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Mark R. Ryan

School of Natural Resources, University of Missouri, Columbia

Bruce D. Dugger

Division of Biological Sciences, University of Missouri, Columbia

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AUDIO TAPES VS. INTERACTIVE COMPUTER SOFTWARE FOR STUDYING BIRD SONGS: THE VALUE OF ACTIVE LEARNING

Mark R. Ryan¹ and Bruce D. Dugger²

¹Associate Professor, Fisheries and Wildlife, The School of Natural Resources,
University of Missouri, Columbia, MO 65211.

²Instructor, Division of Biological Sciences, University of Missouri, Columbia, MO 65211.
Current Address: Post-doctoral Associate, MacArthur Agro-Ecology Research Center,
Lake Placid, FL 33862.

ABSTRACT: We tested the use of audio tapes versus interactive computer software for learning of bird songs by undergraduate students at the University of Missouri. Overall final grades did not differ between semesters when audio tapes or computer software were used to study bird songs. Mean song quiz scores were higher (21.63 vs. 19.48; 25 maximum, $P = 0.04$) and mean quiz score variances lower (0.49 vs. 0.75, $P = 0.007$) when students had access to interactive computer software than when they used audio tapes to study bird songs. Key factors affecting improved student performance seemed to be higher student interactions and peer teaching activity, self-testing options, and ease of access to specific quiz material provided by interactive computer software.

INTRODUCTION

Identifying bird species from auditory cues is essential to most avian population research, population monitoring, and conservation efforts. Avian ecologists use song or call note identification to establish presence, determine relative abundance, or quantify density of birds during breeding, migratory, and winter residency periods (Verner 1985). Whereas some individuals show amazing ability to learn birds songs and calls, recognizing hundreds of species (Forsyth 1994), most people find learning bird songs tedious and difficult. Until recently most students of bird song used phonograph records or audio tapes for study, but the advent of CD-ROM has resulted in a variety of computer software to aid in learning bird songs. We used data from our Ornithology course at the University of Missouri to test whether the use of CD-interactive software improved student performance on bird song quizzes versus their performance using audio tapes.

METHODS

In our Ornithology course at the University of Missouri we require students to learn 70 common bird songs. From 1985 to 1995 we made available to students audio tapes for study of the required songs and quizzed them on subsets of songs throughout the semester. We compiled study tapes of the required songs from several commercially available phonograph or tape sources. We made available photo slides

sets matched to the song tapes in our teaching laboratory which was open daily from approximately 0700 to 1800 hours Monday to Friday. However, most students made copies of our tape or purchased their own and studied tapes outside of the classroom. Here we present data from the last 5 semesters (during years from 1989 through 1995) when tape availability, song quiz structure, etc. were identical to 1996-1997 when interactive software for bird song study was used.

In 1996 we obtained a computer with CD-ROM and audio playback capability for dedicated use by Ornithology students. We made various computer software available to students in 1996 and 1997 for study of the same songs required in prior years. Two primary interactive computer packages were used by students. We made available National Audubon Society's Interactive CD-ROM Guide to North American Birds©. This software shows visual images of a bird species while playing the song. We also installed on the computer the program Bird Song Master©. This software, without visuals, plays the Peterson Field Guide Compact Disc for Bird Songs©. It also allowed us to create files of the only the required songs in the same order previously used with audio tapes. This was not an option with the Audubon CD-ROM software. Bird Song Master had random quizzing options for the students to use for self-testing. Students had access to the interactive software on the same schedule as in prior years. Some students in 1996 and 1997 continued to use audio tapes for study outside of class, but the great majority used the computer during, and especially outside of regularly scheduled class times.

Song quiz format was consistent across years of our study. The complete list of required songs was broken down into 5 subsets of 12-16 songs. Although all songs are available for study throughout the semester, bi-weekly song quizzes covered only 1 subset of songs. Quizzes consisted of 5 songs, randomly chosen from a subset. We played the 5 quiz songs in order and then repeated the sequence once. Each song was worth 1 point, therefore the total song quiz points each semester totaled 25 points. Total course points available varied slightly among years of our study, but song quiz points were a small proportion of the total in all years (ca. 4%).

