CORE COMPETENCY 5: Assessing Student Learning

Six-Step Outline

Pedagogical effects on student learning and satisfaction in an introductory fisheries and wildlife cours

I designed a mentoring teaching project with guidance from Dr. Henry "Rique" Campa for an introductory fisheries and wildlife course (FW 101, Fundamentals of Fisheries and Wildlife Ecology and Management) in the Department of Fisheries and Wildlife at Michigan State University during the fall of 2016. This mentored teaching project fulfills partial requirements of the graduate Certificate in College Teaching Program (CCTP) and the FAST (Future Academic Scholars in Teaching) Fellowship Program. The following outline details my thought-process in conceptualizing the project, implementation of the project, and preliminary findings.

CORE COMPETENCY 5: Assessing Student Learning

Teaching and Learning Goal

As a developing educator, I want to ensure I know how to structure my courses and curricula in a way that most positively impacts student learning and satisfaction in the classroom. In other words, I want to know how to ensure my students learn and how I can keep them happy. The FW 101: Fundamentals of Fisheries and Wildlife Ecology and Management course is unique in structure because it features a primary instructor and several guest instructors (i.e., people who are invited to speak to a class they do not normally teach). Given the number and variety of instructors, and also the number and variety of teaching styles and strategies, I feel it is a well-suited course in which to explore how to most positively impact student learning and satisfaction.

Generally, in courses with both primary and guest instructors, I have observed few differences among the ways a primary instructor and guest instructor structure and teach a class. In my experience, primary instructors and guest instructors typically lecture for an entire class period, but not always. Based on these observations, I am designing a mentored teaching project that evaluates differences among instructors' teaching styles and strategies (or lack thereof) and resulting impacts to the effectiveness of student learning and student satisfaction. Initially, while I thought guest instructors may appear to have an "edge" over primary instructors by bringing valuable diversity of knowledge, experience, and perspective into a classroom, I can see (based on the following assumptions) how they might present major challenges that could negatively impact student learning and satisfaction:

- Guest instructors do not usually participate in a class more than once during a course and, thus, may not be as invested as the primary instructor in ensuring students learn the material;
- Guest instructors are often unfamiliar with the students, making it difficult for them to quickly gauge how much students already know about the material and properly acknowledge (and correct) common misconceptions among students;
- Guest instructors may be unaware of, or not think about, specific information about the class they are teaching, making it difficult for them to share their knowledge in a way that relates well to course or class learning goals and objectives; and,
- Guest instructors may fail to develop their own class learning goals and objectives or assessments, potentially negatively impacting overall student learning and satisfaction in the classroom.

In addition to serving as my teaching mentor, Dr. Henry "Rique" Campa is serving as the primary instructor for the FW 101 course this fall (2016). As a Professor in the Department of Fisheries and Wildlife, the NSF-Center for the Integration of Research, Teaching and Learning (CIRTL)-MSU Institutional Leader, and FAST Fellowship Program Director, Dr. Campa is expertly trained, extremely experienced, and incredibly knowledgeable regarding effective teaching styles and strategies. In this course, Dr. Campa will likely challenge my notion of what I would normally consider to be the traditional primary instructor (i.e., lecturer)—rather, he plans to use active-learning

strategies (e.g., peer-to-peer instruction, iClicker questions, model-making) to interact with our students. In addition to Dr. Campa, guest instructors will include: a graduate student (me) who will receive guidance directly from Dr. Campa, other professors from the Department of Fisheries and Wildlife, and individuals from the government sector (i.e., state and federal agency professionals).

I am eager to test the effectiveness of Dr. Campa's teaching styles and strategies against those of our guest instructors. Before we implement the project, we are also considering the following assumptions:

- In contrast to Dr. Campa, most guest instructors (except for me, because I know better!) will be unlikely to use any active-learning strategies in their lectures;
- If guest instructors have been invited to the class multiple prior times, then they probably will not modify or update their lectures; and,
- Guest instructors will be unlikely to develop learning goals, objectives, and assessments in line with the course syllabus, which Dr. Campa will share with them.

