinary education or recommendations for additional program content. Those that are clearly and directly related to program impact on student learning in the sciences have been color coded in Table 8 for easy reference.

**Table 8. Teacher Comments: Program Impact on Student Learning in the Sciences**

D8	Please share any other thoughts you have on the extent to which the VNS program increases student learning in the sciences:
<ul style="list-style-type: none"> <li>▪ <i>I appreciate the use of journals and this helps me hold students accountable. It helps them to reflect as well and is a way for them to feel confident and show what they learned.</i></li> <li>▪ <i>The way the program involves the students in the learning process is wonderful. They love running the experiments. The time is so valuable because it is so organized and runs so smoothly.</i></li> <li>▪ <i>While the consistency of monthly instruction for students is endlessly important, the naturalists could benefit from slightly longer sessions that allow them to guide the students in active inquiry of science topics. I totally understand the time crunch in schools, so even guiding the classroom teachers themselves to extend the lessons in a way that allows for deeper and more thoughtful pondering of questions can increase the students ability to rely and trust their own observations and thinking about our world.</i></li> <li>▪ <i>The VNS program really aligns with the Common Core Standards which is great for the kids and teachers.</i></li> <li>▪ <i>They start making connections with what they did with the VNS volunteers/Naturalist and the other things we do in science.</i></li> <li>▪ <i>I love the blending of writing, science and art with the VNS program. I would love to see more reading or info text usage in some of the visits. Often, the first time a student is introduced to a field guide is during one of the all day field trips. I know that the lessons are packed full and there may be material limitation, but using actual field guides during class lessons may be helpful. Also, with the rollout of NGSS, teachers are finding less (even no) emphasis on the scientific method. It would be great if the lessons would mirror this, when possible.</i></li> <li>▪ <i>Consistently talking about form and function with every lesson definitely increases student learning in science. Every lesson can be brought back to these integrated parts.</i></li> <li>▪ <i>I was able to get my students outdoors quite a bit at the end of the year. I feel the students were more ready to engage in outdoor exploration in general because the of the foundation the naturalists program provided.</i></li> <li>▪ <i>Many of our students don't make it out of their own backyards. Being so hands-on is a huge benefit.</i></li> <li>▪ <i>We do not have a science curriculum, just science standards, so the VNS program is a great way to cover some of the standards. I am able to reference the activities in my teaching and extend the skills they learn.</i></li> <li>▪ <i>The various activities provide skills students can use in our regular science program.</i></li> </ul>	

## Teacher Professional Development in the Sciences

Teachers were asked seven questions about the impact of the VNS program on their own learning in the sciences. Table 9 displays the pattern of their responses when asked to rate their agreement with six statements about the program; Table 10 displays their free-response comments about this topic.

Ninety-five percent of teachers “moderately” or “strongly” agreed that the VNS program enhances their connection with their school science curriculum, with 75 percent “strongly” agreeing. Ninety-six percent of teachers “moderately” or “strongly” agreed that the VNS program is “very helpful for strengthening and supporting my own learning in the sciences,” with 83 percent “strongly” agreeing.

Eighty-eight percent of teachers “moderately” or “strongly” agreed that they have “learned a lot of science content through working with the VNS program,” with 73 percent “strongly” agreeing. The remaining teachers “slightly” agreed.

Eighty-eight percent of teachers also “moderately” or “strongly” agreed that “VNS has helped me learn a lot about how different kinds of scientists do their work,” with 63 percent “strongly” agreeing. All but one of the remaining teachers “slightly” agreed, while one “slightly” disagreed. Ninety-one percent of teachers “moderately” or “strongly” agreed that “VNS has given me valuable practice in the skills and activities that scientists perform,” with 73 percent “strongly” agreeing. The remaining teachers “slightly” agreed.

Eighty-eight percent of teachers “moderately” or “strongly” agreed that “I have become more confident with science topics and activities through my VNS experiences,” with 75 percent “strongly” agreeing. The remaining teachers “slightly” agreed.

**Table 9. Teacher Ratings of Impact on Educator Learning in the Sciences**

Perceived impact on <b>adult learning in the sciences</b> :							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
E1	In my experience as a teacher or volunteer, the VNS program enhances my own connection with our school science curriculum.	-	-	3 %	3	20	75
E2	The VNS program is very helpful for strengthening and supporting my own learning in the natural sciences.	-	-	-	5	13	83
E3	I have learned a lot of science content through working with the VNS program as a teacher or volunteer – ideas and knowledge about how nature works.	-	-	-	13	15	73
E4	VNS has helped me learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	-	-	3	10	25	63
E5	VNS has given me valuable practice in the skills and activities that scientists perform.	-	-	-	10	18	73
E6	I have become more confident with science topics and activities through my VNS experiences.	-	-	-	13	13	75

Note. N=40. Each row contains the proportion (percentage) of teachers who gave each response to the question. Row percentages may not add to exactly 100% due to rounding.

Teachers were invited to share thoughts about the extent to which the VNS program increases their own learning in the sciences. Their verbatim comments are listed in Table 10. Most comments expressed positive views of the program; some discussed other topics such as how the VNS experience helps them as teachers. Those that are clearly and directly related to **program impact on educator learning in the sciences** have been color coded in Table 10 for easy reference.

**Table 10. Teacher Comments: Program Impact on Educator Learning in the Sciences**

E7	Please share any other thoughts you have on the extent to which the VNS program increases your own learning about the sciences:
<ul style="list-style-type: none"> <li>▪ <i>Thank you for this valuable resource. I have learned so much. I am not a science oriented teacher and wow this program has opened my eyes to a great way of teaching students. I love the teaching format!</i></li> <li>▪ <i>I only moderately agree since I'm already confident within the science concepts asked about.</i></li> <li>▪ <i>The quality of instruction and content is wonderful. The visiting naturalists are flexible and patient with the kind of instruction our population of students need.</i></li> <li>▪ <i>From working with our Naturalist I have definitely become more comfortable with science and actually want to continue to learn more with my students.</i></li> <li>▪ <i>I am not sure how to respond when you say 'different kinds of scientists.' Do you mean a ornithologist vs. botanist vs. naturalist? The skills were pretty generalized, appropriately so for 4th grade.</i></li> <li>▪ <i>It has afforded me opportunities to connect with events that I have had, share those events with the students, and model to them the observations of our natural world and just how freaking cool it is.</i></li> <li>▪ <i>I find this program helps me find focus in my own science lessons. It has helped me simplify what I am teaching and lends to a better experience rather trying to cram it all in to one lesson.</i></li> <li>▪ <i>I have been very impressed with the opportunities VNS offers classroom teachers. My content knowledge has been greatly increased by both my classroom experience with VNS, as well as additional workshops I have attended.</i></li> <li>▪ <i>I learn something new each time. I have enjoyed this program alongside my students.</i></li> <li>▪ <i>4 years ago when I was first introduced to the naturalist program I had no clue what a science journal was or how to be a naturalist. Now I am confident in helping my students journal and enjoy doing my own journal outside of VNS.</i></li> <li>▪ <i>I am always able to reference back to our VNS experiences when teaching our biology curriculum.</i></li> <li>▪ <i>Some of the lessons don't pertain to our curriculum. Hopefully this next year through aligning our science with NGSS it will compliment it. I remember learning about birds, beaks, feet, etc. in earlier years of teaching so it is interesting to see how to apply the lessons, journaling, and activities in a consistent engaging way.</i></li> </ul>	

## School Capacity to Provide Engaging Science Education

Teachers were asked eight questions about the impact of the VNS program on the capacity of their school to provide engaging science education for students. Table 11 displays the pattern of their responses when asked to rate their agreement with seven statements about the program; Table 12 displays their free-response comments about this topic.

All teachers “moderately” or “strongly” agreed that the VNS program enables their school to provide engaging science activities to students beyond what they would otherwise be able to provide, and that the program enables their students to go deeper than they would otherwise go into science topics in the school curriculum. More than 80 percent of teachers “strongly” agreed. Ninety-seven percent of teachers “moderately” or “strongly” agreed that the VNS program “enhances our school’s capacity to address Montana state standards in science education,” with 74 percent “strongly” agreeing.

Ninety-seven percent of teachers “moderately” or “strongly” agreed that the VNS program “enhances our science curriculum with additional content beyond the topics we would otherwise be able to cover,” with 89 percent “strongly” agreeing. Ninety-seven percent of teachers “moderately” or “strongly” agreed that because of the VNS program “our students have access to a greater number and variety of science learning activities,” with 87 percent “strongly” agreeing.

All teachers “moderately” or “strongly” agreed that due to the VNS program, “our students have more access to real-life experiences with science-oriented role models;” 92 percent “strongly” agreed.

Eighty-eight percent of teachers “moderately” or “strongly” agreed that they have “learned a lot of science content through working with the VNS program,” with 73 percent “strongly” agreeing. The remaining teachers “slightly” agreed. Ninety-four percent of teachers “moderately” or “strongly” agreed that the VNS program “has enabled me personally, as a teacher, to do a better job helping kids learn about the sciences,” with 74 percent “strongly” agreeing.

**Table 11. Teacher Ratings of Impact on School Capacity to Provide Engaging Science Education**

Perceived impact on <b>school capacity to provide engaging science education</b> :							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
F1	The VNS program enables our school to provide engaging science activities to students beyond what we would otherwise be able to provide.	-	-	-	-	18 %	82
F2	The VNS program enables our students to go deeper than we would otherwise go into science topics in our curriculum.	-	-	-	-	13	87
F3	The VNS program enhances our science curriculum with additional content beyond the topics we would otherwise be able to cover.	-	-	-	3	8	89
F4	Our students have access to a greater number and variety of science learning activities because of the VNS program.	-	-	-	3	11	87
F5	Our students have more access to real-life experiences with science-oriented role models due to the VNS program.	-	-	-	-	8	92
F6	The VNS program enhances our school’s capacity to address Montana state standards in science education.	-	-	-	3	24	74
F7	The VNS program has enabled me personally, as a teacher, to do a better job helping kids learn about the sciences.	-	-	3	3	8	87

Note. N=38. Each row contains the proportion (percentage) of teachers who gave each response to the question. Row percentages may not add to exactly 100% due to rounding.

Teachers were also invited to share their thoughts about the extent to which the VNS program increases the capacity of teachers and schools to provide engaging science education. Their verbatim comments are listed in Table 12. All comments expressed positive views of the program; some discussed other topics related to prior questions (e.g. student engagement in the VNS activities, interdisciplinary connections). Those that are clearly and directly related to **program impact on school capacity to provide engaging science education** have been color coded in Table 12 for easy reference.

**Table 12. Teacher Comments: Program Impact on School Capacity to Provide Engaging Science Education**

F8	Please share any other thoughts you have on the how the VNS program has affected your capacity or your school's capacity to provide engaging science education for students:
<ul style="list-style-type: none"> <li>▪ <i>I enjoyed listening to my students bring back memories of prior class experiences and, for example, specifically recalling how the smaller cans held more heat than the larger cans when we were comparing it to animals. They loved the hands-on experiences. I also like how it reinforces how I tell students we need to learn, record, think, then do the experiments--hands-on, fun stuff. Then reflect. It makes them understand the process.</i></li> <li>▪ <i>The focus of naturalist's lessons completely engage our students.</i></li> <li>▪ <i>Everything helps. Many of the activities are good enhancement for our curriculum.</i></li> <li>▪ <i>Many teachers I know use the VNS program to set them up to focus on the physical science portion of their curriculum. It is less about going deeper into life sciences, and more about just freeing up (especially fourth grade test-laden teachers) so that they can cover their very physical science heavy curriculum.</i></li> <li>▪ <i>The hands on experiments are by far the best. The most engaging, something I would have difficulty prepping for and carrying out, and the kids favorite. [Our school] has adopted the Next Generation Science Standards, and they are slightly different than the Montana State science standards. FYI.</i></li> <li>▪ <i>Response to data ties well into math and language arts curriculum.</i></li> <li>▪ <i>It's impossible for us teachers to cover as in-depth as you do. We do not have the knowledge or resources that you do.</i></li> <li>▪ <i>VNS is able to offer positive opportunities and experiences to my students that I would be unable to provide and most of my students would be unlikely to experience on their own.</i></li> <li>▪ <i>The activities are very engaging and without the program we would not have the funds, materials, or time to provide similar experiences to our students.</i></li> <li>▪ <i>Our budget is tight. For a very fair cost, we are able to provide our students with experiences we would not otherwise be able to provide.</i></li> <li>▪ <i>Because each VNS activity has hands-on activities, it encourages me to strive for the same. Science should be fun, engaging, and provide students with models to manipulate. It takes a great deal of time to do this every single day. We can be guaranteed students will get this with VNS.</i></li> <li>▪ <i>I find this program helps me find focus in my own science lessons. It has helped me simplify what I am teaching and lends to a better experience rather trying to cram it all in to one lesson. [Note: this comment from Table 10 is repeated here since it is relevant to the topic of school capacity to provide engaging science education.]</i></li> </ul>	



## School Capacity to Provide Interdisciplinary Education

In addition to the sections above about science education, teachers were asked seven questions about the impact of the VNS program on the capacity of their school to provide interdisciplinary education for students by integrating reading, mathematics, writing, technology skills, or visual arts skills into project-based interdisciplinary activities. Table 13 displays the pattern of their responses when asked to rate their agreement with seven statements about the program; Table 14 displays their free-response comments about this topic.

Eighty-nine percent of teachers “moderately” or “strongly” agreed that the VNS program “offers students well-rounded, project-based, interdisciplinary activities in which they learn and apply many different academic subjects at once through real-life, authentic experiences.”

Among specific academic disciplines, perceived program impact on visual art and writing skills were rated highest, with 79 to 81 percent of teachers “moderately” or “strongly” agreeing that the VNS program enhances student opportunities to learn and practice skills in these topics.

Student opportunities to learn and practice skills in mathematics and reading were the next highest rated program benefits in this section of the survey, with 61 percent of teachers “moderately” or “strongly” agreeing that the VNS program enhances student opportunities in these topics.

More than half of teachers (53 percent) “moderately” or “strongly” agreeing that the VNS program enhances student opportunities to learn and practice using technology.

**Table 13. Teacher Ratings of Impact on School Capacity to Provide Interdisciplinary Education**

Perceived impact on <b>school capacity to provide engaging education in other topics:</b>							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
G1	In addition to science, the VNS program helps our school provide more engaging ways for students to learn and practice <b>mathematics</b> .	-	-	8 %	32	24	37
G2	The VNS program also helps our school to provide engaging ways for students to learn and practice <b>writing</b> .	-	-	3	18	21	58
G3	VNS enables our school to offer new, engaging ways for students to learn and practice using <b>technology</b> .	-	8	21	18	21	32
G4	VNS gives our school additional engaging ways for students to learn and practice <b>reading</b> .	-	3	8	29	24	37
G5	VNS gives our students additional engaging opportunities to learn and practice <b>visual art skills</b> .	-	3	3	13	18	63
G6	The VNS program offers students well-rounded, project-based, interdisciplinary activities in which they learn and apply many different academic subjects at once through real-life, authentic experiences.	3	-	-	8	21	68

Note. N=38. Each row contains the proportion (percentage) of teachers who gave each response to the question. Row percentages may not add to exactly 100% due to rounding.

Teachers were also invited to share their thoughts about the extent to which the VNS program has affected the capacity of schools to provide engaging interdisciplinary or transdisciplinary education. Their verbatim comments are listed in Table 14; note that this topic was spontaneously raised by some teachers in response to earlier questions. Most comments expressed positive views of the program; one highlighted the difficulty of doing this at the fourth grade level. Those that are clearly and directly related to program impact on school capacity to provide interdisciplinary education have been color coded in Table 14 for easy reference.

**Table 14. Teacher Comments: Program Impact on School Capacity to Provide Interdisciplinary Education**

G7	Please share any other thoughts you have on the how the VNS program has affected your school's capacity to provide engaging interdisciplinary or transdisciplinary education for students:
	<ul style="list-style-type: none"> <li>▪ <i>I think I covered it in the prior sharing. This is the best program for students. It covers all aspects of learning.</i></li> <li>▪ <i>We leave so much behind in our district right now because it isn't part of the test. This program is so wonderful in engaging all the areas of the child development.</i></li> <li>▪ <i>The fall field trip engages the students to use many disciplines and skills when the students are asked to be the expert on a species and teach that new learning to other students.</i></li> <li>▪ <i>Not a whole lot of reading opportunities. Math is a tough one, too ... as most VNS teachers do not know what that grade is even responsible for covering or where they are in their scope/sequence. Teaching graphing may be a necessary fourth grade math standard, but if they have not been taught the skill, it falls on the VNS teacher and that can feel frustrating for them. I would highly encourage Nancy Seiler, or artists of similar skill sets to work with the VNS program or teachers. Even a professional development course for participating VNS schools could be helpful.</i></li> <li>▪ <i>The practical application of measurement is the best application, along with the artistic side.</i></li> <li>▪ <i>We will use the internet to explore, expand, on topics brought in by the VNS.</i></li> <li>▪ <i>Each lesson involves measurement, observation, and journaling modeling real-world applications.</i></li> <li>▪ <i>The connection between art, writing and science is a real strength of the VNS and strengthens my students' skills to observe.</i></li> <li>▪ <i>Interdisciplinary teaching is a method, or set of methods, used to teach a unit across different curricular disciplines. An example is how we bring in Language Arts, Science and Technology to form an interdisciplinary unit on Ecosystems (animal adaptations). Students learn from the VNS about animal adaptations and we apply that to extend their learning.</i></li> </ul>

## Overall Comments on Program Impact

Teachers were also asked a series of open-ended, general questions about the overall impact of the VNS program. First, their verbatim comments about overall program impact on students are listed in Table 15. All comments expressed positive views of the impact on students; some address specific program goals that were the focus of earlier questions. Aside from generalized positive comments, themes included:

- Student engagement in nature and science, increased appreciation for the natural world
- Increased knowledge, skills, and experience in science, exploration, observation and inquiry
- Opportunities for all students to participate and succeed

**Table 15. Teacher Comments: Overall Program Impact on Students**

H1	How would you describe the impact of the VNS program on students?
	<ul style="list-style-type: none"> <li>▪ <i>Each and every student can participate, no matter what their level.</i></li> <li>▪ <i>Positively, my class is always excited to have our Naturalist visit our room!</i></li> <li>▪ <i>Affects child and family.</i></li> <li>▪ <i>They look forward to the visits, instruction, and hands-on activities.</i></li> <li>▪ <i>Students are able to notice more finite pieces of nature after participating in the VNS program.</i></li> <li>▪ <i>My students enjoyed every activity. They learned good observational skills.</i></li> <li>▪ <i>Great! Students love the activities and the field trips.</i></li> <li>▪ <i>PROFOUND.</i></li> <li>▪ <i>The students love when the Naturalist comes to visit. They are engaged while they are here.</i></li> <li>▪ <i>Very positive.</i></li> <li>▪ <i>It allows them to begin appreciating the natural world.</i></li> <li>▪ <i>It is a positive impact on students.</i></li> <li>▪ <i>Powerful.</i></li> <li>▪ <i>Students were excited for the naturalist to come! They also had access to materials (scientific instruments, tools, models) that our classroom does not own.</i></li> <li>▪ <i>The experiments are the best - the skulls, the use of tools, the feathers and more - they engage students natural curiosity and allow them interact beyond just always listening or reading.</i></li> <li>▪ <i>Excellent.</i></li> <li>▪ <i>Positive.</i></li> <li>▪ <i>Students look forward to the VNS naturalist each month and the hour flies!</i></li> <li>▪ <i>This has been a very positive experience. The students are always engaged and their enthusiasm transfers to other parts of our science program. Furthermore, I have been able to remind students how to interact with nature in a positive manner.</i></li> <li>▪ <i>They enjoy the hands-on opportunities.</i></li> <li>▪ <i>Exciting and engaging.</i></li> <li>▪ <i>Positive.</i></li> <li>▪ <i>Positive and engaging.</i></li> <li>▪ <i>Very positive, students are able to engage in activities they would otherwise be unable to experience. They deepen their understanding of their "place". Some of my "struggling " students (in the traditional academic sense) are very knowledgeable and they shine with our naturalist program. This experience boosts their confidence and lets them take on a different role in the classroom.</i></li> <li>▪ <i>The impact on students is incredible. The majority of the population at my school would not have these experiences without the program.</i></li> <li>▪ <i>Mostly positive.</i></li> <li>▪ <i>Students love the knowledge our naturalist brings! It offers a new element of understanding for them.</i></li> <li>▪ <i>For a very fair cost, we are able to provide experiences we would not otherwise be able to provide.</i></li> <li>▪ <i>All students are able to be successful no matter their level.</i></li> </ul>

Teacher comments on the VNS program impact on schools are listed in Table 16. All comments lauded the program as having positive impacts on the school (except one teacher who responded “I’m not sure”). Several teachers noted that the program’s reputation precedes it – students in earlier grades look forward to reaching the grade level in which they get to participate in the program.

**Table 16. Teacher Comments: Overall Program Impact on Schools**

H2	How would you describe the impact of the VNS program on your school?
	<ul style="list-style-type: none"> <li>▪ <i>Students cannot wait to get to 5th grade to get involved!</i></li> <li>▪ <i>I'm not sure.</i></li> <li>▪ <i>It is what all lower grade students look forward to.</i></li> <li>▪ <i>The instructors are very pleasant and helpful to support our staff with science.</i></li> <li>▪ <i>The VNS program helps our 5th grade students connect to nature in a powerful way, setting an example for our younger grades.</i></li> <li>▪ <i>Great.</i></li> <li>▪ <i>Adds excitement to 4th grade.</i></li> <li>▪ <i>Amazing.</i></li> <li>▪ <i>The 4th graders have been very successful with the program.</i></li> <li>▪ <i>Positive.</i></li> <li>▪ <i>It frees us up to teach more physical and earth science.</i></li> <li>▪ <i>Positive.</i></li> <li>▪ <i>Critical.</i></li> <li>▪ <i>Same as above. 4th grade feels lucky to have this feature in our year.</i></li> <li>▪ <i>Excellent.</i></li> <li>▪ <i>Positive.</i></li> <li>▪ <i>Positive!</i></li> <li>▪ <i>The impact has been positive. I believe the students leave with a better understanding of practical science applications, use of equipment, and understanding of their local environment.</i></li> <li>▪ <i>They look forward to the arrival of the naturalist.</i></li> <li>▪ <i>Gives us more of a connection with what's available in our town.</i></li> <li>▪ <i>Rewarding.</i></li> <li>▪ <i>It provides another way of offering our students instruction.</i></li> <li>▪ <i>Very positive, third graders come up and talk about "getting to do the naturalist" program next year. There are few things in school that are universally positive experiences for all our student populations, however I think VNS comes as close as anything to fulfilling this!</i></li> <li>▪ <i>The fourth grade LOVES the program and it enriches our learning!</i></li> <li>▪ <i>Mostly positive.</i></li> <li>▪ <i>We are already an outdoor oriented school so to offer more programs to be able to do that is amazing.</i></li> <li>▪ <i>Very impactful. It correlates perfectly with the standards.</i></li> <li>▪ <i>The news of VNS in 5th grade has been started in 2nd grade with our buddies. They are excited to hear what 5th graders do and look forward to science.</i></li> </ul>

Teacher comments on the VNS program impact on teachers are listed in Table 17. All comments about the program were positive. In addition to general positive remarks, teachers noted impacts on their own science content knowledge and on their ability to teach science (i.e., their pedagogical content knowledge).

**Table 17. Teacher Comments: Overall Program Impact on Teachers**

H3	How would you describe the impact of the VNS program on yourself as an educator?
	<ul style="list-style-type: none"> <li>▪ <i>I have learned so much! This program is a great teaching tool on how to present science in a creative and involved way.</i></li> <li>▪ <i>What a great team I have with [my VNS naturalist]. It gives me a great background.</i></li> <li>▪ <i>As an teacher, I gain lots of tips on classroom science instruction.</i></li> <li>▪ <i>I love the VNS program! I feel like I learned more powerful ways to ask my students questions about nature, and I learned a lot during VNS lessons too.</i></li> <li>▪ <i>Great.</i></li> <li>▪ <i>It's good for me to be an observer in my class. It gives me a different perspective into my classroom and students.</i></li> <li>▪ <i>Hands down the best thing for my 4th graders.</i></li> <li>▪ <i>I feel more confident in teaching science and wanting to explore with my students.</i></li> <li>▪ <i>It has taught me new ideas and also has given me the chance to supplement my students' learning.</i></li> <li>▪ <i>More confidence in teaching life science.</i></li> <li>▪ <i>Helpful.</i></li> <li>▪ <i>Refreshing.</i></li> <li>▪ <i>Any science, always continues to spark my own excitement about science!</i></li> <li>▪ <i>I naturally enjoy science and feel that my background in it is mostly solid. I appreciate watching another teacher teach, as there are always things to pick up on.</i></li> <li>▪ <i>Excellent.</i></li> <li>▪ <i>Positive.</i></li> <li>▪ <i>Make more connections to what they have learned to our curriculum.</i></li> <li>▪ <i>I would say this program has consistently been one of the best parts of my year. I can participate with the class, which is important for them to see. It gives the students access to materials that may be in trunks, but having a naturalist come and guide students gives me a chance to build relationships with my class that can be a challenge when teaching and being the disciplinarian.</i></li> <li>▪ <i>I learned about birds.</i></li> <li>▪ <i>It has taught me a lot about nature! I've become a better science teacher because of VNS.</i></li> <li>▪ <i>Insightful.</i></li> <li>▪ <i>I have learned a great deal and am able to refer to that information when it relates to a topic in our science curriculum.</i></li> <li>▪ <i>My understanding of our local flora and fauna has greatly increased. My science content knowledge is stronger. I love that my students get to learn from other teachers and see me learning alongside them.</i></li> <li>▪ <i>I have loved participating and learning alongside my students.</i></li> <li>▪ <i>Mostly positive.</i></li> <li>▪ <i>Through the VNS and supplemental classes MNHC offers I have become a better outdoor educator, not afraid to think outside the box and offer my students a new view on science in general.</i></li> <li>▪ <i>It has allowed me to provide scientific learning experiences that I would not have been comfortable providing on my own.</i></li> <li>▪ <i>It has shown me how to be consistent and use hands-on materials to engage students.</i></li> </ul>

Teacher comments on unexpected effects of the VNS program are listed in Table 18. Many teachers expressed surprise at the level of engagement of students in the program's focus on nature and scientific observation and investigation. Some reported observing individual students who became more actively involved in the VNS lessons than they were during typical school activities. Other individual comments listed in Table 18 are also noteworthy.

