

Teachers Talk About Wonderwise: The Use and Impacts of the Women in Science Learning Series

Amy N. Spiegel, Ph.D.

June 2002

Wonderwise Learning Kits

**Funded by the Howard Hughes Medical Institute
and the National Science Foundation**

Produced by the University of Nebraska State Museum

Evaluation Report



University of Nebraska-Lincoln 209 Teachers College Hall Lincoln, NE 68588-0284

Teachers Talk About Wonderwise: The Use and Impacts of the Women in Science Learning Series

Abstract

This evaluation study examines 113 teachers' responses to a web-based survey about Wonderwise, a series of museum-developed learning kits featuring women scientists. The results show that many teachers felt the kits provided a rare opportunity to teach science beyond the textbook, and they liked the inquiry-based nature of the activities. The majority of teachers identified the quality of the materials and the interactive science experiences as the primary benefit to students. One-third of teachers specifically identified the women scientists as role models as a key component. Half of the teachers used Wonderwise to meet their science curriculum objectives or state and national standards. Overall, teachers using the kits appear to make diverse use of the kits, enjoy using them, and feel the kits help them meet important goals in their teaching.

Introduction

In the last decade, teachers in the United States have been asked to provide more hands-on, experiential science curricula for their students. With the publication of the Benchmarks for Science Literacy (AAAS, 1993) and the National Science Education Standards (National Research Council, 1996), inquiry-based science has been identified as a critical and necessary element for every science classroom. Elementary teachers, who frequently lack expertise in science, need appropriate science resources to bring into their classrooms. One often over-looked resource to provide science content is museums. Museums of all types, including nature centers, aquariums, and science and natural history museums, provide resource kits for elementary teachers to use in their classrooms, and many that currently do not provide such kits plan to offer them in the future (Cole, Jacobson, Barrett, Fleming, Klossner, and Leone, 1998). Some institutions have been providing this type of outreach service for over a hundred years (Patton, 1991). Yet there is little published information about how these kits are developed by the museums or used by teachers. This article briefly describes the development of a series of museum-based science kits and then details one part of a study designed to evaluate the use and impact of these kits for the teachers and students using them.

In 1992, the Howard Hughes Medical Institute funded the University of Nebraska State Museum to develop a series of science outreach kits. The project, called Wonderwise, was designed to motivate students, especially girls, to pursue scientific activities and careers. These kits and the initiative that funded them respond to two important national issues: 1) the need at the elementary level for accessible and high quality, inquiry-based curricula that conform to the new national standards, and 2) the concern that relatively few women choose to pursue scientific careers.

Through interactive, multi-media learning kits, Wonderwise presents women scientists who can be important role models. Developed for 4th to 6th grade students, each kit focuses on one scientist and one science topic related to the scientist's work. A 10 to 15-minute video provides students with a "field trip" into the scientist's laboratory and out into the field where she works, as well as sharing some insight about why the featured scientist became interested in science and what kinds of science activities she enjoyed as a child or budding scientist. Five activities, each of which can be completed in about an

hour, allow students to investigate science topics that are directly related to the work of the featured scientist. Each kit also features a CD-ROM that includes the video, a biography of the scientist, and supplemental materials and resources. The kits are “drop-in” curricula, which can be tied to textbooks or used independently.

The kits were developed using published science teaching and learning standards, including those from McREL, the National Science Education Standards from the National Research Council, and the Nebraska Science Frameworks. Consequently, the kits provide participatory, inquiry-based activities that are designed to be compatible with current curricula for upper elementary students. In addition, as a Nebraska-based project, the development of the kits was also strongly influenced by the context of the teachers who would be using the kits. Starting in 1993, every school district in Nebraska has been required, through state legislation, to incorporate multicultural education “into all phases of the curriculum of grades kindergarten through twelve.” (LB 79-720) This created a specific need for resources that highlight diversity. The Wonderwise kits, which feature women scientists from a variety of ethnic and cultural backgrounds, provide the opportunity for teachers to teach about diversity within an academic subject; in this case, science.

Through a variety of methods, from surveys to trial testing to interviews, teachers were consulted during the process of kit development. An iterative development process that included trial-testing, feedback and revision ensured that Wonderwise activities were shaped by real-life classroom and teacher constraints. In addition, about two dozen classroom teachers from around the state participated in a week-long residential mentors’ workshop to become “Wonderwise mentor teachers.” These Wonderwise mentors then went on to teach their peers about the Wonderwise kits, creating a wide network of dissemination.

An example that clearly illustrates the design principles behind Wonderwise is the *Otters in Action* activity from the Sea Otter Biologist Kit. Students can watch the featured scientist and her colleagues in the video doing a variety of activities in the course of their work. One of those activities is counting the behaviors of the otters to understand how they spend their time and how this affected by food scarcity. Students are then guided through a series of activities to help them learn about observing behavior. This classroom lesson culminates in students actually tallying otters’ behaviors and making meaning from their data. Included in the kit is 15-minute video segment of “Otters in Action.” This is the raw data students use to record their observations of the otters. Students are thus doing an activity that is a scientific activity. A more complete description of the Wonderwise kits and their development is described in Diamond et. al., 1996 (see also Fox, 1993 and <http://wonderwise.unl.edu>).

Previous evaluation studies on the Wonderwise kits have included classroom observation, teacher interviews, and student surveys, which helped us understand in greater depth what was occurring in a smaller number of classrooms (see Spiegel, Diamond, & Dethlefs, 2001). To gain a broader perspective about the implementation and use of the kits across Nebraska, the current study was devised. The goals of this evaluation study were to understand the extent to which the intended design of the kits translated into real classroom applications across a broad sample of teachers. The specific goals of this study were:

- 1) To learn which features of the kits were most salient to teachers,

- 2) To learn how students reacted to the kit,
- 3) To understand how the kits fit into the curriculum and met teachers goals, and
- 4) To identify perceived strengths and weaknesses of the kits for the teachers using them.

