FEATURE ARTICLE

Wild Bird Workshop: A Professional Development Opportunity for Educators

JANEL L. ORTIZ, APRIL A. T. CONKEY, LEONARD A. BRENNAN, LA VONNE FEDYNICH, MARYBETH GREEN

Abstract

The lack of environmental education in many primary and secondary school systems is likely due to overloaded school curricula, lack of funds, large classroom sizes, and other contributing factors. Through the integration of hands-on activities following the training of teachers, we can improve the impact of environmental education. Our goals in this study were to (1) develop a new kit-based, hands-on, experiential wildlife curriculum for grades K–12, focused on wild birds; (2) train educators on the curriculum through a professional development workshop; and (3) evaluate participants on their affinities for, perceptions of, and attitudes toward wildlife and birds. The results suggested that the workshop was minimally effective in influencing positive responses or improvement in perceived knowledge about birds, though in general the educators came into the workshop with positive perceptions and attitudes toward wildlife. Participants emphasized in their responses the importance of outdoor lessons and the potential for integrating citizen science in the classroom. Opportunities such as this can arm teachers with tools for the classroom and create stewards of the environment and conservationists through hands-on activities in field techniques and real-world research.

Key Words: *professional development; teacher training; birds; environmental education; conservation education; kit-based curriculum; experiential learning.*

Introduction

Environmental education is absent in many primary and secondary school systems, especially in urban areas (Paige et al., 2010). The push for environmental education has included proposed amendments to the Elementary and Secondary Education Act of 1965. For example, the No Child Left Inside Act, which was reintroduced in 2013 (Everett & Raven, 2012), is designed to encourage the training of teachers in environmental education, promote hands-on field experiences, and decrease the gap in environmental knowledge in grades K–12. However, very few schools offer such opportunities. Much of their hesitation can be attributed to overloaded school curricula; lack of funds, necessary facilities, and resources; large classroom sizes; lack of appropriate lessons; and, potentially, the location of the school (Barthwal & Mathur, 2012). Integration of hands-on activities or having a biologist in the classroom can improve the impact of environmental education (Huxham et al., 2006; Awasthy et al., 2012). Connecting students with nature is also the first step in their development as stewards of the environment and conservationists.

> *"Birds are everywhere – perfect for an outdoor class session and an easy, accessible, and interesting research model for students."*

Much of the research on wildlife education has taken place during a camp or in on-site outdoor education programs, which exclude many students who are unable to attend (Dettmann-Easler & Pease, 1999). Inclusion of wildlife in K–12 curricula has the potential to expand awareness and appreciation of nature among students in primary and secondary schools who may not have the chance to participate in extracurricular wildlife programs or camps. Wildlife science can easily fit into many of the topics covered in life science or biology classrooms but can also blend into topics covered in the social sciences, health, math, and other subjects (Wilke et al., 1980; LeCount & Baldwin, 1986; Waller, 2011). Adams and Thomas (1986) provided three recommendations to improve wildlife education: (1) a national survey of work being done on wildlife education for future policy changes, (2) direct involvement of wildlife professionals in preservice training for teachers, and (3) the implementation of a "conservation educator" position within wildlife department faculties of universities. The purpose of the present study was to address the second recommendation – and support the No Child Left Inside Act – by providing teachers a professional development opportunity and kit-based educational curriculum materials free of charge. Specifically, our goals were to

- develop free K–12 educational curriculum materials integrating wildlife techniques and real-world scientific research from the Caesar Kleberg Wildlife Research Institute;

The American Biology Teacher, Vol. 82, No. 1, pp. 3–10, ISSN 0002-7685, electronic ISSN 1938-4211. DOI: https://doi.org/10.1525/abt.2020.82.1.3.

- engage and train educators on the curriculum by offering a free professional development workshop; and
- assess teachers' affinities for, perceptions of, and attitudes toward birds, wildlife, and citizen science.

○ A New Wildlife Curriculum

We developed five hands-on, kit-based (Jones & Eick, 2007), experiential lesson plans to cover aspects of wild bird conservation techniques and real-world research, which we call the Wild Bird Conservation Curriculum (WBCC). The lesson plans include bird identification and survey methods, simulation of bird capture and banding (Figure 1), citizen science participation through bird identification and surveys, aging birds by wing characteristics, identifying internal parasites, and learning about habitat fragmentation through GIS (geographic information system) concepts. The lesson plans and supplemental material are freely available online (Figure 2).

For easy implementation in the classroom, the lessons are aligned with Texas Essential Knowledge and Skills (TEKS) and


Caesar Kleberg WILDLIFE Research Institute

Learning Objectives

1. Identify bird species using a bird guide
2. Record measurements of bird characteristics
3. Demonstrate proper bird handling

Lesson Concept

Tools allow scientists to gather information on bird species and their population sizes.