Teaching Question

This fall (2016), Dr. Campa and I plan to implement the mentored teaching project in the FW 101 course, which is designed to highlight a survey of topics and concepts to primarily first- and second-year undergraduate students. This course is a requirement for students majoring in Fisheries and Wildlife and also serves to recruit, and raise awareness about the field among, non-major students.

In the context of this course, Dr. Campa and I are interested in asking the following question: what are the impacts of different teaching styles and strategies, exemplified by a variety of instructor types, on student learning and satisfaction?

Based on my conversations with Dr. Campa, some preliminary research, and our assumptions, we hypothesize that, in FW 101, students will respond better to teaching strategies and styles: 1) in which learning objectives, active-learning strategies, and formative/summative assessments are aligned; and, 2) used by the primary instructor and graduate student than those used by other guest instructors. We further hypothesize that, in FW 101, students will prefer class periods taught by the primary instructor and graduate student to those taught by other guest instructors.

Assessment Technique

Dr. Campa and I plan to collect information from FW 101 students in a variety of ways. At the beginning of the course, we plan to use a questionnaire (i.e., concept check) to collect information about students' prior knowledge regarding topics that will be covered during the course. We will use the results of this questionnaire to identify a baseline of current student knowledge and potential student misconceptions. At the end of the course, we will use the same questionnaire to collect information about students' knowledge gained.

Periodically during the course, Dr. Campa and I plan to use in-class formative assessments (e.g., concept checks and quizzes [n=6]) to compare students' knowledge gained among various class periods. Dr. Campa and I also plan to use summative assessments (e.g., exams) that include questions aligned with prior topics covered during the course to measure student knowledge gained. Throughout the course, Dr. Campa and I will individually monitor and observe each class period, taking notes and detailing obvious differences among teaching styles and strategies. We will also broadly categorize each class period based a perceived level of instruction (e.g., proficient, master, expert) at which the material is transmitted from instructor to student.

Lastly, Dr. Campa and I will use a customized survey (e.g., SIRS form) to inquire about students' overall satisfaction and preference among primary- versus guest instructor-led class periods.
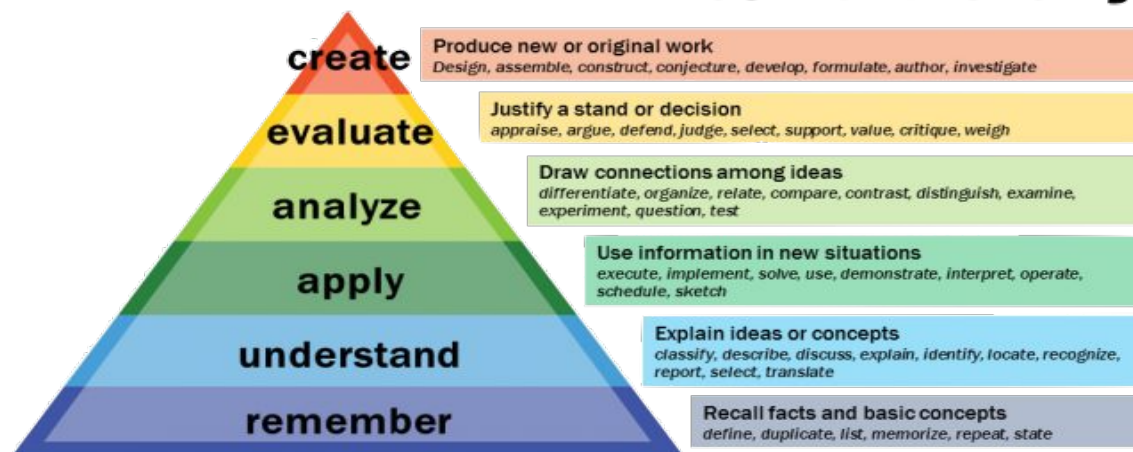
Classroom Practice

In addition to the questionnaires (i.e., concept checks), quizzes, summative assessments, and surveys, Dr. Campa and I will rely on the lectures (and our assumptions about how they will be structured) to help us test our question.