Methods

Participants

Because Wonderwise was originally developed as a statewide program, only Nebraska teachers were included in the sampling frame. Teachers who had been involved with Wonderwise at different levels were identified separately. The most involved level were the Wonderwise Mentor Teachers. These were teachers who had been partners with the museum by participating in a weeklong, residential summer workshop about Wonderwise and who had helped disseminate the kits by conducting their own Wonderwise workshops to their colleagues (these were typically half-day workshops, although they varied considerably). Mentor teachers received their own copies of the kits to keep and use in their classrooms. In addition, other individuals who had been highly involved in Wonderwise development, through training, writing, or substantial trial testing, were also included in this Wonderwise Mentor group. The second level of involvement were teachers who had participated in those mentor-led Wonderwise workshops or other Wonderwise workshops conducted by museum staff. The workshops ranged from one hour introductory sessions to multiple day work sessions. The third and last group of Wonderwise-involved teachers were those who had had the least contact with the museum. These teachers had learned about Wonderwise through their colleagues or the museum but had never been formally trained to use the kits. They may have requested copies of the kits through the Wonderwise website or the museum, or may have borrowed kits from their colleagues. Thus, every teacher who had contact with the museum about the Wonderwise kits was included in the sampling frame. The names of over 950 Nebraska educators who were associated with Wonderwise at any level were identified in this manner. Then, using the web-based directory of the Nebraska State Department of Education, this list was updated to provide a final list of 819 educators with current Nebraska addresses.

Instrument

The web-based instrument (see Appendices) was developed to gather information from teachers using the Wonderwise kits. The instrument was designed as an evaluation tool, and was structured to provide both summative data to determine to what extent the kits were meeting the goals for which they were designed, and formative data to inform the development of future kits. The questions asked how the kits were typically used, how well the kits fit into the teachers' curricula, what impact the kits had on students, and what the teachers found most and least useful in the structure of the kits.

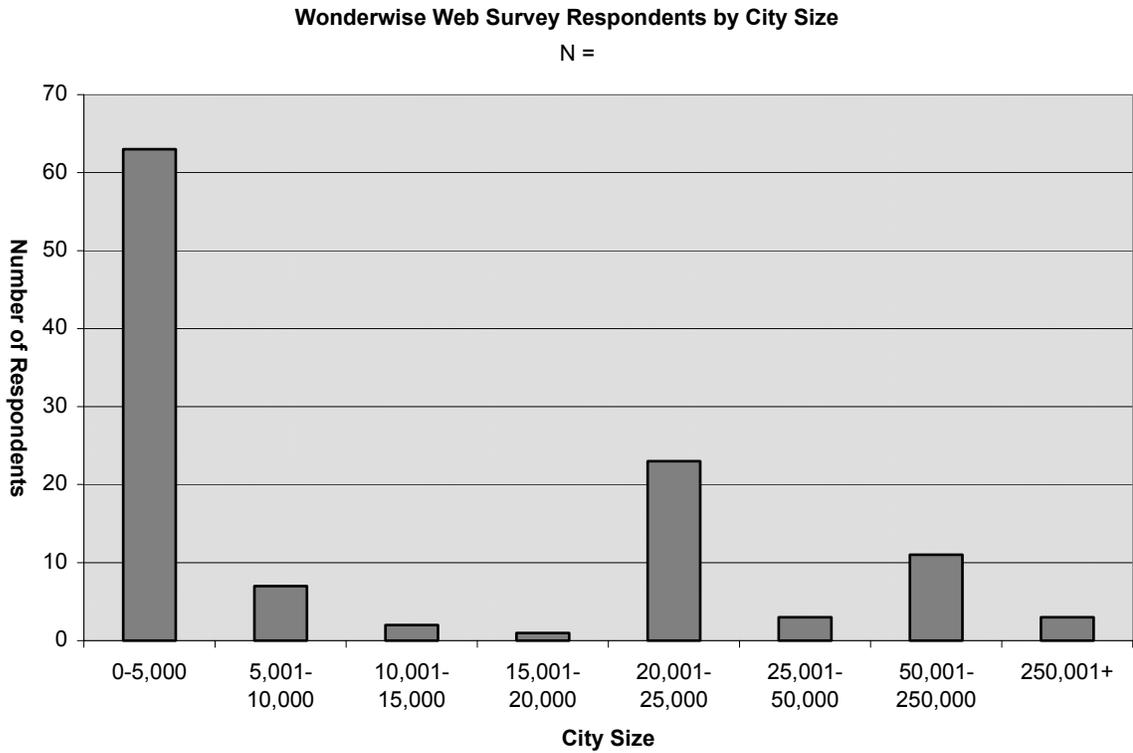
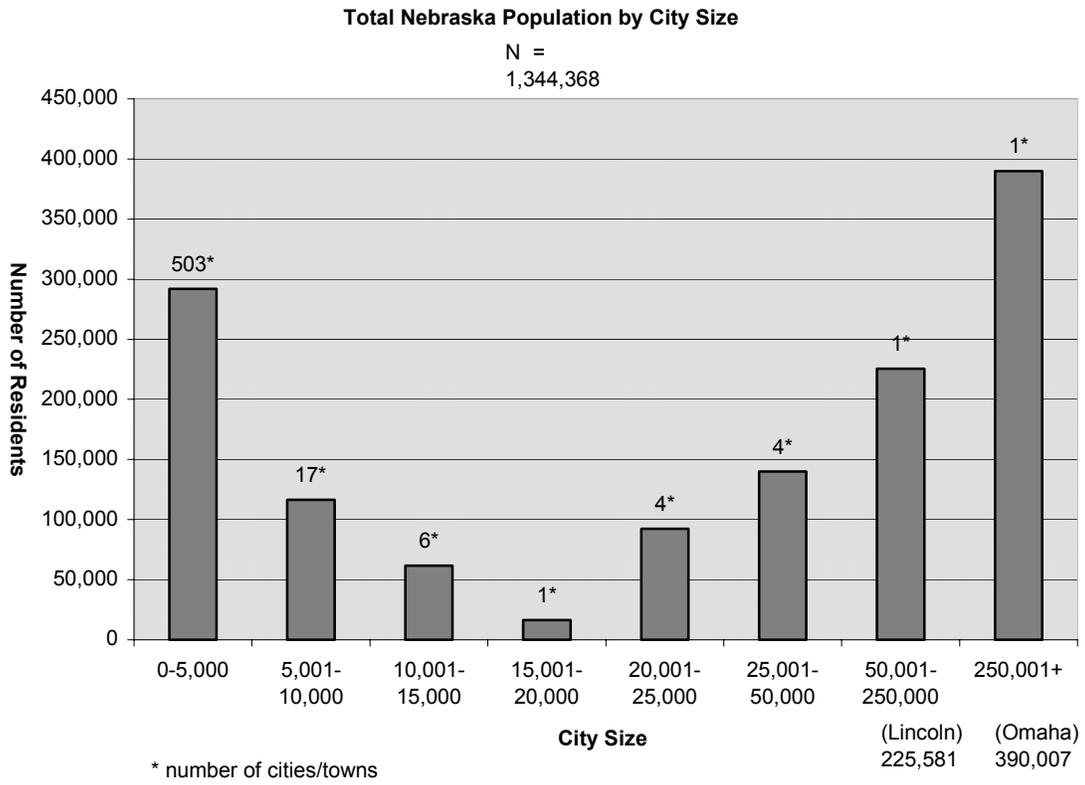
Questions about impact and use were purposefully left open-ended so that respondents were not prompted to identify particular characteristics or aspects about the kits. For example, one of the most important design features of the Wonderwise kits is the use of female scientist role models. Asking about this feature directly would have yielded little information about whether teachers had independently identified this aspect as useful. So, rather than suggest or list features that the developers had identified,