TEKS

(4) Scientific Investigation & Reasoning (C) **collect and record data using the International System of Units (SI)** and qualitative means such as labeled drawings, writing, and graphic organizers;.

(4) Scientific Investigation & Reasoning (A) use appropriate tools to **collect, record,** and analyze information, including **journals/ notebooks**, beakers, Petri dishes, meter sticks, graduated cylinders, hot plates, test tubes, triple beam balances, microscopes, thermometers, calculators, computers, timing devices, and **other equipment** as needed to teach the curriculum.

Grade: 6
Subject: Science
Time Required: 30-40 min
Group Size: 2
Approx. Cost: $20*

TEXAS A&M UNIVERSITY KINGSVILLE

Be a Bird Biologist!

Learning how to capture and mark wild birds.

Topic: Wildlife Techniques

Monitoring animal populations in a certain area is a very important part of a wildlife biologist's job. Wildlife biologists do this to estimate the number of individuals living in the area or to see if the animal returns to the area in the future.

Depending on the type of animal, there are different ways of capturing and marking the animals. For small mammals like rodents, wildlife biologists use box traps which capture the animal live as they are lured into the box by the pre-bait left by the biologists. When these traps are checked, biologists can identify, weigh, and mark the animal. However, for wild birds different techniques are used including one called mist-netting. A mist-net is a very thin, almost invisible net that the birds fly into and get caught. Biologists remove the birds from the net and handle the birds in one of two grips known as bander's grip or photographer's grip. These grips allow for ease of handling and lessens the stress on the bird. When in the hand, the biologists band the bird's leg after identifying, weighing, and measuring it. Once they are done processing the bird, it is released. On their next mist-netting session, if they capture that bird again, they can keep track of its visits and age. Having this population data available on each animal will allow them to know if the same animal is revisiting the area again (i.e. migrating bird) or if the animal lives in the area (i.e. resident bird).

Here students will be out in the field as a junior bird biologist handling and marking birds to track their populations! Using a field notebook (or field sheets) students will be measuring and recording information on each bird they extract from the net. Students will be using tools such as rulers and scales to gather information on the bird.

Materials

Artificial birds (with legs)* (1/2 students)
Cloth Bag* (1/2 students)
Ruler (1/2 students)
Bird ID Guide (1/2 students)
Colored Zip-tie (2/2 students)
Net (e.g. bird netting)* x10 ft
Scale x5 (Shared among class)
Field Notebook w/ Bird Banding Field Notes Sheet (1/student)
Pencil/Pen (1/student)

Dark-Eyed Junco (*Junco hyemalis*) in bander's grip.
Photo Credit: Janel Ortiz

Figure 1. Educators explored banding as a way to capture and mark birds through a simulation activity in the lesson "Be a Bird Biologist!"

Figure 2. Wild Bird Conservation Curriculum Lesson Plans home page, showing links to lesson plan documents, supplemental material, assessments, and rubrics (https://www.ckwri.tamuk.edu/research-programs/wildlife-education-outreach/events/lesson-plans/wild-bird-conservation-curriculum).

