

# Evaluating Action Research

**After reading this chapter you should be able to:**

- 10.1** Identify criteria for evaluating the quality of action research.
- 10.2** Apply the criteria for evaluating action research to a published article and/or your own action research project.

Whereas Chapter 8 showed teacher researchers how to ensure that action is planned with consideration of the findings of the study and the potential obstacles to implementing change and Chapter 9 described the writing process and suggestions for how to “get the word out,” this chapter addresses the criteria for evaluating action research reports in terms of area of focus, research questions, locus of control, data collection, ethics, reflective stance, action, the relationship between action and data, and format. A published journal article is included at the start of the chapter for evaluation.

## “Let’s Talk”: Discussions in a Biology Classroom: An Action Research Project

Penny Juenemann

### Introduction

*Action research has provided me with the opportunity to engage in professional development, enabling me to reflect on my teaching and determine whether I am living up to my values. In this action research project, I have been studying how my teaching has changed in order to facilitate meaningful discussions in the classroom, and I have been assessing how these changes impact my students. The motivation for this study came from my desire to have students make connections between what they already know and new knowledge they encounter in biology. By reflecting upon my teaching I discovered that I was doing most of the biology-related talking. As an undergraduate we*

*discussed the importance of a student-centered classroom and when I graduated I was confident that I would always be a student-centered teacher. It has been almost ten years since I received my undergraduate degree and I haven't always lived up to that value. By increasing my ability to facilitate meaningful discussions I hope to swing the pendulum back to the students. I teach biology to all tenth-grade students and believe that it is important that students are able to make connections between biology content we cover in the classroom and the world around them. By engaging in more discussions I believe students' learning will become more meaningful.*

## **Context**

*During the 2003–2004 school year at Two Harbors High School I taught five sections of tenth-grade biology, one section of twelfth-grade Advance Placement biology and one section of eleventh- and twelfth-grade physics daily. Each class had approximately 22 students except AP biology, which had 8 students. My action research focused on my tenth-grade biology students.*

## **Research Questions**

*How will incorporating more meaningful discussions into my biology classroom affect my teaching and the ability of students to learn?*

### *Sub-questions*

- 1. How do I need to change my teaching to facilitate more meaningful discussions in my biology classroom?*
- 2. Will having more meaningful discussions allow students to learn content at a higher level?*
- 3. Will having more meaningful discussions help students make connections between biology content and the world around them?*
- 4. Will having more meaningful discussions increase students' ability to make informed decisions regarding socially and/or ecologically significant issues?*

## **Theoretical Framework**

*This paper is about my journey as a teacher through action research. Action research is a process by which teachers attempt to study their problems scientifically in order to guide, correct, and evaluate their decisions and actions concerning their teaching and learning. Action research requires the researcher to be reflective of his or her practice. Through action research the researcher is striving to live his or her values in the classroom.*

*I feel it is important for students to make connections between what they already know and what we learn in class. To acquire a deep understanding of complex ideas (meaningful learning), students need to make connections between what they know and new knowledge that they encounter. Such an epistemology is referred*

to as constructivism. One of the first philosophers to explain constructivism was Piaget. The idea can be traced back even further to Giambattista Vico in 1710 who proclaimed, "To know means to know how to make." He substantiates this notion by arguing that one knows a thing only when one can explain it (Yager, 2000, p. 44).

Through better discussions, students can develop a better understanding of the content being covered in class. As Lord (1994) suggests, "By attempting to explain what one knows about a topic to someone else, explainers test the fit of their understanding. Similarly, while trying to understand what a colleague is saying, listeners question and challenge their own understanding and try to fit the material into their already established cognitive foundations" (Lord, 1994, pp. 346–347).

Students must talk about what they are doing, relate it to past experience, and then apply it to their daily lives. By discussing topics that are relevant to students' lives but also contain the biological concepts students are required to know, students will construct their knowledge in a meaningful way. By monitoring these discussions, teachers can obtain immediate feedback. If one student is incorrectly explaining material aloud to another, the teacher can do immediate re-teaching. More optimistically, teachers can also give immediate praise.

Early on in my project I realized that it would be important to ask good questions and monitor student responses and cognition. There are three domains of learning: cognitive, affective and psychomotor. In 1956, Benjamin Bloom defined the cognitive (the mental process or faculty of knowing) domain for educators (Henson, 1993, p. 124). He developed a taxonomy for categorizing questions, objectives, or responses. His six categories can be divided into two groups, low order and high order. The low-order categories are the simplest and the least demanding, whereas high-order categories require greater understanding and are thus more demanding. Low-order categories are knowledge and comprehension. High-order categories involve application, analysis, synthesis, and evaluation. Asking higher-order questions challenges students to think while promoting learning, as higher-order questions require students to process information in ways associated with greater comprehension and understanding. In order for me to stimulate meaningful discussions, I need to ask questions of a higher order on Bloom's taxonomy. Simple knowledge-based questions elicit little discussion. Another important concept regarding questioning is wait time. It is recommended to wait three to five seconds after asking a question, and again after the response, in order to give students a chance to think and formulate a high-order response. A third important consideration in questioning is the use of Socratic dialogue. In Socratic dialogue, teachers respond to students' questions with questions. It is also very important that students ask questions. "If we want to engage students in thinking through content we must stimulate their thinking with questions that lead them to further questions" (Elder, 1998, p. 298).

After monitoring discussions for about a month, I discovered that the make-up of the group conducting the discussion is important, as people learn in different ways. The main learning styles are visual, auditory, and kinesthetic. Visual learners learn best by seeing, auditory learners learn best by hearing and talking, and kinesthetic

learners learn best by doing. People can possess any combination of these learning styles, but often one is dominant. Through discussions with a critical friend, I decided to try grouping students heterogeneously by their learning styles. Later on, after reading more literature, I discovered that many teachers have had success grouping their students heterogeneously by ability. I then tried arranging my students heterogeneously by learning style and ability in an attempt to improve discussions.

