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Can Reading Questions Foster Active Learning? A Study of Six College Courses

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Many instructors strive to encourage student reading outside of class and active learning in class. One pedagogical tool, structured reading questions, can help do both. Using examples from question sets across six courses, the authors illustrate how reading questions can help students achieve the six active-learning principles described by Svinicki (1991). Qualitative and quantitative assessment data indicate that students often complete readings before class, that they view the questions as very helpful in their learning, and that they use the questions primarily to help understand what information is important and connect it to prior knowledge. Some differences in use are evident across class standing.

Introduction

Reading Questions as a Pedagogical Tool

Across many different courses, instructors expect students to prepare for class by completing reading assignments. At the same time, an increasing use of active learning strategies to engage students encourages the use of classroom discussions. These two pedagogical components often complement each other—preparation before a class session can promote greater involvement in discussions (Green & Rose, 1996; McElwee, 2009; Trudeau, 2005). After all, it is unlikely that students will contribute meaningfully to discussions about the material if they have not first read and

comprehended the basic concepts on which the discussion is to be based (Karp & Yoels, 1976).

We have witnessed instructors using a wide range of strategies to encourage reading before a class session, including exhortation ("please, this is important"), threats ("some of this information will be on the exam"), appeal to financial considerations ("remember, you are paying over $100 dollars per class meeting, so you'll want to get your money's worth"), and promises ("you will find this very interesting"). We have also witnessed instructors, eager to spend time in interactive class discussions, become discouraged when students are unprepared to engage in concepts for which the assigned readings should have primed them. The latter point is particularly important for the lead author's own approach to teaching, which centers on active learning. As a teacher, I judge my efforts to be a success when students become actively engaged in a subject and take initiative to learn. I see my role as helping students to acquire and practice the skills necessary to engage successfully in critical thinking. While students will forget specific subject matter details from a course, I hope that they gain skills to synthesize ideas and make sense of new information—in other words, to build knowledge.

The intertwined challenges of getting students to read and developing active learning throughout the course have led the lead author to use structured reading questions in every course. I began with the intent of motivating student preparation for class so that during class time the students could participate in an active learning community through activities and discussions based on concepts covered in the readings. However, student feedback over the years has indicated that students attribute a variety of learning outcomes to these questions, including elements of active learning. Thus, rather than just serving as preparation for active learning, use of the reading questions can make reading itself an instance of active learning. In this article, we share the results from several years of student feedback, which have been generated by the first author (the instructor) via anonymous questionnaires, as well as by the coauthor, who has performed dozens of small-group instructional diagnostic (SGID) sessions with students in these courses. We begin with a brief description of prior scholarship on college student reading behavior, including text comprehension and active learning. Subsequently, we discuss some details about the courses we studied to provide context for our data. Next, we describe the study methods and results. Finally, we draw some discussion points from the results and offer concluding thoughts.

Prior Scholarship

Student Reading and Active Learning

Empirical research has indicated that students spend less time reading than their instructors recommend for them to be successful. For example, Sikorski et al. (2002) found that most students reported reading their psychology course textbook less than three hours per week. Clump, Bauer, and Bradley (2004) found that students, on average, completed less than 30% of the assigned psychology readings before class. Thus, the reading challenge is not solely in motivating students to read; teachers must also help students to comprehend texts. A variety of strategies are available to help students understand what they read. For example, prior to reading, the instructor can provide an overview of the text, help students establish a purpose for reading, and pre-teach key words they will encounter (Sibold, 2010). During reading, students can utilize reading strategies such as Survey, Question, Read, Recite, Review (SQ3R), which helps the reader see the structure of the text, activate prior knowledge, and ask and answer questions about the text (Robinson, 1970).

Inquiry into how students read and comprehend text have included elaborative interrogation studies focusing on the comprehension strategy, during reading, of asking readers periodically to answer the question "Why is this true?" about a concept in the text. Research results indicate that responding to a "why" question activates prior knowledge, thus helping the reader to place the new information into his or her existing knowledge structure, which promotes understanding and retention (Levin, 2008; Smith, Holliday, & Austin, 2010). This research begins to show how helping students engage with a text can be an important strategy for getting them to engage critically in active learning.