questions about the kits were open-ended and qualitative, allowing respondents to cite any features about the kits that were most salient to them and to describe them in their own words. While this method may yield results less favorable to the evaluation than a checklist or closed-ended questions, it provides a truer picture of how teachers think about the kits and perceive their utility in their classrooms.

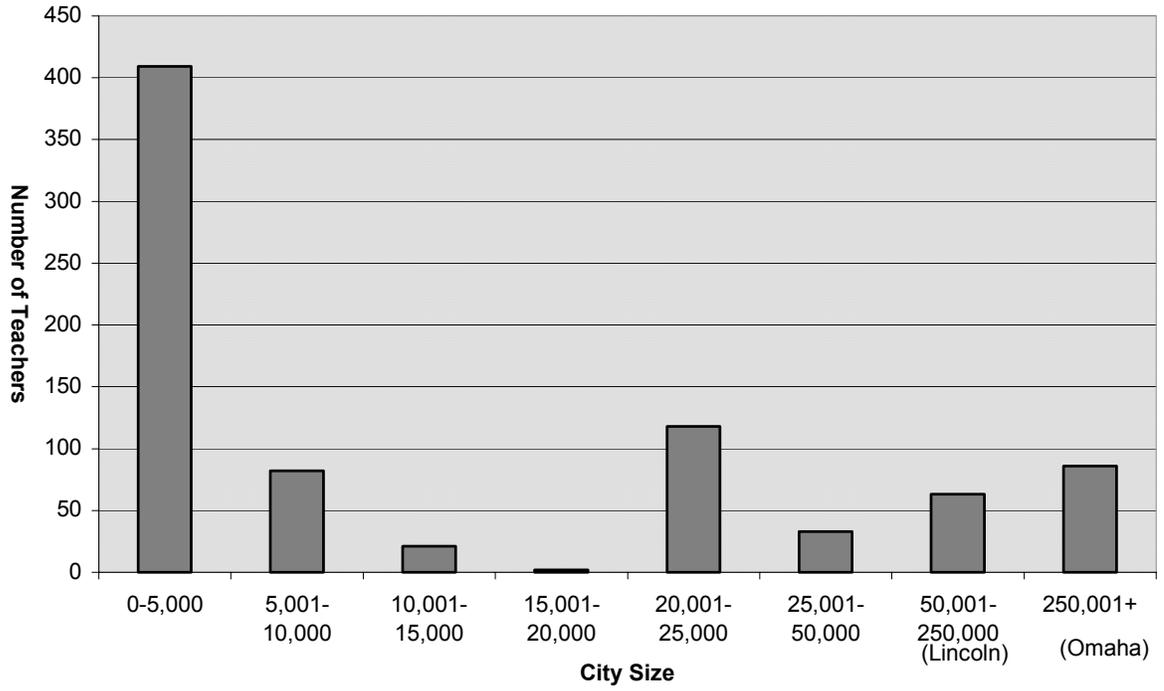
The survey was web-based for ease of data-gathering and analyses. Every teacher in Nebraska has an internet account assigned through their local school district. Nearly all have received training to use the account and the world wide web. The identified participants were sent a letter via U.S. mail asking them to log into the Wonderwise website and complete a survey. For those who did not have web access, a self-addressed stamped postcard, which they could return to receive a paper copy of the survey, was included. All participating teachers received a gift incentive for completing the survey. Three weeks after the initial letter was mailed, a follow-up postcard was sent to remind teachers to participate. One month after this was mailed, the web survey was taken off the Wonderwise website. During this seven-week response period, 103 teachers from the mailing list logged on to the website and completed the survey. Although seven teachers requested paper surveys, only two were returned. In other words, 98% of the respondents chose to complete the survey via the web. An additional 8 teachers who were not sent letters completed the web survey. They may have learned of the survey through the Wonderwise web site itself, or may have had a colleague alert them to the survey. Altogether, the total number of individual respondents was 113, resulting in a response rate of 14%.