**Table 18. Teacher Comments: Unexpected Program Effects**

H4	Have you observed any surprising or unexpected effects of the VNS program?
	<ul style="list-style-type: none"> <li>My presenter is fabulous. She handles students in a professional and caring way. We work together to make the learning experience tailored to each student.</li> <li>Children aware of their local ecosystem.</li> <li>It was surprising how much the students enjoyed teaching each other.</li> <li>My students are more willing to thoughtfully reflect after using their naturalist journals.</li> <li>Science is one of my students' favorite subjects.</li> <li>My students really enjoy science and have become very respectful of nature.</li> <li>How interested and engaged my students are the entire time the VNS program/teacher is presenting.</li> <li>The level of high engagement.</li> <li>Several students who are not usually high achievers have really shined as part of this program.</li> <li>Kids can find anything outside worth observing. When they learn how to look, being outside can be a completely different experience.</li> <li>Quality lesson after quality lesson.</li> <li>Students who may not otherwise be interested in science getting excited about it!</li> <li>Yes, I have found that I've extended the skills into my own outdoor activities. We sketch, label, observe and follow the naturalist skills in other areas of our curriculum. (For example, we study the state of Montana in 4th grade curriculum, and that includes the plants and animals.)</li> <li>Yes, the connections kids make to nature!!!!</li> <li>No.</li> <li>I find myself learning something new each year even though I have done the program for years.</li> <li>They are more engaged in discussions about science.</li> <li>No.</li> <li>Always fun to see kids in a different setting learning and questioning.</li> <li>I have noticed students who normally sit back become more engaged.</li> <li>Increased confidence in observational skills, former students who come back and ask me to tell our naturalist about something they found or saw or experienced.</li> <li>I have made a new friend!</li> <li>Not really.</li> <li>Na.</li> <li>Every year, my students are always engaged, excited, and eager to learn. I never have to worry about off-task behavior.</li> <li>I am always in awe at how excited students look forward to the monthly visit. They get to know the presenter and feel very comfortable participating because she always engages all students no matter their level of learning.</li> </ul>



Teacher comments on strengths of the VNS program are listed in Table 19. Themes in their view of program strengths included:

- Hands-on activities (10 comments)
- Field trips and other outdoor activities (8 comments)
- Consistency over time of well-organized lesson and activity formats (5 comments)
- Engaging science activities (5 comments)
- Journals (4 comments)
- Student appreciation and knowledge of nature (4 comments)
- The program naturalists (3 comments)

**Table 19. Teacher Comments: Program Strengths**

H5	What are the best, most important or most effective parts of the VNS program?
	<ul style="list-style-type: none"> <li>▪ <i>I like the consistency of using the journal, lesson, hands-on activities, then reflection. Students and I know what is required.</i></li> <li>▪ <i>Outdoors.</i></li> <li>▪ <i>I love how the students use the journals each time, to extend thinking, and include graphing.</i></li> <li>▪ <i>I love the day-long field trips. I think students are able to feel like scientists. I also love that students learn more about what it means to be a scientist... writers, artists, observers, etc.</i></li> <li>▪ <i>Hands-on activities and observational skills.</i></li> <li>▪ <i>Students are more aware of needs in nature and the effect humans have. They are better journal writers.</i></li> <li>▪ <i>The presenter/teacher!</i></li> <li>▪ <i>The relationship that has been built between my Naturalist and myself. We both want "our" students to enjoy her time with us while learning about nature.</i></li> <li>▪ <i>The hands-on activities.</i></li> <li>▪ <i>That science can be done by anyone.</i></li> <li>▪ <i>The field trips and hands-on experiments.</i></li> <li>▪ <i>Monthly visits with science experiments and field trips.</i></li> <li>▪ <i>Opportunities to learn observation skills. Great field trips!</i></li> <li>▪ <i>It is the hands-on experiments first, and then the field trips. The field trips are aptly timed to put a framework around our experiences, and spending extended time outdoors is an important part of being a naturalist.</i></li> <li>▪ <i>VNS is very organized, well planned, equipped, and offers another voice to the students' resume.</i></li> <li>▪ <i>Hands-on activities.</i></li> <li>▪ <i>All of it.</i></li> <li>▪ <i>I think giving students a chance to be in and care about their natural world is one of the most important things adults can do in order to utilize, conserve, and protect this beautiful place.</i></li> <li>▪ <i>The hands-on activities.</i></li> <li>▪ <i>The knowledge the children gain about nature and their surroundings.</i></li> <li>▪ <i>The Naturalists themselves.</i></li> <li>▪ <i>The program helps the students become curious, inquisitive and be more observant of their surroundings.</i></li> <li>▪ <i>Hands-on experiences, expert naturalists, field trips, opportunities for my students to engage with other teachers and learn about their home.</i></li> <li>▪ <i>My students getting to learn through engaging and meaningful lessons. My students getting excited about science.</i></li> <li>▪ <i>The hands-on activities (especially the skulls) and keeping journals.</i></li> <li>▪ <i>The consistency of the program! How organized and knowledgeable the whole staff is.</i></li> <li>▪ <i>The hands-on experiences with specimens, skulls, and tools, as well as simulations of real-life situations (bird beaks, "animals")</i></li> <li>▪ <i>The lessons are consistent. Students know once they learn about the topic they will journal, do hands-on activities, and then bring it full circle to discuss and reflect on what they learned.</i></li> </ul>

Teacher comments on weaknesses of the VNS program are listed in Table 20. Most comments reflected the opinion that there were no weak aspects of the program, but several teachers suggested the program lessons could benefit from **more time** or continued updates to maintain connections to the newly adopted Montana **science standards**, and there were other **individual suggestions**.

**Table 20. Teacher Comments: Program Weaknesses**

H6	What are the least important or least effective parts of the VNS program?
	<ul style="list-style-type: none"> <li>▪ <i>I am unaware of any ineffective parts of the VNS program. As an educator I am very pleased.</i></li> <li>▪ <i>It's hard to think of any ineffective parts.</i></li> <li>▪ <i>None, everything is wonderful.</i></li> <li>▪ <i>Some of the writing. The kids just do it to be done with it.</i></li> <li>▪ <i>I think there could be more natural alignments to NGSS or specific grade level offerings.</i></li> <li>▪ <i>Lecture portions.</i></li> <li>▪ <i>Not really.</i></li> <li>▪ <i>Could be more time, concepts.</i></li> <li>▪ <i>Can't think of one.</i></li> <li>▪ <i>Too short of time, more connections to NGSS.</i></li> <li>▪ <i>I can't really think of anything that seems unimportant.</i></li> <li>▪ <i>None!</i></li> <li>▪ <i>NA.</i></li> <li>▪ <i>None at this time.</i></li> <li>▪ <i>Time! Sometimes we run out of time to fully discuss and synthesize a lesson or experiment.</i></li> <li>▪ <i>The solo hike.</i></li> <li>▪ <i>I don't believe there are any.</i></li> <li>▪ <i>I feel the program has so many positives. I cannot think of any least effective parts.</i></li> </ul>

Teachers were asked for recommendations for program improvement; their verbatim comments are listed in Table 21. Most teachers offered commendations for the program as it stands rather than suggestions for changes. Themes in recommendations included more inquiry-focused activities, more time for the program, particular field trip locations, and more connection to science standards.

**Table 21. Teacher Comments: General Program Recommendations**

H7	What changes would you recommend to improve the VNS program?
	<ul style="list-style-type: none"> <li>▪ Absolutely nothing at this point!</li> <li>▪ As I wrote earlier, including inquiry more often to get students thinking more deeply.</li> <li>▪ None.</li> <li>▪ Nothing it is PERFECT.</li> <li>▪ Nothing.</li> <li>▪ More phenomena-based teaching and questioning from the students.</li> <li>▪ Nothing.</li> <li>▪ Keep the experiments.</li> <li>▪ Just a thought - this year we went to Silvers Park. I thought it was a good location - especially with the pond station. Would it work to have a field trip there, and then include a rotation to your museum?</li> <li>▪ None at this time.</li> <li>▪ None that I can think of.</li> <li>▪ Longer time periods in class, more connections to NGSS.</li> <li>▪ Maybe a bit more reading. We do get the Naturalist journal, but perhaps leaving us with some kind of reading passage (or poem or ???).</li> <li>▪ I loved the field trip to the Bonner area ... maybe add that in so that we can see the owls on a shorter trip.</li> <li>▪ None! We'd love to have you more, but we know that we can't.</li> <li>▪ NA.</li> <li>▪ None at this time.</li> <li>▪ Love to see more with earth science, as that is a huge part of the 4th grade NGSS and is also very relevant for our area.</li> <li>▪ Adapt in some ways to the cover more of the fourth grade NGSS standards.</li> <li>▪ I would try to create a cycle of 2-3 years worth of activities so the kids would have some variety year to year. Many of these kids have siblings or friends that are older and know exactly what we will be doing before we even start.</li> <li>▪ Field trip timing ... thanks Montana weather.</li> <li>▪ I love this program. Thank you!</li> <li>▪ I have been with this program for years. I cannot think of a thing to change!</li> </ul>

## Teacher Recommendations on Program Focus

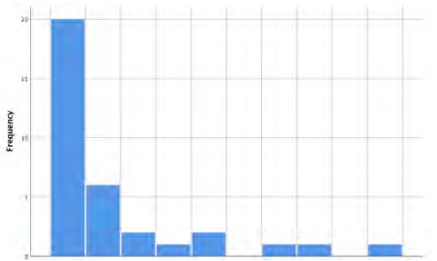
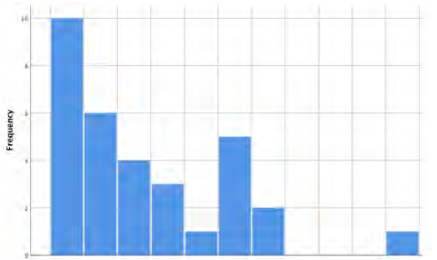
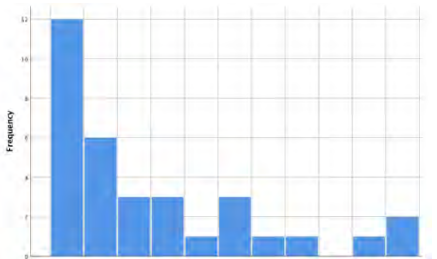
Teachers were asked to respond to three questions about the recommended focus or emphasis of the VNS program. Each of these questions presented two opposing prototypical points of view, and asked teachers to rate where their personal opinion fell on the spectrum from one opposing view to the other. These opinion statements are displayed in Table 22, with the distribution of teacher responses displayed graphically between each pair of opposing opinions. The graphs are scaled from zero on the far left side to 100 on the far right side. All highly these distributions were highly skewed, with the majority of teachers endorsing opinions closer to the statement displayed on the left side of Table 22.

Most teachers supported the opinion that it is important and useful for students to have the same Visiting Naturalist all year, as opposed to having experiences with different Visiting Naturalists throughout the year. The mean score on this scale was 15.8 ( $SD = 23.8$ , median score = 6.5,  $N = 34$ ).

Most teachers supported the opinion that having positive, engaging experiences learning about nature and science is more important for students than efficiently “covering” a lot of standard curriculum content. The mean score on this scale was 26.8 ( $SD = 25.3$ , median score = 20,  $N = 32$ ).

Most teachers supported the outdoor activities are an essential, irreplaceable part of the VNS program, as opposed to viewing the indoor VNS lessons as being equally effective. The mean score on this scale was 28.2 ( $SD = 30.2$ , median score = 15,  $N = 33$ ).

**Table 22. Teacher Recommendations on Program Focus**

Please choose one number to indicate the degree to which your opinion matches the descriptions on each side:			
H8	It's important and useful for students to have the same Visiting Naturalist all year, so they can get to know the naturalist well and form a positive relationship with a new adult role model who has science skills and interests.		It would be better to have different Visiting Naturalists throughout the year, so students can experience multiple naturalist role models with different kinds of science skills and styles.
H9	The most important part of VNS is that students have positive experiences to develop their interest in nature, science and learning. “Covering” lots of “content” or “standards” is less important than developing students’ identities as self-directed observers and learners in the real world.		We are responsible for making sure students learn a lot of specific content from our curriculum and Montana standards. This means we must stay focused and use time efficiently; fun, “engaging” activities, which kids can do on their own time, are less important during school hours than covering the full curriculum.
H10	Outdoor activities are an essential, irreplaceable part of the VNS experience, not just for occasional field trips but for most VNS lessons during the regular school day.		Indoor VNS lessons are often just as effective for student engagement and learning; it isn't necessary to be outside in order to learn about nature and science, the key is having time to focus on these topics.

Note.  $N=32-34$ . The online interface registered teacher responses ranging from 0 (left side of charts) to 100 (right side of charts).

Table 23. Teacher Ratings of Other MNHC Education Resources

Experience with other resources for educators from the Montana Natural History Center							
Please select one answer in each row to indicate how helpful each <b>MNHC resource</b> has been:		How many teachers have tried this?		Not Helpful At All	A Little Helpful	Fairly Helpful	Very Helpful
		Percent	N				
i1	Teacher Benefits Program	44 %	15	-	7 %	27	67
i2	Nature Discovery Traveling Trunks	47	16	-	12	38	50
i3	Museum Field Trips	38	13	-	23	31	46
i4	Interactive Distance Learning	35	11	-	36	27	36
i5	Virtual Science School	21	7	-	43	29	29
i6	Educator Workshops	62	21	-	10	19	71
i7	SPARK! Nature Observation & Journaling Program	21	7	-	29	14	57
i8	Montana Natural History Center Self-Guided Tour	38	13	-	31	54	15
i9	Adult Master Naturalist Courses	27	9	-	22	11	67
i10	Please add any other thoughts or recommendations about these educational resources:						
<ul style="list-style-type: none"><li>▪ <i>I so enjoy this program and hope it continues as students benefit and that is what this is about. Thank you!</i></li><li>▪ <i>The adult resources are quite helpful, and classroom teachers benefit from the well planned experiences.</i></li><li>▪ <i>More teacher PD that can be taken for PIR, OPI renewal or graduate credits.</i></li><li>▪ <i>I would like to continue getting information about the resources MNHC provides for educators. I would be interested in attending a teaching training workshop!</i></li><li>▪ <i>Love the trunks!</i></li><li>▪ <i>I guess I didn't realize how much was available. I will be checking into these various programs!</i></li><li>▪ <i>We were able to go the Naturalist Museum due to flooding in our area. This was so much fun and educational. I am happy we got to experience it. I think the traveling trunks would be beneficial. I'd be interested in using these in the classroom.</i></li></ul>							

Note. N=34. The two columns for "How many teachers have tried this?" display the percentage and number of all 34 responding teachers who did not respond "I haven't tried this." The four data columns to the right report the percentages, among only those who had tried a resource, who gave each particular rating of that MNHC resource.

Table 24. Teacher Interest in Other MNHC Education Resources

Interest in other resources for educators from the Montana Natural History Center							
Please select one answer in each row to indicate how interested you are in each <b>MNHC resource</b> :		How many teachers are interested in this?		Slightly Interested	Somewhat Interested	Very Interested	I have specific plans to use this
		Percent	N				
I11	Teacher Benefits Program	88 %	30	17 %	27	56	-
I12	Nature Discovery Traveling Trunks	100	34	3	24	62	12
I13	Museum Field Trips	100	34	9	44	47	-
I14	Interactive Distance Learning	76	26	19	38	42	-
I15	Virtual Science School	79	27	11	37	52	-
I16	Educator Workshops	81	31	10	29	55	6
I17	SPARK! Nature Observation & Journaling Program	85	29	14	31	52	3
I18	Montana Natural History Center Self-Guided Tour	85	29	24	24	52	-
I19	Adult Master Naturalist Courses	76	26	15	23	46	15
I20	Please add any other thoughts or recommendations about these educational resources:						
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Note. N=34. The two columns for “How many teachers are interested in this?” display the percentage and number of all 34 responding teachers who did not respond “I’m not interested in this.” The four data columns to the right report the percentages, among only those who had some interest in a resource, who reported each particular level of interest in that MNHC resource.



## Teacher Interviews

In Fall, 2018 a random sample of eight participating teachers were interviewed to ask about the context in their schools, their views on the value of the VNS program, and their recommendations for improvement or sustainability of the program. This section presents a summary of their responses to the nine interview questions. Quotes have been lightly edited to remove identifying content.

*How many years has your school participated in the VNS program? Were you at the school before VNS naturalists started visiting? How many years have you participated in VNS?*

The teachers and schools represented in the interview sample had substantial experience with the program. None had begun working with VNS only recently. Half of the teachers who were interviewed reported that their schools had participated in the VNS program for nine or more years; the other half reported that their schools had participated in the program for three to eight years. Two of the teachers had partnered with VNS since the program was first introduced to their school; in the other six schools, the VNS program was initially started in the classrooms of other teachers before those interviewed began working with the program. Half of the teachers had personally worked with the VNS naturalists in their classroom for two to five years; the other half had worked with the program for six years or more.

*Before your school participated in the VNS program, what opportunities did students in your school have for learning about nature and related science content and practices?*

All eight teachers reported that students in their school had very limited opportunities for learning about natural and related science content and practices before the VNS program. Some reported having guest speakers or one-time outdoor field trips or similar activities organized by and dependent upon the initiative of individual teachers. No schools were reported to have consistent, ongoing opportunities for students of the scope provided by VNS prior to their participation in VNS. One school was reported to have an ongoing relationship with a local natural area that some teachers accessed, and another had participated briefly in a project in which university students offered science lessons in the school. Several teachers commented on the limited or non-existent science curriculum and/or time devoted to science in their schools prior to VNS, a topic which was raised again in answers to later questions.

*What are the challenges in your school in engaging students in learning about nature, natural history, and science in general?*

There were several themes in teacher responses to this question. These themes are noted below, color coded to match the verbatim quotes listed in Table 25:

- Limited time available in the school schedule for science in general and especially for field trips (but one teacher noted that VNS helps address time constraints through transdisciplinary learning across the curriculum)
- Limited or poor quality curriculum or teaching resources in the school for science or natural history (see previous question for more on this)
- Limited teacher preparation for teaching science, content knowledge
- Limited funding for field trips, transportation
- Weather, getting outside; access to outdoor sites useful for educational purposes. Limited student access to nature outside of school, limited prior knowledge and experience; cultural norm of staying inside on screens

**Table 25. Teacher Interview Comments: Challenges to Teaching About Nature and Science**

What are the challenges in your school in engaging students in learning about nature, natural history, and science in general?

- *We've talked about this a lot, there are a lot of challenges. Time is a huge one. Schools are cutting science time and social studies to focus on math and reading. Going outside takes more time than other science lessons. Access to quality areas is a challenge for many schools. We're fortunate to have our space. Many schools have to use their school yard. Resources for educators also – many teachers don't have content knowledge or confidence to teach about local natural science. MNHC offers a lot.*
- *A lot of anxiety about covering all the curriculum and getting everything scheduled. National standards also put a crimp on things, caused a focus on reading and math, and science and outdoor education were put on the back burner. So time is a challenge. Also we weren't trained well in our university teacher preparation to do good science with kids. The VNS program encourages field journals, observation, drawings – those things go across the curriculum to other disciplines where you want kids to be more observant through out the day, so there are a lot of cross-over elements of the VNS program that help teachers with other curriculum that they are doing.*
- *We had science kits which were good but our new kits are not as hands-on, so we're very happy to have VNS visiting the classroom and the field trips. The curriculum that we do have is rather wordy, so we try to make sure they have a basic knowledge of science concepts, and then we're going to provide them with more hands-on opportunities, more project-oriented. Making sure there is a balance is something we aim to address. Having materials that are easy to access and are affordable is a challenge. We purchase a lot of our own materials but making sure that the kids are engaged, manipulating, participating, thinking about how science applies to their real life. The naturalist materials really support what we want to do to add to the curriculum and get kids excited about science. Our kids love it when they see the naturalists on the schedule.*
- *Access outside of school; they have little prior knowledge – not all, but a majority don't have a lot of experience in the outdoors and nature. Their families don't always prioritize that. Lower SES families don't always get out. A lot don't know how to swim. Fishing is an expensive hobby. They enjoy it but it just doesn't happen for them as much as you would think. Funding is also a challenge – the cost of getting out on field trips, transportation, all of that would be difficult without VNS. The time allotted for science keeps shrinking because the priorities are on math and reading. Transportation is a problem; our school would have to pay for the bus to do that. We manage to pay for the VNS trips but generally this is difficult to get.*
- *Getting them outside. Weather can be a challenge; kids may not be excited if it's cold and rainy. It can be hard at first before they've experienced it; they can be tentative, scared if they haven't been outside much.*
- *Too much love of video games. The social norm of being inside, letting the TV do the babysitting and teaching at home. At school, time is an issue. Takes time to go outside and do things.*
- *The biggest challenge is our location. We can't do much engaging hands-on stuff right here, so the field trips are great. Our school location doesn't have a great outdoor space.*

*Does the VNS program provide your students with opportunities they wouldn't otherwise have? If so, what are the most important things the program provides? If not, are there opportunities you would like the program to provide for your students that it currently does not?*

Teachers answered this question affirmatively and gave examples of what they consider to be the most important things provided to students by the VNS program. These included:

- Hands-on practical experiences, engaging curriculum, tools and materials not otherwise available
- Field trips, outdoor experiences, place-based education
- High value, low cost, well designed program
- Extensive natural history and science content knowledge provided by new adult role models using a different style of pedagogy
- Interdisciplinary focus that provides a basis for drawing various parts of the school curriculum together thematically to address standards

**Table 26. Teacher Interview Comments: What the VNS Program Adds to Schools**

Does the VNS program provide your students with opportunities they wouldn't otherwise have? If so, what are the most important things the program provides? If not, are there opportunities you would like the program to provide for your students that it currently does not?

- Yes, definitely. The hands-on experience. There are always tools or objects for them to touch and examine and measure. Also the field trips let us get out in the field – experiential learning that would be harder to do without VNS. VNS is an in-depth program for relatively little cost, especially for a year-long program. They always provide everything that's needed. For what we pay, we get so much in return.
- Absolutely. Some kids' families take them out hiking in natural areas, but there is a larger population who don't get those experiences for place-based education. Their families just don't know or don't do that or they're too busy or it's not a priority. For those kids it's huge to get them outside to learn about plants and animals. Kids get excited when they get to be experts on local flora and fauna, they love to share that with their families and they feel more connected to our local place.
- Yes. We have opportunities to go outside, but the VNS naturalists add such rich content knowledge, quality information offered in a fresh way from a new adult. It's nice to have someone come in with something special. The pedagogy is really nice. Amazing staff, quality naturalists, educators who know their content, provide great information and quality learning time.
- Yes! Hands-on lessons experience with a lot of different things. Touching specimens, taking stuff apart, digging into the different lessons in the classroom. On field trips they get to experience these places that may be 10 minutes away but they've never been to or didn't know they were. Access to public lands with a guide and interpreter who can structure it for them and make it informative.
- Yes, 100%. The best part is about being a naturalist, an artist, a writer, a scientist. Once the VNS folks leave I can connect all those things with our writing and science work, and the art teacher builds on it also. We all know what they've done with VNS and what they will be doing, so we can connect other lessons with it and connect to Montana standards also.
- It helps provide more opportunities for hands-on activities, engagement in careers ideas, interactions with the community, how to run a scientific experiment with fidelity, how to take scientific notes with drawings, measurements and appropriate details. Being outside, in local areas on the field trips, letting them see what is locally available, all of the animals and plants, local connections are powerful for our students.
- Yes. I'm always really impressed with the VNS curriculum, being able to motivate the students and be of high interest to them, the hands-on activities and the observations, journals, data, graphs. Even though it's only once per month the students make a lot of gains in their understanding of science and learning things about form and function and other things. The field trips are wonderful; they used to be longer, now they start a little later. They strive hard to think about what their goals are and to repeat those each time with the students so they understand themselves as naturalists, with the ability to act as real scientists, make observations, understand the adaptations that animals use to survive and reproduce. Use of tools like microscopes and binoculars, sampling tools, they don't have access to in their schools. Things like skulls and bird wing samples wouldn't be available otherwise, those are important.
- Yes. I love how they connect math, collecting of data, our math curriculum to science. Also the exposure to trained naturalists and guest speakers that are enthusiastic about nature. The kids make connections when they go out in nature, even those who never thought about things like why trees turn colors or the function of a flower. That exposure is great. I really appreciate what they bring.