Another path my action research has taken me on is cooperative learning. Cooperative learning models also recommended that groups be arranged heterogeneously. In a study conducted on cooperative learning at the college level the researcher said, "We experienced first hand that homogenous teams are a prescription for disaster in a cooperative learning driven course. . . . It is important for students from different backgrounds to work together and learn from each other's perspectives and strengths" (Trempey, 2002, p. 32). To facilitate meaningful discussions, students need to work together cooperatively. This practice was reinforced by the results of a questionnaire I gave my students in which they stated that participation was important for quality discussions to take place. To address this concern, I began using some cooperative learning techniques. Cooperative learning is an approach that encourages students to collaborate with each other to achieve common learning goals. According to Johnson and Johnson (1985) one of the main elements of cooperative learning is "individual accountability," where every student is responsible for contributing to the group. This can be done by assigning and checking individual contributions to the group, assigning roles or jobs to every member, randomly quizzing every member over the material, and/or giving individual tests. Another essential element is "positive interdependence" when students feel they need each other in order to complete the task successfully. According to Holubec (1992), cooperative learning is also a style that leads toward higher-level thinking. When students are working together and discussing the material, they will work beyond the lower-order questions. Within discussion groups, students need to accept and learn from each other's opinions, strengths and contributions. Lotan's research found that students can be empowered by this type of group work. "Group-worthy tasks require students to share their experiences and justify their beliefs and opinions. By assigning such tasks, teachers delegate intellectual authority to their students and make their students' life experiences, opinions and points of view legitimate components of the content to be learned" (Lotan, 2003, p. 72).

The affective domain, which addresses students' attitudes and values, is also important in the classroom. Part of my research examined socially and/or ecologically significant issues, with the hope of encouraging moral growth in my students, helping them become more aware of their values and to allow them to make connections between biology and the world around them (between new and preexisting knowledge). In addition to making necessary connections, hopefully students will improve their critical thinking skills. Woodruff explains how discussing these issues can increase students' critical thinking skills, "Ethical thinking is neither a matter of pure intellect nor of gut feelings and prejudices. What is important here is one's reasoning and critical thinking skills. Thus, by strengthening and expanding these skills, the

*student will be able to view our ever-changing biological world from a new perspective, and not be limited by the past or previous belief-systems" (Woodruff, 1992, p. 2).*

*In summary, through my action research and my desire to be more of a constructivist teacher, I have found it necessary to research good questioning skills, higher-order learning, learning styles, and cooperative learning.*

## **Changes in My Teaching Practices**

*The main focus of my research is on small group discussions, as that is where more students can participate in a more comfortable environment. Though I didn't have a defined method of research as I began, I collected and analyzed data and made what I thought were appropriate changes in my teaching as I progressed through my action research. The following is a list of changes that I made.*

- 1. I increased the number of discussion opportunities in my classroom.*
- 2. I administered a learning style inventory, then arranged students into groups heterogeneously based on their learning style, and later on arranged students heterogeneously by learning style and ability.*
- 3. I increased the number of high-order questions. Throughout my research I tried to ask higher-order questions according to Bloom's taxonomy in hopes that students would increase their higher-order responses. When preparing discussion questions I referred to Bloom's taxonomy. Also, I tried to keep myself from directly answering a student's question, instead guiding them to their own understanding through an increase in Socratic dialogue.*
- 4. I used more cooperative learning techniques. From the first questionnaire that I gave students I discovered that students wanted everyone to participate more, including themselves. I used roles or jobs within a group, the numbered heads technique, the round robin technique, and the jigsaw technique. In the numbered heads technique, the students were numbered off within a group and told that I would randomly pick a person from their table to answer a question. They must work together to make sure everyone understands the topic. The round robin technique is when each group has one paper and it is passed around the table for everyone to contribute to. I used this technique to review the plant kingdom. Students were instructed to make a dichotomous key as a group going around the table until the key was finished. The jigsaw method uses two groups, a "home" group (their original group) and the "jigsaw" group. First, students start in their home group to discuss the issue; then they break into their jigsaw group (students are numbered within their home group, then all like numbers get together to make the jigsaw group). Last, students return to their home group to share information they collected. While using cooperative learning groups, I had a student mention that discussions should be "worth more," referring to points, and it was suggested by a colleague to have students evaluate each other on their participation.*

*In response to this I developed a rubric for students to evaluate each other on their participation.*

- 5. As a way to involve students in discussions, I designed and facilitated discussions on socially and ecologically significant issues. Ten of the twenty discussions focused on socially and/or ecologically significant issues. Some discussions involved scientific articles. First, students read the articles and answered questions independently. Then they discussed their answers to the articles using a cooperative learning technique. Another type of activity I used was dilemma cards, for example, "Deer Dilemma" modified from an activity in Project Wild where students had to respond to the ecological impacts that the growing deer population has in our environment and design a solution as a group. I used the jigsaw method for this activity.*
- 6. Another way to involve students in discussions was by having them design and carry out labs as a group. I provided them with the question and with some guidelines—guided inquiry. Four of the twenty planned discussions were designing labs.*

## **Data Collection and Analysis**

*Data collection for this study came from several sources. To analyze this data I read through my journal on a regular basis, analyzed student questionnaires, and discussed results with my validation team while searching for themes within the data.*

### **Teacher Journal**

*While reflecting on my journal entries I was able to verify the need for this action research project. In an early entry I was concerned about "down time"—students not engaged—and a couple months later was very excited about initiating a good discussion. Reading journal entries helped guide my teaching.*

### **Student Questionnaires**

*Students responded to two questionnaires. The greatest benefit from the first questionnaire was that students let me know that participation was critical for group work success. One open-ended question on the questionnaire was: What can I (the teacher) do to improve discussions in the classroom? Eight percent of the students responded that I should make sure everyone participated. The second open-ended question was: What can you (the student) do to improve discussions in the classroom? Forty-six percent of the students responded that they should participate more. From this first questionnaire I also noticed that students want to make connections between what we are doing in biology and the world around them. Two students made the comment, "Have things we may run into later in life." One student seemed to be aware of the benefit of discussions to constructivism: "Have a weekly class discussion that involves not only what we learned but what we know."*

**chart 1 ■ Triangulation of Data**

Research Questions	Data Collection Techniques			
	1	2	3	4
How do I need to change my teaching to facilitate more meaningful discussions in my biology classroom?	Teacher Journal	Student Questionnaire	Student Interviews	Lesson Plan Book
Will having more meaningful discussion allow students to learn content at a higher level?	Audiotape of discussions	Student Questionnaire	Unit Tests	
Will having more meaningful discussion help students make connections between biology content and the word around them?	Audiotape of discussions	Student Questionnaire	Student Interviews	
Will having more meaningful discussions increase students' ability to make informed decisions regarding socially and/or ecologically significant issues?	Student Questionnaire	Mock situations where students use their biology knowledge and skills to address a social or ecological problem.	Student Interviews	