Teacher Group	Number in Sample	Number Returned	Percent Returned
Mentor Teachers and others highly involved in Wonderwise	31	12	39%
Teachers taking Wonderwise workshops	781	93	12%
Teachers requesting materials or other information	7	0	0%
Teachers not included in museum database	0	8	N/A
Total	819	113	14%

Eighty-six percent of those responding were female (n=98), 14% were male (n=15), and 2 persons did not specify sex. Ninety-nine percent (n=112) identified their ethnic background as “White, not Hispanic,” and one person identified herself as “Black.” About half of the teachers in the original sample were from towns under 5000 people in size, and this was also true of the respondents. In fact, with respect to town-size or urbanicity, the respondents were very similar to the original sample. In comparing the teachers involved in Wonderwise to the state’s population distribution, the Wonderwise use has focused on smaller, rather than larger cities. This is illustrated in the following series of graphs: 1) Total Nebraska Population by City Size; 2) Wonderwise Web Survey Sampling Frame by City Size, and 3) Wonderwise Web Survey Respondents by City Size). These graphs depict how the distribution and use of Wonderwise has been greater in smaller towns, and less prevalent in Nebraska’s single large city, Omaha.



Wonderwise Web Survey Sampling Frame by City Size
(N=819)



Results

Student Learning

The majority of teachers identified the quality of the materials and interactive science experiences as the primary impact on students. Teachers felt that the hands-on activities and videos grabbed students' attention and made learning fun. For many teachers, the kits provided a somewhat rare opportunity to learn science beyond the textbook, and they liked the inquiry-based nature of the activities.

I feel they think [the kits] are interesting and give the information in a different way than just using a textbook. 23

The activities are exciting and memorable. I have had students from previous years ask if I am still doing certain activities. 38

It gives them other alternative methods of science. Because it is not solely from the book and it is interesting. 82

The insight of each kit, experiments and activities offered get youth involved with hands on learning. 9

[The kits make learning] science fun, hands-on and easy to understand. 100

[My students] think it is cool observing otters and [that it] would be fun to be a scientist. 94

They love to get to do activities instead of just reading the material. 64

About a third of teachers felt that the women scientists as role models were a key component for their students. A quarter of teachers mentioned that exposing students to real life science and scientists was important, and several teachers also thought that it opened students' eyes to the possibilities of different careers in science. One teacher wrote that, "*The kits made students, especially girls, aware that anyone can be a scientist, 33*" while another teacher noted that the kits were direct in showing, "*how women can become scientists. 4*" Other comments make clear that both the teachers and students found the women scientists depicted in the kits to be a compelling and crucial component.

I think they see that science isn't just for men. They do notice the women scientists at work. It seems to excite them and some of them have seemed very interested. 3

They see scientists working at jobs that are not typical of what scientists do in the books or magazines they read (not the stereotypical Einstein as a scientist) and the women tell about how they became interested in science. These women are good role models for all kids. 106

I think the students from our rural area found the women scientist to be unusual models—not typical to women and moms of our town. 51

Female and male students see interesting, vital women scientists making important discoveries and contributions. 115

I think they show especially the girls that science is important and that there are many science related careers. 79

Watching the Judy Sakanari video reminds my female students that women can and do have exciting jobs in Science! 21

Several teachers focused on the importance of really seeing what a scientist does, and the exposure that the kits provided to the students.

It has shown them that women can be scientists and that scientists do all sorts of things. 42

These kits help demonstrate how, as children, they can work as a scientist and see what someone in this field does each day. 55

It is important for them to see what the job of a scientist entails. 34

Students get to see real women scientists at work and not just read about topics. Students can relate to the individuals and see themselves as scientists too.99

The teachers also appreciated the currency and relevance of the topics, and how the kits helped students connect with science in a way that was unique and exciting.

They allow students to study issues that are relevant to today's society and see contemporary science in action. .100

It gives them a real world look at applications that affect them both directly and indirectly. 31

The videos help connect the scientists to the kids. Knowing science is real life is important for them. 18

The kits are relevant to their world. 61

Our learners were engaged, they asked questions, they were able to make connection and developed an interest for continued learning. 81

I think students have been impressed with the women scientists and the quality of activities in the kits. They think they are cool! 32

My students have learned the various responsibilities of scientists and all the different places they go. My students' interests have been sparked. 17

Most teachers mentioned more than one area of impact for their students. It seems that the kit made an impression on students because it was fun and engaging, but the teachers also saw that it was important learning tool with some key lessons about women and real science.

Educational Objectives

Because the kits incorporated published science teaching and learning standards, including those from McREL (Kendall & Marzano, 2000), the National Science Education Standards from the National Research Council (1996), the American Association for the Advancement of Science (1993), and the Nebraska Science Frameworks (Nebraska Department of Education, 1994), it was anticipated that the kits would help teachers fulfill their goals for standards-based curricula.

Half of the teachers used Wonderwise to meet their science curriculum objectives or state and national standards. They saw Wonderwise as a way to meet these externally-imposed standards as well as help them meet their own personal objectives for what they want to include in their own science teaching. Statements included,

*[The kits] follow along well with our state standards and working towards a more hands-on curriculum.*¹¹⁶

*[Wonderwise kits] involve students with scientific process. Develop critical thinking skills. Enjoy science.*⁷⁹

*[Wonderwise kits meet my goals of] teaching science lessons that are: relevant to students, keep them interested and on task, hands-on and fun!*¹⁰⁰

*They enable the students to problem solve and gather data. The students also have hands-on experience with various activities.*⁶⁰

*[The Wonderwise kits meet my goals for] knowing [the] human body, flower parts, rainforest levels.*⁶⁴

One teacher even took the time to list and detail 21 state eighth grade science standards, which was nearly a full page of single-space text. This teacher's response included a diverse and broad set of standards, from "Standard 8.2.1: Identify questions and form hypotheses that can be examined through scientific investigations – use appropriate tools and techniques to gather, analyze and interpret data – develop descriptions, explanations, predictions and models using evidence – think critically and logically to make the relationships between evidence and explanation – communicate scientific procedures and explanations – use mathematics in scientific inquiry," to "Standard 8.7.5: Investigate how population levels effect resources and environments."