*What responses or changes have you observed in your students that you believe are a result of the VNS program?*

Several themes are present in teacher comments about changes in their students that the teachers believe to result from the VNS program (see Table 27 for verbatim quotes):

- Engagement in learning about the natural world
- Engagement in a sense of place; awareness and appreciation of their local landscape and community
- Observations skills, ability to focus attention on extended tasks
- Natural science knowledge, interest, aspirations, and connections to other disciplines
- Positive relationships with the VNS naturalists

**Table 27. Teacher Interview Comments: Impact on Students**

What responses or changes have you observed in your students that you believe are a result of the VNS program?
<ul style="list-style-type: none"> <li>▪ <i>The kids are always 100% engaged. For us, in the rural environment, they see nature every day, so you might think they wouldn't find it interesting, but the opposite is true. Since they have some background knowledge, they are even more interested. Kids who have moved from larger places are also really excited, it may be the first time they've seen an animal skull, etc. We've had the same naturalist the entire time and she has always done a great job.</i></li> <li>▪ <i>Getting excited about knowing about nature and where they live. Students have a sense of pride in knowing birds, or being able to talk with some authority about plants, etc. Skills for observation carry over into the classroom in other ways, slowing down and paying attention to details. They feel pride about where they live and the opportunities nearby to experience nature. Greater sense of appreciation for nature, especially after the field trips. We go to locations near the school so the kids connect to that; they may have been to those places before with their families but now they know a lot more about them and feel pride about that.</i></li> <li>▪ <i>Their journaling and willingness to be expressive in writing and drawing grows a lot. We practice it every month and they aren't afraid to be wrong, they keep observing, doing it and learning.</i></li> <li>▪ <i>Having more knowledge of natural science. It's something we can bring up all year round when we reference other things or read other books. We bring it up all the time – connections to other parts of our curriculum. Those experiences can be connected to lots of other things. Since they come once per month it builds on itself and connects to other lessons and topics.</i></li> <li>▪ <i>Many of them have bought their own personal journal to write about their findings and share with the VNS naturalist when they come. They make their own observations and journals on their own time. Some purchase sketch pads. They sketch and write about things they find.</i></li> <li>▪ <i>Over the years, I think they're more excited about science and science careers, they see a connection more than they would without the VNS program naturalists coming in. They have an enthusiasm that kids naturally have, but it's enhanced with the participation in this program.</i></li> <li>▪ <i>They look forward to the naturalist coming in. They are able to look back in their journals and remember earlier lessons. Some of them find their journal and notes a tool they will keep and refer back to. Students are well behaved when the naturalist is there, and I attribute that to their high interest and motivation, and the ability of the naturalists to work with students at different levels with different needs, and make adaptations for students with different needs. This helps students see that everyone is valued.</i></li> <li>▪ <i>They are more aware of what's happening outside, around them. They notice things and report them to [the VNS naturalist]. Some of the kids are noticing birds migrating through, changes in plants. Closer connection to the changes that are happening, to the data and experiments. I hope it motivates them to pursue science careers. The exposure is great for the kids; better than I can do.</i></li> </ul>

*Has this program has helped you as a teacher? If so, how?*

Teacher comments on how the program has helped them as teachers, listed in Table 28, focused on two themes:

- Improved teacher knowledge of science content and practices and local natural history; improved confidence and enjoyment in teaching science; improved pedagogical content knowledge (methods for teaching this particular content)
- Provision of expert science instruction by the program compensates for limited teacher capacity to teach science and address state science standards

**Table 28. Teacher Interview Comments: Impact on Teachers**

Has this program has helped you as a teacher? If so, how?
<ul style="list-style-type: none"> <li>▪ <i>It definitely has. Science is not my strongest suit so I rely heavily on textbook curriculums to guide me. To have someone come in with expertise and give them the hands-on experience takes pressure off me. I know they are getting a very high quality science education even though it's not my strength.</i></li> <li>▪ <i>It reinforces science standards, which is super helpful. The VNS program is focused more on life science and definitely reinforces that. It also addresses other science practices like collecting and interpreting data. Our school is lucky to have time for science, though not as much as for math and reading, so it's nice to have this dedicated time for science with people who are experts.</i></li> <li>▪ <i>I've become more confident in being able to help, I have more knowledge now. I've also taken master naturalist classes to help me with this, and can do this throughout the year, not just during the VNS lessons.</i></li> <li>▪ <i>Yes, it has. I feel like I have more knowledge and excitement. I've learned a lot alongside my students, tons of great information about different parts of natural science, that's more accessible to me now. I'm more confident taking kids outside to study things. I've become more comfortable and confident about teaching science content to my students, and extending the VNS lessons.</i></li> <li>▪ <i>I love this stuff. I enjoy and learn a lot from VNS about how better to engage kids in science lessons. Connecting to naturalist topics and Montana topics has been helpful since I'm not from here.</i></li> <li>▪ <i>I certainly enjoy having the program in my classroom. It's well-run, it helps me have a greater appreciation for our natural areas and science opportunities in the valley.</i></li> <li>▪ <i>I believe it has. We weren't given a solid background in science in the university teacher prep program; the content knowledge base may have been adequate, but the methods to be a good science teacher were not. I've graded their journals and that helps students know the importance of us all working together. I've learned some science content as well. Having the VNS staff as a model for teachers is really important.</i></li> <li>▪ <i>I've learned a lot, it's made me more aware of changes, birds, my surroundings, lots of things. I'm getting a lot out of it. I try to ask questions of the naturalist and approach it like a learner also. I watch how they set things up, establish targets for what we're going to learn today, to set things up for what the focus will be. I've tried to model that same type of pedagogy – setting the stage by establishing targets at the beginning of a lesson.</i></li> </ul>

*What recommendations do you have for improving the VNS program or for sustaining it in your school? Are there any things you'd like to see added, or changed?*

Several teachers offered positive comments about the program in response to this question; detailed responses are provided in Table 29. Among the recommended changes, three themes stand out:

- Continued work to maintain or expand connections to Montana science standards as these have recently been changed to align better with the Next Generation Science Standards (NGSS)
- Provide more “add-on” extensions so that teachers can leverage the VNS lessons into additional units, lessons, activities, or interdisciplinary connections across the curriculum
- Offer optional ways to expand the time devoted to the program: an option for longer class sessions, or programming for additional grade levels

**Table 29. Teacher Interview Comments: Recommendations for Program Improvement**

What recommendations do you have for improving the VNS program or for sustaining it in your school? Are there any things you'd like to see added, or changed?
<ul style="list-style-type: none"> <li>▪ <i>No suggestions really. It's such a great program. It's throughout the year and keeps the kids going continuously without being a constant interruption to everything else that needs to happen in the school year, it fits in with our pace. They provide all the materials and the naturalist is comfortable taking over the instruction so I just assist. The price is absolutely reasonable for all those in-class experiences and field trips.</i></li> <li>▪ <i>They are making an effort in this area, but I'd like to see it expanded beyond the life sciences. Their staff has the knowledge to do it. Fourth grade standards have changed and earth science is now a focus, so it would be good to tie this into VNS more. Our local area has a lot of places that can be used for this. VNS is tied more to the older standards; it would be good to tie in more with NGSS.</i></li> <li>▪ <i>It's a well oiled machine. They have add-on lessons and it would be interesting if they could share those more – do the lesson, then offer the add-on as something we could also do. Not all classes get the add-ons. They have fantastic leadership, their field trips are great, I have nothing negative to say or anything they should change. If it's not broken, don't fix it!</i></li> <li>▪ <i>I really love it. The amount of time is perfect. With the change in 4th grade standards we don't have as much natural science, so looking for ways to incorporate the new science standards into the VNS lessons would be good. The VNS lessons do a great job of showing the whole picture, even if they address standards that are now supposed to be taught in earlier grades. Fourth grade standards have been changed more toward earth science, natural disasters, energy, it's all over the map. The VNS lessons were well aligned to the old 4th grade standards. We love the program and don't want to lose it!</i></li> <li>▪ <i>The writing piece is good, the topics are good. I wish it could be longer than an hour. Once a month is good, I'm not saying to come more than once a month, but longer than an hour would be good. Even having an option for 1.5 hours would be very helpful – an optional 20-30 minute extension.</i></li> <li>▪ <i>It's pretty well balanced. We always appreciate more field trips. For teachers, changing some of the field trip activities from year to year would make it more interesting for us, a little more variety, but for the kids it's always new. Make sure it's connected and aligned with the new science standards and stays up with changes. Once a month visits are perfect. The staff is really well trained, we really appreciate their ability to work with all kinds of students. They're doing a wonderful job.</i></li> <li>▪ <i>I believe it's a sound program with really good qualities. They have made changes over the years. They used to give kids a template to collect cloud cover data over the month and report back the data – they don't do as much of that any more, it would be nice to do more of that where students continue to make observations or collect data in between naturalist visits, and then we work with it. This may take too much time, but the kids were always excited to report to the naturalist what they had done. I think the naturalists were surprised that we followed through on those things so diligently, so maybe other teachers didn't keep up with it. That helps the kids feel like they are doing real science though, and that's important.</i></li> <li>▪ <i>More time. Maybe expand to fifth grade. It's not broken so don't fix it! I've seen it for many years, worked with several naturalists. It's changed and grown and teachers have a chance to give feedback and help refine the lessons. Some of the lessons are harder than others, but I don't have any real recommendations to change.</i></li> <li>▪ <i>If VNS could provide more resources – websites, reading, ways kids could do more research or reading on their own – that would help. The Naturalist magazine is helpful, kids can read that and write about it. They need ways to do additional work on their own – VNS gives teachers a lot of resources but kids also need resources to keep them working on these topics.</i></li> <li>▪ <i>Note: A comment offered in response to a later interview question also offers insight into how the program might be further optimized for maximum benefit: Providing more clarity in program communications about connections to standards might increase teacher and school enthusiasm or interest in participating; another way to help schools get the most from the program might be to encourage a grade-level or school-wide model in which teachers meet to discuss how to leverage the program for interdisciplinary, cross-curricular connections that amplify the program while gaining time efficiencies across subjects (e.g., reading, writing, mathematics, social studies or art units that tie in with VNS content).</i></li> </ul>



*Is there anything the VNS program could do to make it easier to implement within your school schedule, curriculum, administrative governance, etc.?*

When asked about issues with logistics, scheduling, administrative support, or integration with school curriculum and how the VNS program might help with such potential problems, teachers reported no problems of this sort. Themes in their responses about logistics focused on positive comments, including:

- VNS program staff communicate well with schools to prevent or solve logistics problems, providing clear written materials about program requirements and expectations.
- Scheduling in schools can be difficult, but the VNS program has been flexible and accommodating.
- Administrators have been supportive of the program in these schools
- Scholarship funding helps reduce any friction that might jeopardize the program.
- One comment includes a suggestion about how schools can get the most benefit from the program, and also implicitly includes a suggestion that the program might better communicate information about connections to state standards. Both of these have been noted above in the section on recommendations for program improvement.

**Table 30. Teacher Interview Comments: School Logistics, Scheduling, Governance**

Is there anything the VNS program could do to make it easier to implement within your school schedule, curriculum, administrative governance, etc.?
<ul style="list-style-type: none"> <li>▪ <i>Scheduling is always tricky. They are wonderful with trying to work with our schedule but they only have so many staff members. Overall they bend over backwards to make things work for us and they are quite pleasant to work with. Every school has a different schedule so it's hard to coordinate with a lot of schools. They've been truly great but they have a limited number of staff to work with. Our administrators have been great about it. VNS sends us dates and information well in advance so that's good.</i></li> <li>▪ <i>We haven't had any problems with school logistics. Our administrator is totally on board. We get help with funding through the VNS program. We pay for the bus transportation but what we get from VNS is well worth it. They are very flexible and easy to communicate with. They are very accommodating with our schedule changes.</i></li> <li>▪ <i>A school has to be willing. It's good to sit down with the team of teachers and talk about how to build VNS into the school program and integrate them more fully. How can the school extend on VNS and connect to standards? Some teachers don't recognize how VNS already addresses standards.</i></li> <li>▪ <i>We haven't had any friction so there isn't anything that could make it better. We're a small school, so it's easy, there's no administrative problem or scheduling problem.</i></li> <li>▪ <i>No problems. They are flexible about the timing. Administration is supportive. We usually get some coverage by scholarship which is helpful. The one hour per month time and the field trip times are no problem. It rolls pretty smooth.</i></li> <li>▪ <i>No problems. VNS provides nice resources to share with administrators to help them understand. The scholarship program is really helpful for our low-income school and for getting administrative support. Field trips are very valuable; teachers don't always want to do the work to make these happen, organize chaperones, etc. The VNS program does a nice job of helping to organize all this with written materials for what we need to do.</i></li> <li>▪ <i>They do a wonderful job with scheduling, they're flexible and excellent at communicating, the emails and support materials are great. No problem with administrative support.</i></li> <li>▪ <i>Admin supports it. I do all the scheduling and set it up for the whole year. VNS communication with us is great. No problems.</i></li> </ul>

*Is there anything else you'd like to add about issues in helping students with their interest and learning about nature and science, or how this program can help?*

At the end of the interviews, teachers were asked if they would like to add any other comments about the topics that had been discussed. Seven of the eight teachers offered positive views of the program that repeated and reinforced the themes in their responses to the earlier questions. One teacher offered a specific suggestion for additional materials the program might provide; this comment has been transferred into the section above on recommendations for program improvement.

**Table 31. Teacher Interview Additional Comments**

Is there anything else you'd like to add about issues in helping students with their interest and learning about nature and science, or how this program can help?
<ul style="list-style-type: none"> <li>▪ <i>It helps me feel better that students are getting quality science education, correlated with the standards they are supposed to learn. I hope we continue to participate for a long time.</i></li> <li>▪ <i>Overall I think the program is amazing. We are really lucky to have it. I think it's awesome. I still have kids who are in middle school, 4 years later, who come in with something they found outside and want to show their naturalist, they're still thinking about it, that's amazing.</i></li> <li>▪ <i>I love the VNS program!</i></li> <li>▪ <i>I've always been very impressed with the naturalists and volunteers in the classroom and on the field trips. Very knowledgeable and good with kids. It's been a great experience. The other participating teachers in my school feel the same way, this is the best or one of the best programs we've ever worked with. They communicate with teachers well – they send us extensions and updates and help us incorporate this in our classrooms outside of when they are here. I love it!</i></li> <li>▪ <i>They are doing a wonderful job! We really appreciate them being available to us.</i></li> <li>▪ <i>One of the main things I've noticed is the relationships that are built with the naturalists and the organization as a whole. They are very friendly and willing to share and also very knowledgeable, I've found that very helpful.</i></li> <li>▪ <i>I hope it keeps going. As long as I'm here I'll keep bringing them in.</i></li> </ul>

## Student Perspectives

A new survey for VNS students was developed and pilot tested in one school during the 2017-2018 school year. The survey was designed to efficiently measure students' overall reactions to the VNS program as well as three major student outcomes for the program: student engagement in the natural world, student engagement in the sciences, and student confidence for doing work in the sciences. Because of the limited student sample and the experimental nature of the survey instrument, findings from the student data are considered preliminary and are best interpreted within the overall context of reports from teachers, naturalists and volunteers. Student data from 2018 will inform future refinements of student survey tools and methods.





Student outcomes were measured by comparing a post-test to a retrospective pre-test ("then-test"). Students were asked, on a single survey at the end of the school year, to rate their engagement or confidence at that time, as well as earlier, at the beginning of the year. This format allows matching student answers on the "then-test" with their post-test answers without collecting individual student names or identifiers or engaging in costly and logistically difficult matching of separate fall and spring surveys. Further, this approach ensured that students had the same understanding of the questions when rating their engagement and confidence before and after the VNS experiences; there was no danger that their understanding of the questions could have changed between the pre- and post-surveys.

This method has been found to produce more accurate ratings in many situations than can be obtained by asking participants to give ratings before they have encountered the content they are being asked about. See for example Nimon, K., Zigami, D., and Allen, J. (2011). Measures of program effectiveness based on retrospective pretest data: Are all created equal? *American Journal of Evaluation* 32(1) 8-28. However, teachers reported that some students had difficulty understanding the questions or the format on this first version of the VNS student survey. Prior research (e.g. Nimon et al.) suggests that separate pre-test and post-test forms (even when administered at the same time) may produce more accurate results, so this expanded format may be better despite potentially requiring more time and effort. A revised format and updated question wording will be pilot tested in a next iteration of the student survey.

## Student Reactions to the VNS Program

As displayed in Table 32, 85 percent of students reported that they “agree” or “strongly agree” that they like learning about plants, animals, and nature. More than 70 percent agreed or strongly agreed that they have a good time when they go on all-day field trips with naturalists, they like it the naturalist visits their classroom, learning about nature is a fun part of school, they enjoy it when they go out on the school yard to learn about nature, and they think schools should offer more nature programs like VNS. More than half, 57 percent, agreed or strongly agreed that they liked making their VNS naturalist journals.

**Table 32. Overall Student Reactions to the VNS Program**

How much do you agree or disagree with these ideas?		Strongly Disagree 	Disagree 	Agree 	Strongly Agree 	“Agree” or “Strongly Agree”
A1	I like it when the naturalist visits our classroom.	2.3 %	20.5	46.6	30.7	77.3
A2	I like learning about plants, animals, and nature.	5.7	9.1	42.0	43.2	85.2
A3	I really enjoy it when we go out on the school yard to learn about nature.	9.1	20.5	36.4	34.1	70.5
A4	I have a good time when we go with the naturalists on all-day field trips.	6.8	13.6	29.5	50.0	79.5
A5	Learning about nature is a fun part of school.	6.9	20.7	34.5	37.9	72.4
A6	I liked making my naturalist journal this year.	17.4	25.6	34.9	22.1	57.0
A7	I think schools should offer more nature programs like this.	14.8	14.8	28.4	42.0	70.4

Note. N = 86 to 88. Row percentages may not sum to 100 due to rounding. One classroom did not receive this set of questions.

## Engagement in the Natural World, Engagement in Science, Confidence in Science

Students were asked to respond to six survey questions about their engagement in the natural world, using a four-point scale ranging from “Not like me at all” to “Very much like me!” Responses to these questions were averaged to form a scale score for **Engagement in the Natural World**. Students were also asked to respond to three similarly structured questions about their engagement in the sciences, and two questions about their confidence in their ability to do scientific work. Their responses to these latter groups of questions were averaged to form scale scores for **Engagement in the Sciences** and **Confidence in Doing Scientific Work**.

Students were asked to respond twice to each question stem. First, for the pre-test (then-test”), they reported how much each statement described them “last year, when I was in third grade.” Next, they responded again, reporting how much each statement described them “now, when I’m in fourth grade.” Psychometric details for these scales are listed in Table 33. Multilevel nesting of students within classrooms was not included in the statistical models for this preliminary study.

Table 34 displays the retrospective pre-test and post-test means for each scale, as well as the test statistics for the differences from pre to post. Change from pre- to post-test on all three scales was statistically significant. For each scale, the average student estimate of their pre-VNS engagement or confidence was near the “A little like me” response (2 on the four-point scale), while their average estimate of engagement or confidence after the year of their VNS experience was near the “Mostly like me” response (3 on the four-point scale). On average, student post-VNS estimates of their *Engagement in the Natural World* and their *Confidence in Doing Scientific Work* were about .5 units higher than their pre-VNS estimate, while their post-VNS estimate for *Engagement in the Sciences* was about .3 units higher than their pre-VNS estimate.

One way to view and interpret these response frequencies is to calculate the extent to which student estimates of their engagement or confidence changed from baseline to post. For example, 34 percent of youth reported that the statement “I was very interested in animals, plants, weather, and other parts of nature” was “Mostly like me” or “Very much like me” last year (prior to their VNS program experiences), while 61 percent reported that this statement is “Mostly like me” or “Very much like me” currently (after their VNS experiences). This increase of 27 percentage points (from 34 percent to 61 percent) represents a 79 percent increase from the baseline endorsement of this descriptor of themselves.

Using this approach – calculating percentage change from baseline rate of “mostly” or “very much like me” ratings – self-reported change from pre to post on these questions ranged from a 33 percent increase (“I am very interested in finding out how to take more classes or get a job as a scientist”) to a 90 percent increase (“I am very interested in finding out how to take more classes or get a job as a naturalist.”) Table 35 displays student responses arranged in this format. Table 36 displays the complete wording and response frequencies for each survey question.

**Table 33. Student Survey Scale Psychometrics**

Scale	Items	Range at Pre-survey	Range at Post-survey	Internal Consistency Reliability (Cronbach’s alpha) Pre, post
Engagement in the Natural World	B1 to B6	1.00 to 4.00	1.00 to 4.00	.81, .88
Engagement in the Sciences	C1 to C3	1.00 to 4.00	1.00 to 4.00	.73, .80
Confidence in Doing Scientific Work	D1 and D2	1.00 to 4.00	1.00 to 4.00	.61, .72

Note. N = 106 or 107.

**Table 34. Student Survey Scale Score Differences Before and After VNS Experiences**

Scale	Pre test Mean (SD)	Post-test Mean (SD)	Difference (SE)	Test statistic
Engagement in the Natural World	2.26 (.75)	2.80 (.82)	.54 (.06)	$t_{(106)} = 9.02$ $p < .00001$
Engagement in the Sciences	2.37 (.94)	2.71 (.92)	.34 (.07)	$t_{(104)} = 5.06$ $p < .00001$
Confidence in Doing Scientific Work	2.12 (.89)	2.64 (.97)	.52 (.08)	$t_{(104)} = 6.26$ $p < .00001$







Note. N = 107 for Engagement in the Natural World, 105 for Engagement in the Sciences and Confidence in Doing Scientific Work.

**Table 35. Student Estimated Item Responses Before and After VNS Experiences**

Last year, I was ...      Now, I am ...	"Mostly" or "Very much" like me (last year)	"Mostly" or "Very much" like me (now)	Difference	Change from baseline rate
... very interested in animals, plants, weather, and other parts of nature.	34.3 %	61.3	27.0	79%
... very curious to find out how animals and plants live and how nature works.	43.4	66.0	22.6	52%
... often looking at nature to see what I can learn.	36.2	63.8	27.6	76%
... very interested in learning how to use journals, microscopes, binoculars and other tools to study nature.	39.3	68.3	29.0	74%
... very interested in helping people take care of animals, plants and nature.	56.8	80.0	23.2	41%
... very interested in finding out how to take more classes or get a job as a naturalist.	19.6	37.2	17.6	90%
... very interested in learning more about science.	45.6	64.7	19.1	42%
... very curious to find out how scientists figure out how things work in nature.	41.6	61.0	19.4	47%
... very interested in finding out how to take more classes or get a job as a scientist.	38.1	50.5	12.4	33%
... confident about my ability to study nature the way scientists do.	32.4	56.0	23.6	73%
... sure that I could do the kind of work that scientists do.	33.6	53.8	20.2	60%

Note. N = 106 or 107.

**Table 36. Student Responses on Engagement in the Natural World, Engagement in Science, and Confidence in Doing Scientific Work**

Please tell us about <b>your interest in plants, animals, nature and science:</b>										
<b><i>Last year, when I was in third grade:</i></b>					<i>Please circle one answer to the left of each statement <b>and</b> one answer to the right.</i>	<b><i>Now, when I'm in fourth grade:</i></b>				
	Not like me at all!	A little like me 	Mostly like me 	Very much like me! 	<b>Last year, I was ...</b> <div>←</div>	<b>Now, I am ...</b> <div>→</div>	Not like me at all!	A little like me 	Mostly like me 	Very much like me! 
B1	16.2 %	49.5	14.3	20.0	... very interested in animals, plants, weather, and other parts of nature.		12.3 %	26.4	29.2	32.1
B2	23.6	33.0	26.4	17.0	... very curious to find out how animals and plants live and how nature works.		15.5	18.4	23.3	42.7
B3	36.2	27.6	21.9	14.3	... often looking at nature to see what I can learn.		14.3	21.9	30.5	33.3
B4	31.8	29.0	18.7	20.6	... very interested in learning how to use journals, microscopes, binoculars and other tools to study nature.		13.5	18.3	34.6	33.7
B5	19.6	23.5	18.6	38.2	... very interested in helping people take care of animals, plants and nature.		7.6	12.4	25.7	54.3
B6	60.7	19.6	13.1	6.5	... very interested in finding out how to take more classes or get a job as a naturalist.		40.0	22.9	21.0	16.2
C1	19.4	35.0	13.6	32.0	... very interested in learning more about science.		11.8	23.5	25.5	39.2
C2	30.2	28.3	20.8	20.8	... very curious to find out how scientists figure out how things work in nature.		17.1	21.9	30.5	30.5
C3	37.1	24.8	14.3	23.8	... very interested in finding out how to take more classes or get a job as a scientist.		28.6	21.0	24.8	25.7
D1	28.6	39.0	20.0	12.4	... confident about my ability to study nature the way scientists do.		18.0	26.0	26.0	30.0
D2	41.3	25.0	17.3	16.3	... sure that I could do the kind of work that scientists do.		23.6	22.6	26.4	27.4

Note. N = 100 to 107. Row percentages within the “last year” and “now” sections may not sum to 100 due to rounding.



## Program Naturalist Perspectives

Naturalists were also asked to report their observations, ratings, comments and recommendations about the VNS program on several of the same topics that teachers had been asked about. (See Table 1 above for an overview of the survey modules and which groups of participants were asked about each topic). Ten naturalists completed the survey; their survey responses are detailed in this section.

### General Perspectives on the *Visiting Naturalist in the Schools* Program

Naturalists were first asked to rate their level of agreement with a set of general, overall statements about the VNS program, using a six-point scale that ranged from “strongly disagree” to “strongly agree.” These statements, response options, and a summary of naturalist ratings are displayed in Table 37. Highlights of these findings are listed below:

**Program Enjoyment.** All naturalists “strongly” agreed that they enjoy participating the program. Almost all strongly agreed that students enjoy the in-class VNS activities and the day-long VNS field trips (80 percent and 90 percent, respectively, strongly agreed, with the remainder “moderately” agreeing.)

There was more variability in naturalist perceptions of the extent to which students greatly enjoy the outdoor VNS activities at their schools, with 50 percent strongly agreeing, thirty percent moderately agreeing, ten percent (one naturalist) slightly agreeing and ten percent (one naturalist) moderately disagreeing.

**Value of Program Components.** All naturalists strongly agreed that the day-long VNS field trips are especially valuable from their perspective. VNS activities at the schools were rated almost as highly, with 6 of ten naturalists “strongly” agreeing that the in-class VNS and school-yard (outdoor) activities are especially valuable, and most of the remainder “moderately” agreeing. One naturalist moderately disagreed that the outdoor activities at the schools are especially valuable.

All naturalists strongly agreed that the core focus of the program (observing and learning about nature) is an important addition to the school curriculum, and 9 of 10 strongly agreed that the visiting naturalists and volunteers provide important role models for students (one naturalist “moderately” agreed).

When asked whether observation and study of local natural history through the program provides students an opportunity for interdisciplinary learning of science, math, reading, writing, and art, 70 percent of naturalists strongly agreed, and the remainder moderately agreed.

**Overall Program Value.** All naturalists “strongly” agreed that the program is well organized and facilitated, the program is a valuable use of their time, and they would recommend the VNS program to other environmental educators, schools and communities in Montana.

**Table 37. Naturalist Ratings of the VNS Program**

General reactions to the VNS program:							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
A1	I enjoy participating in the Visiting Naturalist in the Schools program.	-	-	-	-	-	100 %
A2	Students greatly enjoy the in-class VNS activities.	-	-	-	-	20	80
A3	Students greatly enjoy the outdoor VNS activities at their schools.	-	10	-	10	30	50
A4	Students greatly enjoy the day-long VNS field trips.	-	-	-	-	10	90
A5	For me as a VNS naturalist, the in-class VNS activities are especially valuable.	-	-	-	-	40	60
A6	For me as a VNS naturalist, the outdoor VNS activities at the schools are especially valuable.	-	10	-	-	30	60
A7	For me as a VNS naturalist, the day-long VNS field trips are especially valuable.	-	-	-	-	-	100
A8	Learning to be a “naturalist” – observing and learning about nature, natural resources, natural history, natural cycles – is very useful and important for students, a very good addition to school curriculum.	-	-	-	-	-	100
A9	The visiting naturalists and program volunteers provide important role models for students as adults with interest, expertise and careers in natural science and natural history education.	-	-	-	-	10	90
A10	The observation and study of local natural history gives students a great opportunity for integrated learning of science, math, reading, writing, and art – engaging students in many core subjects at once.	-	-	-	-	30	70
A11	The VNS program overall is well organized and facilitated.	-	-	-	-	-	100
A12	Participating in the VNS program has been a valuable use of my time.	-	-	-	-	-	100
A13	I would recommend the VNS program to other environmental educators as an exemplary program.	-	-	-	-	-	100
A14	I would recommend the VNS program to other schools and communities in Montana.	-	-	-	-	-	100

Note. N=10. Each row contains the proportion (percentage) of naturalists who gave each response to the question.

## Student Engagement in the Natural World

Naturalists were asked eight questions about the impact of the VNS program on student engagement in the natural world. Table 38 displays the pattern of their responses when asked to rate their agreement with seven statements about the program; Table 32 displays their free-response comments about this topic.

All naturalists agreed that “most students come to school already interested in learning about animals, plants, weather, and other parts of nature,” with six of 10 “moderately” or “strongly” agreeing.

All naturalists “moderately” or “strongly” agreed that the VNS program builds on students’ existing curiosity about nature, helps extend their awareness and interests into new aspects of the natural world, and helps students learn to use scientific tools to explore and extend their engagement in nature. At least 7 of 10 naturalists “strongly” agreed with all these statements.

Eight of 10 naturalists also “moderately” or “strongly” agreed that the program supports continued engagement in the natural world for students who already have a strong and positive history of experiences in nature (two others “slightly” agreed), while all naturalists “moderately” or “strongly” agreed that the program offers gentle and inviting pathways into nature for those with limited or negative prior experiences.

Nine of ten naturalists agreed that the program helps students appreciate the importance of thoughtful management, conservation, and stewardship of natural resources, with 30 percent “moderately” agreeing and 20 percent “strongly” agreeing. Four of ten naturalists “slightly” agreed and one slightly disagreed with this statement.