For instance, the students will be exposed to lectures given by the primary instructor (Dr. Campa), a graduate student (me), and other guest instructors. Dr. Campa and I worked together to design our lectures according to effective, evidence-based teaching guidance from the primary literature. In total, Dr. Campa plans to teach 4 (16%) of the lectures, and I plan to teach 3 (12%). My lectures will focus on the following topics: ecological concepts, introductions and invasions, and criminal justice in natural resources. Dr. Campa and I will provide the other guest instructors with no guidance, asking them to conduct their class periods as they please. We do not expect to see the same type, and level, of evidence-based teaching tools, styles, and strategies in their lectures, however we will monitor and observe each class period for instances in which they are evident.
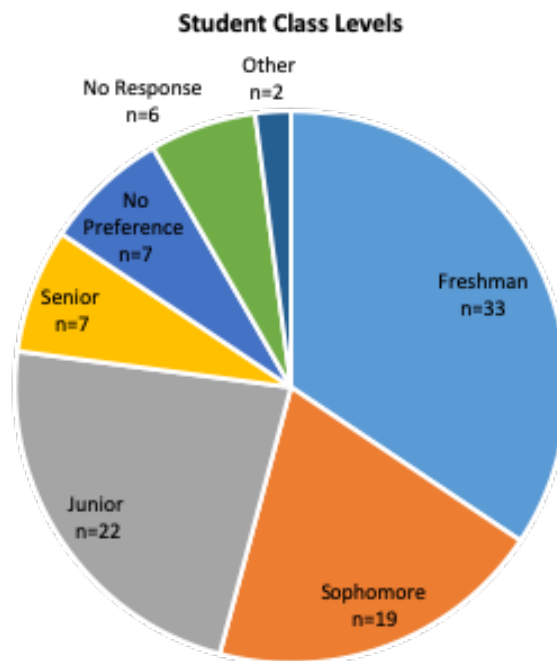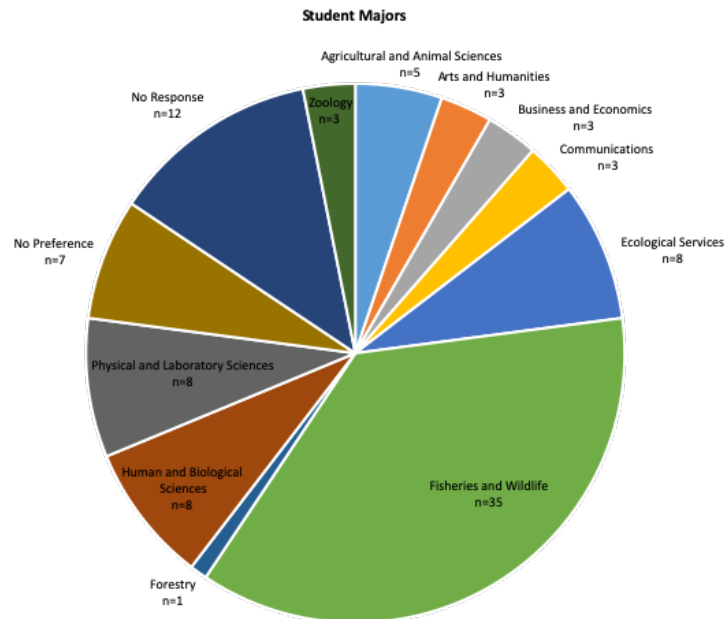
Based on the topics presented during the course, Dr. Campa and I will, together, take time to write or "Bloomify" questions to be included on formative and summative assessments (Bloom 1956). By taking the time and effort to write assessment questions that are: 1) directly linked to, and in line with, prior course material; and, 2) written in an improved way (compared to past assessment questions), we believe our students will respond better on (i.e., learn more through) the assessments.

Bloom's Taxonomy

create — Produce new or original work
Design, assemble, construct, conjecture, develop, formulate, author, investigate

evaluate — Justify a stand or decision
appraise, argue, defend, judge, select, support, value, critique, weigh

analyze — Draw connections among ideas
differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test

apply — Use information in new situations
execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch

understand — Explain ideas or concepts
classify, describe, discuss, explain, identify, locate, recognize, report, select, translate

remember — Recall facts and basic concepts
define, duplicate, list, memorize, repeat, state

Summary of Results

In the fall of 2016, the FW 101 course included 96 undergraduate students, representing 26 majors and more than 21 colleges and departments. The course was comprised mostly of freshman (34%).