In addition to meeting science standards, many teachers also mentioned other goals that the Wonderwise kits helped them meet. Several identified the importance of showing "real-life" science and scientists, and providing career role models. Others focused on the hands-on nature of the kits, which they felt was an effective teaching method. In a similar vein, several teachers appreciated how the kits integrated different ways of learning to reach more students. Comments included,

*The kits help me show real-life situations for science concepts. They also help in my personal goal of creating activities for different learning types and intelligences.*³⁸

[The kits] gave the students hands on activities that were different from the text and activities that I had designed. It is always nice to use different media to be sure that you are meeting the needs of all students. 72

It teaches them hands on science. It teaches them that anyone from anywhere can be a scientist if they try for it.40

[The kits meet my objectives of:] 1) understanding and using the scientific method, 2) cooperative group work, 3) hands on activities (students are involved in science), and 4) students understand that science has many different field of study and they are open to anyone that enjoys science. 13

Some teachers also mentioned trying to show diversity in science, both multicultural and gender, and that the Wonderwise kits gave them this opportunity. Teachers noted that the kits “*show exciting women in science 25*” and “*raise awareness of women in science and math fields18.*” And, as one teacher wrote, “*They definitely highlight multiculturalism.42*” A handful of teachers also identified the cross-curricular aspect of Wonderwise.

Fit with Existing Curricula

There is strong local control of education in Nebraska, where, in spite of heavy consolidation of districts in the last several decades, there are over 800 separate school districts and systems, the vast majority of which are rural. Science kits and other resources need to fit into existing curricular units if they are going to be used in the classroom. In remote, rural areas, where entire schools have fewer than a dozen students (of which Nebraska has a few hundred), teachers’ decisions about classroom materials are very individual. These teachers, who have multi-age and multi-grade classrooms, often have little science background or training and are more dependent on self-contained resources. We were interested in understanding how well the Wonderwise kits were able to be incorporated into existing curriculum and whether teachers were able to adapt the kits to fit their specific needs.

The Lincoln Public Schools recently officially adopted the Wonderwise kits to be used in both Social Studies and Science in grades 4 through 7. For example in science at the fifth grade level, African Plant Explorer is now used in the Chemistry unit, Pollen Detective is used in the Rocks and Fossils unit, and Urban Ecologist is used in the Water and Wetlands unit. In Social Studies at the fourth and sixth grade levels, the videos from the Sea Otter Biologist and Rainforest Ecologist are used for units on different regions of the world.

The overwhelming majority of teachers incorporate the Wonderwise kits into their existing science curriculum units and use them alongside their texts or as extensions. Some teachers have designed their own science units by combining various resources while others primarily use an existing text and include Wonderwise as supplemental material. For example, teachers wrote,

I use this one most often with my unit on pollination from the Merrill Science book.4 [Pollen Detective]

This kit fits in with the animal unit I teach in 4th grade and the biomes unit in 5th grade.¹² [Sea Otter Biologist]

It fits with the fourth grade Scott Foresman science textbook used in my school. I like using it with my students to show animals using camouflage in their habitats.²³ [Rainforest Ecologist]

Our class takes part in a three week Rainforest Unit where every subject is connected to the Rainforest.⁵²

When we are studying the human body and its parts and the digestive system. We use it with our book Holt Science.⁶⁴ [Parasite Sleuth]

I use the urban ecologist unit in conjunction with our cell and microbes unit in our Discovery Science book.⁷⁶

While many teachers just indicated a specific topic that they integrated a kit with, such as “Botany class” or “Rainforest unit,” many others listed publishers or curricula. Over two dozen specific texts or units were mentioned, and these included:

- Merrill Science book
- McGraw-Hill series
- Discovery Works textbook
- Holt and D. C. Heath
- Scott Foresman
- A Beka text (homeschool text)
- Science Horizons by Silver Burdett and Ginn
- Tar Beach (interdisciplinary unit based on this book)
- Biology Principles and Applications (text)
- Science Anytime – Harcourt, Brace
- Science Interactions by Glencoe
- The Monterrey Bay Aquarium
- Silver Burdett and Ginn
- Voyage of the Mimi 2 -- Mayan Indian unit
- Island of the Blue Dolphins
- Discovery Works – Silver Burdett
- Creepy Crawlers
- Holt Science
- World from Macmillan (Social studies)
- Houghton-Mifflin Rainforest science unit
- Discovery Science book
- FOSS unit called “Structures of Life”
- Discover Our Heritage Ancient Africa Unit (Social studies book)
- AGS Biology Book
- “Acres of Agriculture” unit
- Where Plants and Animals Live (Silver Burdett Ginn, 3rd grade text)
- McMillan/McGraw Hill
- Science Explorer –Prentice Hall

Almost a third of teachers use the kits across the curriculum, including them in their social studies, reading, health, and math classes. Teachers explained,

*We study the rainforest in Science and Social Studies and the projects in the kit fit in very well with our studies and then we also get into predicting, estimating, and inferring with the nut experiment in the kit. So we cover Math and Reading as well.*³

*It fits in with the study of Africa and science/geology.*²⁶

*My elementary school has adopted a reading series. One theme in the series is taking care of our world. One of the stories included is about the Exxon Valdez. We talk about the damage which occurred as a result of the oil spill and then I show the video, "Sea Otter Biologist." I want the students to see first hand how others are doing their part to take care of the earth.*⁵⁰

*We use this kit with our Ocean unit in Science. Our text is "Discovery Works Silver-Burdett. We have already combined it with Reading as we read "Island of the Blue Dolphins."*⁶⁰

*[We use this with our] Social Studies book – Discover our Heritage – Ancient Africa Unit.*⁸⁴

*[We use the kit with] Voyage of the Mimi, II – study of the Maya of Central America and their environment.*⁹⁸

A handful of teachers indicated that they use the kits as stand-alone units in their classes. These were mostly special-case situations, such as a special-education teacher, a home-school teacher, and a teacher of gifted children. For example, one teacher wrote

*Being a pull-out school we haven't gotten the regular science curriculum. Wonderwise is used in place of the curriculum.*⁶

Features of the Kit

Teachers were enthusiastic about the kits. Nearly half identified the activities as the most useful feature, most often citing them collectively. A handful of teachers mentioned one or two specific activities that they liked best. The teachers cited the "hands-on" nature of the activities as enjoyable for students, and the design as easy to use for themselves. Some representative comments include,