**Table 38. Naturalist Ratings of Impact on Student Engagement in the Natural World**

Perceived impact on <b>student engagement in the natural world</b> :							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
B1	Most students come to school already interested in learning about animals, plants, weather, and other parts of nature.	-	-	-	40 %	50	10
B2	The VNS program builds on students' curiosity about the natural world by encouraging and supporting their interest in learning about the nature around them.	-	-	-	-	20	80
B3	The VNS program helps students extend their awareness and interests into new aspects of the natural world they may not have noticed or thought about.	-	-	-	-	10	90
B4	The VNS program helps students learn how to use tools to explore and extend their engagement in the natural world (e.g. journals, microscopes, field guides, binoculars, etc.)	-	-	-	-	30	70
B5	The VNS program helps students appreciate the importance of thoughtful management, conservation, and stewardship of natural resources.	-	-	10	40	30	20
B6	For students with a strong interest in nature, the VNS program offers role models and pathways that support their continued pursuit of these interests.	-	-	-	20	10	70
B7	For students with limited or negative experiences in nature, the VNS program offers gentle and inviting pathways into discovering and developing their interest in the natural world.	-	-	-	-	60	40

Note. N=10. Each row contains the proportion (percentage) of naturalists who gave each response to the question.

Naturalists were asked to share thoughts about the extent to which the VNS program builds on student curiosity and enhances student engagement in the natural world. Their verbatim comments are listed in Table 39. Several comments affirmed the impact of the program on student engagement in the natural world, and some linked this to specific aspects of the program such as hands-on activities, consistent ongoing time devoted to nature study, or ongoing mentoring relationships. Several naturalists also commented that the program might be able to do more to develop student awareness of natural resource stewardship or conservation efforts.

**Table 39. Naturalist Comments: Program Impact on Student Engagement in the Natural World**

B8	Please share any other thoughts you have on the extent to which the VNS program builds on student curiosity and enhances student engagement in the natural world:
<ul style="list-style-type: none"> <li>I think the VNS program does a great job in engaging students in the study of nature. And it fits in with their school curriculum. I don't think it promotes stewardship as strongly. And in my opinion, while it does provide a mentor, it doesn't necessarily promote pathways to continued pursuit of nature study.</li> <li>I think the VNS program could do better at using our curriculum to point students toward meaningful ways of engaging in conservation and stewardship. If we ask students what they can do to help the natural world, how many will simply answer that they can recycle and pick up litter? How can we guide them toward more meaningful answers to this question?</li> <li>I wouldn't totally agree that students learn about management, conservation and stewardship of natural resources as it's more focused on identification, natural history, patterns, etc. It would be great to take it one step further to empathize the conservation efforts.</li> <li>Hands-on aspects of the program, along with quality authentic tools, are VNS attributes that enhance curiosity and learning.</li> <li>The VNS program builds on student curiosity and enhances student engagement in the natural world through exploration, example, and consistency. The VNS program allows educators to make a lasting impact through continued exposure throughout the school year. This allows students the time to explore and build their curiosity throughout the year while consistently seeing their Naturalist lead by example and get excited with them about the discoveries they make throughout the year.</li> <li>Over the years I have had students at the end of the course say "When I grow up I want to be a naturalist," "I'm going to ask for binoculars for my birthday," "I want to do this again next year," etc. Comments like these demonstrate the effectiveness of the program.</li> <li>The strength of the mentor relationship between students and their visiting naturalist provides a valuable opportunity to encourage and further develop and support students' interest in the natural world at a deeper level.</li> </ul>	



## Student Engagement in the Sciences

Naturalists were asked nine questions about the impact of the VNS program on student engagement in the sciences. Table 40 displays the pattern of their responses when asked to rate their agreement with eight statements about the program; Table 34 displays their free-response comments about this topic.

All naturalists “moderately” or “strongly” agreed that the VNS program makes school science curriculum more interesting and accessible for students, the VNS program is very helpful for developing and strengthening student interest and engagement in the natural sciences, and the in-class VNS activities at schools and the VNS field trips increase student interest in science. Sixty percent or more “strongly” agreed with these statements. All naturalists agreed that student interest in science is increased by the outdoor VNS activities at schools, with 30 percent “moderately” and 50 percent “strongly” agreeing.

Nine of 10 naturalists agreed that student interest in science is increased by their experiences and relationships with the visiting naturalists and program volunteers; 20 percent “moderately” agreed and 70 percent “strongly” agreed. One naturalist reported not having enough experience to answer.

Nine of 10 naturalists agreed that through their VNS experiences, students become more aware of learning and career options involving the sciences, with 40 percent “moderately” agreeing and 20 percent “strongly” agreeing. One naturalist reported not having enough experience to answer.

Seven of 10 naturalists agreed that through their VNS experiences, students become more interested in learning and careers in science as a result of their VNS experiences, with 30 percent “moderately” agreeing and 30 percent “strongly” agreeing. Three naturalists reported not having enough experience to answer this question.

**Table 40. Naturalist Ratings of Impact on Student Engagement in the Sciences**

Perceived impact on <b>student engagement in the sciences</b> :								
Please indicate your level of agreement with the following statements:		I haven't had enough experience to answer this	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
C1	The VNS program makes school science curriculum more interesting and accessible for students.	-	-	-	-		30 %	70
C2	The VNS program is very helpful for developing and strengthening student interest and engagement in the natural sciences.	-	-	-	-		30	70
C3	The in-class VNS activities increase student interest in science.	-	-	-	-		40	60
C4	The outdoor VNS activities at schools increase student interest in science.	-	-	-	-	20	30	50
C5	The day-long VNS field trips increase student interest in science.	-	-	-	-		20	80
C6	Student interest in science is increased by their experiences and relationships with the visiting naturalists and program volunteers.	10	-	-	-		20	70
C7	Through their VNS experiences, students become more aware of learning and career options involving the sciences.	10	-	-	-	30	40	20
C8	Many students become more interested in learning and careers in science as a result of their VNS experiences.	30	-	-	-	10	30	30

Note. N=10. Each row contains the proportion (percentage) of naturalists who gave each response to the question.



Naturalists were also asked to share thoughts about the extent to which the VNS program influences student engagement in learning about the sciences. Their verbatim comments are listed in Table 41. Several noted that it is difficult to assess this topic given the age of the students and the need for a long-term study to address this question.

**Table 41. Naturalist Comments: Program Impact on Student Engagement in the Sciences**

C9	Please share any other thoughts you have on the extent to which the VNS program increases student engagement in learning about the sciences:
<ul style="list-style-type: none"> <li>▪ <i>I do have some teachers who are able to plan some of their science lessons around the monthly VNS schedule. I think this is so helpful for students, since they're able to make science connections by drawing on their experience in VNS. And I do see students thinking scientifically and asking scientific questions during VNS lessons and field trips. But as far as engagement in science curriculum once I've left the classroom, I don't think I have enough experience to really answer that.</i></li> <li>▪ <i>I'm not sure that the curriculum identifies careers in the sciences, as we don't connect kids directly with scientists nor do we reference them. I think it strengthens knowledge for kids who already enjoy the outdoors and natural history, but this could be built upon.</i></li> <li>▪ <i>We need longer term follow up surveys from students to know the answer to this question.</i></li> <li>▪ <i>As VNS instructors, we could likely all do a better job of informing students of more careers in the sciences. That said, we do engage with any questions that might come up on that topic. It is hard for me to say how the VNS program impacts student interest in careers - every year there are students that say they want to be a Naturalist, botanist, or ornithologist, but they're all so young that it's hard to say if others are impacted in this way.</i></li> <li>▪ <i>To increase student engagement in learning about science requires that teachers as well as naturalists have specific opportunities to facilitate more targeted conversations with students about career opportunities and learning fields in the sciences. Conversations that highlight and extend the positive connections that kids have with the VNS program experiences to thoughts about their future studies and goals.</i></li> </ul>	





## Student Learning in the Sciences

Naturalists were asked eight questions about the impact of the VNS program on student learning in the sciences. Table 42 displays the pattern of their responses when asked to rate their agreement with seven statements about the program; Table 36 displays their free-response comments about this topic.

All naturalists “moderately” or “strongly” agreed that “The VNS program greatly enhances school science curriculum,” with 90 percent “strongly” agreeing. All naturalists “moderately” or “strongly” agreed that “Students learn a lot of science content through their VNS experiences,” with 50 percent “strongly” agreeing. All naturalists “moderately” or “strongly” agreed with the remaining statements in this section, except those who responded that they hadn’t had enough experience to answer.

Ninety percent (nine of ten naturalists) “strongly” agreed that the VNS program is very helpful for strengthening and supporting student learning in the natural sciences, and 80 percent “strongly” agreed that the VNS program helps students learn to use tools for scientific investigation (remaining naturalists responded that they hadn’t had enough experience to answer).

Sixty percent of naturalists “strongly” agreed that the VNS program gives students valuable practice in the skills and activities that scientists perform, with 30 percent “moderately” agreeing (one responded that they hadn’t had enough experience to answer). Forty percent of naturalists “strongly” agreed that the VNS program helps students learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting – with 50 percent “moderately” agreeing (one responded that they hadn’t had enough experience to answer).

Forty percent of naturalists “strongly” agreed that students become more confident with science topics and activities through their VNS experiences, with 40 percent “moderately” agreeing (three responded that they hadn’t had enough experience to answer).

**Table 42. Naturalist Ratings of Impact on Student Learning in the Sciences**

Perceived impact on <b>student learning in the sciences</b> :								
Please indicate your level of agreement with the following statements:		I haven't had enough experience to answer this	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
D1	The VNS program greatly enhances school science curriculum.	-	-	-	-	-	10 %	90
D2	The VNS program is very helpful for strengthening and supporting student learning in the natural sciences.	10	-	-	-	-	-	90
D3	Students learn a lot of science content through their VNS experiences – ideas and knowledge about how nature works.	-	-	-	-	-	50	50
D4	The VNS program helps students learn to use tools for scientific investigation (e.g. journals, microscopes, field guides, binoculars, etc.)	20	-	-	-	-	-	80
D5	VNS helps students learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	10	-	-	-	-	50	40
D6	VNS gives students valuable practice in the skills and activities that scientists perform.	10	-	-	-	-	30	60
D7	Students become more confident with science topics and activities through their VNS experiences.	30	-	-	-	-	40	30

Note. N=10. Each row contains the proportion (percentage) of naturalists who gave each response to the question.

In addition to student engagement in science learning, naturalists were asked to share thoughts about the extent to which the VNS program increases actual student learning in the sciences. Their verbatim comments are listed in Table 43. One comment contains a recommendation for program revision (more student work done individually or in pairs). Other comments note the value of linkages between VNS program content and other science curriculum and learning activities occurring in the school, how VNS extends learning beyond school curriculum, or the cumulative nature of what students learn about science through their year-long VNS program experience.

**Table 43. Naturalist Comments: Program Impact on Student Learning in the Sciences**

D8	Please share any other thoughts you have on the extent to which the VNS program increases student learning in the sciences:
	<ul style="list-style-type: none"> <li>▪ <i>VNS provides science experience that students wouldn't otherwise receive, and shows them that there are many more aspects to science learning than what they may have seen in school so far.</i></li> <li>▪ <i>I would like to see more of the experiments done individually or in pairs, rather than large groups because the ambitious/passionate kids will do all the work for the group.</i></li> <li>▪ <i>There is a drastic difference between students at the October field trips and their May field trips. Students have a solid relationship with the Naturalists that includes strong desires to share naturalist observations from their lives as well as the observations made on those days. On the May field trip students often jump in to remind themselves and others about expectations, directions on how to use equipment, how to behave as a naturalist, and the importance of stewardship (picking up trash, staying on trails, etc.). This enthusiasm is indicative of student confidence and competence related to the VNS program.</i></li> <li>▪ <i>Activities such as graphing and measuring, sharing data and conclusions, and other aspects of the curriculum assist in science literacy. I have found that when a class happens to align their science with a VNS topic, for example plant parts and function, the students are more interested, engaged, and successful than in other classes. It seems especially helpful when the VNS content aligns with what they are already learning in school.</i></li> <li>▪ <i>New standards (NGSS) don't define science content in the same way as we have it in the question above ... it is more in terms of science practices than content about how the natural world works. I think VNS also strongly helps students with science practices (observation, arguing from evidence, asking questions, gathering data, etc.)</i></li> <li>▪ <i>Engaging teachers, actively, in the VNS program, and working with them on a personal and professional level, is the key to helping connect VNS with science learning in the classroom when VNS is not present.</i></li> </ul>

## Naturalist Professional Development in the Sciences

Naturalists were asked seven questions about the impact of the VNS program on their own learning in the sciences. Table 44 displays the pattern of their responses when asked to rate their agreement with six statements about the program; Table 38 displays their free-response comments about this topic.

Seventy percent of naturalists “moderately” or “strongly” agreed that the VNS program enhances their connection with school science curriculum, with 30 percent “strongly” agreeing. All naturalists “moderately” or “strongly” agreed that the VNS program is “very helpful for strengthening and supporting my own learning in the sciences,” with 70 percent “strongly” agreeing.

All naturalists “moderately” or “strongly” agreed that they have “learned a lot of science content through working with the VNS program,” with 80 percent “strongly” agreeing.

Sixty percent of naturalists also “moderately” or “strongly” agreed that “VNS has helped me learn a lot about how different kinds of scientists do their work,” with 10 percent “strongly” agreeing. The remaining naturalists “slightly” agreed. Seventy percent of naturalists “moderately” or “strongly” agreed that “VNS has given me valuable practice in the skills and activities that scientists perform,” with 30 percent “strongly” agreeing. The remaining naturalists “slightly” agreed.

Ninety percent of naturalists “moderately” or “strongly” agreed that “I have become more confident with science topics and activities through my VNS experiences,” with 60 percent “strongly” agreeing. The remaining naturalist “slightly” agreed.

**Table 44. Naturalist Ratings of Impact on Educator Learning in the Sciences**

Perceived impact on <b>adult learning in the sciences</b> :							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
E1	In my experience as a teacher or volunteer, the VNS program enhances my own connection with our school science curriculum.	-	-	-	30 %	40	30
E2	The VNS program is very helpful for strengthening and supporting my own learning in the natural sciences.	-	-	-	-	30	70
E3	I have learned a lot of science content through working with the VNS program as a teacher or volunteer – ideas and knowledge about how nature works.	-	-	-	-	20	80
E4	VNS has helped me learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	-	-	-	40	50	10
E5	VNS has given me valuable practice in the skills and activities that scientists perform.	-	-	-	30	40	30
E6	I have become more confident with science topics and activities through my VNS experiences.	-	-	-	10	30	60

Note. N=10. Each row contains the proportion (percentage) of naturalists who gave each response to the question.

Naturalists were invited to share thoughts about the extent to which the VNS program increases their own learning in the sciences. Their verbatim comments are listed in Table 45. All comments described ways in which their experiences as VNS naturalists have expanded their own learning.

**Table 45. Naturalist Comments: Program Impact on Educator Learning in the Sciences**

E7	Please share any other thoughts you have on the extent to which the VNS program increases your own learning about the sciences:
	<ul style="list-style-type: none"> <li>▪ <i>The VNS program--teaching the same lessons on repeat--has strengthened my observation skills and general natural history knowledge. I don't have deep understanding of the topics but having to prepare to lead classes has ensured that I have a reasonable amount of background knowledge. I find that this is useful throughout my job! Especially when I need to know insect orders!</i></li> <li>▪ <i>I have expanded my own natural history knowledge so much through the VNS program. It's not so much that I learn from the specific class lessons, although of course I have. More significantly, it's the act of teaching these lessons that leads to more curiosity and questions, which I investigate either on my own or through conversations with other VNS staff. I also find myself referencing this newfound knowledge and interest in other settings, such as outdoors with family or friends, or on trips to new places where I try to interpret new observations in light of knowledge I've gained through VNS.</i></li> <li>▪ <i>The VNS program is different in each classroom. Teachers that jump in to share what students are learning and how VNS curriculum connects to their lessons make a huge impact on the program and how connected the VNS instructor is to the classroom as a whole.</i></li> <li>▪ <i>Understanding what it truly means to be a lifelong learner is a very valuable lesson to share with students. Being an expert isn't the goal, it's valuing and cultivating the desire and the practice in connecting what you already know with new experiences and new questions to keep on learning all your life.</i></li> </ul>





## Overall Comments on Program Impact

Naturalists were asked a series of open-ended questions about the program as a whole, which are presented in this section. First, their verbatim comments about overall program impact on students are listed in Table 46. These comments describe program impact on student engagement with science and nature, and connecting students' home lives and daily experiences to science and school-based learning. Themes in their observations echoed some of those in the teacher comments, including:

- Student engagement in nature and science, increased appreciation for the natural world
- Increased knowledge, skills, and experience in science, exploration, observation and inquiry

Table 47 displays naturalist comments about program impact on schools. Themes included enhancing or supporting school science curriculum and teacher skills and resources for science instruction including enhanced inquiry-based teaching, and interdisciplinary lessons integrating language arts and other arts.

**Table 46. Naturalist Comments: Overall Program Impact on Students**

H1	How would you describe the impact of the VNS program on students?
	<ul style="list-style-type: none"> <li>▪ <i>Students are able to connect science-learning to outdoor and nature-based topics. I think this makes science more accessible and something they can use at home.</i></li> <li>▪ <i>VNS engages students' innate curiosity about the natural world. The student-centered approach allows them the freedom to follow their own interests in a way that is sometimes more difficult in a classroom setting.</i></li> <li>▪ <i>It makes science learning come alive and interesting.</i></li> <li>▪ <i>Builds on innate and/or prior interest, hopefully builds interest in students who are not as interested in nature.</i></li> <li>▪ <i>The VNS program provides students with tools and motivation to engage and enhance their curiosity of the natural world.</i></li> <li>▪ <i>Positive and encourages affinity and curiosity for the natural world.</i></li> <li>▪ <i>Students get the opportunity to get hand-son experience with science and nature study, and to do it in an engaging and different way than they are used to.</i></li> <li>▪ <i>Students are excited about new challenges and naturalist content. They retain the excitement about the time spent with their naturalist for some time, and this could be used to greater effect in follow-up programming or opportunities to stay connected.</i></li> </ul>

**Table 47. Naturalist Comments: Overall Program Impact on Schools**

H2	How would you describe the impact of the VNS program on schools?
	<ul style="list-style-type: none"> <li>▪ <i>We hear that this has become a core of the science curriculum for a lot of our schools. The program ties all the 4th grades together so all the students have the same experience. In addition, we've seen over time that teachers in the VNS program become more comfortable with nature-based topics and outdoor exploration. They also benefit from the naturalist mentor.</i></li> <li>▪ <i>VNS allows teachers to bring knowledge and experience into their classroom in a non-intimidating way. I hope that it takes some pressure off of them, too: rather than feeling like they need to be an expert at everything, they can hand off the topic of natural history to a qualified instructor, and trust that their students are in good hands. Teachers and schools can feel confident that their students are gaining valuable skills taught by knowledgeable instructors.</i></li> <li>▪ <i>It is a great support for teachers whether they are excellent or mediocre science content teachers-- enhances teacher resources across the board.</i></li> <li>▪ <i>Actual science curriculum!</i></li> <li>▪ <i>The VNS program connects students through shared or anticipated experience. The impact of natural curiosity on teachers also translates to a culture of inquiry in their classrooms.</i></li> <li>▪ <i>Enhances science curriculum. Possibly enhances science test scores?</i></li> <li>▪ <i>Enhanced, integrated lessons that touch on science, ELA, and the arts. Enriching experiences for their students that directly link to curriculum and that help students practice science and ELA practices.</i></li> <li>▪ <i>VNS enhances the creative and supportive opportunities for actively engaged teachers to meet science standards, and for those who need more support, it helps move them forward in feeling more confident about science content and available resources they can effectively use in their curriculum.</i></li> </ul>

Table 48 displays naturalist comments about how the VNS program affects themselves as educators. Themes included increased natural history content knowledge, improved skills as educators, meaningful connections with students, and ongoing curiosity and life-long learning.

In Table 49, naturalist comments about surprising or unexpected effects of the program are listed. These focused on program effects that extend into the community, and that extend over time, through ongoing relationships, observations and discussions of natural phenomena involving students, teachers, naturalists, and their friends and family.

**Table 48. Naturalist Comments: Overall Program Impact on Naturalists**

H3	How would you describe the impact of the VNS program on yourself as an educator?
	<ul style="list-style-type: none"> <li>It has made me a stronger educator. I'm more thoughtful in my teaching. I also have expanded my breadth of natural history understanding.</li> <li>VNS has taught me so much about the natural world. It has also sparked my own curiosity and enable me to engage in deeper natural history investigations, both on my own and with coworkers. I have also learned so much about student learning styles, classroom management, curriculum development, and countless more topics that are crucial to my growth as an educator.</li> <li>Reinforces value of hands-on learning, importance of strategic big-picture ideas for learning goals, with flexibility in how to deliver.</li> <li>Learning more broadly.</li> <li>The VNS program has taught me how to slow down and remember the basics of being a Naturalist. It has reminded me to value curiosity, perspective, and questions.</li> <li>It is a rewarding experience to work with the students.</li> <li>Invigorating, meaningful connections to students, and the opportunity to see them learn and grow throughout the year.</li> <li>It reiterates the value I have of hands-on learning, and of student-generated vs. teacher-directed means as a way of highly successful learning.</li> </ul>

**Table 49. Naturalist Comments: Unexpected Program Effects**

H4	Have you observed any surprising or unexpected effects of the VNS program?
	<ul style="list-style-type: none"> <li>I often find myself referencing VNS lessons or topics in unexpected places, such as with friends or while spending time with other children. I think that spending so much time with VNS has made the curriculum and topics so familiar to me that they are always in the front of my brain! The fact that the VNS program cultivates instructors who are often thinking about VNS, even when off the clock, seems like a huge benefit to the local community. It allows us to spread knowledge of the natural world in a more informal and relaxed setting, and it acts as positive advertising for MNHC and for natural history in general.</li> <li>Depth of student connections is hard to measure but it appears very deep. I want to know how long this impact lasts for students in their educational path.</li> <li>Students ask questions about evolution/natural selection without direct prompting.</li> <li>I am often surprised by conversations with old students and how much they remember about the VNS program as well as their enthusiasm to share naturalists observations made since their time with me.</li> <li>Increased teacher engagement and knowledge of natural history and nature exploration.</li> <li>I am often surprised at the strength of the emotionally connective relationship that develops over the year.</li> <li>Years later I meet kids that say they loved the program.</li> </ul>



Tables 50 displays naturalist comments about strengths of the VNS program, which echoed many of the themes summarized earlier in teacher reports of program strengths:

- Hands-on activities
- Field trips and other outdoor activities
- Consistency over time of well-organized lesson and activity formats
- The program naturalists and their relationships with students
- Engaging science activities

**Table 50. Naturalist Comments: Program Strengths**

H5	What are the best, most important or most effective parts of the VNS program?
	<ul style="list-style-type: none"> <li>▪ <i>The field trips and being outside. The students really respond well to hands-on materials but the program seems to be at it's best in the field.</i></li> <li>▪ <i>The mentoring aspect is so crucial. Not every student wants a mentor, or is willing to put themselves in the vulnerable position of getting close to an adult instructor. But for those that do, it's an invaluable experience for both parties. I love noticing which students are drawn to which instructors, and vice versa.</i></li> <li>▪ <i>Quality REAL artifacts and tools for learning, strong mentor as "guider" not "expert/teacher" role.</i></li> <li>▪ <i>Experiments, graphing, field trips.</i></li> <li>▪ <i>I feel the most effective part of the VNS program is the consistency with their Naturalist. Though the program could be taught more quickly in a few weeks, it seems wildly beneficial to spread it out over the year so students have prolonged exposure, engagement, and attachment to their naturalist journey with their teaching naturalist mentor.</i></li> <li>▪ <i>The naturalist/mentor, the all-day field trips, year-long consistent programming, emphasis on exploration and discovery.</i></li> <li>▪ <i>Inquiry-based learning, place-based learning, outdoor experiences, natural specimens to explore.</i></li> <li>▪ <i>See above comment [on emotionally connective relationships], and that this connection can be used to a deeper degree as follow-up learning for students.</i></li> <li>▪ <i>Field trips.</i></li> </ul>

Table 51 displays naturalist comments about the least important or least effective VNS program components. These individual perspectives and recommendations include useful insights for program improvement. There were few themes, i.e. similar insights offered by more than one naturalist, other than the observation that the “canimals” lesson might be improved to make it more engaging at this grade level, and that school yards are becoming increasingly impoverished as outdoor sites for naturalist observations, which has implications for VNS schoolyard activities. Each comment in Table 44 offers useful clues to areas where the VNS program might be further developed.