Student Majors

Agricultural and Animal Sciences
n=5

Arts and Humanities
n=3

Business and Economics
n=3

Communications
n=3

Ecological Services
n=8

Fisheries and Wildlife
n=35

Forestry
n=1

Human and Biological Sciences
n=8

Physical and Laboratory Sciences
n=8

No Preference
n=7

No Response
n=12

Zoology
n=3

Student Class Levels

Other
n=2

No Response
n=6

No Preference
n=7

Senior
n=7

Junior
n=22

Sophomore
n=19

Freshman
n=33

FW 101 was led by 1 primary instructor (Dr. Campa) and featured 18 guest instructors including 1 graduate student (me), 12 professors affiliated with MSU's Department of Fisheries and Wildlife, and 5 state and federal agency professionals. These instructors covered a variety of topics (Figure 1).
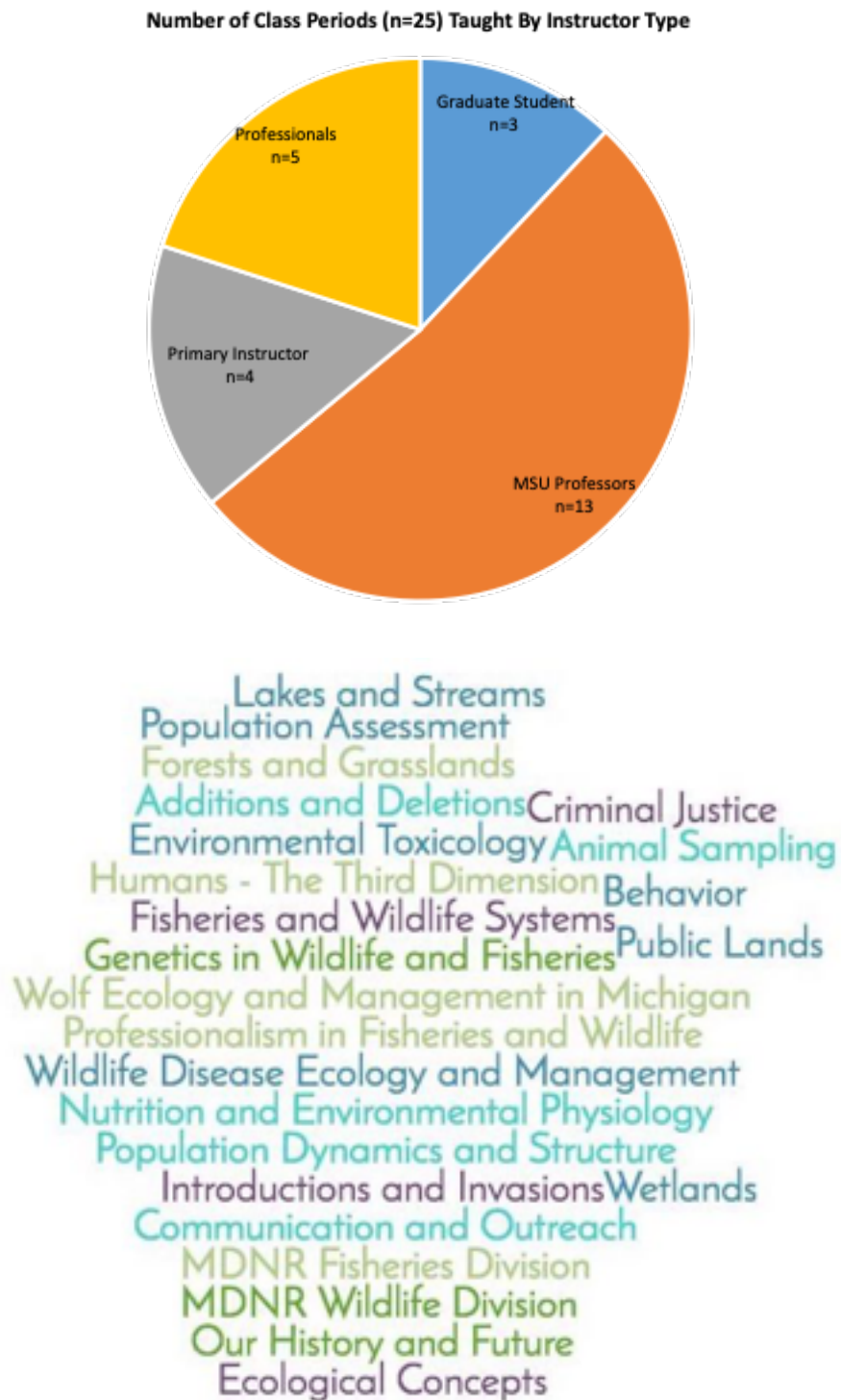
Number of Class Periods (n=25) Taught By Instructor Type