*The hands-on activities are extremely helpful. My students really enjoy all of the activities and they seem to grasp the concepts much better than when we simply read or watch a video about a topic. The favorite activity is cleaning the oil spill.*³⁸

*The activity guide is the most useful. It is easy to understand and the instructions are easy for the students to follow.*⁶³

*I love the hands-on approach to learning and the accompanying experiments.*⁶⁸

[The] hands-on activities – [for] example, [the] poison frog camouflage activity (my students even named their frogs) [gives my students a] variety of learning experiences that I could not provide otherwise. 115

The activities motivate the students and the hands-on materials really keep them interested. 79

About a third of teachers pointed to the video as a key component, with comments such as

The video is awesome, eye-opening. 3

The video, especially the extra footage at the end for animal observation. This gives the students excellent practice for when we go out into the field and observe local animals for their behavior. 34

The video of real life people doing their jobs [is the most useful feature of the kit].48

The video is excellent. It helps students learn about other root crops that are eaten by people all over the world. It also helps the students understand how important plants are in medicine. 84

Almost a third of teacher also indicated that the overall design of the kits, rather than or in addition to a specific component, was what they found most useful about the kits. They mentioned the “easy to find” materials, the “user-friendly” design, the adaptability of the components, the completeness of the kits, and the reproducible pages. For example, one teacher liked “the teacher friendly set up of the individual lessons. At times, I used them all and other times I would pull out just an individual lesson to fit a certain concept I was trying to get across.11” Another teacher echoed this, saying s/he liked “the way the kit was put together. Very easy to follow and use.49” Other comments included

It is easy to use and has simple directions. All of the materials used are easy to pick up. 52

The lessons are easy to use and do not have to all be done or done in any order, which helps at the change-over times of the unit when you may need a filler or not. 62

I like how it is so teacher friendly and everything is there in one kit. 47

Activities are well designed and easy to set up and use. 72

A few teachers emphasized some other aspects of the kit, mentioning the important information contained in the kits and what the students learned. A few teachers also cited the diversity in the scientists as a key feature, and a small number also picked out the CD-ROM as the most useful element.

When asked what they found most difficult or least useful about the kits, most teachers found little to criticize in the kits. About half of teachers either wrote “nothing [was least useful]” or left their responses blank. Apparently those who choose to use

them have found them to be a good fit in their classrooms. Ten teachers identified specific activities that were difficult or cumbersome, such as “oil clean-up¹³” or “preparing the rocks⁷⁸” or “with younger kids, [the delicate shells] have a tendency to break.¹⁰⁶”

Ten teachers found that the consumables were sometimes difficult to replace or that materials were not available in their locale.

Materials at times are hard to find. ⁴⁰

*Re-supplying the kits [is the most difficult aspect].*⁴²

Reordering the ascaris worms was little more than my secretary wanted to deal with! ⁶²

I have had some difficulty finding the tapioca flour. ⁸⁴

Eight of the teachers felt that the difficulty level of the materials, most often the biography, was too high for their students. Comments included,

Some of the information is too in depth for my students. ⁴⁹

It was difficult for the students to correctly tally otter behaviors. ⁵¹

The reading material is a bit difficult for my third graders. I find it more useful to read bits and pieces. ⁶⁸

Some of the critical thinking questions have been too difficult for the students. ⁷⁶

Biography is difficult for fourth grade students. ⁸⁶

A few teachers had trouble finding the time or space to do as many of the activities as they wanted.

All of it was useful, though we don't do everything in the kit due to time restraints. ³³

Without adequate facilities for science in the classroom, we have to move from the room for some activities. ⁸⁵

Time is always a factor as well as the availability of resources outdoors.
¹⁰⁸

The time involved to complete the entire unit [is difficult]. ¹¹⁶

A few teachers identified the CD-ROM as least useful. As one teacher noted, “I don't have a decent computer in my classroom.²⁵” One teacher had difficulty “incorporating all of [the kits] in my Science curriculum.³⁹” Another teacher found that “the evaluations activities sometimes did not help me understand what the students had really understood of the subject covered. I often supplemented.⁹⁵”

Responses to Individual Kits

When asked to comment on specific kits, many teachers reiterated what they had already said about the kits, indicating that they “*grabbed kids’ interest*” or that “*the video and activities were fun for the students and related to my unit objectives*.”⁶³ Some also noted the importance of the women scientists and how the hands-on activities were interesting for the students. However, some teachers indicated specific qualities in certain kits that made them particularly useful in their classrooms.

Teachers often remarked about how useful the Sea Otter Biologist Kit was for their ecology or environmental studies, with comments such as

*Great for population studies in environmental science.*⁵

*Ties in with the destruction of the earth and how we can [act] as caretaker of the earth to help maintain it.*⁴⁷

*[This kit] helps with developing a positive attitude about caring for our environment. We don’t have a lot of ecology in our text so this really helps fill the void.*³

Several teachers used this kit to inform their students about the ocean, noting that “*this exposes students to an area different than where they live*.”⁹² They also felt that the kit was “*useful for understanding the devastating effects of an oil spill on plants and animals*.”³⁵

One teacher described how this kit helped her extend own Nebraska field trip to see the migration of sandhill cranes along the Platte River in the spring. “*[The] video is great! We go to see the sandhill cranes in March and students replicate the activity of the Sea otter [biologist] when they look for behaviors. We do a simplified version in the field of preening, dancing and eating. Students work in pairs and watch and record the cranes. I would not have done this activity if it weren’t for the kit. Then we use the kit in May and it is a nice connection*.”⁶²

As with the other kits, teachers noted that the Pollen Detective Kit fit in well with their science objectives, with comments such as,

*Fit in perfectly with our Science book and objectives. The kids love it.*³

*Good for Botany, [and] all classes needing beginning activities dealing with process – acquiring samples, categorizing samples, compiling data and interpreting results.*⁵