**Table 51. Naturalist Comments: Program Weaknesses**

H6	What are the least important or least effective parts of the VNS program?
	<ul style="list-style-type: none"> <li>▪ <i>The teacher training has been a struggle. The graduate program we ran in 2017-2018 was much better than previous options but it still needs work. We also need to set stronger expectations of teachers--i.e. that they should be present and engaged during lessons. Beyond that, the canimals lesson is a bit complex and could be replaced with something that is easier for a 4th grader to see and comprehend.</i></li> <li>▪ <i>Honestly I think this varies from student to student. I really appreciate how VNS works to include many different learning styles and interests. This variation allows for students to really latch onto what appeals to them and run with it. Depending on a student's interests or needs, some parts of VNS may be less effective or less important. I think it's up to us as educators to recognize that VNS was crafted for a variety of learners and personalities, and know when to push students to continue versus when to allow them to put less effort into a certain aspect of the lesson.</i></li> <li>▪ <i>Use of school yard outdoor natural resources has great potential in theory, but most school yards have increasingly little natural habitat to use.</i></li> <li>▪ <i>Some journaling activities aren't directly tied to content/learning objectives.</i></li> <li>▪ <i>The least effective part of the VNS program is teachers that are absent or not engaged for the lesson. Students tend to get a lot more out of the program when teachers are asking questions, making connections, and setting the example in their classroom.</i></li> <li>▪ <i>Some of the lessons seem more engaging than others.</i></li> <li>▪ <i>Probably the canimals lesson and the current format of the fill the bill lesson that are both built around a rigid scientific method format--they aren't engaging for kids, are hard to explain, aren't driven by student discoveries or interest, and don't align with the new improved ways of teaching science (focusing on practices and skills rather than just a 5-step scientific method) that NGSS incorporates.</i></li> <li>▪ <i>Trying to make outdoor school site based experiences a part of the monthly VNS lessons is a valuable goal, but it is increasingly difficult due to 1) lack of natural areas in the school yard, and 2) lack of time to complete the lessons and still have outdoor explorations, given the current curriculum.</i></li> </ul>

Further naturalist recommendations for program improvements are listed verbatim in Table 52. Each of these individual comments are interesting, along with the common themes touched on by more than one naturalist, including recommendations for:

- More emphasis on skills and processes for inquiry and learning rather than specific, fixed content
- More teacher involvement in the VNS activities and in customizing or extending for their students

**Table 52. Naturalist Comments: General Program Recommendations**

H7	What changes would you recommend to improve the VNS program?
	<ul style="list-style-type: none"> <li>▪ <i>I'd like to see it focus more on teaching skills and the process scientists go through as they explore and learn about the world and less about specific natural history topics. We can use nature as a central theme but rather than focus so hard on making sure that students can name different feather types, I'd rather them be able to explore and learn about feathers, asking their own scientific questions.</i></li> <li>▪ <i>I would like to see VNS provide students with more information on what they can do to be stewards of the natural world. I find it infuriating that protecting the natural world is a politicized topic. It seems obvious to me that if we engage students' sense of wonder about the natural world, they will naturally place more value in it and be drawn to protecting it. How can we capitalize on this natural progression without entering into politically controversial territory?</i></li> <li>▪ <i>Greater personal connection between classroom teachers and their assigned naturalist. Time allowance to help develop this connection and flexibility to tailor or subtly focus the VNS curriculum for their students' needs.</i></li> <li>▪ <i>More scientific content and practice, I think we could push the students just a little more to try new things.</i></li> <li>▪ <i>I would recommend revisiting the teacher contract/partnership to formally request engagement from teachers that may have had the program for many years and don't know how their class could benefit from their involvement.</i></li> <li>▪ <i>Make each visit 2 hours long! Though I know this can't happen.</i></li> <li>▪ <i>More room for student-driven inquiry and exploration; less focus on needing to get across a lot of natural history "content" and instead giving students more opportunities to use nature as a lens for exploration and an opportunity to participate in science and writing practices that follow the learning cycle. Some lessons are strong in this area and others could be reformatted to focus less on shoving in content and more on giving students the tools they need to explore and be self-directed learners.</i></li> <li>▪ <i>Continued efforts to engage teachers in both participation during the lessons, and to continue to provide input about what THEY find needed in supporting the school curriculum. Varying the specific skills or modifying the main focus for the needs of different schools or teachers, while still maintaining a larger stable curriculum is an important flexibility.</i></li> <li>▪ <i>As much hands-on and less lecture.</i></li> </ul>

## Naturalist Recommendations on Program Focus

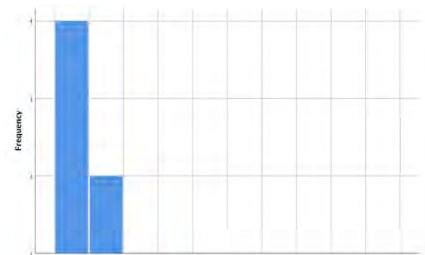
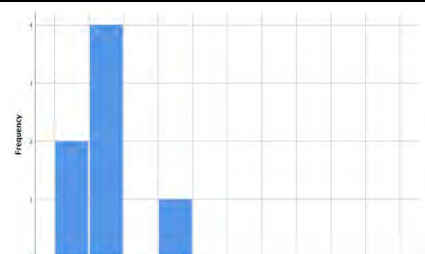
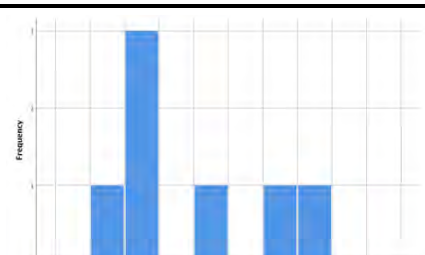
Naturalists were asked to respond to three questions about the recommended focus or emphasis of the VNS program. Each of these questions presented two opposing prototypical points of view, and asked naturalists to rate where their personal opinion fell on the spectrum from one opposing view to the other. These opinion statements are displayed in Table 53, with the distribution of naturalist responses displayed graphically between each pair of opposing opinions. The graphs are scaled from zero on the far left side to 100 on the far right side. All highly these distributions were highly skewed, with the majority of naturalists endorsing opinions closer to the statement displayed on the left side of Table 46.

Most naturalists supported the opinion that it is important and useful for students to have the same Visiting Naturalist all year, as opposed to having experiences with different Visiting Naturalists throughout the year. The mean score on this scale was 8.4 ( $SD = 10.0$ , median score = 4,  $N = 10$ ).

Most naturalists supported the opinion that having positive, engaging experiences learning about nature and science is more important for students than efficiently “covering” a lot of standard curriculum content. The mean score on this scale was 13.3 ( $SD = 11.2$ , median score = 10,  $N = 10$ ).

Most naturalists supported the outdoor activities are an essential, irreplaceable part of the VNS program, as opposed to viewing the indoor VNS lessons as being equally effective. The mean score on this scale was 39.4 ( $SD = 25.0$ , median score = 28,  $N = 10$ ).

**Table 53. Naturalist Recommendations on Program Focus**

Please choose one number to indicate the degree to which your opinion matches the descriptions on each side:			
H8	It's important and useful for students to have the same Visiting Naturalist all year, so they can get to know the naturalist well and form a positive relationship with a new adult role model who has science skills and interests.		It would be better to have different Visiting Naturalists throughout the year, so students can experience multiple naturalist role models with different kinds of science skills and styles.
H9	The most important part of VNS is that students have positive experiences to develop their interest in nature, science and learning. “Covering” lots of “content” or “standards” is less important than developing students’ identities as self-directed observers and learners in the real world.		Schools are responsible for making sure students learn a lot of specific content from the curriculum and Montana standards. This means schools must stay focused and use time efficiently; fun, “engaging” activities, which kids can do on their own time, are less important during school hours than covering the full curriculum.
H10	Outdoor activities are an essential, irreplaceable part of the VNS experience, not just for occasional field trips but for most VNS lessons during the regular school day.		Indoor VNS lessons are often just as effective for student engagement and learning; it isn't necessary to be outside in order to learn about nature and science, the key is having time to focus on these topics.

Note.  $N=10$ . The online interface registered naturalist responses ranging from 0 (left side of charts) to 100 (right side of charts).

## Program Volunteer Perspectives

Volunteers were also asked to report their observations, ratings, comments and recommendations about the VNS program on several of the same topics that teachers had been asked about. (See Table 1 for an overview of the survey modules and which groups of participants were asked about each topic).

Twenty-six volunteers responded to the survey; their survey responses are detailed in this section. Volunteers were asked to report the length of their experiences as volunteers in K-12 schools as well as how many years they had been involved with the VNS program. The average number of years volunteering in schools was 6.7 ( $SD = 12.5$ ; 19 volunteers responded to this question) while the average number of years working with the VNS program was 4.4 ( $SD = 12.5$ ; 20 volunteers responded to this question).

### General Perspectives on the *Visiting Naturalist in the Schools* Program

Volunteers were first asked to rate their level of agreement with a set of general, overall statements about the VNS program, using a six-point scale that ranged from “strongly disagree” to “strongly agree.” These statements, response options, and a summary of volunteer ratings are displayed in Table 54. Highlights of these findings are listed below:

**Program Enjoyment.** More than 90 percent of volunteers “strongly” agreed that they enjoyed participating the program and that students greatly enjoy the outdoor VNS activities at their schools. More than 85 percent strongly agreed that their students greatly enjoy the in-class VNS activities and the day-long VNS field trips. Remaining volunteers “moderately” agreed.

**Value of Program Components.** More than half of volunteers “strongly” agreed that each of the major activity formats of the program were “especially valuable,” including the in-class activities, the outdoor activities at the school, and the field trips. All volunteers “strongly” or “moderately” agreed that the outdoor activities at the school and the field trips were especially valuable. In-class program activities received lower ratings, with 13 percent of volunteers “slightly” agreeing and 33 percent “moderately” agreeing that these were especially valuable.

More than 80 percent of volunteers strongly agreed that the core focus of the program (observing and learning about nature) is an important addition to the school curriculum and that the visiting naturalists and volunteers provide important role models for students; most others “moderately” agreed.

When asked whether observation and study of local natural history through the program provides students an opportunity for interdisciplinary learning of science, math, reading, writing, and art, 81 percent of volunteers strongly agreed, 12 percent moderately agreed, one teacher slightly agreed and one moderately disagreed.

**Overall Program Value.** Eighty-eight percent of volunteers “strongly” agreed that the naturalists they have worked with have been very knowledgeable about natural history and natural science topics and skills and 92 percent “strongly” agreed that the visiting naturalists were very skilled at effectively communicating and at managing student activities. More than two thirds strongly agreed that the program is well organized and facilitated, the program is a valuable use of their time, and they would recommend the VNS program to other volunteers, schools and communities. Most of the remaining volunteers “moderately” agreed with these statements.

**Table 54. Volunteer Ratings of the VNS Program**

General reactions to the VNS program:							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
A1	I enjoy participating in the Visiting Naturalist in the Schools program.	-	-	-	-	4 %	96
A2	Students greatly enjoy the in-class VNS activities.	-	-	-	-	17	83
A3	Students greatly enjoy the outdoor VNS activities at their schools.	-	-	-	-	9	91
A4	Students greatly enjoy the day-long VNS field trips.	-	-	-	-	13	88
A5	For me as a volunteer, the in-class VNS activities are especially valuable.	-	-	-	13	33	54
A6	For me as a volunteer, the outdoor VNS activities at the schools are especially valuable.	-	-	-	-	32	68
A7	For me as a volunteer, the day-long VNS field trips are especially valuable.	-	-	-	-	23	77
A8	Learning to be a “naturalist” – observing and learning about nature, natural resources, natural history, natural cycles – is very useful and important for students, a very good addition to school curriculum.	4	-	-	-	8	88
A9	The visiting naturalists and program volunteers provide important role models for students as adults with interest, expertise and careers in natural science and natural history education.	-	4	-	4	12	81
A10	The observation and study of local natural history gives students a great opportunity for integrated learning of science, math, reading, writing, and art – engaging students in many core subjects at once.	-	4	-	4	12	81
A11	The VNS program overall is well organized and facilitated.	-	4	4	8	15	69
A12	The individual visiting naturalists I have worked with have been very knowledgeable about natural history and natural science topics and skills.	4	-	-	8	19	69
A13	The individual visiting naturalists I have worked with have been very skilled at effectively communicating and at managing student activities.	-	4	-	4	23	69
A14	Participating in the VNS program has been a valuable use of my time.	-	-	-	-	12	88
A15	I would recommend the VNS program to other volunteers.	4	-	-	-	8	88
A16	I would recommend the VNS program to other schools and communities in Montana.	4	-	-	-	8	88

Note. N=22 to 26. Each row contains the proportion (percentage) of volunteers who gave each response to the question. Row percentages may not add to exactly 100% due to rounding.



## Student Engagement in the Natural World

Volunteers were asked eight questions about the impact of the VNS program on student engagement in the natural world. Table 55 displays their responses when asked to rate their agreement with seven statements about the program; Table 56 displays their free-response comments about this topic.

More than 90 percent of volunteers agreed that “most students come to school already interested in learning about animals, plants, weather, and other parts of nature,” with 52 percent “moderately” or “strongly” agreeing. More than 95 percent of volunteers (all but one) “moderately” or “strongly” agreed that the VNS program builds on students’ existing curiosity about nature, helps extend their awareness and interests into new aspects of the natural world, and helps students learn to use scientific tools to explore and extend their engagement in nature. Each of these statements received “strong” agreement from at least 69 percent of volunteers.

All volunteers “moderately” or “strongly” agreed that the program supports continued engagement in the natural world for students who already have a strong and positive history of experiences in nature (two others “slightly” agreed), and 92 percent “moderately” or “strongly” agreed that the program offers gentle and inviting pathways into nature for those with limited or negative prior experiences.

Eighty-two percent of volunteers agreed that the program helps students appreciate the importance of thoughtful management, conservation, and stewardship of natural resources, with 38 percent “moderately” agreeing and 42 percent “strongly” agreeing. One volunteer “slightly” agreed, two slightly disagreed, and two “moderately” disagreed with this statement.

**Table 55. Volunteer Ratings of Impact on Student Engagement in the Natural World**

Perceived impact on <b>student engagement in the natural world</b> :							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
B1	Most students come to school already interested in learning about animals, plants, weather, and other parts of nature.	-	9 %	-	39	26	26
B2	The VNS program builds on students' curiosity about the natural world by encouraging and supporting their interest in learning about the nature around them.	-	4	-	-	27	69
B3	The VNS program helps students extend their awareness and interests into new aspects of the natural world they may not have noticed or thought about.	-	4	-	-	19	77
B4	The VNS program helps students learn how to use tools to explore and extend their engagement in the natural world (e.g. journals, microscopes, field guides, binoculars, etc.)	-	4	-	-	15	81
B5	The VNS program helps students appreciate the importance of thoughtful management, conservation, and stewardship of natural resources.	-	8	8	4	38	42
B6	For students with a strong interest in nature, the VNS program offers role models and pathways that support their continued pursuit of these interests.	-	-	-	-	27	73
B7	For students with limited or negative experiences in nature, the VNS program offers gentle and inviting pathways into discovering and developing their interest in the natural world.	-	-	4	4	27	65

Note. N=23 to 26. Each row contains the proportion (percentage) of volunteers who gave each response to the question. Row percentages may not add to exactly 100% due to rounding.

Volunteers were asked to share thoughts about the extent to which the VNS program builds on student curiosity and enhances student engagement in the natural world. Their verbatim comments are listed in Table 56; names or other identifying information have been redacted from two comments.

Several comments affirmed the impact of the program on student engagement in the natural world, with one volunteer appropriately noting that observations of student interest and engagement in real time don't necessarily provide evidence of a long-term impact on student interest.

Several volunteers commented that the program might be able to do more to develop student awareness of natural resource stewardship or conservation efforts.

**Table 56. Volunteer Comments: Program Impact on Student Engagement in the Natural World**

B8	Please share any other thoughts you have on the extent to which the VNS program builds on student curiosity and enhances student engagement in the natural world:
<ul style="list-style-type: none"> <li>I will take this opportunity to share specifically ... [My local school] REALLY needs this program. A lot of the kids start out the year shouting about how they have learned to shoot and kill and stomp on animals/plants in nature. VNS opens wide new doors of perspective and observation; many will say on the final field trip that they want to grow up and be a naturalist. That to me is SUCCESS – even the thought planted in their head. It gives me an opportunity to connect with people in this town that I might not otherwise connect with – my goal: to influence as many people as I can, starting in my backyard, to help them love nature, be curious, and realize that we MUST protect and enhance our environment for us and for future generations. VNS is a wonderful way to do that. Thank you ... Final thought, you all know, it is so hard to put into words what being in nature and feeling a part of it does to our wellbeing, connection with Mother Earth and confidence. That is what you give to these kids. They need it so very much.</li> <li>I think the program is very effective. I would like to see a little more on how to preserve the natural resources that we have, how to maintain our countryside free of trash, how to eliminate the use of plastics, etc. I think it is a very important part of the students' immersion in the natural world, so that they can become steward of the land as well.</li> <li>I was so impressed yesterday on their field trip to hear so many of them express determination to involve their families in exploring nature this summer.</li> <li>Need more on conservation/stewardship. We offer them fun and tools, but do not teach them how to be stewards of the land and the things we are observing.</li> <li>I don't generally like using adverbs to describe other people's level of interest and/or participation in the program. I do believe that [the VNS naturalists I know] do an excellent job of engaging and holding the interest of the students, but I have no way of assessing any lasting effect on student interest. We should perhaps ask the parents and/or teachers about this. With the limited time available, we impart a lot of fascinating information and hands-on practice. If the kids get 10% of what they give back to me by way of context and insights, their time is well spent.</li> <li>Some of the naturalists from MNHC are much more skilled and knowledgeable than others, just as some teachers are more engaged and interested than other teachers. I do feel that the level of engagement and interest of the teacher in the classroom impacts student interest and engagement.</li> <li>Too much material crammed into sessions and we rush to get through them, not leaving enough time to clarify doubts students have, to finish journaling and absorbing what was presented.</li> </ul>	

## Volunteer Learning in the Sciences

Volunteers were asked seven questions about the impact of the VNS program on their own learning in the sciences. Table 57 displays the pattern of their responses when asked to rate their agreement with six statements about the program; Table 58 displays their free-response comments about this topic. Ninety percent of volunteers “moderately” or “strongly” agreed that the VNS program enhances their connection with their school science curriculum, with 74 percent “strongly” agreeing. Eighty-eight percent of volunteers also “moderately” or “strongly” agreed that the VNS program is “very helpful for strengthening and supporting my own learning in the sciences,” with 75 percent “strongly” agreeing. The remaining volunteers “slightly” agreed. Seventy-six percent of volunteers “moderately” or “strongly” agreed that they have “learned a lot of science content through working with the VNS program,” with 63 percent “strongly” agreeing. The remaining volunteers “slightly” agreed.

Fifty percent of volunteers “moderately” or “strongly” agreed that “VNS has helped me learn a lot about how different kinds of scientists do their work,” with 36 percent “strongly” agreeing. Twenty-seven percent “slightly” agreed, while 23 percent “slightly” or “moderately” disagreed. Fifty-two percent of volunteers “moderately” or “strongly” agreed that “VNS has given me valuable practice in the skills and activities that scientists perform,” with 38 percent “strongly” agreeing. Twenty-nine percent “slightly” agreed, while 19 percent “slightly” or “moderately” disagreed. Sixty-nine percent of volunteers “moderately” or “strongly” agreed that “I have become more confident with science topics and activities through my VNS experiences,” with 52 percent “strongly” agreeing. Twenty-two percent “slightly” agreed, while 8 percent “slightly” or “moderately” disagreed. Comments about program impact on their own learning focused on science and natural history content.

**Table 57. Volunteer Ratings of Impact on Educator Learning in the Sciences**

Perceived impact on adult learning in the sciences:							
Please indicate your level of agreement with the following statements:		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
E1	In my experience as a teacher or volunteer, the VNS program enhances my own connection with our school science curriculum.	-	-	-	11 %	16	74
E2	The VNS program is very helpful for strengthening and supporting my own learning in the natural sciences.	-	-	-	13	13	75
E3	I have learned a lot of science content through working with the VNS program as a teacher or volunteer – ideas and knowledge about how nature works.	-	-	-	25	13	63
E4	VNS has helped me learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	-	5	18	27	14	36
E5	VNS has given me valuable practice in the skills and activities that scientists perform.	-	5	14	29	14	38
E6	I have become more confident with science topics and activities through my VNS experiences.	-	4	4	22	17	52

Note. N=19 to 24. Each row contains the proportion (percentage) of volunteers who gave each response to the question. Row percentages may not add to exactly 100% due to rounding.

**Table 58. Volunteer Comments: Impact on Educator Learning in the Sciences**

E7	Please share any other thoughts on the extent to which the VNS program increases your own learning about the sciences:
<ul style="list-style-type: none"> <li>Having been a teacher in the elementary classes for 13 years, this has served as a refresher course with emphasis on topics that I did not know about (shape of skulls, importance of teeth for determining herbivores, omnivores, etc. E.g., the make up of feathers in a bird's wing and the importance of each section. It has been fun to share the learning with the students.</li> <li>Often students will have questions to which I have to say, "I don't know." I encourage them to do further research, and I try myself to find out the answer(s) to share at the next visit.</li> </ul>	

## Overall Comments on Program Impact

Volunteers were asked a series of open-ended questions about the program as a whole, which are presented in this section. First, their verbatim comments about overall program impact on students are listed in Table 59. All comments expressed positive views of the program impact on students. Aside from general positive remarks, themes in their observations echoed some of those in the teacher and naturalist comments, including:

- Student engagement in nature and science, increased appreciation for the natural world
- Increased knowledge, skills, and experience in science, exploration, observation and inquiry

**Table 59. Volunteer Comments: Overall Program Impact on Students**

H1	How would you describe the impact of the VNS program on students?
	<ul style="list-style-type: none"> <li>▪ <i>Life-changing for those students who do not have the privilege of walking out their back door into nature or the privilege of having parents to facilitate direct, unstructured time observing the natural world. I strongly believe that time exploring and observing nature as a child is the single most important way to create good future stewards of the natural world.</i></li> <li>▪ <i>I hope that it has a great impact on the students.</i></li> <li>▪ <i>Very positive.</i></li> <li>▪ <i>Increases curiosity and interest in nature.</i></li> <li>▪ <i>Hands-on opportunities to explore the natural world, development of caring and appreciation for the natural world, developing curiosity and skills in applying the scientific method.</i></li> <li>▪ <i>Very positive. I feel that when the students engage in what they are learning they come away with a better understanding of nature, their roles as budding scientists and more confidence in science.</i></li> <li>▪ <i>Some children are enamored of the program, but some forget everything the next day. Overall, it's a good program which they enjoy.</i></li> <li>▪ <i>Students curiosity is sparked by looking at nature in new ways.</i></li> <li>▪ <i>I would hope that it increase their interest in the out of doors and conservation but also would help motivate them in other studies.</i></li> <li>▪ <i>It gives good hands-on experience and lets them meet people who have spent years actually doing science.</i></li> <li>▪ <i>Most students are interested, engaged, and excited when we come in the classroom or go on field trips. For most students, the natural world is almost intrinsically engaging.</i></li> <li>▪ <i>The students I have seen seem so interested in all the programs and certainly learn so much from the classes – hopefully these increase their knowledge of the natural world.</i></li> <li>▪ <i>The program helps kids who wouldn't usually go outdoors to spend some time exploring and appreciating nature. For kids that already spend a significant amount of time outdoors, the program helps those students enhance their naturalist skills and maybe gain some new knowledge that they can pass on to their families.</i></li> <li>▪ <i>The structure provides opportunities for observation, measurement, and setting hypotheses.</i></li> <li>▪ <i>Connection to nature and their surrounding outdoor classroom.</i></li> <li>▪ <i>The students really enjoy the program.</i></li> <li>▪ <i>Moderate to large. Depends on factors such as maturity level, instructor, teacher, and instruction hours.</i></li> <li>▪ <i>Enthusiasm.</i></li> <li>▪ <i>Most of the kids seem to enjoy it immensely.</i></li> <li>▪ <i>I have seen students get very excited about classroom, outdoor and field trip activities in the VNS program. The impact is huge!</i></li> <li>▪ <i>I have loved watching students become more at home in the natural world and more adept at using critical thinking skills as we explore different experiments in the classroom.</i></li> </ul>

Table 60 displays volunteer comments on the impact of the VNS program on schools. Many volunteers were unsure of the overall impact on schools as institutions. Some noted that the program served to support the school science curriculum and instruction or connect the school curriculum and activities to the local natural world, including integrated interdisciplinary approaches.

**Table 60. Volunteer Comments: Overall Program Impact on Schools**

H2	How would you describe the impact of the VNS program on schools?
	<ul style="list-style-type: none"> <li>▪ <i>Don't know.</i></li> <li>▪ <i>I would hope that it is good for the schools.</i></li> <li>▪ <i>Assists teachers in the teaching about nature and its importance.</i></li> <li>▪ <i>Provides expertise and materials to support the science curriculum.</i></li> <li>▪ <i>Also very positive. In this age of ever-increasing budget cuts, and more and more disconnect with nature, this program helps teachers with both problems. The VNS program helps kids learn about nature, science and stewardship.</i></li> <li>▪ <i>Not sure. A great program to bring into the schools, but have no idea how it impacts the schools as institutions.</i></li> <li>▪ <i>Connects schools to MNHC and importance of nature in curriculum.</i></li> <li>▪ <i>As an occasional volunteer, I don't have enough information to assess.</i></li> <li>▪ <i>I hope it is a positive adjunct to the science curriculum.</i></li> <li>▪ <i>Any added program that provides another teacher can only be beneficial to the kids. Variety.</i></li> <li>▪ <i>It's a great addition to the science curriculum already implemented in classrooms. It's great that teachers can use the information from the naturalist lesson and expand it into larger units in their classrooms.</i></li> <li>▪ <i>I haven't checked into this specifically, but I expect that the VNS program supports specific objectives within the science curriculum for 4th grade, and that more exposure to activities to support those curricular goals would be welcome.</i></li> <li>▪ <i>I'd hope it enhances their curriculum.</i></li> <li>▪ <i>Schools keep coming back which shows their satisfaction with the program.</i></li> <li>▪ <i>It's a good program in supporting teachers. Its consistent and at appropriate learning level.</i></li> <li>▪ <i>Solid.</i></li> <li>▪ <i>Don't know.</i></li> <li>▪ <i>I think that having outside experts in the classroom is important to the schools. Kids who go through the VNS program learn so much as the entire program is framed around a naturalist being a scientist, a writer, and an artist.</i></li> <li>▪ <i>It is a very positive impact as the kids themselves develop a bond with the natural world and also learn to work together.</i></li> </ul>

Table 61 displays volunteer comments on the impact of the VNS program on themselves as educators. Aside from generalized positive remarks, specific themes included increased natural history content knowledge, improved skills as educators, and meaningful connections with students.

**Table 61. Volunteer Comments: Overall Program Impact on Volunteers**

H3	How would you describe the impact of the VNS program on yourself as an educator?
<ul style="list-style-type: none"> <li>▪ <i>Soul-filling. Inspiring children to observe the natural world around them is one of the most important gifts that adults can give to children.</i></li> <li>▪ <i>I enjoy working in the program and the kids.</i></li> <li>▪ <i>An outlet for teaching and reaching kids about an interest of mine.</i></li> <li>▪ <i>As a retired teacher, this gives me the opportunity to engage with kids in a fun, rewarding way.</i></li> <li>▪ <i>It has helped me be more confident in my own naturalist skills.</i></li> <li>▪ <i>As a retired teacher and a Master Naturalist, it's something I thoroughly enjoy doing.</i></li> <li>▪ <i>It keeps me engaged with kids and curious about nature.</i></li> <li>▪ <i>It has been beneficial both in creating opportunities for dealing with youngsters and in being able to work with the knowledgeable staff.</i></li> <li>▪ <i>All positive. Their enthusiasm is infectious.</i></li> <li>▪ <i>I enjoy working with students and I find I have learned a lot. I always appreciate the MNHC staff's willingness to give me ideas and suggestions to help facilitate lessons in the classroom.</i></li> <li>▪ <i>I have learned from every lesson and I have loved to see the kids participate!</i></li> <li>▪ <i>It's fantastic!! As a kid, I had a strong connection with the natural world and spent a lot of time outdoors. However, as I got older I began to lose that connection. I have really enjoyed being able to spend my workday in the beautiful natural areas around Missoula and to share my excitement about the natural world with kiddos.</i></li> <li>▪ <i>I have learned a great deal in the sciences myself, and am more confident to step in to assist teaching.</i></li> <li>▪ <i>Refreshing, invigorating and makes me feel part of the community.</i></li> <li>▪ <i>I learn something with every class.</i></li> <li>▪ <i>It's been fun and rewarding.</i></li> <li>▪ <i>Enlivening.</i></li> <li>▪ <i>I enjoy the teaching aspect most. And helping kids connect with nature and science is rewarding.</i></li> <li>▪ <i>The VNS program continues to motivate me to learn more about the natural world and explore topics that I was previously not very interested in.</i></li> <li>▪ <i>It's been great. I love the kids and really love watching the way they grow over the school year.</i></li> </ul>	



Volunteer comments about surprising or unexpected effects of the program are listed in Table 62. Themes in their remarks included surprise at the level of student enthusiasm for learning about nature, the level of knowledge and creative insights about nature that students exhibit, and the amount of growth and learning that they observe in students over the course of the program year.