Figure 1. Various topics covered in FW 101 during the fall of 2016.

Dr. Campa and I collected information about the course instructors by categorizing different pedagogical approaches and teaching styles and strategies used through our monitoring and observations of class periods. We collected information about student learning by categorizing: 1) approaches based on their inclusion of learning objectives, active-learning strategies, and their perceived level of instruction; and, 2) formative and summative assessment material based on instructor type and level of instruction. Lastly, we collected information about student satisfaction by developing, disseminating, and evaluating a customized survey (e.g., SIRS form) to obtain students' opinions about instructor types and the overall course.

Dr. Campa and I concluded the majority of class periods in FW 101 included learning objectives (14, 56%), excluded active learning strategies (16, 64%), and were taught at proficient levels (16, 64%). One hundred percent of all class periods led by a graduate student instructor included learning objectives and active learning strategies (Table 1).

Table 1. The number and percentage of total class periods led by each instructor type and characterized by the inclusion or exclusion of learning objectives, active learning strategies, and perceived level of instruction.

		Number and Percentage of Class Periods Taught by Instructor Type			
		Primary Instructor (n=4)	*Graduate Student (n=3)*	*MSU Professors (n=13)*	*Agency Professionals (n=5)*
Learning Objectives	*Included*	3	6	2	3
	Excluded	0	7	2	2
Active Learning Strategies	*Included*	3	2	3	1
	Excluded	0	11	1	4
Level of Instruction	*Proficient*	3	6	4	3
	Master	0	5	0	2
	Expert	0	2	0	0

Based on these results and identification of key characteristics, we categorized the following types of observed pedagogical approaches as: inferior, below average, average, above average, and superior (Table 2).

Table 2. Types of observed pedagogical approaches.

Type of Pedagogical Approach	Key Characteristics
Superior	Learning objectives included
	Active learning strategies included
	Level of instruction and assessments aligned
Above Average	Learning objectives included
	Active learning strategies included

Type of Pedagogical Approach	Key Characteristics
	Level of instruction and assessments semi-aligned
Average	Learning objectives included or excluded
	Active learning strategies included or excluded
	Level of instruction and assessments semi-aligned
Below Average	Learning objectives excluded
	Active teaching strategies excluded
	Level of instruction and assessments semi-aligned
Inferior	Learning objectives excluded
	Active teaching strategies excluded
	Level of instruction and assessments mis-aligned