Active engagement with a text is an example of active learning, which shifts the role of the instructor from "sage on a stage" to "guide on the side," seeking to promote knowledge rather than transmit facts (King, 1993). Promoting knowledge entails connecting material to prior knowledge, weighing arguments, applying concepts to novel situations, and learning appropriate learning strategies (Barr & Tagg, 1995; Bonwell & Eison, 1991; Palloff & Pratt, 2007; Svinicki, 1991). Research studies have shown that active learning strategies are "superior to lectures in promoting the development of students' skills in thinking and writing" (Bonwell & Eison, 1991, p. 1). Active learning has been shown, for example, to improve college science students' ability to ask higher-order questions compared to traditional lecture format (Marbach-Ad & Sokolove, 2000).

Bonwell and Eison (1991) define active learning as "instructional activi-

ties involving students in doing things and thinking about what they are doing" (p. iii). Numerous examples have been demonstrated for in-class activities to promote active learning, such as think-pair-share, generating examples, concept mapping, problem posing, guided reciprocal peer questioning, debates, role-playing, and pair summarizing (Bonwell & Eison, 1991; King 1993; Lochhead & Whimbey, 1987).Less is known, however, about the degree to which teachers can promote active learning outside of class through structured reading questions that might also motivate students not only to read but to read more critically.

The Teaching Context: Students and Courses

The lead author teaches courses at The Ohio State University, a large land-grant public university in Columbus, Ohio. Most of these courses are in the School of Environment and Natural Resources, with an additional course in the John Glenn School of Public Affairs. The courses are either 4 or 5 credits on the quarter system and typically meet twice a week for 1.75 hours per session. The students in these courses range from sophomores to doctoral level and come primarily from the natural and social sciences along with professional fields. Structured reading questions have been used across this diverse range of learners. The courses for which data were collected for this study are as follows:

- **Natural Resources Policy (taught in 2010 and 2009):** An intermediate-level undergraduate course that is required for all majors in the School of Environment and Natural Resources. A majority of students are in the natural sciences, with a minority in the social sciences. Rarely do these students have any political science or policy background upon entering the course. Class size is typically 40-50. Course topics include policy making processes, governmental institutions, and current environmental issues. Class time is spent in a series of "mini-lectures" interspersed with small-group and whole-class discussion.

- **Public Forest and Lands Policy (2010):** A combined graduate/undergraduate-level optional course. Most students are natural resources social sciences or forestry majors; some students are in the interdisciplinary Environmental Sciences Graduate Program. Class size

is typically 10-20. Course topics include public lands history and laws, agency policy-making processes, bureaucratic culture, and current issues. Class time is spent mostly in small-group and whole-class discussions.

- **Ecosystem Management Policy (2009):** A graduate-level optional course. Most students are in the social sciences of natural resources, although a sizable minority are from the natural sciences, and some come from city and regional planning. Class size is typically 10-15. Course topics include theory and practice of integrating natural and social science for managing watersheds, forests, and regions. Class time is spent mostly in small-group and whole-class discussions.

- **Public Policy Formulation and Implementation (2009):** An introductory graduate-level course required of all students in the M.P.A. and M.A. programs in the Glenn School of Public Affairs. Most of the students in this evening course are working professionals with a wide range of backgrounds in the public sector, but typically they do not have prior coursework in public policy. Class size is typically 40-50. Course topics include the policy system, agenda setting, legislative decision making, implementation theory, and performance management. Class time is spent mostly in small-group and whole-class discussions.