**Table 62. Volunteer Comments: Unexpected Program Effects**

H4	Have you observed any surprising or unexpected effects of the VNS program?
	<ul style="list-style-type: none"> <li>▪ <i>Yes - many times I have seen low-income children from the public schools have a "first" experience during the field trip days. Like: "I have never seen an owl before!" Once, a boy asked me: "How do I look you up?" When I asked what he meant, he said: "How do I come back here again to see stuff and learn?" I smiled and almost cried because we were just at Greenough Park but he had never been there before even though he only lived a few blocks away. I told him he could ride his bike there any time. On the next field trip, he brought his mom as a chaperone, and she was just as excited as he was. They had just never been introduced to that kind of experience before.</i></li> <li>▪ <i>Some of the students get really excited about the natural world.</i></li> <li>▪ <i>Enjoy the joy which students show about nature education.</i></li> <li>▪ <i>I am often amazed at the level of knowledge many kids have about the natural world.</i></li> <li>▪ <i>Not really.</i></li> <li>▪ <i>No.</i></li> <li>▪ <i>The interesting comparisons they make within the context of their experience is fascinating and original.</i></li> <li>▪ <i>One thing that has surprised me is that students don't seem to have internalized a respect for nature, i.e. not picking flowers, stomping on spiders, throwing objects, etc.</i></li> <li>▪ <i>No.</i></li> <li>▪ <i>I have found that after field trip season has ended, I miss being outside so much!! I get a very strong yearning to be outdoors every day.</i></li> <li>▪ <i>The class participation always surprises me.</i></li> <li>▪ <i>Not really.</i></li> <li>▪ <i>Yes. I participated in an early session one year but couldn't return until the spring field trip. It was easy and impressive to see how much the students had learned, how their behavior was more advanced outside, and their vocabulary had increased dramatically.</i></li> <li>▪ <i>When I volunteered for my first spring field trips I was absolutely amazed at how much the kids knew and could express themselves about the natural world. I wasn't fully aware of the in-classroom activities at the time, but now I can see just how important those are and how I can better incorporate what I know they are learning in the classroom on field trips.</i></li> <li>▪ <i>I have enjoyed watching some of the shy children become more confident through both in-class and outdoor exercises. Empowering those children who have learned "naturalists skills" of observation by fishing or hunting with parents or grandparents has also been pretty cool. They are really excited by the positive feedback they receive when they spot elk or deer tracks, or identify a type of fish or snake, or hear bird songs first, or spot a bird before anyone else.</i></li> </ul>

Tables 63 displays volunteer comments about strengths of the VNS program, which echoed many of the themes summarized earlier in teacher or naturalist reports of program strengths:

- Hands-on activities
- Field trips and other outdoor activities
- Journals
- Consistency over time of well-organized lesson and activity formats
- The program naturalists and their relationships with students
- Engaging science activities

**Table 63. Volunteer Comments: Program Strengths**

H5	What are the best, most important or most effective parts of the VNS program?
	<ul style="list-style-type: none"> <li>▪ <i>I only participate in the day-long field trips, but splitting the classes up into small groups and taking them out to have direct experiences in nature is highly effective.</i></li> <li>▪ <i>Day long field trips.</i></li> <li>▪ <i>Outreach, <u>relationships</u>, education.</i></li> <li>▪ <i>I think the best, most important, and most effective part of the VNS program is for kids to see that knowledge about the natural world is valuable and important to their future.</i></li> <li>▪ <i>The hands-on work that allows the students to apply what they are learning.</i></li> <li>▪ <i>The hands-on experience that the children get, on the specimens that are brought in.</i></li> <li>▪ <i>Field trips, experiments, journaling.</i></li> <li>▪ <i>The field trips and the journaling.</i></li> <li>▪ <i>The hands-on aspect involves and engages them in ways they may not have had before.</i></li> <li>▪ <i>I like that it includes plants, mammals, and birds. The field trips are really effective in expanding the classroom learning.</i></li> <li>▪ <i>Seeing the students work together in teams to complete an activity.</i></li> <li>▪ <i>Field trips. The classroom lessons are great as well, but it's great for the kids to physically be in nature and to be able to apply all of the knowledge and skills they have learned.</i></li> <li>▪ <i>I love that the curriculum is assessed and revised, even during my short tenure with VNS.</i></li> <li>▪ <i>Outdoor field days in fall and spring.</i></li> <li>▪ <i>The knowledge of the naturalist.</i></li> <li>▪ <i>Monthly visits. Two field trips.</i></li> <li>▪ <i>The sequencing, combined with the field trips.</i></li> <li>▪ <i>The entire program is quite impressive. If I had to choose one thing I would say that emphasizing on field trips what the kids learn from their naturalists during school visits is a very effective way to teach and to learn.</i></li> <li>▪ <i>It would be hard to choose. The classroom and outdoor activities work together to help the kids learn how to approach problems thoughtfully and respectfully, how to work with others, and how to treat nature with love.</i></li> </ul>

Volunteer comments on weaknesses of the VNS program are listed in Table 64. Most volunteers declined to respond or responded without noting a program weakness. Several volunteers suggested the program lessons could benefit from **more time**, and there were other individual suggestions for more emphasis on conservation and stewardship, more science, and less journaling within some of the VNS lessons.

**Table 64. Volunteer Comments: Program Weaknesses**

H6	What are the least important or least effective parts of the VNS program?
	<ul style="list-style-type: none"> <li>▪ <i>I don't know enough about the rest of VNS program to answer this question.</i></li> <li>▪ <i>Sometimes the class times are a bit weak on science.</i></li> <li>▪ <i>Not enough time or opportunities to educate in depth.</i></li> <li>▪ <i>Not enough emphasis on conservation and stewardship.</i></li> <li>▪ <i>Too much journaling in some classroom sessions makes it more burdensome than an effective tool.</i></li> <li>▪ <i>There is not enough time for most lessons. Students are rushed and instructors get frustrated. I think the lessons either need to be shortened or the time in the classroom lengthened.</i></li> <li>▪ <i>It's all important!</i></li> <li>▪ <i>Some of the lessons need revision to better follow evolving educational approaches.</i></li> <li>▪ <i>I like the math. I always wonder if there is time during the lesson for them to absorb it.</i></li> <li>▪ <i>I'm not sure there are any.</i></li> </ul>

Further volunteer recommendations for program improvements are listed in Table 65. In addition to interesting single comments from individuals, common themes from more than one volunteer included recommendations for **more teacher involvement in the VNS activities** and **more time for the program**.

**Table 65. Volunteer Comments: General Program Recommendations**

H7	What changes would you recommend to improve the VNS program?
	<ul style="list-style-type: none"> <li>▪ <i>I think the bird field guides we make for the students should be available for sale for cheap. Many, many students and parents ask for them after going on the nature hikes because they want to continue to use them at home.</i></li> <li>▪ <i>Get each of the teachers involved in the program.</i></li> <li>▪ <i>Expand time or times per month.</i></li> <li>▪ <i>Continue to evaluate individual lessons as you have done this year. Great improvement in the Arthropod exploration and the lesson on birds and feathers.</i></li> <li>▪ <i>More emphasis on conservation and stewardship.</i></li> <li>▪ <i>Smaller groups with more volunteers or closer teacher involvement.</i></li> <li>▪ <i>Requiring classroom teachers to be engaged in the learning process would be great instead of sitting on their computers. There is a dramatic difference in student engagement in classrooms where the teacher is also engaged.</i></li> <li>▪ <i>I would incorporate more reflecting/awareness activities into the field days. Also, I would incorporate behaviors of a naturalist, i.e. patient, curious, quiet, etc. see this link: <a href="https://www.fws.gov/uploadedFiles/What%20is%20a%20NATURALIST.pdf">https://www.fws.gov/uploadedFiles/What%20is%20a%20NATURALIST.pdf</a></i></li> <li>▪ <i>Happy with the program.</i></li> <li>▪ <i>Bring in educational experts to help in review and revision of lesson plans.</i></li> <li>▪ <i>To me it feels like the field trips are too short. It would be great to have at least an hour for each station.</i></li> <li>▪ <i>Some of the experiments could be revisited. It wouldn't hurt to have a scientist sit down and talk about ways specific experiments could be improved. Some of the kids are a little overwhelmed by some of the experiments.</i></li> </ul>

## Volunteer Comments and Recommendations on the Role of Program Volunteers

Volunteers were asked about the role of volunteer in the VNS program. As professional staff naturalists have increasingly taken responsibility for delivering the program, the volunteers have seen their responsibilities change, and these survey questions were designed to gather feedback to insure that the volunteers continue to have a meaningful and satisfying role in VNS activities.

Table 66 displays volunteer comments and recommendations about their role in the VNS program, including whether this role is satisfying and allows them to share their knowledge and talents and mentoring skills and whether changes might improve the structure of the volunteer role in the program model. Most volunteers offered generalized positive comments that they enjoy the program and have no recommendations for changes. Some offered more specific positive commendations, and two offered suggestions for improvements: being more able to volunteer with the same class each month, and having more in-depth training or orientation before each season.

**Table 66. Volunteer Comments and Recommendations on the Role of Program Volunteers**

H8	How satisfied are you with the role of volunteer in the VNS program? Does this role offer you good opportunities to share your knowledge and talents, and to mentor kids? Would you recommend any changes in how the volunteer role is structured in relation to the VNS naturalists and the program model?
	<ul style="list-style-type: none"> <li>▪ <i>I think the organization is generally fine, but it does feel a little chaotic in the field sometimes, which might be unavoidable.</i></li> <li>▪ <i>I like the program.</i></li> <li>▪ <i>Well satisfied. Would like better guarantee of volunteering with same class each month.</i></li> <li>▪ <i>I love how the program is so flexible in allowing volunteers to take on as much responsibility as we are comfortable with.</i></li> <li>▪ <i>Very satisfied. No changes needed.</i></li> <li>▪ <i>Volunteering is one of my favorite activities every month.</i></li> <li>▪ <i>Very.</i></li> <li>▪ <i>The more I do it, the better I get. No surprise there.</i></li> <li>▪ <i>I appreciate working with naturalists who will listen to my feedback after a lesson. Sometimes I see ways to make the lesson more efficient and effective. I also greatly appreciate direction from the MNHC naturalists to make my role more productive.</i></li> <li>▪ <i>I enjoy working with the teachers and it does offer good opportunities to share.</i></li> <li>▪ <i>MNHC offers plenty of opportunity for shadowing/mentoring so that volunteers feel comfortable in leading stations. It might be worth it to have a more in-depth training/orientation before each season (similar to the training done for staff) so that volunteers are fully prepared for what field trips are really like.</i></li> <li>▪ <i>It is perfect. I just wish I could give more time.</i></li> <li>▪ <i>Very satisfied.</i></li> <li>▪ <i>Yes, I am satisfied. It does allow for a moderate level of sharing.</i></li> <li>▪ <i>I feel better about participating in the field trips. I feel less useful (usually) during the classroom visits.</i></li> <li>▪ <i>Satisfied.</i></li> <li>▪ <i>I am very satisfied.</i></li> <li>▪ <i>Yes - the naturalists I have worked with have been really welcoming.</i></li> </ul>

Table 67 displays personal reflections from volunteers about what they enjoy or gain from the program and whether they would recommend this role to others. Aside from generalized positive remarks, specific themes included increased natural history content knowledge and meaningful connections with students. Many affirmed that they would (and do) recommend the VNS volunteer role to others.

**Table 67. Volunteer Personal Comments and Recommendations**

H9	What do you personally enjoy or gain from serving as a VNS volunteer? Would you recommend this role to others who have relevant skills or experiences to offer?
	<ul style="list-style-type: none"> <li>▪ <i>I love having the direct experience helping kids learn in the field because it is so important. I personally gain a deeper knowledge of place as I visit the same areas over and over again and learn who lives there, when they breed, nest, migrate, fledge, etc. I highly recommend this role to others.</i></li> <li>▪ <i>I like the interaction with the kids.</i></li> <li>▪ <i>Enjoy everything about fourth graders!</i></li> <li>▪ <i>I love sharing my love of the outdoors, especially birds and native plants, and also my journaling skills. Yes!</i></li> <li>▪ <i>I did not get to volunteer this year because of scheduling conflicts. I loved it in the past, plan on doing it next school year and do recommend it to others.</i></li> <li>▪ <i>Interacting with the students. Yes, would recommend.</i></li> <li>▪ <i>The kids are great. They are so enthusiastic about answering questions.</i></li> <li>▪ <i>Field trips - the sense of wonder do children have. I would and have recommended this to others.</i></li> <li>▪ <i>I have really enjoyed working with the program naturalists and yes, I would recommend to others.</i></li> <li>▪ <i>I love connecting with children.</i></li> <li>▪ <i>I love seeing the kids and I love learning some of the info I have forgotten!!</i></li> <li>▪ <i>I love learning from both the students and the other naturalists I work with. I learn something new at every classroom visit and every field trip. I would definitely recommend this role to others.</i></li> <li>▪ <i>Connecting children to nature is my heart's desire. And, yes, I would recommend this to anyone with an interest in children and nature.</i></li> <li>▪ <i>Personal growth. Love the kids. Would definitely recommend.</i></li> <li>▪ <i>My number one education priority is science education, followed by learning about the natural world. I would recommend to others.</i></li> <li>▪ <i>Reminders about the science, meeting the staff, meeting with other volunteers, having children in my life, feeling useful.</i></li> <li>▪ <i>I do recommend volunteering with VNS.</i></li> <li>▪ <i>I enjoy continuing to learn about the natural world from the VNS naturalists, other volunteers, the teachers, and the kids! I especially enjoy seeing kids learning about the natural world and that reading, writing, and experimenting are all important parts of being a naturalist.</i></li> <li>▪ <i>This is just the best. I love volunteering, I love the staff, I love the whole MNHC experience.</i></li> </ul>

## Volunteer Recommendations on Program Focus

Volunteers were asked to respond to three questions about the recommended focus or emphasis of the VNS program. Each of these questions presented two opposing prototypical points of view, and asked volunteers to rate where their personal opinion fell on the spectrum from one opposing view to the other. These opinion statements are displayed in Table 68, with the distribution of volunteer responses displayed graphically between each pair of opposing opinions. The graphs are scaled from zero on the far left side to 100 on the far right side. All highly these distributions were highly skewed, with the majority of volunteers endorsing opinions closer to the statement displayed on the left side of Table 46.

Most volunteers supported the opinion that it is important and useful for students to have the same Visiting Naturalist all year, as opposed to having experiences with different Visiting Naturalists throughout the year. The mean score on this scale was 15.6 ( $SD = 15.2$ , median score = 11,  $N = 20$ ).

Most volunteers supported the opinion that having positive, engaging experiences learning about nature and science is more important for students than efficiently “covering” a lot of standard curriculum content. The mean score on this scale was 21.1 ( $SD = 18.2$ , median score = 22,  $N = 21$ ).

Most volunteers supported the outdoor activities are an essential, irreplaceable part of the VNS program, as opposed to viewing the indoor VNS lessons as being equally effective. The mean score on this scale was 28.2 ( $SD = 25.3$ , median score = 24.5,  $N = 20$ ).

**Table 68. Volunteer Recommendations on Program Focus**

Please choose one number to indicate the degree to which your opinion matches the descriptions on each side:																							
H10	It's important and useful for students to have the same Visiting Naturalist all year, so they can get to know the naturalist well and form a positive relationship with a new adult role model who has science skills and interests.	<table><caption>Data for H10 Bar Chart</caption><thead><tr><th>Score Range</th><th>Frequency</th></tr></thead><tbody><tr><td>0-10</td><td>9</td></tr><tr><td>10-20</td><td>3</td></tr><tr><td>20-30</td><td>5</td></tr><tr><td>30-40</td><td>1</td></tr><tr><td>40-50</td><td>1</td></tr><tr><td>50-60</td><td>1</td></tr></tbody></table>	Score Range	Frequency	0-10	9	10-20	3	20-30	5	30-40	1	40-50	1	50-60	1	It would be better to have different Visiting Naturalists throughout the year, so students can experience multiple naturalist role models with different kinds of science skills and styles.						
Score Range	Frequency																						
0-10	9																						
10-20	3																						
20-30	5																						
30-40	1																						
40-50	1																						
50-60	1																						
H11	The most important part of VNS is that students have positive experiences to develop their interest in nature, science and learning. "Covering" lots of "content" or "standards" is less important than developing students' identities as self-directed observers and learners in the real world.	<table><caption>Data for H11 Bar Chart</caption><thead><tr><th>Score Range</th><th>Frequency</th></tr></thead><tbody><tr><td>0-10</td><td>10</td></tr><tr><td>10-20</td><td>0</td></tr><tr><td>20-30</td><td>7</td></tr><tr><td>30-40</td><td>4</td></tr><tr><td>40-50</td><td>1</td></tr><tr><td>50-60</td><td>1</td></tr></tbody></table>	Score Range	Frequency	0-10	10	10-20	0	20-30	7	30-40	4	40-50	1	50-60	1	Schools are responsible for making sure students learn a lot of specific content from the curriculum and Montana standards. This means schools must stay focused and use time efficiently; fun, "engaging" activities, which kids can do on their own time, are less important during school hours than covering the full curriculum.						
Score Range	Frequency																						
0-10	10																						
10-20	0																						
20-30	7																						
30-40	4																						
40-50	1																						
50-60	1																						
H12	Outdoor activities are an essential, irreplaceable part of the VNS experience, not just for occasional field trips but for most VNS lessons during the regular school day.	<table><caption>Data for H12 Bar Chart</caption><thead><tr><th>Score Range</th><th>Frequency</th></tr></thead><tbody><tr><td>0-10</td><td>10</td></tr><tr><td>10-20</td><td>3</td></tr><tr><td>20-30</td><td>0</td></tr><tr><td>30-40</td><td>4</td></tr><tr><td>40-50</td><td>2</td></tr><tr><td>50-60</td><td>2</td></tr><tr><td>60-70</td><td>0</td></tr><tr><td>70-80</td><td>1</td></tr><tr><td>80-90</td><td>1</td></tr></tbody></table>	Score Range	Frequency	0-10	10	10-20	3	20-30	0	30-40	4	40-50	2	50-60	2	60-70	0	70-80	1	80-90	1	Indoor VNS lessons are often just as effective for student engagement and learning; it isn't necessary to be outside in order to learn about nature and science, the key is having time to focus on these topics.
Score Range	Frequency																						
0-10	10																						
10-20	3																						
20-30	0																						
30-40	4																						
40-50	2																						
50-60	2																						
60-70	0																						
70-80	1																						
80-90	1																						

Note.  $N=20$  or 21. The online interface registered volunteer responses ranging from 0 (left side of charts) to 100 (right side of charts).



## Findings by Topic

This section integrates the available responses from each of the three educator groups (teachers, volunteers, and program naturalists) along with responses from students to questions on each major topic in the study. In most cases, more detail is available in the prior sections that report the specific responses of each group.

### General Perspectives on the *Visiting Naturalist in the Schools Program*

#### **Program Enjoyment.** Educators and students enjoy the program.

More than 90 percent of teachers and program volunteers and all program naturalists “strongly” agreed that they enjoyed participating the program. All three groups of educators (teachers, volunteers, and naturalists) reported that students greatly enjoy the VNS field trips, in-class and outdoor (schoolyard) activities, with almost educators strongly or moderately agreeing in this perception. Students concurred; 85 percent of students agreed or strongly agreed that they like learning about plants, animals, and nature. Almost 80 percent of students reported agreeing or strongly agreeing that they have a good time on VNS field trips, as well as when VNS naturalists visit their classroom; 70 percent reported enjoying outdoor VNS activities on their school yard, and 70 percent of students agreed or strongly agreed that “schools should offer more nature programs like this.”



**Value of Program Components.** Educators value all aspects of the program, including the three activity formats (field trips, in-class and outdoor school yard activities), the addition of interdisciplinary study of local natural history to school curriculum, and the use of program naturalists and volunteers as additional role models for students.

Of the three activity formats, the field trips were most highly rated, with all teachers, volunteers and naturalists moderately or strongly agreeing that these are “especially valuable.” All teachers and naturalists along with 87 percent of volunteers gave similarly high ratings to the VNS in-class activities, while the outdoor activities in the school yards were similarly rated by all volunteers, 98 percent of teachers, and 90 percent of program naturalists. Among these three formats, teachers and naturalists gave their lowest ratings to the schoolyard activities, while volunteers gave their lowest ratings to the indoor classroom activities.

All teachers and naturalists and 96 percent of volunteers strongly or moderately agreed that “Learning to be a naturalist – observing and learning about nature, natural resources, natural history, natural cycles – is very useful and important for students, a very good addition to our school curriculum.”

All teachers and naturalists and 93 percent of volunteers strongly or moderately agreed that “The visiting naturalists and program volunteers provide important role models for students as adults with interest, expertise and careers in natural science and natural history education” and that “The observation and study of local natural history gives students a great opportunity for integrated learning of science, math, reading, writing, and art – engaging students in many core subjects at once.”

Table 69 summarizes responses from the three educator groups to these questions.

**Table 69. Summary of Overall Ratings of Program Components**

Program Component	Teachers	Volunteers	Naturalists
Field Trips	100% (84%)	100 (77)	100 (100)
In-Class Activities	100 (84)	87 (54)	100 (60)
Schoolyard Activities	98 (81)	100 (68)	90 (60)
Observing and Learning About Nature	100 (95)	96 (88)	100 (100)
Naturalists as Adult Role Models	100 (93)	93 (81)	100 (90)
Nature Study as Interdisciplinary Education	100 (81)	93 (81)	100 (70)

Note. Values in cells are the proportion (percent) of each group who “strongly” or “moderately” agreed with statements affirming the value of each program component (values in parentheses are the percent who “strongly” agreed).

Only teachers and students were asked about the VNS naturalist journals that students use to record their observations and experiments. The pattern of feedback on the student journals was positive overall, though there was variability in both student and teacher ratings. More than three quarters of teachers (77 percent) reported using the VNS student journal as an assessment or grading tool in their classrooms, with 58 percent “strongly” or “moderately” agreeing that they use the student journals in this way. A majority of students (57 percent) agreed or strongly agreed that they liked making their naturalist journal (26 percent disagreed and 17 percent strongly disagreed).

**Overall Program Value.** Teachers, students, school volunteers, and program naturalists believe the program as a whole is well organized and facilitated, a valuable use of their time, and worth recommending to others.

All teachers and 88 percent of volunteers “strongly” agreed that the naturalists they have worked with have been very knowledgeable about natural history and natural science topics and skills. More than 90 percent of teachers and volunteers “strongly” agreed that the visiting naturalists were very skilled at effectively communicating and at managing student activities.

A majority of teachers, naturalists and volunteers strongly agreed that the program is well organized and facilitated (93 percent of teachers, 100 percent of naturalists, and 69 percent of volunteers), the program is a valuable use of their time (95 percent of teachers, 100 percent of naturalists, and 88 percent of volunteers), and they would recommend the VNS program to other educators, schools and communities (98 percent of teachers, 100 percent of naturalists, and 88 percent of volunteers). All of the remaining teachers and most of the remaining volunteers “moderately” agreed with these statements.

Table 70 summarizes responses from the three educator groups to these questions.

**Table 70. Summary of Overall Ratings of Program Value**

Program Value Statement	Teachers	Volunteers	Naturalists
Naturalists are Knowledgeable About Natural History and Science	100% (100%)	88 (69)	-
Naturalists are Skilled at Communication and Student Management	100 (91)	92 (69)	-
Program is Well Organized and Facilitated	100 (93)	84 (69)	100 (100)
Program is a Valuable Use of My Time	100 (95)	100 (88)	100 (100)
Would Recommend Program to Other Educators (Peers)	100 (98)	96 (88)	100 (100)
Would Recommend Program to Other Montana Schools and Communities	100 (98)	96 (88)	100 (100)

Note. Values in cells are the proportion (percent) of each group who “strongly” or “moderately” agreed with statements affirming the value of each program component (values in parentheses are the percent who “strongly” agreed). Naturalists were not asked to rate themselves.

Similarly, 85 percent of students reported that they “agree” or “strongly agree” that they like learning about plants, animals, and nature. More than 70 percent agreed or strongly agreed that they have a good time when they go on all-day field trips with naturalists, they like it the naturalist visits their classroom, learning about nature is a fun part of school, they enjoy it when they go out on the school yard to learn about nature, and they think schools should offer more nature programs like VNS.

For details of the responses of teachers, students, naturalists and volunteers, please refer to the earlier chapters that report specific findings for each group.

## **Perceived Impact on Student Engagement in the Natural World**

Teachers, naturalists, and volunteers were asked eight questions about the impact of the VNS program on student engagement in the natural world. This section integrates findings from all three groups, as well as student responses to related questions. For detailed responses of teachers, students, naturalists and volunteers, please refer to the chapters that report specific findings for each group. Open-ended comments reported in those chapters reinforce the pattern of quantitative ratings summarized below, and provide vivid personal examples of their observations of VNS program impact on student engagement in the natural world.

### **Do youth come to school with an innate, pre-existing curiosity about the natural world?**

All teachers, all program naturalists, and more than 90 percent of volunteers agreed that “most students come to school already interested in learning about animals, plants, weather, and other parts of nature,” with 78 percent of teachers, 60 percent of naturalists, and 52 percent of volunteers percent “moderately” or “strongly” agreeing.

### **Does the VNS program build on students’ existing curiosity about the natural world?**

All teachers and naturalists along with 96 percent of volunteers “moderately” or “strongly” agreed that the VNS program builds on students’ existing curiosity about nature, helps extend their awareness and interests into new aspects of the natural world, and helps students learn to use scientific tools to explore and extend their engagement in nature.

All teachers, 80 percent of naturalists, and all volunteers “moderately” or “strongly” agreed that the program supports engagement in the natural world for students who already have a strong and positive history of experiences in nature; all teachers, all naturalists, and 92 percent of volunteers also “moderately” or “strongly” agreed that the program supports engagement in the natural world for students with limited or negative prior experiences in nature.

### **Does the VNS program support the development of natural resource stewardship?**

All teachers, 90 percent of naturalists, and 92 percent of volunteers agreed that the program helps students appreciate the importance of thoughtful management, conservation, and stewardship of natural resources. However, agreement with this statement was not as strong as agreement with the three statements about building on student curiosity about the natural world. “Moderate” or “strong” agreement with the statement on resource stewardship was reported by 88 percent of teachers, 50 percent of naturalists, and 80 percent of volunteers. Forty percent of naturalists, 12 percent of teachers and 4 percent of volunteers only “slightly” agreed, while 16 percent of volunteers “slightly” or “moderately” disagreed, as did 10 percent of volunteers. In opened-ended comments, some naturalists and volunteers expressed the view that the program might be able to do more to promote conservation and stewardship.

Table 71 summarizes responses from the three educator groups to these rating scales.

**Student Perspectives.** Students were also asked six questions in which they estimated their own engagement in the natural world both before and after their participation in the VNS program. They reported that their engagement in nature after their participation in the VNS program was significantly greater than it had been before their participation in the program, including greater interest and curiosity in animals, plants, weather, and other parts of nature; more frequent observation of nature; more interest in learning how to use scientific tools to study nature; more interest in helping take care of animals, plants, and nature; and more interest in finding out how to take more classes or get a job as a naturalist.