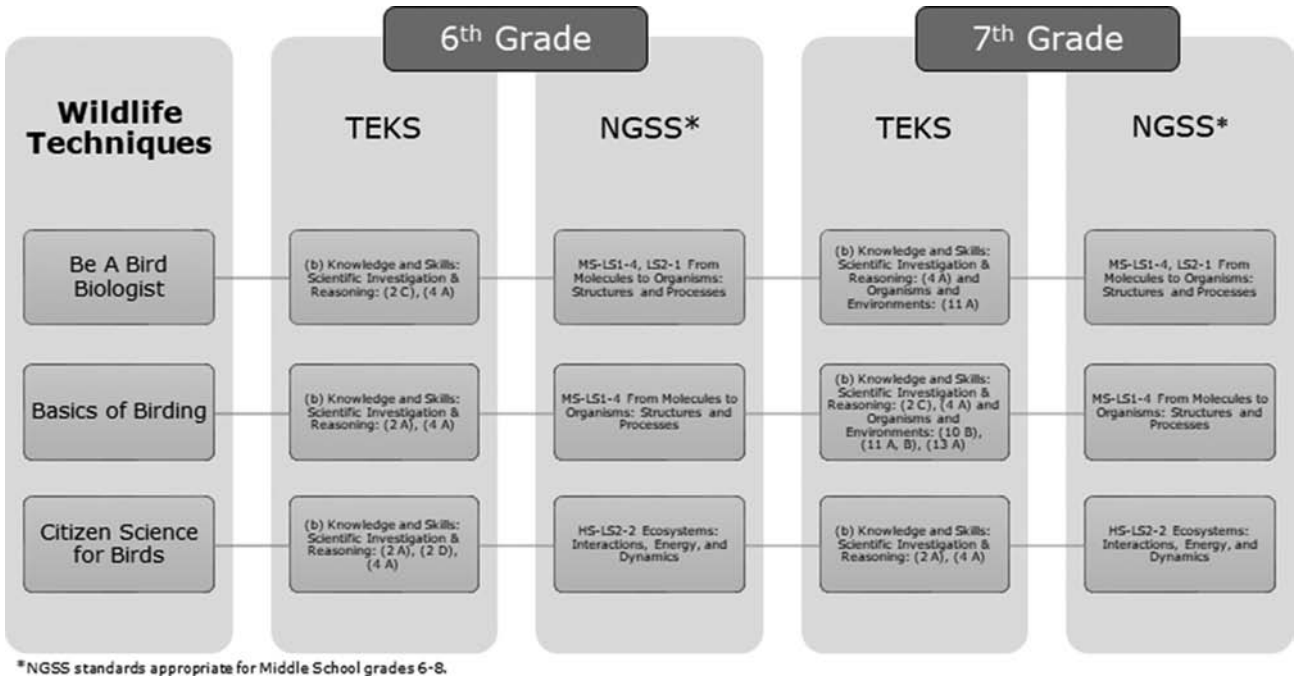


Figure 3. Lesson unit "Wildlife Techniques" of the Wild Bird Conservation Curriculum for grades K–12, with corresponding Texas Essential Knowledge and Skills (TEKS) and the *Next Generation Science Standards* (NGSS) for grades 6 and 7.

Next Generation Science Standards for sixth- and seventh-grade science (Figures 3 and 4) and are designed to turn students into wildlife researchers. However, the curriculum can be modified for any grade level. Lesson plans include teacher guides with introductions of topics, procedures for conducting the lesson plan, lesson assessment, and potential ways to expand the lesson to include more topics or increase the complexity for different grade levels. In addition, each lesson plan lists the requisite TEKS standards, learning objectives, related vocabulary and definitions, materials required to conduct the lesson successfully and their

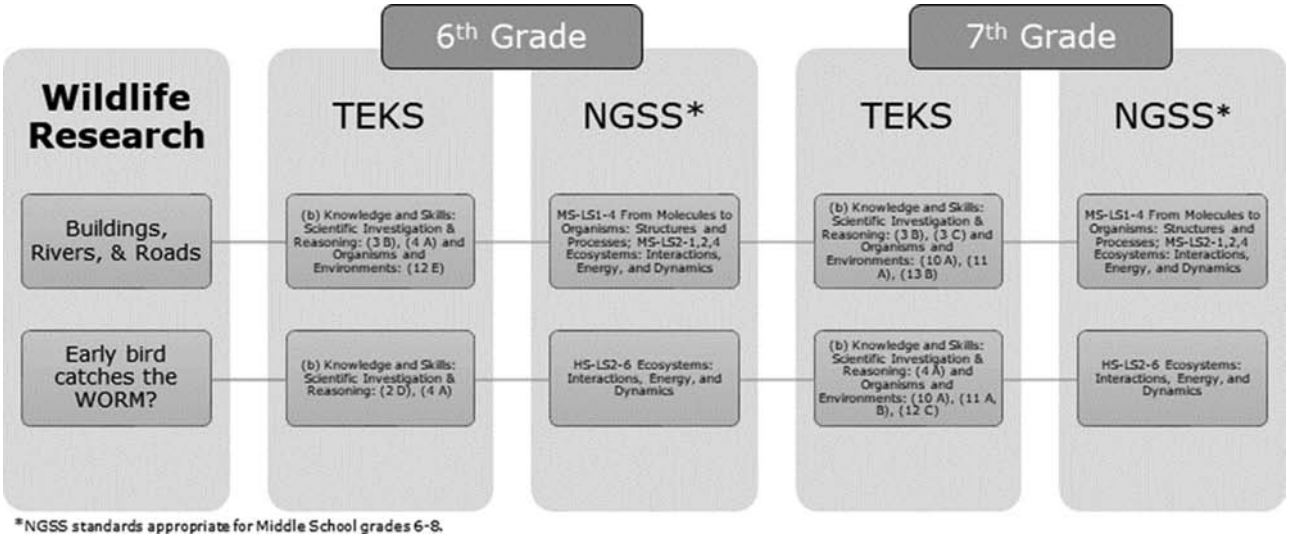


Figure 4. Lesson unit "Wildlife Research" of the Wild Bird Conservation Curriculum for grades K–12, with corresponding Texas Essential Knowledge and Skills (TEKS) and the *Next Generation Science Standards* (NGSS) for grades 6 and 7.

cost, group size required for activities, and time required to complete the lesson.