Teachers most often cited using this kit with their units on plants, indicating, “*this fits well into biology and plant units*,”¹⁴ and “*this [kit] worked out so well when I teach my plant life unit*.”⁴⁷ However, a couple teachers found that this kit did not fit with their curriculum. One teacher wrote, “*I have used this kit only as an ‘extra’ because it does not tie in with our district’s curriculum*.”⁴³

Teachers indicated that “*kids with asthma really like this one!*⁶⁹” and that “*kids relate to allergies.*¹¹⁰” Consequently, some teachers were able to use this kit in their health classes. A few teachers also remarked that they appreciated having a Nebraska scientist featured in this kit, noting that students “*like this because they can see we have scientists in Nebraska*⁵⁶” and having a “*Nebraska Native [is] very useful.*⁷⁴”

Many teachers use the Rainforest Ecologist Kit because the rainforest is a popular science topic for this age group and the activities fit into their curriculum. Teachers noted that the activities were “*useful in learning about the rainforest,*¹⁹” that the kit was “*easy to incorporate with my unit,*⁴⁹” and that they were “*perfect for my rain forest unit!*⁸⁰” One teacher even noted that “*I have nearly eliminated the use of the text book chapters on the rainforest because this kit is so much more interesting and informative.*”

A few teachers noted that they used this kit across the curriculum, in social studies and art. Comments included,

*[This kit] flows with our Mayan unit.*⁵⁴

*[This kit] exposes students to a different biome than they live in.*⁹²

*[The rainforest kit] is useful for understanding why preservation of the rainforests is needed in the environment.*³⁵

A few teachers cited particular activities as being useful, writing that “*kids have loved the nut testing (hardness of shell and oil content)*⁶” and “*the frog camouflage activity attracts all types [of students].*³⁴” One teacher felt that the kit as a whole helped set the right tone for her science class, writing,

*The frogs are an inspiration for the entire year – we use this unit for our school opener.*¹¹⁶

Teachers generally found the Parasite Sleuth Kit to be very applicable to their curriculum in a variety of subjects, including health, zoology and animal studies. Comments included,

*It was very useful in learning about the digestive system.*¹⁹

*Useful in zoology to study the tissue development of parasitic worms, along with introducing the concept of parasitic disease and its worldwide affect.*⁵

*Works well with parasite/host/fungi unit.*⁹¹

*Good for teaching general health issues.*⁴⁰

*Useful when we study single-celled organisms.*⁶⁰

*It fits with our sixth grade objectives.*⁴³

This was also a kit that elicited several comments about “kid appeal.”

*Very high interest for kits.*⁶

*The students love the worm part of this and I like the thinking that they have to do when classifying the types of parasites.*⁵⁶

*Kids love it!*⁹⁹

*Not my personal favorite . . . but the kits love it!*²⁹

A few teachers felt that it was not a good fit with their curriculum, indicating that it was “*too high level for lower students*,¹¹⁰” or that “*it is not in my curriculum*.”⁸⁰ One teacher, who did not find a fit with the curriculum, also noted that, “*I have had some negative comments about the parasite dissection, so I do not do this anymore*.”³⁸ A couple teachers used this kit as a supplemental piece, to “*extend science*.”⁴⁶

Teachers found that the African Plant Explorer Kit fit into their curriculum most easily, using it to meet a variety of instructional objectives. Comments included,

*Got to practice geography skills.*¹¹

*Used parts during our health studies.*¹³

*I tie this one into the Rainforest ecologist units.*²⁹

*This kit fits well with our study of different ecogysystems.*³⁸

*It fit in well with my Africa unit.*⁶⁵

*Good for geography and art (loved the Batik).*⁹⁵

Several teachers, however, were still trying to figure out how to fit it in, indicating “*This unit is new to me and I am still working on how to incorporate into my curriculum*,”⁴⁷ or that they had “*only used parts of the kit*”⁵⁹ so far.

Teachers mentioned some of the specific activities as being especially appealing, such as the “*activity with starch detection*,”¹² and “*the penny activity*”¹¹⁰ Other comments included, “*Great activities. The students really liked doing the cassava, etc.*”³⁷, and one teacher “*Especially liked the Casava gel resist-dye activity*.”³³ However, one teacher noted that “*this kit is pretty difficult because of the dye*.”¹³

This kit was appealing not only for the specific hands-on activities, but also for the broader goals that it met for teachers. Comments included,

*This kits helps students see what plants produce starch and provide food for people in third world countries.*³²

*This one is my favorite. I rally like the way she breaks the stereotype mold of scientists.*⁵⁶

*I like the multicultutural aspects of this one with the 5th grade Plant unit.*⁶⁹

Because Urban Ecologist was the last kit developed and had only recently become available, only fifteen teachers who responded about this kit had actually used it with their students. However, all of these were very positive about it. Teachers indicated that they used this for ecology or environmental studies and that the kit “*makes students aware of [their] surroundings and [gives them a] better understanding of their world.*”¹⁰⁸

A few teachers were particularly enthusiastic about the activities. Comments included,

*These activities are great! The sound activity, hitchhiker activities, watershed activity, and the transect activity are great for students to learn by doing.*³²

*[This kit is] excellent for the transect activity – introducing the idea of how to systematically count things in the natural and changing environment.*⁵

*The listening activity was great, and this was about Nebraska.*⁹⁵

Conclusions and Discussion

The information gathered from this study has provided a descriptive and useful picture of how over 100 teachers in Nebraska are making use of Wonderwise. Several conclusions can be drawn from the results of this study.

- 1) *The World Wide Web is already a viable means of gathering data from teachers.* Using the internet to gather the data proved to be an effective device for Nebraska teachers, the vast majority of whom have access to the World Wide Web. Less than 2% of the respondents to this survey chose to complete the hard-copy version of the survey, even though this option was readily available.
- 2) *Wonderwise has been particularly embraced by rural teachers.* In the development of the kits, access to quality of materials for rural teachers was an important consideration. Both the distribution of the kits and the respondents on the survey came disproportionately from the more rural areas of the state. This may be because teachers in more populated districts have greater access to diverse, quality science materials. It may also reflect how local control of curriculum decisions means that new materials can be implemented more readily in smaller districts.
- 3) *The Wonderwise kits have fit readily into a broad spectrum of curriculum.* With teachers naming over 25 different units and texts that they use with the kits, it is clear that the kit content and materials are applicable across a wide variety of instructional content. Not only in science, but also in math, reading, social studies, and health units, the Wonderwise Kits have been adapted to fit into instruction in many ways. Many teachers also indicated that they use the kits as stand-alone units.
- 4) *The Wonderwise kits meet teachers’ educational objectives for teaching and learning.* Teachers liked how the materials got students interested and involved

in active learning, and they also saw the kits as a way to meet science curriculum objectives and state standards.