**Table 71. Summary of Ratings of Program Impact on Student Engagement in the Natural World**

Program Value Statement	Teachers	Volunteers	Naturalists
Most students come to school already interested in learning about animals, plants, weather, and other parts of nature.	88% (39%)	52 (26)	60 (10)
The VNS program builds on students' curiosity about the natural world by encouraging and supporting their interest in learning about the nature around them.	100 (76)	96 (69)	100 (80)
The VNS program helps students extend their awareness and interests into new aspects of the natural world they may not have noticed or thought about.	100 (80)	96 (77)	100 (90)
The VNS program helps students learn how to use tools to explore and extend their engagement in the natural world (e.g. journals, microscopes, field guides, binoculars, etc.)	100 (88)	96 (81)	100 (70)
The VNS program helps students appreciate the importance of thoughtful management, conservation, and stewardship of natural resources.	88 (61)	80 (42)	50 (20)
For students with a strong interest in nature, the VNS program offers role models and pathways that support their continued pursuit of these interests.	100 (85)	100 (73)	80 (70)
For students with limited or negative experiences in nature, the VNS program offers gentle and inviting pathways into discovering and developing their interest in the natural world.	100 (76)	92 (65)	100 (40)

Note. Values in cells are the proportion (percent) of each group who “strongly” or “moderately” agreed with statements affirming the value of each program component (values in parentheses are the percent who “strongly” agreed). Naturalists were not asked to rate themselves.



## **Perceived Impact on Student Engagement in the Sciences**

Teachers and naturalists were asked nine questions about the impact of the VNS program on student engagement in the sciences. This section integrates findings from both groups, as well as student responses to related questions. For detailed responses of teachers, students, and naturalists, please refer to the chapters that report specific findings for each group. Open-ended comments reported in those chapters reinforce the quantitative ratings summarized below, and provide vivid, quotable examples of their observations of VNS program impact on student engagement in the sciences.

Naturalists were offered the chance to respond “I haven’t had enough experience to answer this.” In this section, those who felt that they were not experienced enough to answer have been removed from the analysis, and response have been rates recalculated based on only those who responded with a substantive rating, to make naturalist response rates comparable to those of teachers. Table 72 displays a summary of teacher and naturalist ratings of eight statements about the impact of the VNS program on student engagement in the sciences.

### **Does the VNS program make school science curriculum more engaging for students?**

All naturalists and 98 percent of teachers “moderately” or “strongly” agreed that the VNS program makes school science curriculum more interesting and accessible for students, with 85 percent of teachers and 70 percent of naturalists “strongly” agreeing. (One teacher “slightly” agreed.)

### **Do the specific VNS activity formats increase student interest in science?**

All teachers and naturalists “moderately” or “strongly” agreed that the VNS program is very helpful for developing and strengthening student interest and engagement in the natural sciences. Ninety-three percent of teachers and 70 percent of naturalists “strongly” agreed.

All teachers and naturalists “moderately” or “strongly” agreed that the in-class VNS activities at schools increase student interest in science. Eighty-five percent of teachers and 60 percent of naturalists “strongly” agreed. All teachers and 80 percent of naturalists “moderately” or “strongly” agreed that student interest in science is increased by the outdoor (schoolyard) VNS activities at schools, with 85 percent of teachers and 50 percent of naturalists “moderately” or “strongly” agreeing. All teachers and naturalists “moderately” or “strongly” agreed that the VNS field trips increase student interest in science. Eighty percent of teachers and naturalists “strongly” agreed.

### **Do relationships with VNS adult role models increase student interest in science?**

All naturalists and 97 percent of teachers “moderately” or “strongly” agreed that student interest in science is increased by their experiences and relationships with the visiting naturalists and program volunteers; 88 percent of teachers and 78 percent of naturalists “strongly” agreed.

### **Does the VNS program increase student interest in further education and careers in science?**

In open-ended comments, several naturalists noted that these questions are difficult to answer without conducting long-term studies, especially given the young age of program participants. However, eighty-five percent of teachers and 67 percent of naturalists “moderately” or “strongly” agreed that through their VNS experiences, students become more aware of learning and career options involving the sciences, with 61 percent of teachers and 22 percent of naturalists “strongly” agreeing. Seventy-eight percent of teachers and 86 percent of naturalists “moderately” or “strongly” agreed that many students become more interested in learning and careers in science as a result of their VNS experiences, with 56 percent of teachers and 43 percent of naturalists “strongly” agreeing.



**Table 72. Summary of Ratings of Program Impact on Student Engagement in the Sciences**

Statement on Student Engagement in the Sciences	Teachers	Naturalists
The VNS program makes our school science curriculum more interesting and accessible for students.	98% (85%)	100 (70)
The VNS program is very helpful for developing and strengthening student interest and engagement in the natural sciences.	100 (93)	100 (70)
The in-class VNS activities increase student interest in science.	100 (85)	100 (60)
The outdoor VNS activities at schools increase student interest in science.	100 (85)	80 (50)
The day-long VNS field trips increase student interest in science.	100 (80)	100 (80)
Student interest in science is increased by their experiences and relationships with the visiting naturalists and program volunteers.	97 (88)	100 (78)
Through their VNS experiences, students become more aware of learning and career options involving the sciences.	85 (61)	67 (22)
Many students become more interested in learning and careers in science as a result of their VNS experiences.	78 (56)	86 (43)

Note. Values in cells are the proportion (percent) of each group who “strongly” or “moderately” agreed with statements affirming the value of each program component (values in parentheses are the percent who “strongly” agreed).

**Student Perspectives.** Students were also asked three questions in which they estimated their own engagement in science before and after their participation in the VNS program. They reported that their engagement in the sciences after their participation in the VNS program was significantly greater than it had been before their participation in the program, including greater interest in learning more about science, greater curiosity to find out how scientists figure out how things work in nature, and greater interest in finding out how to take more classes or get a job as a scientist.



## **Perceived Impact on Student Learning in the Sciences**

Teachers and naturalists were asked eight questions about the impact of the VNS program on student learning in the sciences. This section integrates findings from both groups, as well as student responses to related questions. For detailed responses of teachers, students, and naturalists, please refer to the chapters that report specific findings for each group. Open-ended comments reported in those chapters reinforce the quantitative ratings summarized below, and provide vivid, quotable examples of their observations of VNS program impact on student learning in the sciences.

Naturalists were offered the chance to respond “I haven’t had enough experience to answer this.” In this section, those who felt that they were not experienced enough to answer have been removed from the analysis, and response have been rates recalculated based on only those who responded with a substantive rating, to make naturalist response rates comparable to those of teachers. Table 73 displays a summary of teacher and naturalist ratings of seven statements about the impact of the VNS program on student learning.

### **Does the VNS program enhance school science curriculum?**

All teachers and naturalists agreed that the VNS program greatly enhances school science curriculum, with 95 percent of teachers and all naturalists “moderately” or “strongly” agreeing, and 67 percent of teachers and 90 percent of naturalists “strongly” agreeing.

### **Does the VNS program support student learning of science content?**

All teachers and naturalists “moderately” or “strongly” agreed that the VNS program is very helpful for strengthening and supporting student learning in the natural sciences. All naturalists and 87 percent of teachers “strongly” agreed. All naturalists and 97 percent of teachers “moderately” or “strongly” agreed that students learn a lot of science content through their VNS experiences. Eighty-three percent of teachers and half of the naturalists “strongly” agreed.

### **Does the VNS program support student learning of science practices?**

All teachers and naturalists “moderately” or “strongly” agreed that the VNS program helps students learn to use tools for scientific investigation. All naturalists and 90 percent of teachers “strongly” agreed.

All naturalists and 97 percent of teachers “moderately” or “strongly” agreed that the VNS program helps students learn a lot about how different kinds of scientists do their work. Seventy-five percent of teachers and 43 percent of naturalists “strongly” agreed.

All naturalists and 97 percent of teachers “moderately” or “strongly” agreed that the VNS program gives students valuable practice in the skills and activities that scientists perform. Eighty-eight percent of teachers and 67 percent of naturalists “strongly” agreed.

### **Does the VNS program support student confidence with science content and practices?**

All teachers and naturalists “moderately” or “strongly” agreed that students become more confident with science topics and activities through their VNS experiences. More than three quarters of teachers (78 percent) and 43 percent of naturalists “strongly” agreed.

The ratings summarized above were reinforced by themes in the teacher and naturalist open-ended comments that emphasized the value of linkages between VNS program content and school science curriculum and learning activities, ways that VNS extends learning beyond school curriculum, and the cumulative nature of what students learn about science through their year-long VNS program experience.



**Table 73. Summary of Ratings of Program Impact on Student Learning in the Sciences**

Statement on Student Learning in the Sciences	Teachers	Naturalists
The VNS program greatly enhances school science curriculum.	95% (67%)	100 (90)
The VNS program is very helpful for strengthening and supporting student learning in the natural sciences.	100 (87)	100 (100)
Students learn a lot of science content through their VNS experiences – ideas and knowledge about how nature works.	97 (83)	100 (50)
The VNS program helps students learn to use tools for scientific investigation (e.g. journals, microscopes, field guides, binoculars, etc.)	100 (90)	100 (100)
VNS helps students learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	97 (75)	100 (44)
VNS gives students valuable practice in the skills and activities that scientists perform.	97 (88)	100 (67)
Students become more confident with science topics and activities through their VNS experiences.	100 (78)	100 (43)

Note. Values in cells are the proportion (percent) of each group who “strongly” or “moderately” agreed with statements affirming the value of each program component (values in parentheses are the percent who “strongly” agreed).

**Student Perspectives.** Students were also asked two questions in which they estimated their own confidence with science practices before and after their participation in the VNS program. They reported that their confidence in doing scientific work after their participation in the VNS program was significantly greater than it had been before their participation in the program, including their ability to study nature the way scientists do and their ability to do the kind of work that scientists do.



## Perceived Impact on Educator Learning in the Sciences

Teachers, naturalists and volunteers were asked seven questions about the impact of the VNS program on their own learning in the sciences. This section integrates findings from all three groups. Table 74 displays a summary of their ratings of six statements about the impact of the VNS program on their learning. For detailed responses of teachers, naturalists and volunteers, please refer to the chapters that report specific findings for each group. Open-ended comments listed in those chapters reinforce the pattern of quantitative ratings summarized below, and provide vivid personal examples of their experiences of VNS program impact on their own learning in the sciences.

### Does the VNS program enhance educator knowledge of science content and curriculum?

Ninety-five percent of teachers, 90 percent of volunteers, and all naturalists “moderately” or “strongly” agreed that the VNS program enhances their connection with school science curriculum, with 74-75 percent of teachers and volunteers and 30 percent of volunteers “strongly” agreeing.

Ninety-six percent of teachers, 88 percent of volunteers, and all naturalists “moderately” or “strongly” agreed that the VNS program is “very helpful for strengthening and supporting my own learning in the sciences,” with 70 to 83 percent “strongly” agreeing. Eighty-eight percent of teachers, 76 percent of volunteers, and all naturalists “moderately” or “strongly” agreed that they have “learned a lot of science content through working with the VNS program,” with 63 to 80 percent “strongly” agreeing.

### Does the VNS program enhance educator knowledge of science practices?

Eighty-eight percent of teachers, 50 percent of volunteers and 60 percent of naturalists “moderately” or “strongly” agreed that “VNS has helped me learn a lot about how different kinds of scientists do their work;” 63 percent of teachers, 36 percent of volunteers, and 10 percent of naturalists “strongly” agreed. Ninety-one percent of teachers, 52 percent of volunteers, and 70 percent of naturalists “moderately” or “strongly” agreed that “VNS has given me valuable practice in the skills and activities that scientists perform;” 73 percent of teachers, 38 percent of volunteers, and 3 of ten of naturalists “strongly” agreed.

### Does the VNS program enhance educator confidence with science content and practices?

Eighty-eight percent of teachers, 69 percent of volunteers, and 90 percent of naturalists “moderately” or “strongly” agreed that “I have become more confident with science topics and activities through my VNS experiences,” with 52 to 75 percent “strongly” agreeing.

**Table 74. Summary of Ratings of Program Impact on Educator Learning in the Sciences**

Program Value Statement	Teachers	Volunteers	Naturalists
In my experience as a teacher or volunteer, the VNS program enhances my own connection with our school science curriculum.	95% (75%)	90 (74)	70 (30)
The VNS program is very helpful for strengthening and supporting my own learning in the natural sciences.	96 (83)	88 (75)	100 (70)
I have learned a lot of science content through working with the VNS program as a teacher or volunteer – ideas and knowledge about how nature works.	88 (73)	76 (63)	100 (80)
VNS has helped me learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	88 (63)	50 (36)	60 (10)
VNS has given me valuable practice in the skills and activities that scientists perform.	91 (73)	52 (38)	70 (30)
I have become more confident with science topics and activities through my VNS experiences.	88 (75)	69 (52)	90 (60)

Note. Values in cells are the proportion (percent) of each group who “strongly” or “moderately” agreed with statements affirming the value of each program component (values in parentheses are the percent who “strongly” agreed).

## **School Capacity to Provide Engaging Science Education**

Teachers were the only group of adults asked about the impact of the VNS program on the capacity of their school to provide engaging science education for students. Detailed analysis of their responses, as well as their open-ended comments giving examples of how the VNS program supports school capacity to provide engaging science education, are available in the full chapter on teacher survey responses.

### **Does the VNS program enhance the capacity of schools to engage students in their science curriculum?**

All teachers (or in some cases 97 percent) “moderately” or “strongly” agreed that the VNS program:

- Enhances their school’s capacity to address Montana state standards in science education
- Enables their students to go deeper than they would otherwise go into science topics in the school curriculum
- Enhances their school’s science curriculum with additional content beyond the topics they would otherwise be able to cover
- Enables their school to provide engaging science activities to students beyond what they would otherwise be able to provide
- Provides students with access to a greater number and variety of science learning activities than they would otherwise have.

Each of these statements received “strong” agreement from 74 percent or more of responding teachers.

### **Does the VNS program provide science-oriented role models for students?**

All teachers “moderately” or “strongly” agreed that due to the VNS program, “our students have more access to real-life experiences with science-oriented role models;” 92 percent “strongly” agreed.

### **Does the VNS program improve teacher science content knowledge and instruction?**

Findings here mirrored those above on educator learning. Eighty-eight percent of teachers “moderately” or “strongly” agreed that they have “learned a lot of science content through working with the VNS program;” 73 percent “strongly” agreed. The remaining teachers “slightly” agreed.

Ninety-four percent of teachers “moderately” or “strongly” agreed that the VNS program “has enabled me personally, as a teacher, to do a better job helping kids learn about the sciences,” with 74 percent “strongly” agreeing.

## **School Capacity to Provide Interdisciplinary Education**

In addition to science education, teachers were asked about the impact of the VNS program on the capacity of their school to provide interdisciplinary education for students by integrating reading, mathematics, writing, technology skills, or visual arts skills into project-based interdisciplinary activities. Detailed analysis and open-ended comments are available in the full chapter on teacher survey responses.

### **Does VNS enhance the capacity of schools to provide project-based, interdisciplinary activities?**

Eighty-nine percent of teachers “moderately” or “strongly” agreed that the VNS program “offers students well-rounded, project-based, interdisciplinary activities in which they learn and apply many different academic subjects at once through real-life, authentic experiences.”

### **Besides science, which academic subjects are integrated in VNS interdisciplinary student activities?**

Among specific academic disciplines, perceived program impact on visual art and writing skills were rated highest, with 79 to 81 percent of teachers “moderately” or “strongly” agreeing that the VNS program enhances student opportunities to learn and practice skills in these topics. Mathematics and reading were the next highest rated subjects, with 61 percent of teachers “moderately” or “strongly” agreeing that the VNS program enhances student opportunities in these topics. More than half of teachers (53 percent) “moderately” or “strongly” agreeing that the VNS program enhances student opportunities to learn and practice using technology.

## **Other General Comments on Program Impact**

In addition to the specific questions discussed above, teachers, naturalists and volunteers were asked open-ended questions about their general views of the impact of the VNS program on students, schools, and themselves, including any unexpected program effects. They were asked to comment on program strengths and weaknesses, and to offer recommendations for improvements. Volunteers were asked about their views and recommendations on the volunteer role in the program. Their verbatim comments are included in the chapters above that detail the responses of each group. The following summary provides an overview and highlights of the themes in their comments.

### **What do observers report about overall program impact on students?**

Teachers, naturalists and volunteers were unanimous in reporting positive program effects on students, especially with regard to student engagement in nature and science; increased appreciation for the natural world and for approaching the world with the skills and attitudes of a naturalist; and increased knowledge, skills, and experience in science, observation, and inquiry. Several teachers also appreciated that the program provides opportunities for all students to participate and succeed.

### **What do observers report about overall program impact on schools and educators?**

Teachers, naturalists and volunteers also reported positive program effects on schools and on themselves as educators. Themes included supporting and enhancing school science curriculum; connecting school science curriculum and instruction to the local community and natural world; extending school curriculum and learning activities beyond what would otherwise be available; increased opportunities for interdisciplinary learning that integrates, science, mathematics, language arts, and visual arts; improved educator content knowledge in science and natural history; improved teaching skills and connections with students; and enhanced ongoing curiosity and lifelong learning for adult educators.



### **What unexpected program effects were reported?**

Teachers, naturalists and volunteers were asked if they had observed any surprising or unexpected effects of the VNS program. Some themes in the responses of teachers included surprise at how engaged students became in scientific observation and investigation of nature, and at how the VNS program activities fostered active and successful participation by some students who were typically less interested, active or successful in school activities. Several volunteers were likewise surprised at how engaged students became in scientific observation and investigation of nature, and several also commented about the level of knowledge and creative insights about nature that students exhibit and the amount of growth and learning that they observed in students over the course of the program year. Naturalists primarily commented about how program effects extend into the community, and extend over time, through ongoing relationships, observations and discussions of natural phenomena involving students, teachers, naturalists, and their friends and family.

### **What are the strengths of the VNS program?**

Teachers, naturalists and volunteers were asked to list the “best, most important, or most effective parts of the VNS program.” Themes in their views of program strengths (and which groups noted each theme) included:

- Hands-on activities (teachers, naturalists, and volunteers)
- Field trips and other outdoor activities (teachers, naturalists, and volunteers)
- Consistency over time of well-organized lessons and activities (teachers, naturalists, volunteers)
- Engaging science activities (teachers, naturalists, and volunteers)
- The program naturalists and their relationships with students (teachers, naturalists, volunteers)
- Journals (teachers and volunteers)
- Student appreciation and knowledge of nature (teachers)

### **What are some recommendations for program improvement?**

Teachers, naturalists and volunteers were also asked to list the “least important or least effective parts of the VNS program,” and to offer recommended changes to improve the program. Many of those surveyed declined to nominate any program weaknesses, either leaving the question unanswered or writing comments about how there are no unimportant or ineffective parts of the program. However, a few themes emerged as potential areas for improvement:

- Not enough time per lesson (or enough overall time for the program during the year – longer or more frequent lessons would be an improvement (teachers, volunteers)
- More active, engaged teacher involvement in the VNS activities and in planning, customizing or extending these activities for their students and curriculum (naturalists and volunteers)
- Since Montana science standards have been recently updated, there are opportunities to update the linkages between VNS lessons or activities and these newly adopted standards (teachers)
- Deteriorating conditions of school yards as outdoor environments for practicing scientific observation of nature might require additional field experiences or shifting the emphasis of some lessons from schoolyard to classroom (naturalists)
- Specific VNS lessons might be improved (“Canimals” and “Fill the Bill”) (naturalists)
- More emphasis on skills and processes for inquiry and learning, rather than emphasizing learning of specific, fixed content (naturalists)

### **How do volunteers view their role in the VNS program?**

Volunteers reported great satisfaction with their role in the program, highlighting the importance of building meaningful connections with students and naturalists and increasing their own natural history content knowledge. Many affirmed that they would (and do) recommend the VNS volunteer role to others. Only two provided recommendations for improvement of this role (more training/orientation for volunteers and more consistency in volunteering with the same class each month). (Note that the second of these recommendations supports the first one in that volunteers can already volunteer for the same class each month if they wish; this may need clarification during volunteer training).

### **Recommendations on Program Focus**

Teachers, naturalists, and volunteers were asked three questions about the recommended focus or emphasis of the VNS program. Each of these questions presented two opposing prototypical points of view, and asked teachers to rate where their personal opinion fell on the spectrum from one opposing view to the other.

#### **Should the same naturalist or different naturalists visit a school during the year?**

Teachers, naturalists, and volunteers strongly supported the opinion that it is important and useful for students to have the same Visiting Naturalist all year (so they can get to know the naturalist well and form a positive relationship with a new adult role model who has science skills and interests), as opposed to having experiences with different Visiting Naturalists throughout the year (which might allow students to experience multiple naturalist role models with different kinds of science skills and styles).

#### **Should VNS focus on positive student experiences with nature and science learning, or on covering the maximum amount of standard curriculum content?**

Teachers, naturalists, and volunteers strongly supported the opinion that having positive experiences to develop their interest in nature, science and learning (developing their identities as self-directed observers and learners in the real world) is more important for students than efficiently “covering” a lot of specific content from school curriculum and Montana standards.

#### **Are indoor VNS activities as effective as outdoor activities?**

Teachers, naturalists, and volunteers strongly supported the view that outdoor activities are an essential, irreplaceable part of the VNS program (not just for occasional field trips but for most VNS lessons during the regular school day), as opposed to viewing the indoor VNS lessons as being equally effective.

## **APPENDIX A**

### **Teacher Survey**

*(Version 3.1; online surveys used to collect teacher feedback in June, 2018)*

## 2018 Visiting Naturalist in the Schools Survey for Teachers

The Montana Natural History Center (MNHC) provides the *Visiting Naturalist in the Schools* (VNS) program to enhance science and natural history education in Montana classrooms, as well as outdoors – in and around the school grounds and on day-long field trips to local natural areas. MNHC naturalists and volunteers work with classroom teachers to support and extend inquiry-based science instruction for 4<sup>th</sup> and 5<sup>th</sup> grade students, focusing on structured observation and exploration of the natural landscape of Montana. Monthly sessions in each classroom throughout the school year with the same visiting naturalist are intended to build relationships and foster continuity of learning and student interest development.

We hope you will help us assess and improve the VNS program by offering your observations, opinions and recommendations on this survey. Your answers will be kept confidential; reports will not identify you individually; only group summaries and common themes among comments will be reported. **Please answer thoughtfully so that we can serve you better.**

General reactions to the VNS program:							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
A1	I enjoy participating in the Visiting Naturalist in the Schools program.	1	2	3	4	5	6
A2	My students greatly enjoy the in-class VNS activities.	1	2	3	4	5	6
A3	My students greatly enjoy the outdoor VNS activities here at the school.	1	2	3	4	5	6
A4	My students greatly enjoy the day-long VNS field trips.	1	2	3	4	5	6
A5	For me as a teacher, the in-class VNS activities are especially valuable.	1	2	3	4	5	6
A6	For me as a teacher, the outdoor VNS activities here at the school are especially valuable.	1	2	3	4	5	6
A7	For me as a teacher, the day-long VNS field trips are especially valuable.	1	2	3	4	5	6
A8	Learning to be a "naturalist" – observing and learning about nature, natural resources, natural history, natural cycles – is very useful and important for students, a very good addition to our school curriculum.	1	2	3	4	5	6
A9	The visiting naturalists and program volunteers provide important role models for students as adults with interest, expertise and careers in natural science and natural history education.	1	2	3	4	5	6
A10	The observation and study of local natural history gives students a great opportunity for integrated learning of science, math, reading, writing, and art – engaging students in many core subjects at once.	1	2	3	4	5	6
A11	I use the VNS student journal as an assessment/grading tool in my classroom.	1	2	3	4	5	6
A12	The VNS program overall is well organized and facilitated.	1	2	3	4	5	6
A13	The individual visiting naturalists I have worked with have been very knowledgeable about natural history and natural science topics and skills.	1	2	3	4	5	6
A14	The individual visiting naturalists I have worked with have been very skilled at effectively communicating and at managing student activities.	1	2	3	4	5	6
A15	Participating in the VNS program has been a valuable use of my time.	1	2	3	4	5	6
A16	I would recommend the VNS program to other teachers.	1	2	3	4	5	6
A17	I would recommend the VNS program to other schools and communities in Montana.	1	2	3	4	5	6

Perceived impact on <b>student engagement in the natural world:</b>							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
B1	Most students come to school already interested in learning about animals, plants, weather, and other parts of nature.	1	2	3	4	5	6
B2	The VNS program builds on students' curiosity about the natural world by encouraging and supporting their interest in learning about the nature around them.	1	2	3	4	5	6
B3	The VNS program helps students extend their awareness and interests into new aspects of the natural world they may not have noticed or thought about.	1	2	3	4	5	6
B4	The VNS program helps students learn how to use tools to explore and extend their engagement in the natural world (e.g. journals, microscopes, field guides, binoculars, etc.)	1	2	3	4	5	6
B5	The VNS program helps students appreciate the importance of thoughtful management, conservation, and stewardship of natural resources.	1	2	3	4	5	6
B6	For students with a strong interest in nature, the VNS program offers role models and pathways that support their continued pursuit of these interests.	1	2	3	4	5	6
B7	For students with limited or negative experiences in nature, the VNS program offers gentle and inviting pathways into discovering and developing their interest in the natural world.	1	2	3	4	5	6
B8	Please share any other thoughts you have on the extent to which the VNS program builds on student curiosity and enhances student engagement in the natural world:						
<i>[Online survey form allows unlimited comment length]</i>							

Perceived impact on <b>student engagement in the sciences:</b>							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
C1	The VNS program makes our school science curriculum more interesting and accessible for students.	1	2	3	4	5	6
C2	The VNS program is very helpful for developing and strengthening student interest and engagement in the natural sciences.	1	2	3	4	5	6
C3	The in-class VNS activities increase student interest in science.	1	2	3	4	5	6
C4	The outdoor VNS activities at schools increase student interest in science.	1	2	3	4	5	6
C5	The day-long VNS field trips increase student interest in science.	1	2	3	4	5	6
C6	Student interest in science is increased by their experiences and relationships with the visiting naturalists and program volunteers.	1	2	3	4	5	6
C7	Through their VNS experiences, students become more aware of learning and career options involving the sciences.	1	2	3	4	5	6
C8	Many students become more interested in learning and careers in science as a result of their VNS experiences.	1	2	3	4	5	6
C9	Please share any other thoughts you have on the extent to which the VNS program increases student engagement in learning about the sciences:						
<i>[Online survey form allows unlimited comment length]</i>							

Perceived impact on <b>student learning in the sciences:</b>							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
D1	The VNS program greatly enhances school science curriculum.	1	2	3	4	5	6
D2	The VNS program is very helpful for strengthening and supporting student learning in the natural sciences.	1	2	3	4	5	6
D3	Students learn a lot of science content through their VNS experiences – ideas and knowledge about how nature works.	1	2	3	4	5	6
D4	The VNS program helps students learn to use tools for scientific investigation (e.g. journals, microscopes, field guides, binoculars, etc.)	1	2	3	4	5	6
D5	VNS helps students learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	1	2	3	4	5	6
D6	VNS gives students valuable practice in the skills and activities that scientists perform.	1	2	3	4	5	6
D7	Students become more confident with science topics and activities through their VNS experiences.	1	2	3	4	5	6
D8	Please share any other thoughts you have on the extent to which the VNS program increases student learning in the sciences:						
[Online survey form allows unlimited comment length]							