- **Research Design (2010):** A graduate-level optional course. Most students are in the social sciences of natural resources. Class size is typically 5-10. Course topics include the scientific method, theory building, qualitative and quantitative research approaches, and development of thesis proposals. Class time is spent mostly in small group and whole class discussions. *Note: This course is also taught by two other instructors who do not use reading question sets.*

In each of these courses, students receive a syllabus that lists the reading schedule for the term. Each assigned reading is accompanied by a set of reading questions, which typically includes between 5 and 15 questions per reading. Students are advised to use the questions as a guide and to think about how they would answer the questions. They are advised that

the reading questions will serve as a basis for in-class discussion and that students in the past have found them to be helpful study guides. Importantly, the reading questions are presented not as a requirement, but as a tool for students who choose to use them. This gives students an element of choice rather than making the questions something they complete for a grade. In 2001 the instructor experimented with requiring students to hand in written responses every class session and work with a group of students to check their responses in class. This strategy was widely panned by the students as busy work and diminished their enthusiasm for the readings, so it was dropped.

Methods

Assessment Data

The lead author/instructor has sought students' input about their learning experiences in these courses through two formal means, one in the middle of the term and the other at the end of the term. After the first third of the term (typically in the fourth week), an instructional consultant of the University Center for the Advancement of Teaching (the coauthor of this article) comes into the classroom to conduct a small group instructional diagnostic (SGID) exercise with the students (Clark & Bekey, 1979). In the instructor's absence, the students provide the consultant with feedback on three key questions: 1. What are the strengths of the course and instructor that assist you in learning? 2. What things are making it more difficult for you to learn? And 3. What specific changes would you recommend to the instructor that would assist you in learning? The students first respond in writing individually or in small groups and then as a class discuss their responses, elaborate on their written comments, and vote on where there is consensus in their feedback. Student comments are compiled and provided to the instructor without any names attached.

At the end of the term, the instructor distributes a feedback form to the students in class and asks them to respond individually to a variety of questions about their learning experience and particular course elements. This form is completed anonymously while the instructor is not present and then collected by a student, who delivers them to a faculty colleague for safekeeping until after grades have been posted.

The instructor has used student feedback as a formative assessment tool to guide his course adjustments for many years and began collecting mid-term feedback with the coauthor's assistance in 2001. Student feedback has consistently indicated that they place a high value on the

reading questions as a learning tool. Qualitative comments on the mid-term (SGID) and end-of-term feedback forms have pointed to a variety of ways that the questions spur their thinking. For example, in mid-term feedback students would answer the question of what helps them learn with descriptions of how the reading questions help them "focus and reflect" or to "think about reading; don't just skim through." This kind of feedback suggested that the questions were doing much more than simply getting students to do their homework. Thus, starting in 2009 the instructor added some specific questions to the end-of-term feedback form to measure quantitatively the learning outcomes that the questions help students to achieve.

Although we have qualitative mid-term feedback (SGID results) on file for the past 10 years, for this analysis we focused on the six course offerings for which we also have quantitative end-of-quarter data—that is, student data from the courses offered between March 2009 and June 2010 (five quarters totaling 141 students). We analyzed qualitative mid-term feedback (SGID) for five of the six course offerings and end-of-term feedback from an open-ended question on the survey questionnaire for the sixth course. We also analyzed quantitative end-of-term feedback from all six course offerings.

Classifying Reading Questions

To measure the impact of different types of reading questions, we considered several taxonomies. Traditionally, Bloom's taxonomy (1956) has been used to describe critical thinking in terms of six educational objectives: knowledge, comprehension, application, analysis, synthesis, and evaluation. Developmental models of learning (Baxter Magolda 2001, 2009; Belenky, Clinchy, Goldberger, & Tarule, 1997; Perry, 1970) also suggest that as learners develop over time, they advance to the "higher" levels of cognition, such as constructed knowledge and contextual knowing. A different classification system tailored to reading questions, devised by Pearson and Johnson (1978) emphasizes that meaning is derived from an interaction between the reader and the text. Their taxonomy includes three types of interactions: textually-explicit (reading the lines; answering by locating ideas within the text), textually-implicit (reading between the lines; answering by making inferences based on the text), and scriptally implicit (reading beyond the lines; answering by going beyond the text).