**chart 2 ■ Analysis of Biology Test**

Date	Test name	Point total for higher-order question/total point	% of points from higher-order questions	Number of tests analyzed	Students' average score on higher-order questions	% of points earned for higher-order questions
9/12/03	Microscope and Scientific Method	10/47	21%	111	6.7	67%
10/10/03	Eukarya Test	13/60	22%	95	8.1	62%
10/29/03	Animal Kingdom	7/22	32%	107	5.4	78%
11/11/03	Bacteria and Viruses	4/22	18%	99	2.6	65%

*In the second questionnaire I noticed that students were still concerned about participation, but they noted several instances when discussions were better because everyone participated. For example, with the round robin virus articles a student said, "Everyone participated because they had different information." And with the deer dilemma some student comments were: "It got everyone involved and participating." "We had to decide something as a group." "We had good conversations." From the second questionnaire I also noticed that students enjoyed discussing socially and ecologically significant articles. A student said, "We shared our point of views and opinions on the article. So I learned others' thoughts on the article."*

*In summary, the questionnaires helped guide me in my research by showing how important it was to the students that everyone participates. I also discovered that students feel it is necessary to make connections between the biology content and the world around them and that they felt that engaging in these discussions helped them to do that.*

### **Unit Tests**

*When analyzing my tests I used Bloom's taxonomy to determine whether questions were low- or high-order questions. Then I studied the students' responses to determine the percent of points earned on the higher-order questions. The purpose was to see if increases in discussions would lead to more points earned on higher-order questions throughout my research.*

*From this data I can conclude that I still need to work on writing higher-order questions. I believe the content type influences the amount and type of questions that are asked.*

### **Audiotapes of Discussions**

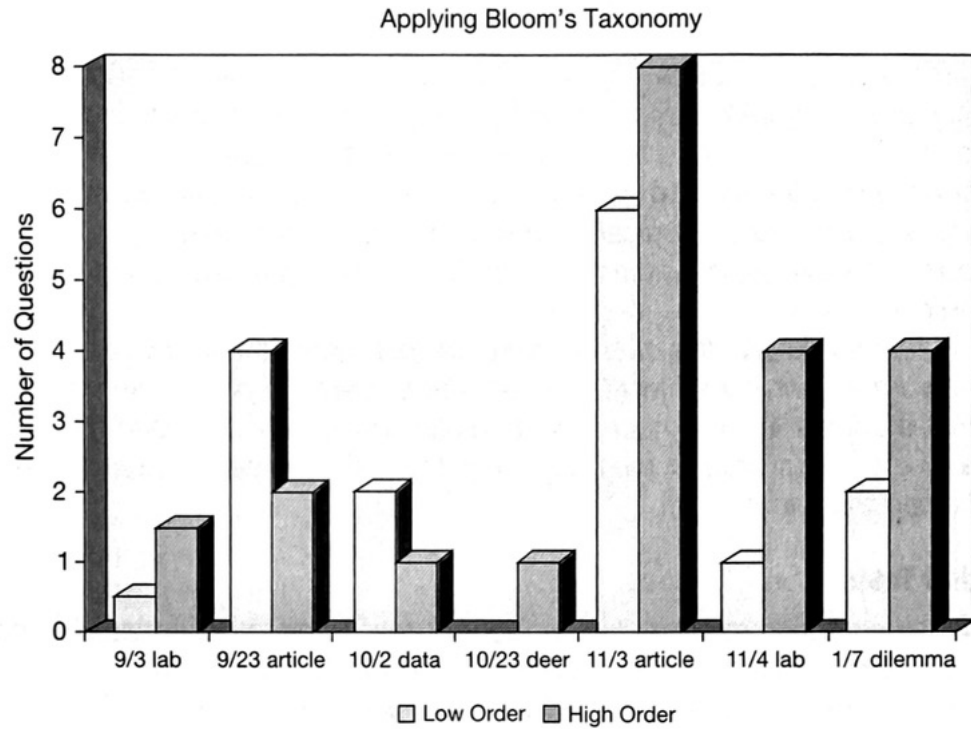
*On seven different occasions I audiotaped discussions. Using Bloom's taxonomy I categorized the discussion questions that I designed prior to the discussions and questions that developed during the discussion. When I audiotaped more than one group, I averaged the number of high- or low-order questions.*

*From this graph I can see that I have increased the number of questions that I am asking as well as the amount of high-order questions that I am asking. However, because this graph combines different types of activities, I graphed the difference between high-order and low-order questions in graph 2.*

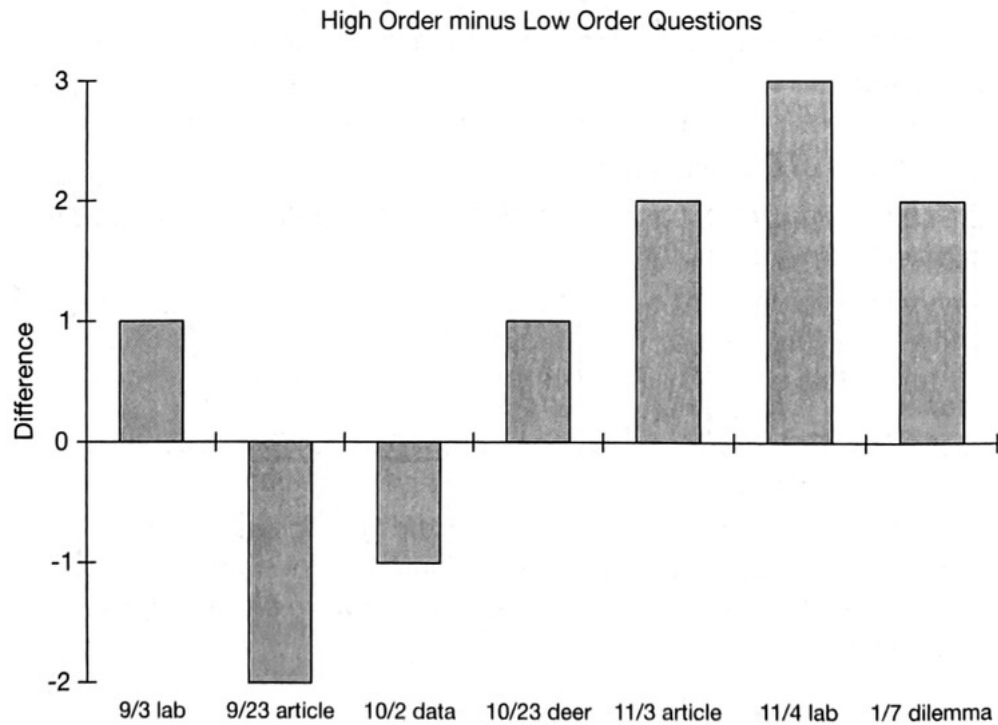
*As indicated by this graph, I am making progress towards asking more high-order questions compared to low-order questions over time.*