○ Workshop Experience

We went through the five lesson plans at a professional development workshop, with the educators participating as the students and the primary author (J.L.O.) as the teacher/facilitator (Figures 5 and 6). The two-day workshop format provided time to cover all material and concepts related to each lesson, while allowing educators the opportunity to practice and ask questions to ensure understanding of the material. It also gave them time to share tips they use to engage students in the classroom and/or when teaching outdoors.

Each lesson allows participants to make observations (that can be recorded as data) of organisms and objects that occur in nature. The observation step is a crucial part of the scientific method that allows students to ask questions about their environment, creating an inquiry-based approach to learning about birds. Lessons incorporate an introductory presentation to introduce participants to common bird identification, examples of maps, and other concepts to help visualize what to look for when outside and give an example of the end product of the activity. These field and classroom lessons include rubric-based evaluations of written worksheets, field notes (Figure 7), map coding, drawings, and data spreadsheets.

Inclusion of a live-bird handling demonstration in the workshop allowed the participants to get a feel for working with a wild animal. They received hands-on experience with house sparrows (*Passer domesticus*) and white-winged doves (*Zenaida asiatica*) and with techniques for trapping, handling, and banding birds (Figure 8). In addition, they learned about the types of live traps used in bird research, the federal and state permits required for capturing and handling birds, and animal care and safety precautions. Experiencing live-bird handling can help teachers retain these concepts and convey them to their students in the simulated capture lesson.

Figure 5. Educators participate in techniques-themed, hands-on lessons during Wild Bird Conservation Curriculum professional development workshops. (**A**) An educator practices identification of field marks of a green jay (*Cyanocorax yncas*) by drawing, coloring, and labeling unique characteristics of the species. (**B**) Educators conduct a bird survey. (**C**) Educators simulate a mist-netting and bird-banding station. (**D**) Educators enter data for contribution to a citizen science project.

Figure 6. Educators practice research-themed, hands-on lessons during Wild Bird Conservation Curriculum professional development workshops. (**A**) Educators age quail wings into categories of juvenile or adult. (**B**) An educator identifies an internal parasite of quail using a light microscope and an identification guide. (**C**) An educator shares a handmade classification map of a quail's home range while identifying potential barriers to its movement.

Collaborative learning occurred throughout all activities. Pair and group work allowed participants to split the effort and help each other complete tasks. Think-pair-share and class presentations at the end of each lesson helped participants sum up their experiences and share the outcomes of their work. Question-and-answer sessions at the end of each activity increased cooperation, collaboration, and discussion among the educators. Discussions included sharing ideas such as alternative materials to use in the lessons and modifications for different age groups and abilities.

○ Outcomes

We assessed the participating educators' affinities, perceptions, and attitudes prior to and after the workshop (Figures 9–11). In the postsurveys, 98% agreed that the workshop material was presented clearly, was organized well, met their expectations, and that they would recommend it to a colleague; 95% agreed that the material would be useful in their teaching; and 89% reported that they planned to use the material in their class.

The participants enjoyed the field experience, including the hands-on training. They also had the opportunity to share classroom ideas with others and to network with educators from local environmental organizations. Some examples of their comments:

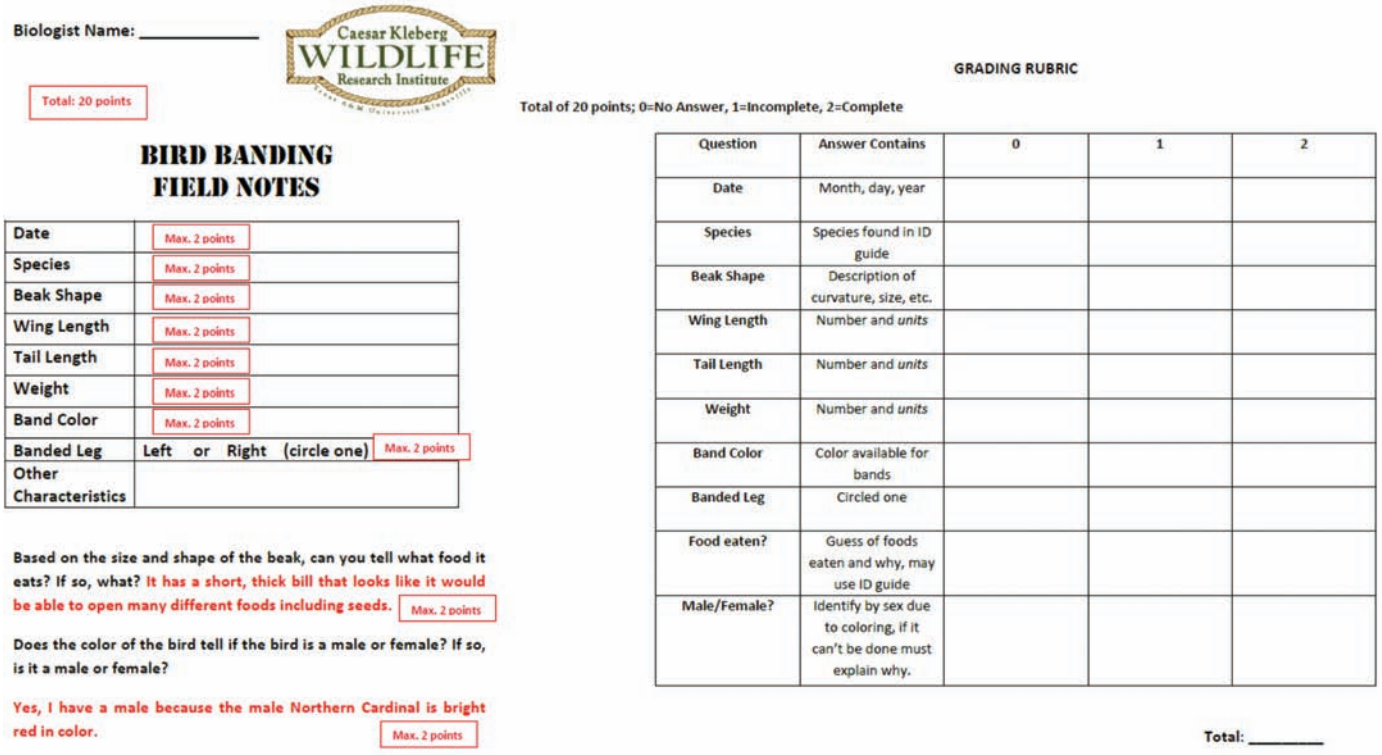
- ". . . greatly enjoyed this presentation – it was far better than any teacher workshops I have attended."
- ". . . wonderful workshop, very well done! Curriculum content and format useful."
- ". . . teachers/participants and leaders could take time to share ideas, experiences – lots of good sharing."
- ". . . great workshop, learned a lot to adapt to use for the lower grade (Pre-K)."

Responses to the presurvey indicated that most of the educators incorporate wildlife into their curriculum and that 44% were aware of citizen science while a slight majority (56%) had not heard of it prior to the workshop. After the workshop, all respondents (100%) reported that they enjoy citizen science. There was a significant improvement between the presurvey and postsurvey in participant responses about possibly incorporating citizen science into their classroom curriculum. In later follow-up interviews, 27% of respondents reported using one or more of the lessons of the WBCC in the classroom or outdoors, while the majority (67%) reported they not had an opportunity to do so.

○ What We Learned

This program investigated potential changes in educator affinity for, perceptions of, and attitudes toward wild birds and other wildlife. The educators had a preexisting affinity for wildlife. Our goal was that this affinity for wildlife would carry over to the educators' perceptions of birds. However, our evaluation methods indicated that their appreciation for and knowledge of bird biology had changed little upon workshop completion. The workshop did increase their awareness of the field of citizen science and the potential to implement projects in their classrooms. After future workshops, we could administer a test or quiz on the lesson material and on bird identification specifically, thus measuring learning gains as well as participants' feelings and attitudes.

The ability to use local species gives this curriculum relevance and accessibility for local classrooms, in a way that has not been fully utilized in education (Huxham et al., 2006). However, there are barriers to the implementation of this and similar curricula in classrooms. Nelson (2010) found that teachers often are not interested in topics that require increased preparation or that lack financial support for additional activities. With the WBCC, we attempted to eliminate the financial barrier by providing the materials needed within kits that are available for loan free of charge, in-class support from wildlife professionals, and training of teachers. While Crim et al. (2017) found that teachers' disinterest in wildlife may be a barrier we have yet to overcome, Barthwal and Mathur (2012) found favorable attitudes toward wildlife in general, particularly among female teachers. In our case, only female teachers opted to implement this curriculum in the classroom, and females outnumbered males in



Biologist Name: _____

Caesar Kleberg WILDLIFE Research Institute

Total: 20 points

BIRD BANDING FIELD NOTES

Date	Max. 2 points
Species	Max. 2 points
Beak Shape	Max. 2 points
Wing Length	Max. 2 points
Tail Length	Max. 2 points
Weight	Max. 2 points
Band Color	Max. 2 points
Banded Leg	Left or Right (circle one) Max. 2 points
Other Characteristics	

Based on the size and shape of the beak, can you tell what food it eats? If so, what? It has a short, thick bill that looks like it would be able to open many different foods including seeds. Max. 2 points

Does the color of the bird tell if the bird is a male or female? If so, is it a male or female?