While Bloom's (1956) and Pearson and Johnson's (1978) systems have been used to analyze questions about texts (for example, Scales & Shen, 2004), our preliminary review of feedback gathered between 2001 and

2008 suggested a broader approach would be more helpful in analyzing the impact of reading questions on student learning. The language of many of the student comments echoed several general principles of learning, such as the importance of structural knowledge, the challenge of knowledge transfer, and the crucial roles of process and metacognition. In looking for language to describe and analyze the student data, we turned, then, not to a single model, but to six "Practical Implications of Cognitive Theories" described by Svinicki (1991; further elaborated in Svinicki, 2004). Svinicki's principles are a synthesis of foundational learning theory, such as Piaget, Vygotsky (1986), and Ausubel (1960), as well as more recent research like that of Bransford, Brown, and Cocking (1999). The principles describe in practical terms the cognitive processes college students must use to learn and are very similar to the processes students have described in their feedback to this instructor. Svinicki's principles are also useful for this study because they provide guidance for planning future questions that can specifically target critical elements of the learning process.

Svinicki (1991) begins with the assertion that "Learners are not simply passive recipients of information; they actively construct their own understanding" (p. 27). The degree to which a learner learns new information depends on a variety of factors, including previous knowledge, beliefs about what is important, how and how often the learner tests his or her understanding, predicted utility of the information, awareness of how his or her biases affect what is absorbed, and understanding how he or she learns best. Svinicki (1991) expresses these factors as the six principles shown in Table 1.

Svinicki argues that all six of these principles are important for fostering learning, with no principle more critical than the others. At the same time, research suggests that for helping students to learn while reading text, questions that ask them to link the new information to their existing understanding of the world may be the most important. This is called "elaboration interrogation theory" (Levin, 2008; Smith et al., 2010).

We first classify the reading questions according to Svinicki's six learning principles in order to show the degree to which a set of reading questions can foster active learning. In addition, we describe results from student mid-term and end-of-term feedback about their use of the reading questions to aid their learning. Quantitative comparisons allow us to identify statistically significant correlations between students' use of the reading questions and their developmental stage, as represented by class standing.

Table 1
**Svinicki's Practical Implications of Cognitive Theories
(Svinicki, 1999, pp. 29-34)**

Principle 1. If information is to be learned, it must first be recognized as important. Implication: The more attention is effectively directed toward what is to be learned (that is, toward critical concepts and major areas), the higher the probability of learning.

Principle 2. During learning, learners act on information in ways that make it more meaningful. Implication: Both instructor and student should use examples, images, elaborations, and connections to prior knowledge to increase the meaningfulness of information.

Principle 3. Learners store information in long-term memory in an organized fashion related to their existing understanding of the world. Implication: The instructor can facilitate the organization of new material by providing an organizational structure, particularly one with which students are familiar, or by encouraging students to create such structures; in fact, students learn best under the latter condition.

Principle 4. Learners continually check understanding, which results in refinement and revision of what is retained. Implication: Opportunities for checking and diagnosis aid learning.

Principle 5. Transfer of learning to new contexts is not automatic but results from exposure to multiple applications. Implication: Provision must be made during initial learning for later transfer.

Principle 6. Learning is facilitated when learners are aware of their learning strategies and monitor their use. Implication: The instructor should help students learn how to translate these strategies into action at appropriate points in their learning.

Results

Reading Questions That Illustrate the Learning Principles

All six of Svinicki's principles can be illustrated across the range of reading questions. Table 2 lists sample questions from the question sets categorized by the learning principles they illustrate. It should be noted that the instructor developed these questions without the specific intention to draw on Svinicki's six principles. However, subsequent question sorting revealed that all six principles have been embodied in the question sets provided to students.