*Student responses from the audiotapes were also categorized using Bloom's taxonomy.*

GRAPH 1 An evaluation of teacher questions



GRAPH 2 Change in higher order questions



Again it is important to note that the six discussions in these graphs are from different types of activities. On 9/3 and 11/4 students designed and conducted their own labs within their discussion group. On 9/3 students had chosen their discussion groups, and on 11/4 they were arranged heterogeneously by ability and learning style. On 9/23 and 11/3 students read articles and answered questions independently and then discussed their answers. On 11/3 they answered their questions using the numbered together cooperative learning technique. On 10/2 students were analyzing data from a lichen field study. On 10/23 students solved the deer dilemma. On 1/7 students responded to an ethical dilemma based on articles they read about stem cell research.

I graphed the difference between high-order and low-order questions from graph 3 in graph 4.

I was excited when I unexpectedly noticed that students had more high-order responses than low-order responses when they were involved in student-centered activities. The three positive bars are from designing their own experiments and from the deer dilemma. Even though I increased the number of higher-order questions with the antibiotic article on 11/3/03, students responded with a higher number of low-order statements. However, I can also see that as discussions have increased, more is being said during the discussions.

### **Student Interviews**

From the student interviews, I found that students believe and appreciate that I am trying to get everyone involved, but two of the four students were still concerned that everyone doesn't always participate. In response to the question "What do you like about my teaching?" one student seemed to recognize that discussions help her make connections, "You teach from the book but then we do other things and we discuss them. It sticks really well. When I first read the chapter I think I'm never going to remember but after a while it all clicks together and by the end it's stuck in my brain." Three of the four students felt that having roles during discussions helped improve the participation, and one felt that it worked really well in the deer dilemma. All four students felt that grading students on their participation would improve discussions. Three of the four students felt that discussing socially or environmentally significant issues was meaningful to them. I asked the following question: We discussed a couple of socially or environmentally controversial issues—the deer population and the antibiotics. How do you feel about discussing these types of issues? Is it meaningful to you? One student responded, "I like to discuss them because it gives you more understanding of the world around you. Cause like I never knew there were so many antibiotic resistant bacteria. I learned a lot from that. And then with the deer it gave me different perspectives because I'm not the deer hunting type so it gave me a different perspective of where people are coming from. And it is something you could relate to in your life." A second student responded, "Oh yeah I take what I think of it and then with the deer you gave us the things that we had to be, the thing that you gave me was not what I was originally thinking so it

*made me think in their point of view which was a lot better than just staying focused on my point of view."*

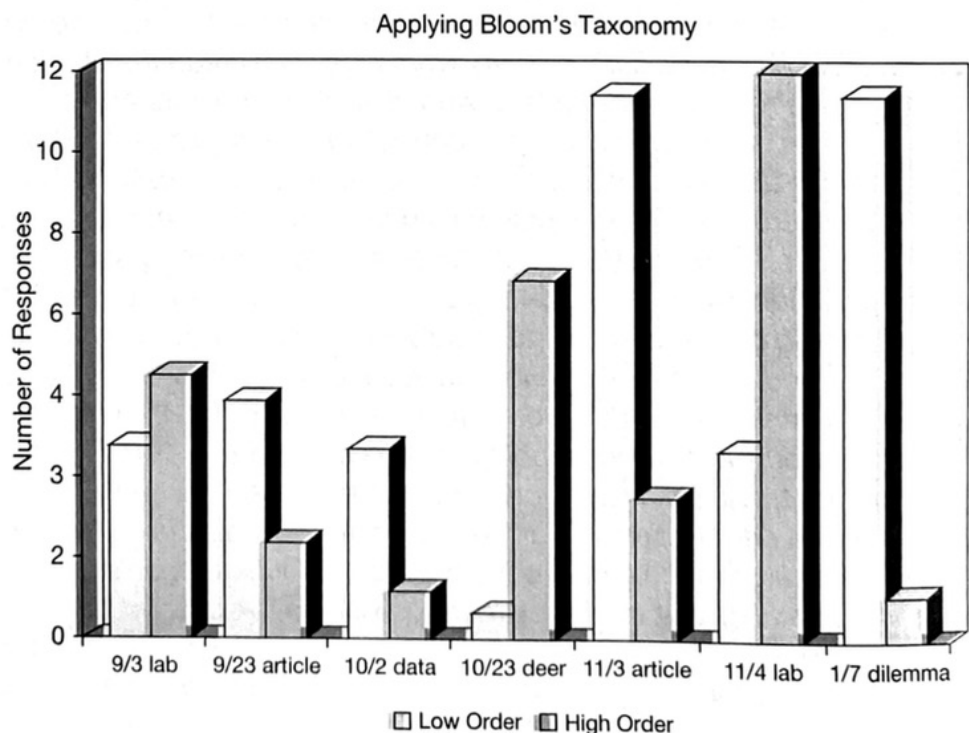
## Results

*As a result of this study many themes emerged. In the following chart I will triangulate the themes that emerged with the data that was collected.*