Yes, I have a male because the male Northern Cardinal is bright red in color. Max. 2 points

GRADING RUBRIC

Total of 20 points; 0=No Answer, 1=Incomplete, 2=Complete

Question	Answer Contains	0	1	2
Date	Month, day, year			
Species	Species found in ID guide			
Beak Shape	Description of curvature, size, etc.			
Wing Length	Number and *units*			
Tail Length	Number and *units*			
Weight	Number and *units*			
Band Color	Color available for bands			
Banded Leg	Circled one			
Food eaten?	Guess of foods eaten and why, may use ID guide			
Male/Female?	Identify by sex due to coloring, if it can't be done must explain why.			

Total: _____

Figure 7. Field Notes sheet for the "Be a Bird Biologist!" lesson with point breakdown, example open-ended answers, and grading rubric.

WBCC workshop attendance and implementation in the classroom (Ortiz et al., 2018). This gender difference among teachers can further skew the exposure students have to conservation education.

Professional development is necessary for educators' continued certification and increases their content knowledge on less familiar topics, such as citizen science and the information presented at our workshop. Training of educators is critical for the implementation of kit-based and experiential learning programs (Arias et al., 2016). Educators often are limited in their background knowledge and preparation time and are unable to execute the array of programs and curricula available for the classroom (Walberg, 1991; Spickler & McCreary, 1999; Nelson, 2010; Crim et al., 2017). Much of the focus in educational settings has been on reducing teacher-centered instruction and improving student-centered instruction through the use of kit-based curricula (Von Secker & Lissitz, 1999; Lawrenz et al., 2001). Kit-based activities and professional development opportunities that are rated highly, such as the WBCC, are essential for supporting educators in keeping up with science curriculum reform (Young & Lee, 2005). We aimed to generate interest in wildlife among educators and to supplement their knowledge by providing a comfortable learning environment in which to improve their confidence in the material and their motivation to take it to their classroom (Murphy et al., 2007).

Although time constraints in the classroom may convince teachers that their ability to incorporate these types of lessons is limited, well-designed experiential curricula can actually save time by meeting multiple standards in an efficient manner, and mere exposure to such lessons can fuel interest in students and generate much more engagement. We can assist educators in fitting these activities into their lesson plan and modifying them to maximize classroom goals. Such additional activities might best be incorporated in classes and subjects that are not state tested at the grade level being taught, in classrooms where educators are with students the entire day (i.e., primary schools), or in team-teaching environments that provide flexibility of time and curriculum (Jacobson et al., 2006). For example, sixth- and seventh-grade students in Texas are not assessed in science; hence, there is more opportunity to incorporate supplemental lessons in conservation or environmental education. Furthermore, aiming at students 6–14 years of age (grades 1–9) can provide a positive social influence on their individuality and identity development (Eccles, 1999) in regard to pro-environmental behavior. Birds are everywhere, even on your school campus – perfect for an outdoor class session and an easy, accessible, and interesting research model for students.

○ WBCC in Your Classroom!

The lessons incorporated in this workshop can be an easy fit for your classroom, particularly if you are interested in using tools and equipment in your activities as well as having students collect data to conduct real-world research. Below are three key suggestions for retention of material and for long-term studies in and outside of the classroom:

- Repeat bird surveys monthly as part of the "Basics of Birding" lesson to gather population trends on your school campus.
- Have students collect data on the numbers of juvenile and adult wings as they age them; you can then integrate math concepts to analyze data. This can also be done for the "captured" birds in the "Be a Bird Biologist" lesson.

Figure 8. Educators practice the (**A**) "bander's grip" on a white-winged dove (*Zenaida asiatica*) and the (**B**) "photographer's grip" on a house sparrow (*Passer domesticus*) during a Wild Bird Conservation Curriculum professional development workshop. The bander's grip is a handling method that allows easy access to the bird's leg for banding with a uniquely numbered band. The photographer's grip, as the name implies, allows someone to capture the entire bird in a photo.

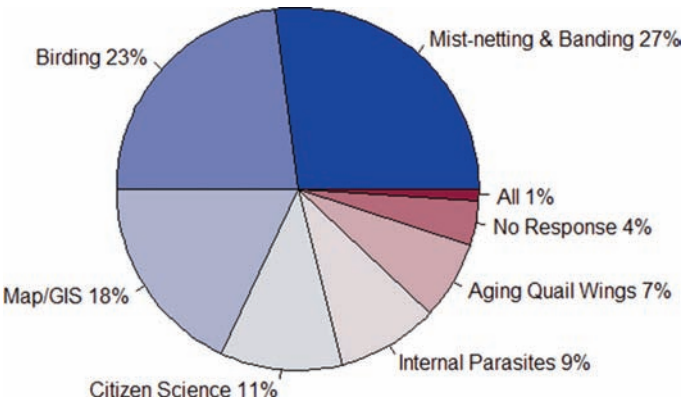


Figure 9. Topics of most interest covered during the professional development workshop, according to postsurvey of participants: mist-netting (capturing) and banding (27%), birding (23%), map/GIS (18%), citizen science (11%), internal parasites (9%), aging quail wings (7%), no response (4%), and all (1%).