Dr. Campa and I investigated relationships among the type of instructor (e.g., primary, guest), type of pedagogical approach (superior, above average, average, below average, and inferior), and student learning (Figure 2).
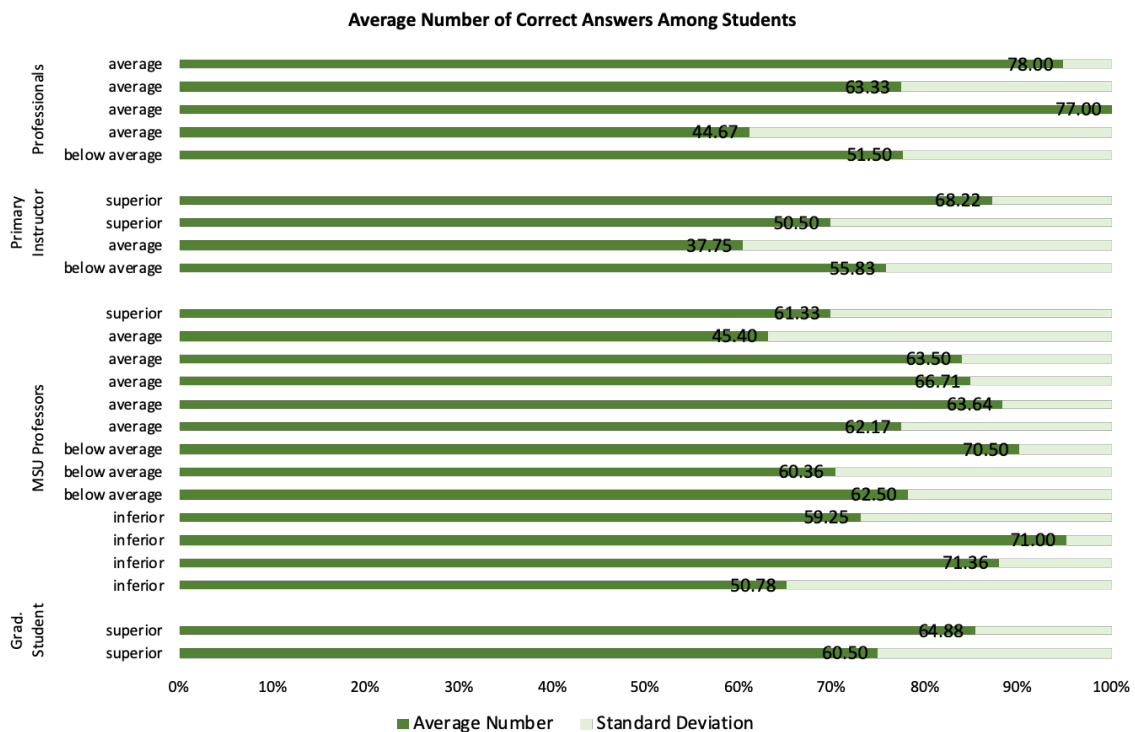

Figure 2. Average number of correct answers among students per type of instructor and pedagogical approach.

We used the average number of correct answers among students on formative (e.g., concept checks and quizzes) and summative assessments (e.g., exams) as a metric for student learning. Overall, Dr. Campa and I collected evidence that suggested student learning (i.e., student performance or student response), increased throughout the course of the semester. While we are still exploring certain relationships for a draft

manuscript we are now (2020) preparing for publication, it is not evident whether or not there is a direct relationship between type of pedagogical approach used and level of student learning. As Figure 2 indicates, some students performed well on questions associated with topics from class periods categorized by "below average" or "inferior" pedagogical approaches. This suggests that variables other than those considered in this project could also be at play in affecting student learning. On both an individual and class level, however, higher levels of student learning corresponded to higher performance on questions asked at a lower Bloom's taxonomic level.