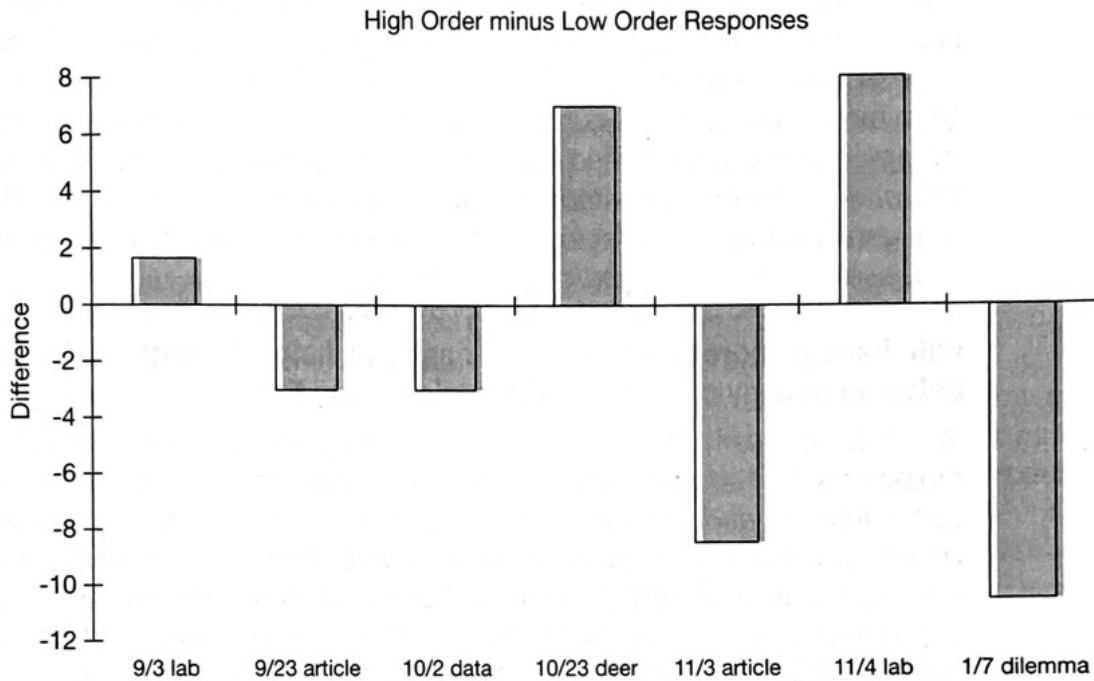
### **How do I need to change my teaching to facilitate more meaningful discussions in my biology classroom?**

*With the goal of facilitating meaningful discussions in my classroom I have been more systematic when designing discussion groups and using more cooperative learning techniques. I have been more thoughtful when designing questions and have required students to be more responsible for their role within their discussion group. I have been focusing more on topics of concern to our society. The numbers of discussions that students participated in are greater this year than in the past. Students are doing more guided inquiry activities than in the past. With the greatest challenge, I have increased the number of higher-order questions that I ask.*

**GRAPH 3** An evaluation of student responses



**GRAPH 4** Change in higher order responses



<i>Theme</i>	<i>Data Source</i>	<i>Data Source</i>	<i>Data Source</i>
Increase in discussion opportunities.	Lesson Plans	Teacher Journal	Student Questionnaire
Increase in cooperative learning techniques.	Lesson Plans	Teacher Journal	Student Interviews
Increase in higher-order questions being asked of students.	Audiotapes of discussions	Unit Test	Teacher Journal
Increase in authentic learning through discussion of socially and ecologically significant issues.	Lesson Plans	Audiotapes of discussions	Teacher Journal
A more student-centered classroom.	Audiotapes of discussions	Student Interviews	Teacher Journal

**Will having more meaningful discussions allow students to learn content at a higher level?**

*From analyzing the audiotape transcriptions, the length of student discussions appears to have increased over time; however, this could be due to*

*the type of discussion. Depending on the type of activity, students increased the number of higher-order responses made during discussions. Student-centered or student-directed activities seemed to elicit higher-order responses. From student responses to a questionnaire, 77% of my students believe that discussions help them learn biology content. I was unable to see any changes in my students' test scores by analyzing points they earned on higher-order questions. Throughout the course of this project, lower-ability students have increased their participation. This could be the result of a variety of factors such as the heterogeneous grouping, maturity, the increase in discussions, and/or other factors.*

### **Will having more meaningful discussions help students make connections between biology content and the world around them?**

*Yes. Having meaningful discussions does help students make connections between biology content and the world around them. One piece of data that supports this result is from an audiotape transcription of a discussion on an article about using hydrogen produced from algae as a fuel source. The question was: Why would you want to fuel your car with pond scum? One student responded, "So we reduce carbon dioxide." Another student in the same group responded, "And we don't need to borrow it (oil) from foreign countries." The article does not discuss, nor had we discussed in class where our fuel supply currently comes from. The deer dilemma clearly helped students connect biology to the world around them because many of my students hunt and there were a lot of varying strong opinions. But as students said on the questionnaires and in interviews, they found it valuable to role-play a perspective other than their own. It was rewarding to learn from parents that students were discussing these issues at home.*

### **Will having more meaningful discussion ncrease students' ability to make informed decisions regarding socially and/or ecologically significant issues?**

*From the second questionnaire 74% of my students felt that discussing socially and ecologically significant issues will help them make informed decisions. From the interviews I discovered that it is through these types of issues that students are really able to make the connections between biology and their life. These issues provide the hook that gets students interested in the topic of study. From interviews students agreed that it is a good idea to discuss these issues, and they are glad that they are informed.*

## **Conclusions**

*To achieve meaningful learning, I have also considered the four commonplaces: teacher, learner, curriculum, and governance.*

### **Teacher**

*Through action research I have become a more reflective teacher. I have studied my teaching and used the data I collected to guide my actions while continuing to collect*

*data for self-evaluation. Throughout my pilot study conducted last year and my current project, action research has connected me to my students. It is their feedback combined with my journal that I have used to make changes in how I teach!*

*Because of this project I am living closer to my values. One of the main motivations for this study was to help students make connections. I have gained a lot of satisfaction from hearing students say that discussions have helped them connect biology to their world.*

*My classroom is a more student-centered environment—I am more learner-sensitive, and constructivism is taking place as I am facilitating more meaningful discussions. By monitoring students' discussions, I listen more, detecting misconceptions and giving students immediate feedback. I learn from my students.*

*Action research has given me a systematic way to make changes in my classroom and determine if those changes are worthwhile. I will continue to facilitate meaningful discussions and use action research as a tool to evaluate the impact that these discussions are having on my students and myself.*

### **Learner**

*Students are talking about science more in the biology classroom! These discussions give students the opportunity to share their knowledge and beliefs, which deepens their understanding through actively discussing and listening. In the course of these discussions students have acquired meaningful learning. Through cooperative learning techniques, students began helping each other in a productive way. Students can learn more in a group than individually. We are more together than alone.*

### **Curriculum**

*This project has not required much change in the biology curriculum. We studied the same topics while I used articles and/or activities to complement these topics. Any extra time these discussions take is worth it, because when students can discuss what they know it reinforces their learning and makes them active learners.*

### **Governance**

*Currently, the state of Minnesota is in the process of developing a new set of standards, which at this time means that biology will have to cover an even broader range of topics. As teachers are asked to cover more material in the same amount of time, it becomes more difficult to set up a learning environment conducive to meaningful learning. I am confident that student discussions will be integral to the meaningful learning of these new standards.*

## **Discussion**

*Action research has given me the opportunity to study my profession in a systematic way. The part of action research that has always been most appealing to me is the*

opportunity to live closer to my professional values. As McNiff (1996) says, "Another difference of action research is that it has an explicit value basis. Your intention as an action researcher would be to bring about a situation that was congruent with your value position." I have long believed that students need to visualize that what they are studying fits into the broader scheme of life. Through constructivist methodologies students can connect what they know and what they have experienced to new pieces of information. Through this action research project I have been able to live closer to my values as I facilitated discussions that helped students make the biology knowledge fit their prior experiences. Through these discussions students are able to learn content at a higher level because they are discussing the issues, formulating the information in their own words. I believe that students need to think critically about the world around them. By studying and discussing social and ecological issues, students are better able to relate these important issues to the biology content they are being exposed to.