Table 2
Svinicki's (1991) Learning Principles
Illustrated by the Reading Questions

Adaptation of Learning Principle	*Sample Reading Questions*
1. Direct attention to critical parts of the reading.	1. Summarize, in your own words, what you think are the main points in this reading. 2. What key trends did the authors find in the data? 3. Explain Table 1. 4. What is the International Joint Commission? What did the countries agree to? 5. What body of knowledge is used to guide this research—to know which variables to examine?
2. Use examples, images, elaborations, and connections to prior knowledge.	1. What are the trends in social capital in the U.S., and why? Have you ever been part of a community with high social capital? Low social capital? What's that like? 2. Think of a high-profile case of a natural resource management issue. Are there aspects of the traditional management model that fit this case? What about the ecosystem model? Which approach do you think is most effective, and why? 3. What do the cases suggest about when partnerships form? How did the watershed group you are working with form? 4. Do you think it is a good thing for the status quo to be favored in public policy? Why or why not? Have you ever tried to change the status quo relating to a policy (in your school, an organization, or a government)? How did you try to make the change? Were you successful?

3. Encourage creation of organizational structures linked to prior knowledge.	1. Which of the contrasts in Table 2.1 most surprised you? Which have you heard before? 2. Is Freemuth correctly characterizing Grumbine's position about (a) who would have decision making authority and (b) how to view humans in Ecosystem Management? 3. How does this article fit with other articles we have read? 4. Earlier we learned about ground-level ozone (smog) as a harmful pollutant. What is the value of stratospheric ozone?
4. Check understanding to refine/revise.	1. What questions or comments do you have about this paper? 2. Write an essay question about a main idea from this reading, that you think would make a good exam question. Write your answer to it. 3. Draw a simple diagram showing how these organizations are related to each other: the U.S. Forest Service, the U.S. Department of Interior, and the U.S. Fish and Wildlife Service.
5. Transfer to new contexts by practicing application.	1. Explain Figure 2.5. What skills/expertise do managers need to navigate this terrain? Where might science contribute? Write a job description for a manager position. 2. Answer the survey questions described in this article. How do your responses compare to Tables 1 and 2? With which group do you most closely align on these questions, and why do you think this is?

Table 2
Svinicki's (1991) Learning Principles
Illustrated by the Reading Questions (*continued*)

Adaptation of Learning Principle	*Sample Reading Questions*
5. Transfer to new contexts by practicing application (*continued*).	3. The authors call for more research in many facets of ecosystem management. Think of a particular research question related to one of these facets. How might you design a study to address your question? 4. Imagine you are a consultant for the Bureau of Land Management, brought in to give advice about how to promote ecosystem management. What would you recommend?
6. Learn about learning strategies, when to use them, monitor their use, adapt them to new situations.	1. The Pettinico article was written for the magazine *Sierra*, which is a publication of the Sierra Club interest group. What word choices or phrasing in the article can you find that are evidence of the author's bias? Why should we read such articles when learning about natural resources policy? 2. This reading is a journal article describing a particular study. What does it add to your understanding of the Advocacy Coalition Framework presented in the previous reading? 3. How might you use concepts in this reading to inform your program analysis project?

Student Reading and Use of the Reading Questions

To what extent do students actually read before class? One end-of-quarter question asked, "Throughout the quarter, how often did you

complete the assigned readings *before* the corresponding class session?" with three possible responses: (1) less than 50% of the time, (2) 50% to 75% of the time, or (3) more than 75% of the time. Across the courses, of $n = 140$ respondents, 12% indicated they completed the readings less than 50% of the time, 29% indicated 50% to 75%, and 59% indicated more than 75%. Statistical analyses did not suggest patterns by class standing; underclassmen reported reading completion rates similar to those of upperclassmen and graduate students.

How useful do the students view the reading questions to be? One question asked, "How helpful were the following items in your learning of course content?" on a five-point scale from 0 (*not helpful*) to 4 (*very helpful*). (The midpoint on the scale (2) was labeled "somewhat helpful," whereas points 1 and 3 were not labeled.) Across the courses, of $n = 136$ respondents, 2% rated the reading questions as "not helpful," 3% rated the questions as 1, 15% rated them as 2, 26% rated them as 3, and 54% rated them as "very helpful." Bivariate correlation analysis indicates a significant link between perceived usefulness and class standing, with higher usefulness linked to lower class standing (*p*-value of 0.027).