- 5) *The Wonderwise women scientists provide important role models.* Teachers indicated that having the kits depict women as scientists was an important feature for girls to see themselves as scientists. Teachers did not equate this to excluding boys; rather, the strong science activities and materials were seen as inspirational and educational for both boys and girls.
- 6) *The diversity portrayed in the kits helps meet a specific need in Nebraska classrooms.* Teachers in Nebraska are required by law to include multicultural education across subjects. The kits highlight diversity both in gender and ethnicity and counter the stereotypic image of the white, male scientist. Some teachers specifically mentioned this feature as an important component, and the portrayal of a “real” (living) scientist was seen as key by many teachers.

This evaluation study provides a look at how a museum-developed resource has been distributed and adopted across a single state. Overall, the kits appear to be a well-received, positive addition to Nebraska classrooms. They have found a niche, particularly in rural classrooms, and help teachers meet their goals in teaching. Teachers’ various uses of the kits reflect both the diversity in elementary classrooms across the state, and how the adaptability in the design of the kits enabled this breadth of use.

References

- American Association for the Advancement of Science. (1993). *Benchmarks for Science Literacy, Project 2061*. New York: Oxford University Press.
- Cole, P., Jacobson, C., Barrett, P., Fleming, K., Klossner, A., & Leone, R. (1998). *Survey on the status of educational programming between museums and schools*. Washington, DC: Institute of Museum and Library Services.
- Diamond, J., Hochman, G., Gardner, S. M., Schenker, B., & Langan, M. (1996). Multimedia science kits: A museum project on women scientists and their research. *Curator*, 39(3), 172-187.
- Fox, K. (1993). Moving science from museum to school. *Science*, 262, 174.
- Institute of Museum and Library Services. (1998). *True Needs True Partners: 1998 Survey Highlights, Museum Serving Schools*. [Electronic version]. (Report No. 1998-00-00). Washington, DC: Institute of Museum and Library Services.
- Kendall, J. and Marzano, R. J. (2000). *Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education, 3rd Edition*. Washington, DC: Association for Supervision and Curriculum Development/Mid-continent Research for Education and Learning.
- National Research Council. (1996). *National science education standards*. Washington, DC: National Academy Press.
- Nebraska Department of Education, (1994). *Math and Science Frameworks*. Lincoln, NE: Nebraska Math & Science Framework Committee (NEBMSFRM)
- Patton, E. (1991). Natural History Loan Materials for the Classroom. In Paisley S. Cato & Clyde Jones (Eds.). *Natural History Museums: Directions for Growth*. (pp. 149-158). Lubbock, TX: Texas Tech. University Press.

Spiegel, A. N., Diamond, J., & Dethlefs, T. (2001). *Museum kits in the classroom: Lessons learned from the Wonderwise Project*. Manuscript submitted for publication.

Appendices

The text and tables below are selected questions and summarized responses from the web survey.

From the list below, select ONE Wonderwise kit you use most often (check one)*:

Kit	Number of respondents N=101	Percentage of total
Sea Otter Biologist	26	26%
Pollen Detective	12	12%
Rainforest Ecologist	42	42%
Parasite Sleuth	8	8%
African Plant Explorer	10	10%
Urban Ecologist	3	3%

*Due to a bug in the web-based data collection program, teachers' responses to this item were not captured with the rest of the data. Teachers were contacted by email or phone to acquire this information or the response was inferred from their subsequent detailed answers about the kit.

How many hours do you typically spend on THIS kit with a single group of children (class)?

Number of hours spent	Number of respondents N=106	Percentage of total
1-2 hours	19	18%
3-4 hours	31	29%
5-6 hours	26	24%
7-8 hours	17	16%
9 or more hours	13	12%

For all of the Wonderwise kits, how many children (by grade level groups below) have used the kits through your instruction?

Grade level	Total number of students experiencing Wonderwise
K-3	493
4-6 grade	3811
7-9 grade	461
High school	0
Total	4765

Twenty respondents did not enumerate any students. Some of these respondents were pre-service teachers who had yet to teach a classroom of students themselves, others had attended a Wonderwise workshop or demonstration, but did not actually have a Wonderwise kit.

Is it useful to you to have the Spanish language versions of each Wonderwise CD-ROM?

Useful to have Spanish version?	Number of respondents N=96	Percentage of total
No	86	90%
Yes	10	10%

Most teachers indicated that they had few or no Spanish-speaking students, so they did not use the Spanish version. However, some teachers with larger Spanish-speaking populations did find it useful. One teacher explained, “I do have a few ESL students in my classroom.⁷⁶” Another indicated that, “The majority of the kids I serve are Spanish speaking.⁴⁸”

For what reasons have you visited the Wonderwise website?

Reason listed	Number of respondents N=106	Percentage of total
Do not visit	34	30%
To see new kits	36	32%
To purchase kits	3	3%
To get free materials	33	29%
Other	27	24%

Nine teachers specifically indicated that they got into the website for the very first time to fill out the survey, although it was evident that many more than that had been enticed to visit the website for the first time to complete the survey. Some of these noted that they “will probably return to the website now that I know about it.²³” Other comments indicated that a small number of teachers log in just to keep updated about Wonderwise.

Choose your gift.

Gift selected	Number of respondents N=111	Percentage of total
Newton’s Apple CD	17	15%
Wonderwise Videos	28	25%
Wonderwise CD-ROMS	17	15%
Husker Videos	23	21%
Common Rocks Kit	26	23%