Because of the high quality visuals associated with the songs on the National Audubon CD Guide and the seeming affinity of current students for computer graphics we expected predominant use that software. We further hypothesized, as we had in making photo slides available with the audio tapes, that seeing an image of the bird while listening to its song would reinforce learning. We expected students to use the Bird Song Master software primarily for its quiz function. Our general hypothesis was that use of interactive computer software would improve song quiz scores from that measured in prior years when audio tapes were used.

RESULTS

Although there has been a trend toward increasing class size in recent years, mean size did not differ between the years that audio tapes were used versus years when computer software was employed ($t = 1.01$, 5 df, $P = 0.17$; Table 1). Because any differences in song quiz results could be confounded by variation in overall student academic ability among years, we tested mean class grade point average based on final course grades. There was no difference in mean final course grade point averages (mid C range, ca. 2.5) between our experimental groups ($t = 0.53$, 5 df, $P = 0.31$; Table 1).

Mean song quiz scores were >2 points (ca. 11%) higher when interactive computer software was used than when audio tapes were used for study ($t = 2.20$, 5 df, $P = 0.04$; Table 1). Variation in student performance within years was less when computer software was studied than when audio tapes were used ($t = 3.76$, 5 df, $P = 0.007$; Table 1).

Table 1. Class size, mean course grade point averages, mean song quiz scores, and mean song quiz variances during years using audio tapes and CD interactive software for studying bird songs at the University of Missouri, 1989-1997.

Audio Tape				
Year	Class Size	GPA ^a	Song Quiz Score	Song Quiz Variance
1989	38	2.68	19.63	0.60
1991	40	2.63	20.75	0.81
1992	46	2.54	17.95	0.73
1994	55	2.18	18.39	0.84
1995	51	2.53	20.67	0.79
Mean	46	2.51	19.48	0.75
± SE	3.2	0.09	0.57	0.04

CD-Software				
Year	Class Size	GPA	Song Quiz Score	Song Quiz Variance
1996	50	2.28	21.95	0.47
1997	53	2.57	21.30	0.50
Mean	51.5	2.43	21.63	0.49
± SE	1.5	0.15	0.33	0.02

^a Based on A = 4, B = 3, C = 2, D = 1, F = 0.

DISCUSSION

As hypothesized, the use of interactive computer software enhanced student learning of bird songs. However, our qualitative observations suggested how students used the software was not as we had expected. Although student use of the software combining visuals of the birds while playing the song was high initially in both semesters, use seemed to shift substantially to the software without visuals. It seems that the software that allowed creation of subsets of the required songs and the self-testing option available with the Bird Song Master program were attractive to students.

We observed another factor in the use of either of the interactive software that may have had a substantial impact on student learning. Students using the computer often worked together in small groups. They quizzed each other, competed with the self-test option, and coached each other on song identification. We strongly suspect that this peer-teaching may have had more impact on student learning than the specifics of the computer packages. The computer hardware and software seemed to enhance the likelihood of peer interactions about the material.

Listening to audio tapes is an inherently passive learning mode that has been repeatedly demonstrated not to enhance

learning and retention (e.g., Chickering and Gamson 1987). Although the computer software for studying bird songs that we made available to students could be used with a minimum of active learning involvement, students seemed to use the programs in an active learning style. Peer-teaching has been recognized as a particularly powerful pedagogy for student learning (Goodlad and Hirst 1989, Topping 1988).

Although our study focused narrowly on learning to recognize auditory signals, the learning atmosphere created by the use of the interactive computer software could be extended to a variety of learning situations. We believe that computer based instruction that incorporates ease of access to specific study material (i.e., the subfile creation option in the Bird Song Master program), self-testing options, and that promotes peer interaction and teaching will have the greatest impact on student learning.

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