Perceived impact on <b>adult learning in the sciences:</b>							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
E1	In my experience as a teacher or volunteer, the VNS program enhances my own connection with our school science curriculum.	1	2	3	4	5	6
E2	The VNS program is very helpful for strengthening and supporting my own learning in the natural sciences.	1	2	3	4	5	6
E3	I have learned a lot of science content through working with the VNS program as a teacher or volunteer – ideas and knowledge about how nature works.	1	2	3	4	5	6
E4	VNS has helped me learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	1	2	3	4	5	6
E5	VNS has given me valuable practice in the skills and activities that scientists perform.	1	2	3	4	5	6
E6	I have become more confident with science topics and activities through my VNS experiences.	1	2	3	4	5	6
E7	Please share any other thoughts you have on the extent to which the VNS program increases your own learning about the sciences:						
[Online survey form allows unlimited comment length]							



Perceived impact on <b>school capacity to provide engaging science education:</b>							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
F1	The VNS program enables our school to provide engaging science activities to students beyond what we would otherwise be able to provide.	1	2	3	4	5	6
F2	The VNS program enables our students to go deeper than we would otherwise go into science topics in our curriculum.	1	2	3	4	5	6
F3	The VNS program enhances our science curriculum with additional content beyond the topics we would otherwise be able to cover.	1	2	3	4	5	6
F4	Our students have access to a greater number and variety of science learning activities because of the VNS program.	1	2	3	4	5	6
F5	Our students have more access to real-life experiences with science-oriented role models due to the VNS program.	1	2	3	4	5	6
F6	The VNS program enhances our school's capacity to address Montana state standards in science education.	1	2	3	4	5	6
F7	The VNS program has enabled me personally, as a teacher, to do a better job helping kids learn about the sciences.	1	2	3	4	5	6
F8	Please share any other thoughts you have on the how the VNS program has affected your capacity or your school's capacity to provide engaging science education for students:						
[Online survey form allows unlimited comment length]							

Perceived impact on <b>school capacity to provide engaging education in other topics:</b>							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
G1	In addition to science, the VNS program helps our school provide more engaging ways for students to learn and practice <b>mathematics</b> .	1	2	3	4	5	6
G2	The VNS program also helps our school to provide engaging ways for students to learn and practice <b>writing</b> .	1	2	3	4	5	6
G3	VNS enables our school to offer new, engaging ways for students to learn and practice using <b>technology</b> .	1	2	3	4	5	6
G4	VNS gives our school additional engaging ways for students to learn and practice <b>reading</b> .	1	2	3	4	5	6
G5	VNS gives our students additional engaging opportunities to learn and practice <b>visual art skills</b> .	1	2	3	4	5	6
G6	The VNS program offers students well-rounded, project-based, interdisciplinary activities in which they learn and apply many different academic subjects at once through real-life, authentic experiences.	1	2	3	4	5	6
G7	Please share any other thoughts you have on the how the VNS program has affected your school's capacity to provide engaging interdisciplinary or transdisciplinary education for students:						
[Online survey form allows unlimited comment length]							

H1	How would you describe the impact of the VNS program on students?
<i>[Online survey form allows unlimited comment length]</i>	
H2	How would you describe the impact of the VNS program on your school?
<i>[Online survey form allows unlimited comment length]</i>	
H3	How would you describe the impact of the VNS program on yourself as an educator?
<i>[Online survey form allows unlimited comment length]</i>	
H4	Have you observed any surprising or unexpected effects of the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	
H5	What are the best, most important or most effective parts of the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	
H6	What are the least important or least effective parts of the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	
H7	What changes would you recommend to improve the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	
Please choose one number to indicate the degree to which your opinion matches the descriptions on each side:	
H8	<div> <div> It's important and useful for students to have the same Visiting Naturalist all year, so they can get to know the naturalist well and form a positive relationship with a new adult role model who has science skills and interests. </div> <div> 1   2   3   4   5   6   7   8   9  ← What number best represents your opinion? → </div> <div> It would be better to have different Visiting Naturalists throughout the year, so students can experience multiple naturalist role models with different kinds of science skills and styles. </div> </div>
H9	<div> <div> The most important part of VNS is that students have positive experiences to develop their interest in nature, science and learning. "Covering" lots of "content" or "standards" is less important than developing students' identities as self-directed observers and learners in the real world. </div> <div> 1   2   3   4   5   6   7   8   9  ← What number best represents your opinion? → </div> <div> We are responsible for making sure students learn a lot of specific content from our curriculum and Montana standards. This means we must stay focused and use time efficiently; fun, "engaging" activities, which kids can do on their own time, are less important during school hours than covering the full curriculum. </div> </div>
H10	<div> <div> Outdoor activities are an essential, irreplaceable part of the VNS experience, not just for occasional field trips but for most VNS lessons during the regular school day. </div> <div> 1   2   3   4   5   6   7   8   9  ← What number best represents your opinion? → </div> <div> Indoor VNS lessons are often just as effective for student engagement and learning; it isn't necessary to be outside in order to learn about nature and science, the key is having time to focus on these topics. </div> </div>

Experience with other resources for educators from the Montana Natural History Center						
Please select one answer in each row to indicate how helpful each <b>MNHC resource</b> has been:		I haven't tried this	Not Helpful At All	A Little Helpful	Fairly Helpful	Very Helpful
I1	Teacher Benefits Program	0	1	2	3	4
I2	Nature Discovery Traveling Trunks	0	1	2	3	4
I3	Museum Field Trips	0	1	2	3	4
I4	Interactive Distance Learning	0	1	2	3	4
I5	Virtual Science School	0	1	2	3	4
I6	Educator Workshops	0	1	2	3	4
I7	SPARK! Nature Observation & Journaling Program	0	1	2	3	4
I8	Montana Natural History Center Self-Guided Tour	0	1	2	3	4
I9	Adult Master Naturalist Courses	0	1	2	3	4
I10	Please add any other thoughts or recommendations about these educational resources:  <i>[Online survey form allows unlimited comment length]</i>					

Interest in other resources for educators from the Montana Natural History Center						
Please select one answer in each row to indicate how interested you are in each <b>MNHC resource</b> :		I'm not interested in this	Slightly Interested	Somewhat Interested	Very Interested	I have specific plans to use this
I11	Teacher Benefits Program	0	1	2	3	4
I12	Nature Discovery Traveling Trunks	0	1	2	3	4
I13	Museum Field Trips	0	1	2	3	4
I14	Interactive Distance Learning	0	1	2	3	4
I15	Virtual Science School	0	1	2	3	4
I16	Educator Workshops	0	1	2	3	4
I17	SPARK! Nature Observation & Journaling Program	0	1	2	3	4
I18	Montana Natural History Center Self-Guided Tour	0	1	2	3	4
I19	Adult Master Naturalist Courses	0	1	2	3	4
I20	Please add any other thoughts or recommendations about these educational resources:  <i>[Online survey form allows unlimited comment length]</i>					

J1	Including 2017/18 but not 2018/19 or pre-service, how many years have you taught in K-12 schools? <i>(Please enter numbers only)</i> _____
J2	Including 2017/18 but not 2018/19 or pre-service, how many years have you worked with the Visiting Naturalist in the Schools program? <i>(Please enter numbers only)</i> _____

*Thank you for your feedback!*

## **APPENDIX B**

### **Naturalist Survey**

*(Version 3.2; online surveys used to collect naturalist feedback in June, 2018)*

## 2018 Visiting Naturalist in the Schools Survey for VNS Naturalists

The Montana Natural History Center (MNHC) provides the *Visiting Naturalist in the Schools* (VNS) program to enhance science and natural history education in Montana classrooms, as well as outdoors – in and around the school grounds and on day-long field trips to local natural areas. MNHC naturalists and volunteers work with classroom teachers to support and extend inquiry-based science instruction for 4<sup>th</sup> and 5<sup>th</sup> grade students, focusing on structured observation and exploration of the natural landscape of Montana. Monthly sessions in each classroom throughout the school year with the same visiting naturalist are intended to build relationships and foster continuity of learning and student interest development.

We hope you will help us assess and improve the VNS program by offering your observations, opinions and recommendations on this survey. Your answers will be kept confidential; reports will not identify you individually; only group summaries and common themes among comments will be reported. **Please answer thoughtfully so that we can serve you better.**

General reactions to the VNS program:							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
A1	I enjoy participating in the Visiting Naturalist in the Schools program.	1	2	3	4	5	6
A2	Students greatly enjoy the in-class VNS activities.	1	2	3	4	5	6
A3	Students greatly enjoy the outdoor VNS activities at their schools.	1	2	3	4	5	6
A4	Students greatly enjoy the day-long VNS field trips.	1	2	3	4	5	6
A5	For me as a VNS naturalist, the in-class VNS activities are especially valuable.	1	2	3	4	5	6
A6	For me as a VNS naturalist, the outdoor VNS activities at the schools are especially valuable.	1	2	3	4	5	6
A7	For me as a VNS naturalist, the day-long VNS field trips are especially valuable.	1	2	3	4	5	6
A8	Learning to be a “naturalist” – observing and learning about nature, natural resources, natural history, natural cycles – is very useful and important for students, a very good addition to school curriculum.	1	2	3	4	5	6
A9	The visiting naturalists and program volunteers provide important role models for students as adults with interest, expertise and careers in natural science and natural history education.	1	2	3	4	5	6
A10	The observation and study of local natural history gives students a great opportunity for integrated learning of science, math, reading, writing, and art – engaging students in many core subjects at once.	1	2	3	4	5	6
A11	The VNS program overall is well organized and facilitated.	1	2	3	4	5	6
A12	Participating in the VNS program has been a valuable use of my time.	1	2	3	4	5	6
A13	I would recommend the VNS program to other environmental educators as an exemplary program.	1	2	3	4	5	6
A14	I would recommend the VNS program to other schools and communities in Montana.	1	2	3	4	5	6

Perceived impact on <b>student engagement in the natural world:</b>							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
B1	Most students come to school already interested in learning about animals, plants, weather, and other parts of nature.	1	2	3	4	5	6
B2	The VNS program builds on students' curiosity about the natural world by encouraging and supporting their interest in learning about the nature around them.	1	2	3	4	5	6
B3	The VNS program helps students extend their awareness and interests into new aspects of the natural world they may not have noticed or thought about.	1	2	3	4	5	6
B4	The VNS program helps students learn how to use tools to explore and extend their engagement in the natural world (e.g. journals, microscopes, field guides, binoculars, etc.)	1	2	3	4	5	6
B5	The VNS program helps students appreciate the importance of thoughtful management, conservation, and stewardship of natural resources.	1	2	3	4	5	6
B6	For students with a strong interest in nature, the VNS program offers role models and pathways that support their continued pursuit of these interests.	1	2	3	4	5	6
B7	For students with limited or negative experiences in nature, the VNS program offers gentle and inviting pathways into discovering and developing their interest in the natural world.	1	2	3	4	5	6
B8	Please share any other thoughts you have on the extent to which the VNS program builds on student curiosity and enhances student engagement in the natural world:						
[Online survey form allows unlimited comment length]							

Perceived impact on <b>student engagement in the sciences:</b>								
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		I haven't had enough experience to answer this	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
C1	The VNS program makes school science curriculum more interesting and accessible for students.	0	1	2	3	4	5	6
C2	The VNS program is very helpful for developing and strengthening student interest and engagement in the natural sciences.	0	1	2	3	4	5	6
C3	The in-class VNS activities increase student interest in science.	0	1	2	3	4	5	6
C4	The outdoor VNS activities at schools increase student interest in science.	0	1	2	3	4	5	6
C5	The day-long VNS field trips increase student interest in science.	0	1	2	3	4	5	6
C6	Student interest in science is increased by their experiences and relationships with the visiting naturalists and program volunteers.	0	1	2	3	4	5	6
C7	Through their VNS experiences, students become more aware of learning and career options involving the sciences.	0	1	2	3	4	5	6
C8	Many students become more interested in learning and careers in science as a result of their VNS experiences.	0	1	2	3	4	5	6
C9	Please share any other thoughts you have on the extent to which the VNS program increases student engagement in learning about the sciences:							
[Online survey form allows unlimited comment length]								



Perceived impact on <b>student learning in the sciences:</b>								
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		I haven't had enough experience to answer this	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
D1	The VNS program greatly enhances school science curriculum.	0	1	2	3	4	5	6
D2	The VNS program is very helpful for strengthening and supporting student learning in the natural sciences.	0	1	2	3	4	5	6
D3	Students learn a lot of science content through their VNS experiences – ideas and knowledge about how nature works.	0	1	2	3	4	5	6
D4	The VNS program helps students learn to use tools for scientific investigation (e.g. journals, microscopes, field guides, binoculars, etc.)	0	1	2	3	4	5	6
D5	VNS helps students learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	0	1	2	3	4	5	6
D6	VNS gives students valuable practice in the skills and activities that scientists perform.	0	1	2	3	4	5	6
D7	Students become more confident with science topics and activities through their VNS experiences.	0	1	2	3	4	5	6
D8	Please share any other thoughts you have on the extent to which the VNS program increases student learning in the sciences:							
<i>[Online survey form allows unlimited comment length]</i>								

Perceived impact on <b>adult learning in the sciences:</b>							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
E1	In my experience as a teacher or volunteer, the VNS program enhances my own connection with our school science curriculum.	1	2	3	4	5	6
E2	The VNS program is very helpful for strengthening and supporting my own learning in the natural sciences.	1	2	3	4	5	6
E3	I have learned a lot of science content through working with the VNS program as a teacher or volunteer – ideas and knowledge about how nature works.	1	2	3	4	5	6
E4	VNS has helped me learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	1	2	3	4	5	6
E5	VNS has given me valuable practice in the skills and activities that scientists perform.	1	2	3	4	5	6
E6	I have become more confident with science topics and activities through my VNS experiences.	1	2	3	4	5	6
E7	Please share any other thoughts you have on the extent to which the VNS program increases your own learning about the sciences:						
<i>[Online survey form allows unlimited comment length]</i>							

H1	How would you describe the impact of the VNS program on students?
<i>[Online survey form allows unlimited comment length]</i>	
H2	How would you describe the impact of the VNS program on schools?
<i>[Online survey form allows unlimited comment length]</i>	
H3	How would you describe the impact of the VNS program on yourself as an educator?
<i>[Online survey form allows unlimited comment length]</i>	
H4	Have you observed any surprising or unexpected effects of the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	
H5	What are the best, most important or most effective parts of the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	
H6	What are the least important or least effective parts of the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	
H7	What changes would you recommend to improve the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	

Please choose one number to indicate the degree to which your opinion matches the descriptions on each side:			
H8	It's important and useful for students to have the same Visiting Naturalist all year, so they can get to know the naturalist well and form a positive relationship with a new adult role model who has science skills and interests.	1   2   3   4   5   6   7   8   9 ← What number best represents your opinion? →	It would be better to have different Visiting Naturalists throughout the year, so students can experience multiple naturalist role models with different kinds of science skills and styles.
H9	The most important part of VNS is that students have positive experiences to develop their interest in nature, science and learning. "Covering" lots of "content" or "standards" is less important than developing students' identities as self-directed observers and learners in the real world.	1   2   3   4   5   6   7   8   9 ← What number best represents your opinion? →	Schools are responsible for making sure students learn a lot of specific content from the curriculum and Montana standards. This means schools must stay focused and use time efficiently; fun, "engaging" activities, which kids can do on their own time, are less important during school hours than covering the full curriculum.
H10	Outdoor activities are an essential, irreplaceable part of the VNS experience, not just for occasional field trips but for most VNS lessons during the regular school day.	1   2   3   4   5   6   7   8   9 ← What number best represents your opinion? →	Indoor VNS lessons are often just as effective for student engagement and learning; it isn't necessary to be outside in order to learn about nature and science, the key is having time to focus on these topics.

Thank you for your feedback!

## **APPENDIX C**

### **Volunteer Survey**

*(Version 3.1; online surveys used to collect volunteer feedback in June, 2018)*

## 2018 Visiting Naturalist in the Schools Survey for Volunteers

The Montana Natural History Center (MNHC) provides the *Visiting Naturalist in the Schools* (VNS) program to enhance science and natural history education in Montana classrooms, as well as outdoors – in and around the school grounds and on day-long field trips to local natural areas. MNHC naturalists and volunteers work with classroom teachers to support and extend inquiry-based science instruction for 4<sup>th</sup> and 5<sup>th</sup> grade students, focusing on structured observation and exploration of the natural landscape of Montana. Monthly sessions in each classroom throughout the school year with the same visiting naturalist are intended to build relationships and foster continuity of learning and student interest development.

We hope you will help us assess and improve the VNS program by offering your observations, opinions and recommendations on this survey. Your answers will be kept confidential; reports will not identify you individually; only group summaries and common themes among comments will be reported. **Please answer thoughtfully so that we can serve you better.**

General reactions to the VNS program:							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
A1	I enjoy participating in the Visiting Naturalist in the Schools program.	1	2	3	4	5	6
A2	Students greatly enjoy the in-class VNS activities.	1	2	3	4	5	6
A3	Students greatly enjoy the outdoor VNS activities at their schools.	1	2	3	4	5	6
A4	Students greatly enjoy the day-long VNS field trips.	1	2	3	4	5	6
A5	For me as a volunteer, the in-class VNS activities are especially valuable.	1	2	3	4	5	6
A6	For me as a volunteer, the outdoor VNS activities at the schools are especially valuable.	1	2	3	4	5	6
A7	For me as a volunteer, the day-long VNS field trips are especially valuable.	1	2	3	4	5	6
A8	Learning to be a “naturalist” – observing and learning about nature, natural resources, natural history, natural cycles – is very useful and important for students, a very good addition to school curriculum.	1	2	3	4	5	6
A9	The visiting naturalists and program volunteers provide important role models for students as adults with interest, expertise and careers in natural science and natural history education.	1	2	3	4	5	6
A10	The observation and study of local natural history gives students a great opportunity for integrated learning of science, math, reading, writing, and art – engaging students in many core subjects at once.	1	2	3	4	5	6
A11	The VNS program overall is well organized and facilitated.	1	2	3	4	5	6
A12	The individual visiting naturalists I have worked with have been very knowledgeable about natural history and natural science topics and skills.	1	2	3	4	5	6
A13	The individual visiting naturalists I have worked with have been very skilled at effectively communicating and at managing student activities.	1	2	3	4	5	6
A14	Participating in the VNS program has been a valuable use of my time.	1	2	3	4	5	6
A15	I would recommend the VNS program to other volunteers.	1	2	3	4	5	6
A16	I would recommend the VNS program to other schools and communities in Montana.	1	2	3	4	5	6

Perceived impact on <b>student engagement in the natural world:</b>							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
B1	Most students come to school already interested in learning about animals, plants, weather, and other parts of nature.	1	2	3	4	5	6
B2	The VNS program builds on students' curiosity about the natural world by encouraging and supporting their interest in learning about the nature around them.	1	2	3	4	5	6
B3	The VNS program helps students extend their awareness and interests into new aspects of the natural world they may not have noticed or thought about.	1	2	3	4	5	6
B4	The VNS program helps students learn how to use tools to explore and extend their engagement in the natural world (e.g. journals, microscopes, field guides, binoculars, etc.)	1	2	3	4	5	6
B5	The VNS program helps students appreciate the importance of thoughtful management, conservation, and stewardship of natural resources.	1	2	3	4	5	6
B6	For students with a strong interest in nature, the VNS program offers role models and pathways that support their continued pursuit of these interests.	1	2	3	4	5	6
B7	For students with limited or negative experiences in nature, the VNS program offers gentle and inviting pathways into discovering and developing their interest in the natural world.	1	2	3	4	5	6
B8	Please share any other thoughts you have on the extent to which the VNS program builds on student curiosity and enhances student engagement in the natural world:						
<i>[Online survey form allows unlimited comment length]</i>							

Perceived impact on <b>adult learning in the sciences:</b>							
Please indicate your level of agreement with the following statements: (Circle only <b>one</b> answer in each row.)		Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
E1	In my experience as a teacher or volunteer, the VNS program enhances my own connection with our school science curriculum.	1	2	3	4	5	6
E2	The VNS program is very helpful for strengthening and supporting my own learning in the natural sciences.	1	2	3	4	5	6
E3	I have learned a lot of science content through working with the VNS program as a teacher or volunteer – ideas and knowledge about how nature works.	1	2	3	4	5	6
E4	VNS has helped me learn a lot about how different kinds of scientists do their work – specific skills for observing, measuring, experimenting.	1	2	3	4	5	6
E5	VNS has given me valuable practice in the skills and activities that scientists perform.	1	2	3	4	5	6
E6	I have become more confident with science topics and activities through my VNS experiences.	1	2	3	4	5	6
E7	Please share any other thoughts you have on the extent to which the VNS program increases your own learning about the sciences:						
<i>[Online survey form allows unlimited comment length]</i>							

H1	How would you describe the impact of the VNS program on students?
<i>[Online survey form allows unlimited comment length]</i>	
H2	How would you describe the impact of the VNS program on schools?
<i>[Online survey form allows unlimited comment length]</i>	
H3	How would you describe the impact of the VNS program on yourself?
<i>[Online survey form allows unlimited comment length]</i>	
H4	Have you observed any surprising or unexpected effects of the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	
H5	What are the best, most important or most effective parts of the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	
H6	What are the least important or least effective parts of the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	
H7	What changes would you recommend to improve the VNS program?
<i>[Online survey form allows unlimited comment length]</i>	
H8	How satisfied are you with the role of volunteer in the VNS program? Does this role offer you good opportunities to share your knowledge and talents, and to mentor kids? Would you recommend any changes in how the volunteer role is structured in relation to the VNS naturalists and the program model?
<i>[Online survey form allows unlimited comment length]</i>	
H9	What do you personally enjoy or gain from serving as a VNS volunteer? Would you recommend this role to others who have relevant skills or experiences to offer?
<i>[Online survey form allows unlimited comment length]</i>	



Please choose one number to indicate the degree to which your opinion matches the descriptions on each side:			
H10	It's important and useful for students to have the same Visiting Naturalist all year, so they can get to know the naturalist well and form a positive relationship with a new adult role model who has science skills and interests.	1   2   3   4   5   6   7   8   9 ← What number best represents your opinion? →	It would be better to have different Visiting Naturalists throughout the year, so students can experience multiple naturalist role models with different kinds of science skills and styles.
H11	The most important part of VNS is that students have positive experiences to develop their interest in nature, science and learning. "Covering" lots of "content" or "standards" is less important than developing students' identities as self-directed observers and learners in the real world.	1   2   3   4   5   6   7   8   9 ← What number best represents your opinion? →	Schools are responsible for making sure students learn a lot of specific content from the curriculum and Montana standards. This means schools must stay focused and use time efficiently; fun, "engaging" activities, which kids can do on their own time, are less important during school hours than covering the full curriculum.
H12	Outdoor activities are an essential, irreplaceable part of the VNS experience, not just for occasional field trips but for most VNS lessons during the regular school day.	1   2   3   4   5   6   7   8   9 ← What number best represents your opinion? →	Indoor VNS lessons are often just as effective for student engagement and learning; it isn't necessary to be outside in order to learn about nature and science, the key is having time to focus on these topics.
J1	Including 2017/18 but not 2018/19, how many years have you worked with the Visiting Naturalist in the Schools program? <i>(Please enter numbers only)</i> _____		
J2	Including 2017/18 but not 2018/19, aside from VNS, how many years have you volunteered in K-12 schools? <i>(Please enter numbers only)</i> _____		

*Thank you for your feedback!*

## APPENDIX D

### Teacher Interview Questions

*(Version 2.0, used to collect teacher feedback in fall, 2018)*

**Visiting Naturalist in the Schools  
Teacher Interview Questions for Fall 2018**

1. How many years has your school participated in the VNS program? Were you at the school before VNS naturalists started visiting? How many years have you participated in VNS?
2. Before your school participated in the VNS program, what opportunities did students in your school have for learning about nature and related science content and practices?
3. What are the challenges in your school in engaging students in learning about nature, natural history, and science in general?
4. Does the VNS program provide your students with opportunities they wouldn't otherwise have? If so, what are the most important things the program provides? If not, are there opportunities you would like the program to provide for your students that it currently does not?
5. What responses or changes have you observed in your students that you believe are a result of the VNS program?
6. Has this program helped you as a teacher? If so, how?
7. What recommendations do you have for improving the VNS program or for sustaining it in your school? Are there any things you'd like to see added, or changed?
8. Is there anything the VNS program could do to make it easier to implement within your school schedule, curriculum, administrative governance, etc.?
9. Is there anything else you'd like to add about issues in helping students with their interest and learning about nature and science, or how this program can help?

## **APPENDIX E**

### **Student Survey**





*(Version 1.4; paper surveys used to collect student feedback in June, 2018)*

## 2018 Visiting Naturalist in the Schools Survey for Students







Through the **Visiting Naturalist in the Schools** program, naturalists and volunteers visit schools each month and lead field trips to learn about the plants, animals and natural world of Montana.

**Students – please tell us your thoughts about the Visiting Naturalist program. Your ideas will help us make the program better.**

Please do **not** put your name on this form. Your answers will be anonymous – private – so nobody will be able to identify your individual answers. **Please answer thoughtfully to help us know what students like you think about the program.**

How much do you agree or disagree with these ideas?  (Circle only <b>one</b> answer in each row.)		Strongly Disagree 	Disagree 	Agree 	Strongly Agree 
A1	I like it when the naturalist visits our classroom.	1	2	3	4
A2	I like learning about plants, animals, and nature.	1	2	3	4
A3	I really enjoy it when we go out on the school yard to learn about nature.	1	2	3	4
A4	I have a good time when we go with the naturalists on all-day field trips.	1	2	3	4
A5	Learning about nature is a fun part of school.	1	2	3	4
A6	I liked making my naturalist journal this year.	1	2	3	4
A7	I think schools should offer more nature programs like this.	1	2	3	4

CONTINUE ON THE BACK →

Please tell us about <b>your interest in plants, animals, nature and science:</b>										
<b><i>Last year, when I was in third grade:</i></b>				<b><i>Please circle <u>one</u> answer to the left of each statement and <u>one</u> answer to the right.</i></b>		<b><i>Now, when I'm in fourth grade:</i></b>				
	Not like me at all!	A little like me 	Mostly like me 	Very much like me! 	<b>Last year, I was ...</b> ←	<b>Now, I am ...</b> →	Not like me at all!	A little like me 	Mostly like me 	Very much like me! 
B1	1	2	3	4	... very interested in animals, plants, weather, and other parts of nature.		1	2	3	4
B2	1	2	3	4	... very curious to find out how animals and plants live and how nature works.		1	2	3	4
B3	1	2	3	4	... often looking at nature to see what I can learn.		1	2	3	4
B4	1	2	3	4	... very interested in learning how to use journals, microscopes, binoculars and other tools to study nature.		1	2	3	4
B5	1	2	3	4	... very interested in helping people take care of animals, plants and nature.		1	2	3	4
B6	1	2	3	4	... very interested in finding out how to take more classes or get a job as a naturalist.		1	2	3	4
C1	1	2	3	4	... very interested in learning more about science.		1	2	3	4
C2	1	2	3	4	... very curious to find out how scientists figure out how things work in nature.		1	2	3	4
C3	1	2	3	4	... very interested in finding out how to take more classes or get a job as a scientist.		1	2	3	4
D1	1	2	3	4	... confident about my ability to study nature the way scientists do.		1	2	3	4
D2	1	2	3	4	... sure that I could do the kind of work that scientists do.		1	2	3	4