How are students using the reading questions? One question asked the students to indicate all of the ways they used the question sets in their learning and included a list of responses relevant for the particular course, as shown in Table 3. Some responses were asked of all students across the courses ($n = 141$ respondents), while others were asked only of students in a subset of the courses, for example, only those students in the courses with a take-home exam. The highest proportion of respondents reported using the questions as an exam study guide (71%), followed by using them to keep track of main ideas covered in class (53%), and answering them during or after doing the assigned reading (52%). For these three responses, which were common to all 141 students across all class standings, statistical analyses did not reveal any correlation between class standing and type of student use of the reading questions.

Student Perceptions of Whether Reading Questions Help Them Achieve the Learning Principles

To measure the degree to which reading questions helped students to achieve each of the six learning principles, a question asked, "If you used the question sets, which of the following did they help you to do? *(circle all that apply)*." As shown in Table 4, pooling together all student responses across the six courses, the most frequent response was for Svinicki's Learning Principle 1, followed by Learning Principle 3.

Table 3
**Frequency and Proportion of Student Use
of Reading Questions for Different Purposes**

Response	N	*Number Who Indicated*	*Percent*
"I used them as an exam study guide."	75	53	71%
"I used them to keep track of main ideas we covered in class."	49	26	53%
"I answered them during or after I read the assigned reading."	141	73	52%
"I looked at them before I read the assigned reading, as a guide for main ideas."	141	55	39%
"I will use them to complete the take-home exam."	58	20	34%
"I used them to review before class sessions."	92	28	30%
"I didn't."	141	16	11%
"Other."	141	4	3%

Note. These are closed-ended responses to the question, "How did you use the question sets in your learning? (circle all that apply)."

　　To examine patterns according to which students are more likely to list particular principles, we turned to theories of cognitive development. These theories suggest that as students mature intellectually, they will achieve higher levels of cognition, represented as the higher-numbered learning principles (Baxter Magolda, 2001; Belenky et al., 1997; Perry, 1970). As an indicator of level of cognitive development, we used class standing (freshman, sophomore, junior, senior, and graduate student) as indicated on the student questionnaires. In addition, we tested for variation across the six courses to account for the fact that some of these courses are more introductory and geared towards undergraduates, others are more advanced and geared toward graduate students, and one is a mix

Table 4
**Learning Principles That Students Perceive
the Reading Questions Help Them to Achieve**

Learning Principle	N	*Number Who Indicated*	*Percent*
1. To understand what information was important	125	108	86%
2. To see how the readings related to my own experiences or the real world	125	19	15%
3. To structure the material or connect it to my prior knowledge	125	57	46%
4. To compare my views with other perspectives or rethink my ideas	125	25	20%
5. To think about how concepts might apply to new contexts	125	39	31%
6. To be aware of my learning strategies and reflect on how I learn best	125	25	20%

of the two. We calculated bivariate correlations between each of the six principles, in turn, and class standing (see Table 5), and between principles and course (see Table 6).

The two significant correlations in Table 5 indicate a link between class standing and Principles 1 and 3. The negative sign in Principle 1 shows that students of higher class standing were less likely to use reading questions to understand what information was important. At the same time, the positive sign in Principle 3 shows that students of higher class standing were more likely to use question sets to structure the material or connect it to prior knowledge.