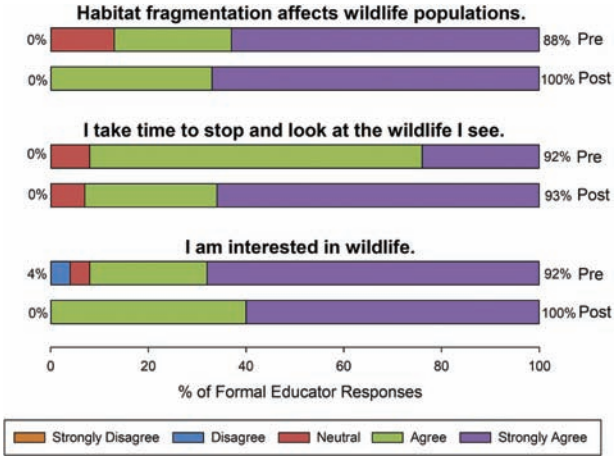


Figure 10. Presurvey (25 responses, top bar) and postsurvey (15 responses, bottom bar) educator responses to statements regarding their attitude toward habitat fragmentation, whether they take time to look at wildlife, and their affinity for wildlife. Percentages on the left represent cumulative percentage of negative responses (in disagreement), and those on the right indicate cumulative percentage of positive responses (in agreement).

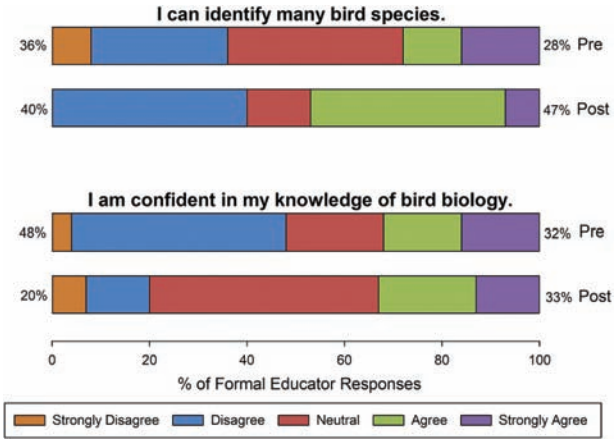


Figure 11. Presurvey (25 responses, top bar) and postsurvey (15 responses, bottom bar) educator responses to statements regarding their perceived ability to identify many bird species and their knowledge of bird biology. Percentages on the left represent cumulative percentage of negative responses (in disagreement), and those on the right indicate cumulative percentage of positive responses (in agreement).

- Introduce Microsoft Excel prior to the "Citizen Science for Birds" lesson. This will ensure that your students are prepared for data entry and will learn a fundamental skill they are sure to use in the future.

○ Additional Resources

For more information on the WBCC or if you are interested in attending a future workshop, please visit https://www.ckwri.tamuk.edu and click on "Events" to see the next scheduled workshop. The WBCC

lessons are freely accessible at https://www.ckwri.tamuk.edu/research-programs/wildlife-education-outreach/events/lesson-plans/wild-bird-conservation-curriculum.

○ Acknowledgments

We thank C. Hilton, A. Fedynich, and the anonymous reviewers for comments that helped improve the manuscript. We thank A. Bruno, K. Bedford, K. Miller, A. Fedynich, W. Colson, Z. Pearson, and J. Pearson for their contributions to the lesson plans. Special thanks to the Elizabeth Huth Coates Foundation of 1992, Rachael and Ben Vaughan Foundation, Coastal Bend Audubon Society, and Leatrice Koch for their financial support of this project. Thanks to all of the educators who participated in the workshop. All workshop evaluations and surveys were approved by the Institutional Review Board for the Protection of Human Subjects at Texas A&M University–Kingsville under protocol no. 2015-040. All live-animal capture and handling demonstrations used for teaching purposes were approved by the Institutional Animal Care and Use Committee at Texas A&M University–Kingsville under protocol no. 2015-02-14. Trapping, handling, and banding of white-winged doves were permitted under the Texas Parks and Wildlife Department's Master-Station Federal Bird Marking and Salvage Permit no. 06827. This is publication no. 19-106 of the Caesar Kleberg Wildlife Research Institute.

References

Adams, C.E. & Thomas, J.K. (1986). Wildlife education: present status and future needs. *Wildlife Society Bulletin*, *14*, 79–86.