Students most frequently indicated their satisfaction with the following lecture topics: wolf ecology and management, fisheries management, and wildlife disease ecology. Two of these lectures were taught by state and federal agency professionals and 1 was taught by an MSU professor. On average, students enjoyed, and were satisfied with, the course. Figure 3 includes selected responses among students from the customized survey (e.g. SIRS form) (Figure 3).
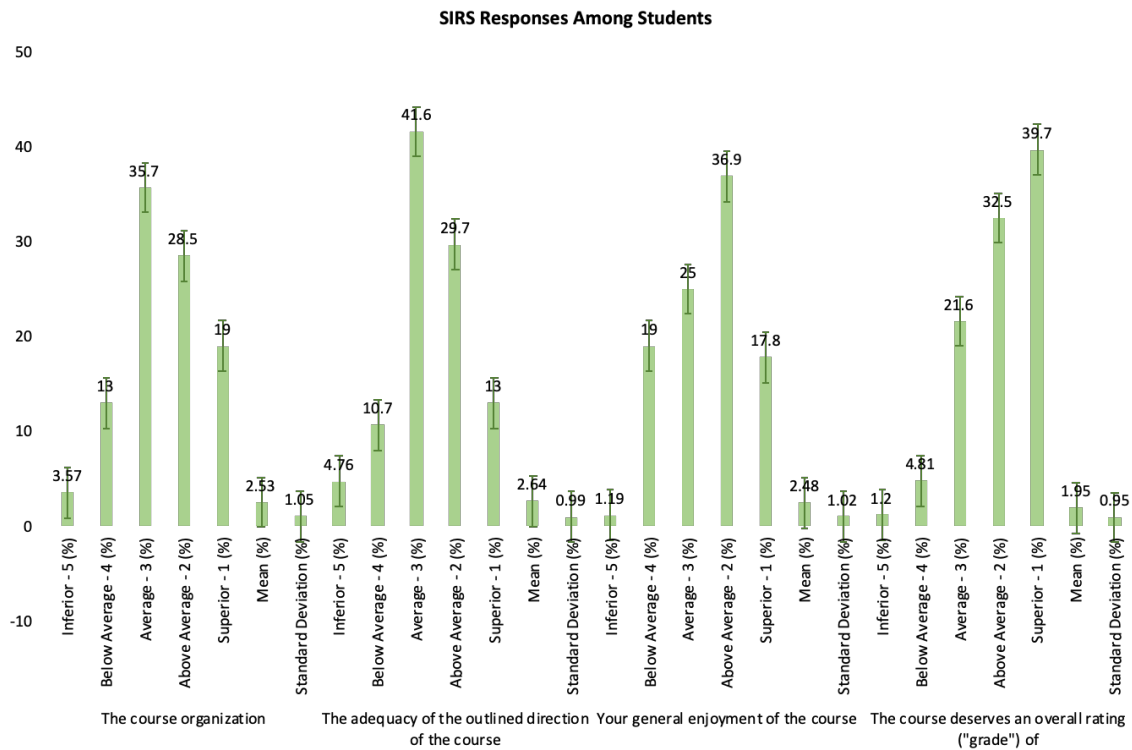

Figure 3. Selected student responses to the customized survey or SIRS form.

Conclusion

Through implementation of my mentored teaching project, I learned how to design and construct an effective lesson plan, inclusive of learning objectives and active learning strategies, focused around a topic (i.e., wildlife ecology and natural resource management) that I am likely to teach one day. Now, I have a deeper admiration for the time and careful thought required by educators in developing their own lesson plans (if they choose to do it right!).

I also learned there are more variables to consider in identifying the right approach to guarantee student learning and satisfaction. Reflecting back on our course and the range of instructors and topics we included, it could have easily been the enthusiasm of some instructors in holding students' attention that may have led to better student performance on assessments. Or, if could have simply been the fact that one class period lasted 20 minutes longer than the others that may have led to poorer student performance on assessments. While there are obviously many variables at play, I still maintain educators have significant control in affecting their students' learning and satisfaction through the teaching styles and strategies, and pedagogical approaches they elect to use—for better or for worse.

There are major implications of this research, not only for future educators of the FW 101 class, but for all the MSU professors who served as guest instructors in this course—and who also might serve as primary instructors in other courses. These professors might consider modifying their lectures to either incorporate more key characteristics of superior pedagogical approaches (Table 2) or revise their assessment questions to model those in line with a lower Bloom's taxonomic level. Perhaps they might notice differences in student learning and satisfaction in their own classes.

This research also has implications for state and federal agencies or other organizations that might hire students coming from the Department and Fisheries and Wildlife at MSU.

For instance, this project offers a snapshot of the main topics and kinds of material introduced to first- and second-year Fisheries and Wildlife majors. Agency professionals should be aware of, and interested in, this kind of instruction and how students are performing, as these factors could indicate students' readiness for future employment with their agencies and organizations. Agency professionals should also feel comfortable providing feedback to Dr. Campa and me about the FW 101 course organization and structure, especially if they identify gaps in information and instruction students will need to be best prepared for a career in natural resource conservation and management.

Funding Sources

References

Bloom, B.S. 1956. Taxonomy of Educational Objectives, Volume I: Cognitive Domain." McKay Publications, New York, New York.