The significant correlation in Table 6 is between the course and Principle 3. For the two undergraduate-level courses (Natural Resources Policy

Table 5
Correlation Between Learning Principles and Class Standing

Learning Principle	N	*Pearson Correlation (Significance)*
1. To understand what information was important	137	-.191 (.025)*
2. To see how the readings related to my own experiences or the real world	137	.012 (.891)
3. To structure the material or connect it to my prior knowledge	137	.173 (.043)*
4. To compare my views with other perspectives or rethink my ideas	137	-.043 (.617)
5. To think about how concepts might apply to new contexts	137	-.046 (.590)
6. To be aware of my learning strategies and reflect on how I learn best	137	-.062 (.471)

Note. *significant at the 0.05 level (2-tailed test)

2009 and 2010), 28% (21 of 75) of respondents who used the question sets marked Principle 3, which was lower than the 65% (11 of 17) of respondents for the mixed-level course (Public Forest and Lands Policy) and the 59% (25 of 49) of respondents for the three graduate-level courses who marked Principle 3.

Qualitative Data

Qualitative data were derived from student comments about each course. Five of the six courses used the small-group instructional diagnostic (SGID) method to obtain written and verbal comments midway through the term. For these courses students responded to the question "What are the strengths of this course?" Table 7 lists student comments about the question sets, both from the individual written portion of the SGID and the whole-class discussion that followed. The sixth course used an open-ended question on the end-of-term feedback questionnaire, which asked, "What things did you like best about this course and/or

Table 6
Correlation Between Learning Principles and Course

Learning Principle	N	*Pearson Correlation (Significance)*
1. To understand what information was important	141	-.153 (.069)
2. To see how the readings related to my own experiences or the real world	141	.161 (.057)
3. To structure the material or connect it to my prior knowledge	141	.250 (.003)**
4. To compare my views with other perspectives or rethink my ideas	141	.101 (.234)
5. To think about how concepts might apply to new contexts	141	.103 (.226)
6. To be aware of my learning strategies and reflect on how I learn best	141	.058 (.498)

Note. **significant at the 0.01 level (2-tailed test)

instructor?" Table 7 shows representative individual written comments from the sixth course. As shown in the table, there was widespread agreement that the question sets were valuable for student learning.

Discussion

Data from the six courses indicate that a majority of the students reported completing assigned readings prior to class over 75% of the time. Without a control group for comparison, it is unclear to what degree the question sets contribute to this result—we do not know how much reading these students would have done in the absence of the question sets. However, this relatively high rate of completing the reading is consistent with the aim of the reading questions. In addition, the reading completion rate did not vary by class standing; students across all levels reported similar rates of completion.

When asked to rate the value of the reading questions in helping them to learn course content, the majority of respondents (54%) indicated the

Table 7
Students' Qualitative Comments About the Value of Reading Questions

Course (Year Taught)	Class Discussion Consensus	Representative Individual Written Comments
Natural Resource Policy (2010)	"We really like the reading questions; they pull out the points he wants us to know and are great for studying for exams."	"Reading questions are helpful in preparing for exams and class." "Reading questions are a strength of the course."
Natural Resource Policy (2009)	"The reading questions help narrow your focus."	"Reading review questions are helpful." "Reading questions are a good tool."
Public Policy Formulation and Implementation (2009)	N/A (collected only individual written comments)	"The reading questions were very helpful to pull together the main concepts." "I liked the reading guides."
Public Forest and Lands Policy (2010)	"The questions designed for each reading provide guidance to what he wants us to pull out of the article."	"Well structured readings with helpful questions pertaining to the sections." "Reading questions helped to identify main points."

| Ecosystem Management Policy (2009) | "The questions help to follow along on readings and see what's important. They give a better understanding of the paper. If you just read, you don't understand what it's going to say, but when you try to answer questions you get a better understanding." | "[The instructor] is very good at providing guiding questions that address the main topics of articles."

"The written questions are a strength of the course." |
| Research Design (2010) | "Questions are useful guides for main points in the readings." | "The set of questions are a useful tool to read the books in a manner that we get the most out of it."

"Preset questions are a very helpful guide to the chapter readings."

"Reading guide is helpful in directing to key points in the readings."

"The question sets help to organize readings and format course concepts." |

highest level of helpfulness (4 on a scale from 0 to 4). There was some variation across class standing, as students with lower class standing tended to value the reading questions more highly. When asked to indicate how they used the reading questions, the highest proportion of respondents indicated using them as an exam study guide (71%), followed by using them as a means to keep track of main ideas covered in class (53%) and answering them during or after the assigned reading (52%). These responses suggest that students used the reading questions not only as they were doing the reading, but also for linking the in-class material as well as for preparing for exams.