The journey we make is not alone—the teacher and the student must both be active participants. Through this project I have learned a lot from my students and myself. This has been the most important lesson of action research—that I can effectively make changes in my teaching profession if I reflect on my own thoughts and the thoughts of my students.

## Bibliography

- Council for Environmental Education. (2000). *Project Wild K12 Curriculum & Activity Guide*.
- Elder, L., & Paul, R. (1998). The Role of Socratic Questioning in Thinking, Teaching, and Learning. *Clearing House*, 71(5), 297–301.
- Henson, Kenneth T. (1993). *Methods and Strategies for Teaching in Secondary and Middle Schools*, 2nd ed. New York: Longman.
- Holubec, E. J. (1992). How Do You Get There From Here? Getting Started With Cooperative Learning. *Contemporary Education*, 63(3), 181–184.
- Johnson, D. W., Johnson, R. T., Holubec, E. J., & Roy, P. (1985). Circles of Learning: Cooperation in the Classroom. *Association for Supervision and Curriculum Development*.
- Lord, Thomas R. (1994). Using Constructivism to Enhance Student Learning in College Biology: *Journal of College Science Teaching*, 23(6), 346–348.
- Lotan, Rachel A. (2003). Group Worthy Tasks. *Educational Leadership*. March. 72–75.
- McNiff, Jean, Lomax, P., & Whitehead, J. 1996. *You and Your Action Research Project*. London: RoutledgeFalmer.
- Novak, J. D. & Gowin, D. B. (1984). *Learning How To Learn*. Cambridge: Cambridge University Press.

- SchoolNet Grass Roots Program. (2003). *GrassRoots Taxonomy of Thinking Skills*. Retrieved October, 2003, from <http://www.schoolnet.ca/grassroots/e/project.centre/shared/Taxonomvy.asp>.
- St. Edward's University Center for Teaching Excellence. (2001). *Bloom's Wheel*. Retrieved October 2003, from <http://www.easykayaker.com/school/reading/bloom.xhtml>.
- Trempey, J. E., Siebold, W. A., & Skinner, M. M. (2002). Learning Microbiology Through Cooperation: Designing Cooperative Learning Activities that Promote Interdependence, Interaction, and Accountability. *Microbiology Education*, 3(1), 26–36.
- Woodruff, Brian. (1992). Woodrow Wilson Biology Institute.
- Yager, Robert E. (2000). The Constructivist Learning Model. *The Science Teacher* 67(1), 44–45.

Note: From "'Let's Talk': Discussion in a Biology Classroom: An Action Research Project" by P. Juene-mann, 2004, *AR Expeditions*. Reprinted with permission.

---

**I**t is unlikely that by the time you have arrived at this point in the text, you will have actually been through the full action research cycle and will be ready to immerse yourself in the next cycle. It is likely, however, that you are currently engaged in the process, perhaps collecting data, undertaking early analysis, monitoring the appropriateness of your data collection, and so on. As the title suggests, this chapter is about evaluating action research. And although it may be premature, given the stage you are at in the process, to discuss its critical evaluation and "public debut," it is appropriate to consider some of those issues now and how they impact your view of your own research and the published research of others.

Knowing how to conduct research and how to produce a research report are valuable skills, but as a professional, you should also know how to consume and evaluate research. Anyone who reads a newspaper, listens to the radio, or watches television is a consumer of research. Many people uncritically accept and act on medical and health findings, for example, because the findings are presented by someone in a white lab coat or because they are labeled "research." Very few people question the procedures utilized or the generalizability of the findings. You have a responsibility to be informed about the latest findings in your professional area and to be able to differentiate good from poor research when investigating a topic. A researcher critically evaluates each reference and does not consider poorly executed research.

To evaluate a research study competently, you must have knowledge of each component of the research process. Your work in previous chapters has given you that knowledge. In this chapter, then, we discuss the criteria on which to evaluate an action research report.

## General Evaluation Criteria for Educational Research

---

Many research studies have flaws. Just because a study is published does not necessarily mean that it is a good study or that it is reported adequately. The most common flaw is that the author has failed to collect or report information about data-gathering procedures, such as tests, observations, questionnaires, and interviews. Other common flaws in a study itself include weaknesses in the research design and inappropriate or biased selection of participants; flaws in the report include failure to state limitations in the research and a general lack of description about the study. Watching for these problems is part of being a competent consumer of research reports; the problems also highlight common pitfalls to avoid in your own research.

At your current level of expertise, you may not be able to evaluate every component of every study. However, you should be able to detect a number of basic errors or weaknesses in research studies. You should, for example, be able to detect obvious indications of researcher bias that may have affected qualitative or quantitative research results. For example, a statement in a research report that “the purpose of this study was to *prove* . . .” should alert you to a probable bias. Remember, we start a study not to *prove* anything but rather to better understand our area of focus.

As you read a research report, either as a consumer of research keeping up with the latest findings in your professional area or as a producer of research reviewing literature related to a defined problem, you should ask and answer a number of questions about the adequacy of a study. The answers to some of these questions are more critical than the answers to others. An inadequate title is not a critical flaw; an inadequate research plan is. Some questions are difficult to answer if the study is not directly in your area of expertise. If you specialize in reading, for example, you are probably not in a position to judge the adequacy of a review of literature related to anxiety effects on learning, and, admittedly, the answers to some questions are more subjective than objective. Whether a study was well designed is pretty clear and objective; most quantitative researchers would agree that the randomized posttest-only control group design is a good design. On the other hand, the answer to whether an author used the most appropriate design, given the problem under study, often involves a degree of subjective judgment. For example, the need for a pretest may be a debatable point; it depends on the study and its design.