Arias, A.M., Davis, E.A., Marino, J., Kademian, S.M. & Palincsar, A.S. (2016). Teachers' use of educative curriculum materials to engage students in science practices. *International Journal of Science Education*, *38*, 1504–1526.

Awasthy, M., Popovic, A.Z. & Linklater, W.L. (2012). Experience in local urban wildlife research enhances a conservation education programme with school children. *Pacific Conservation Biology*, *18*, 41–46.

Barthwal, S.C. & Mathur, V.B. (2012). Teacher's knowledge of and attitude toward wildlife and conservation. *Mountain Research and Development*, *32*, 169–175.

Crim, C., Moseley, C. & Desjean-Perrotta, B. (2017). Strategies toward the inclusion of environmental education in educator preparation programs: results from a national survey. *School Science and Mathematics*, *117*, 104–114.

Dettmann-Easler, D. & Pease, J.L. (1999). Evaluating the effectiveness of residential environmental education programs in fostering positive attitudes toward wildlife. *Journal of Environmental Education*, *31*, 33–39.

Eccles, J.S. (1999). The development of children ages 6 to 14. *Future of Children*, *9*(2), 30–44.

Everett, M.W. & Raven, M.R. (2012). Incorporating conservation education in agricultural education. *Agricultural Education Magazine*, January–February, 9–10, 14.

Huxham, M., Welsh, A., Berry, A. & Templeton, S. (2006). Factors influencing primary school children's knowledge of wildlife. *Journal of Biological Education*, *41*, 9–12.

Jacobson, S.K., McDuff, M.D. & Monroe, M.C. (2006). *Conservation Education and Outreach Techniques*. New York, NY: Oxford University Press.

Jones, M.T. & Eick, C.J. (2007). Implementing inquiry kit curriculum: obstacles, adaptations, and practical knowledge development in two middle school science teachers. *Science Education*, *91*, 492–513.

Lawrenz, F., Huffman, D. & Welch, W. (2001). The science achievement of various subgroups on alternative assessment. *Science Education*, *85*, 279–290.

LeCount, A.L. & Baldwin, K.L. (1986). The bear in the classroom. *International Conference on Bear Research and Management*, *6*, 209–217.

Murphy, C., Neil, P. & Beggs, J. (2007). Primary science teacher confidence revisited: ten years on. *Educational Research*, *49*, 415–430.

Nelson, A. (2010). Environmental education and ecology in a life science course for preservice K–8 teachers using Project Wildlife in learning design. *American Biology Teacher*, *72*, 156–160.

Ortiz, J.L., Conkey, A.A.T., Brennan, L.A., Fedynich, L. & Green, M. (2018). Wild birds in the classroom: evaluation of student affinities, perceptions, and attitudes in response to an experiential curriculum. *International Journal of Environmental and Science Education*, *13*, 787–803.

Paige, K., Lawes, H., Matejcic, P., Taylor, C., Stewart, V., Lloyd, D., et al. (2010). "It felt like real science!" How Operation Magpie enriched my classroom. *Teaching Science*, *56*, 25–33.

Spickler, T. & McCreary, C. (1999). Making the case for teaching science using a hands-on inquiry-based approach. Pittsburgh, PA: Bayer Corporation.

Von Secker, C.E. & Lissitz, R.W. (1999). Estimating the impact of instructional practices on student achievement in science. *Journal of Research in Science Teaching*, *36*, 1110–1126.

Walberg, H.J. (1991). Improving school science in advanced and developing countries. *Review of Educational Research*, *61*, 25–69.

Waller, P. (2011). Bringing endangered species to the classroom. *American Biology Teacher*, *73*, 277–279.

Wilke, R.J., Peyton, R.B. & Hungerford, H.R. (1980). Strategies for the training of teachers in environmental education: a discussion guide for UNESCO training workshops on environmental education. Paris: UNESCO.

Young, B.J. & Lee, S.K. (2005). The effects of a kit-based science curriculum and intensive science professional development on elementary student science achievement. *Journal of Science Education and Technology*, *14*, 471–481.

JANEL L. ORTIZ (ortizjanel@gmail.com) is a Diversity Postdoctoral Fellow in the Department of Biology, University of San Diego, San Diego, CA 92110. She is also the creator of the Wild Bird Conservation Curriculum and former facilitator of the professional development workshops at the Caesar Kleberg Wildlife Research Institute. APRIL A. T. CONKEY (april.conkey@tamuk.edu) is an Assistant Professor and LEONARD A. BRENNAN (leonard.brennan@tamuk.edu) is a Professor at the Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville, Kingsville, TX 78363. LA VONNE FEDYNICH (lavonne.fedynich@tamuk.edu) is a Professor and MARYBETH GREEN (mary.green@tamuk.edu) is an Associate Professor in the Department of Educational Leadership and Counseling, Texas A&M University-Kingsville.