Data from this study provide insight into the degree to which the question sets can help students achieve the six learning principles described by Svinicki (1991). The most frequent learning principle indicated was Principle 1: Direct attention to critical parts of the reading (86%), followed by Principle 3: Encourage creation of organizational structures linked to student prior knowledge (46%). These were also the two principles significantly linked to class standing, with Principle 1 more often indicated by students of lower class standing and Principle 3 more often indicated by students of higher class standing. In fact, the difference in Principle 3 was also evident in comparing the distribution of scores in different courses, with the students in the graduate-level and mixed-level course offerings more likely to indicate the question sets helped them to achieve this principle than did the students in the undergraduate-level course.

It is interesting to note the value of linking new material to a reader's prior knowledge (Principle 3). This is one of the key aids Sibold (2010) recommends instructors can provide to enhance student engagement with text, although she does not list reading questions as a means to do so. It is also a key variable driving the effects of elaborative interrogation strategies (Levin, 2008; Smith et al., 2010). Thus, the finding that students with lower class standing less often find that the reading questions help them to achieve this suggests they need further assistance in doing so. Instructors should consider providing more direction and practice for these students.

Conclusions

Active learning is a key strategy for helping learners to build knowledge. Increasing emphasis on active learning has led to a variety of in-class techniques that instructors can use. But active learning can be encouraged outside the classroom as well, via reading assignments that are accompanied by structured questions. These questions were provided

as a learning tool for students to use if they chose rather than as a graded course component. Our experience across six college courses, with a wide range of students, suggests that most students chose to use the questions and found them helpful in their learning. In fact, 59% of students across the six courses reported they had completed class readings prior to coming to class at least 75% of the time. Over half of the students rated the question sets as "very helpful" for their learning, the highest point on a 5-point scale.

Reading questions supported by in-class discussions of the readings can foster active learning in a variety of ways. They motivate students to do the reading before class, and they are used by students not only to help them comprehend text, but also to study for exams and to keep track of main ideas discussed in class as well.

Reading questions can support the six active learning principles from cognitive theory described by Svinicki (1991). While understanding what information is important (Principle 1) was the most frequently listed, structuring the material and connecting it to prior knowledge (Principle 3) was indicated by nearly half of the respondents. Importantly, the sixth principle, learn about learning strategies, suggests a need for students to be aware of how they learn: Twenty percent of respondents indicated the reading questions helped them to achieve this principle. The fact that students can articulate and identify a variety of learning outcomes that come from the reading questions suggests that they have become conscious of their learning. This finding is in line with Svinicki's (1991) advice: "From the cognitive perspective, teachers are faced with two tasks. First, we must organize the course and its content in a way consistent with what we believe about how learning takes place, paying attention to structure, sequence, examples, and activities. Second, and simultaneously, we must help students learn how to learn content, a step in sophistication above the mere learning of content itself" (p. 29).

The instructor's role in creating the reading questions is critical. While it is perhaps most natural to write many questions focusing on Principle 1, it is also possible to write questions corresponding to the other principles, and students do recognize that these types of questions help them to achieve learning outcomes. Writing such a variety of questions takes a significant time investment initially from the instructor, but fortunately, the questions can be re-used, with or without modification, for future courses that use the same readings.

The perceived value of reading questions was explored in this study in the context of an instructional style emphasizing active learning. That is, the instructor used the reading questions to spark in-class discussion,

which comprised a large component of each of these courses. It is unknown to what degree reading questions would be valued by students in a class setting with a primarily lecture-driven style. However, to the extent that written texts are an important course element in many courses, it is expected that reading questions that foster active learning will enhance students' motivation to read and their comprehension while reading. In addition, they will likely lay the groundwork for student engagement during the class session, as students who have prepared are more likely to participate.

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