Despite the lack of complete agreement in some areas, most professionals recognize that evaluation of a research report is a worthwhile and important activity. Major problems and shortcomings are usually readily identifiable, and you can formulate an overall impression of the quality of the study. Moreover, you should be able to transfer the skills you need to evaluate published research to the evaluation of your own research. In the sections that follow, I list for your consideration evaluative questions that can be applied to action research. This list is by no means exhaustive, and as you read it, you may very well think of additional questions. You may also note that not every criterion applies equally to both quantitative and qualitative research studies.

## Criteria for Evaluating Action Research

As discussed in Chapter 1, action research conducted in school settings is research done *by* and *for* teachers and students, not research done on them. As such, the methods for doing action research and the methods for sharing action research are uniquely suited to its special purposes. Given these distinctions, what are the criteria for evaluating action research? Each of us who accepts the responsibility of being a self-governing professional must apply some or all of the criteria for evaluating the quality of the action research accounts that we encounter.

Based on a number of evaluative schema, I have devised a list of criteria and questions, shown in Research in Action Checklist 10-1, to help you evaluate your own action research efforts and the efforts of others. These questions are intended to capture the essence of the multitude of evaluation criteria described earlier in the chapter and to bring together the criteria for the action research process described throughout the text.



### RESEARCH IN ACTION CHECKLIST 10-1

#### Criteria for Evaluating Action Research

- \_\_\_\_\_ Area of focus—Does the area of focus involve teaching and learning?
- \_\_\_\_\_ Research questions—Does the researcher state questions that were answerable given the researcher's expertise, time, and resources?
- \_\_\_\_\_ Locus of control—Was the area of focus within the researcher's locus of control?
- \_\_\_\_\_ Data collection—Did the researcher use appropriate data collection techniques (qualitative and/or quantitative) to answer the study's research questions?
- \_\_\_\_\_ Ethics—Did the research face any ethical challenges? If so, how were they resolved?
- \_\_\_\_\_ Reflective stance—In what ways has the action research effort contributed to the researcher's reflective stance on the ways teaching and learning are viewed?
- \_\_\_\_\_ Action—Did the outcomes of the study lead to action?
- \_\_\_\_\_ Action-data connection—How is the proposed action connected to the study's data analysis and interpretation?

## Applying Action Research Evaluation Criteria

---

In this section, I will apply the action research evaluation criteria listed in Research in Action Checklist 10–1 to this chapter’s opening vignette, “‘Let’s Talk’: Discussions in a Biology Classroom: An Action Research Project,” by Penny Juenemann.

### Area of Focus

Ideally, an action research study conducted by a teacher should have an area of focus that involves teaching and learning, is within the teacher’s locus of control, and is something the teacher feels passionate about and would like to change or improve. Some of these characteristics are difficult to evaluate based on reading an action research account. For example, how do we know that the researcher is passionate about the area of focus and that it is something that she would like to change or improve on? However, when reviewing the article presented at the beginning of the chapter, you can see that Juenemann’s focus is on her own biology classroom (“How will incorporating more meaningful discussions into my biology classroom affect my teaching and the ability of students to learn?”). Juenemann makes a strong connection between her area of focus and the context that led her to the desire to have students make connections between what they already know and the new knowledge they encounter in her biology classroom. Juenemann also connects her area of focus to a strong theoretical framework based in constructivism and cooperative learning principles.

A poor-quality research article lacks clarity of focus, or it has an area of focus that narrows the focus a bit but does not address a specific teaching and learning intervention, for example, “How do biology students learn?” A research question such as this does not provide the researcher with the required level of specificity related to a specific teaching and learning intervention. The word *focus* suggests clarity, and an area of focus that lacks clarity does not provide the action researcher with the guidance necessary to implement a study.

### Research Questions

Research questions breathe life into the area-of-focus statement and help provide a focus for the action researcher’s data collection plan. These questions should provide the researcher with a workable way to proceed with the research. When reviewing the Juenemann article, you can see that she lists the following research questions:

1. “How do I need to change my teaching to facilitate more meaningful discussions in my biology classroom?”
2. “Will having more meaningful discussions allow students to learn content at a higher level?”

3. "Will having more meaningful discussions help students make connections between biology content and the world around them?"
4. "Will having more meaningful discussions increase students' ability to make informed decisions regarding socially and/or ecologically significant issues?"

These questions clearly link to the area of focus and strongly suggest sources of data needed to determine the effectiveness of an instructional intervention.

In contrast, a poor-quality research article would include questions that did not relate to the area of focus and specifically to teaching and learning. For example, a poor-quality study might ask, "How do higher-level analysis and application questions enable students to be better citizens?" While an interesting question, it would be impossible for an action researcher to "measure" what it means to be a good citizen.

### **Locus of Control**

By definition, an action research area of focus and research questions must be answerable and in the teacher researcher's locus of control. For example, Juenemann states, "My action research focused on my tenth-grade biology students." A poor-quality action research article would include an area of focus and research questions that are outside the teacher researcher's locus of control, for example, "My action research focused on my teaching partner's eleventh-grade physics students." Clearly, Juenemann's teaching partner's eleventh-grade physics students would be outside her locus of control! It is a common pitfall for a teacher researcher to overly broaden the scope of the research to include data sources outside the teacher's locus of control, in this case, to compare tenth-grade biology student performance against student performance in other areas of study.

### **Data Collection**

When reviewing an action research report, you should carefully consider the appropriateness of the sources of data the teacher researcher has identified. Will these data sources provide the teacher researcher with the information necessary to answer the research questions? For example, if the teacher researcher was studying the impact of a specific teaching intervention on student achievement on statewide assessment tests, did the teacher researcher collect test scores and analyze the results using appropriate descriptive statistical analysis? Similarly, if the teacher researcher was studying the impact of a classroom management intervention on student attitudes towards school, did the teacher researcher use a semantic differential to measure student attitude changes along with individual and/or focus group interviews? The Juenemann article lists the following data collection sources: teacher journal, student questionnaires, unit tests, audiotapes of discussions, student interviews, and the teacher's lesson plan book (see Chart 1: Triangulation of Data). These data sources can be matched to the four research questions in the study and also allowed Juenemann to triangulate her findings. For example:

- Research question 1.** How do I need to change my teaching to facilitate more meaningful discussions in my biology classroom? Data sources: teacher journal (based on observations of student discussions in class), student questionnaire, student interviews, and lesson plan book.
- Research question 2.** Will having more meaningful discussions allow students to learn content at a higher level? Data sources: transcriptions of audiotapes of discussions, student questionnaire, and unit test results.
- Research question 3.** Will having more meaningful discussions help students make connections between biology content and the world around them? Data sources: transcriptions of audiotapes of discussions, student questionnaire, and student interviews.
- Research question 4.** Will having more meaningful discussions increase students' ability to make informed decisions regarding socially and/or ecologically significant issues? Data sources: student questionnaire, social problem simulation, and student interviews.

Juenemann's research report would have been of inferior quality if she had included any data sources that did not contribute to her understanding of her research questions. For example, collecting data about another teacher's tenth-grade biology class would not have been relevant to Juenemann's study. This kind of data would be outside Juenemann's locus of control and would not provide any insights into the effectiveness of her own teaching of biology.

## Ethics

When reviewing an action research article, the reader should be sensitive to any possible ethical challenges faced by the researcher. For example, were students' individual test scores made public in a manner that would have resulted in student embarrassment and ridicule? While Juenemann does not address any specific ethical challenges that she faced conducting the study, it appears as though student scores were shared only as group data, thus protecting individual students from being identified. There is no indication that Juenemann experienced any problems related to the confidentiality and anonymity of her students. Juenemann's research report would have been unacceptable had she violated any of the ethical tenets of conducting action research, for example, had she specifically singled out students by name and test score.

## Reflective Stance

Ideally, an action research study results in the researcher adopting a reflective stance on the ways teaching and learning are viewed. Juenemann was very clear

about the impact of the action research process on the way she views teaching and learning when she states the following:

Through action research I have become a more reflective teacher. I have studied my teaching and used the data I collected to guide my actions while continuing to collect data for self-evaluation. Action research has connected me to my students. It is their feedback combined with my journal that I have used to make changes in how I teach!

Juenemann's article would have been of an inferior quality if she had failed to discuss how the action research process had impacted her classroom practices.

## Action

As Kurt Lewin reminds us, "No action without research; no research without action" (cited in Adelman, 1993, p. 8). Ideally, an action research study should lead to action by the teacher researcher. In Juenemann's article, several statements make it clear that the outcomes of the research led her to take action: "My classroom is a more student-centered environment." "I am more learner-sensitive and constructivism is taking place as I am facilitating more meaningful discussions." "By monitoring students' discussions, I listen more, detecting misconceptions and giving students immediate feedback." Juenemann's research report would be of inferior quality had it failed to discuss how she is taking action based on what she learned about her teaching and her students' learning.

## Action-Data Connection

Juenemann clearly links data analysis to her actions in the section of her research titled "Data Collection and Analysis." For example, she states, "The questionnaires helped guide me in my research by showing how important it was to the students that everyone participates." "When analyzing my tests I used Bloom's taxonomy to determine if questions were low- or high-order questions. . . . From this data I can conclude that I still need to work on writing higher-order questions." Juenemann also does an excellent job of visually displaying her data (see graphs 1–4) to provide the reader with a clear connection between her data and the actions embedded in the research project. Juenemann's research report would have been of inferior quality had she failed to connect proposed actions to the analysis of data.

## This Is Just the Beginning!

---

It should come as no surprise that I suggest toward the end of this text that now is really the beginning of your work. At this point, you have invested considerable time and energy reading about action research, learning how to do action research,

## Voices from the Field

### Applying Action Research Evaluation Criteria

Table 10-1 provides an evaluation summary evaluation for each student's written action research project included in the text. All of these projects were completed as part of an action research preservice teacher education program requirement. They were completed under the constraints common to student teachers and conducted in a "cooperating teacher's" classroom during a 10-week student teaching placement. They provide us with rich narratives of neophyte teachers and teacher researchers. They are included in this book not as exemplars but rather as authentic examples of teachers implementing action research in their classrooms for the first time. One of the challenges for neophyte researchers, especially student teachers, is to make explicit the action that the findings of their studies will lead to in terms of their teaching practices. Perhaps in part this is due to the fact that these four teachers were student teachers and didn't connect their findings to life in their own classrooms. Nevertheless, we can infer from the findings of their projects the kinds of actions they would take when faced with the same teaching and learning problem.



#### ENHANCEDtext video example 10-1

The action researchers shown in the videos featured in this text very graciously offered the write-ups of the research projects they describe throughout the text for you to review and evaluate. In your view, what are the strengths of each project, and what recommendations might you offer to these first-time action researchers—**Doug, Jureen, Jeannette,** and **Rachelle?**

locating action research within the broader framework of socially responsive research, developing your own action research efforts, clarifying an area of focus, establishing data collection techniques, undertaking data analysis and interpretation, and formulating an action plan through the use of a Steps to Action Chart. In short, you have done much work in a relatively short amount of time.

But now comes the real test of any educational innovation. Can it become a critical component of your regular, ongoing teaching practice? If you have found ways to overcome the potential obstacles to incorporating action research into the reflective practice stance you now have, you are well on your way to living the life of a reflective teacher researcher. Living this professional life, in the ways described here, can enable us to change the culture of schools so that we can once again evoke the faith and confidence of our communities in our schools and in our profession of teaching.

We can all think of reasons why we shouldn't be incorporating action research into our craft culture—most notably because we are challenged by the

**table 10-1 ■ Applying Action Research Evaluation Criteria to Student Projects**

	<b>Doug</b>	<b>Jureen</b>	<b>Jeanette</b>	<b>Rachelle</b>
Area of focus	The purpose of this study was to examine how a teacher could improve student motivation through including expressed student interest in instruction.	The purpose of this study was to determine the effect of integrating technology into a classroom that was not addressing the National Education Technology Standards (NETS).	The purpose of this study was to determine if the basal reading program in the school district showed evidence of gender bias.	The purpose of this study was to determine the effect of formative assessments on students' summative assessment scores, morale, and attitude toward the class.
Research questions	<ol style="list-style-type: none"> <li>1. What do unmotivated students look like? What are their characteristics?</li> <li>2. What are the current options for freshman year?</li> <li>3. What are students' physical, academic, and career goals?</li> <li>4. What are the current tools for freshmen for interest and goals? What do they need?</li> </ol>	<ol style="list-style-type: none"> <li>1. What impact does the use of technology have on the students' attitudes toward subject content?</li> <li>2. What impact does the use of technology have on promoting interest in learning further technology skills?</li> <li>3. Does the introduction of technology lead to the increased use of technology?</li> <li>4. Does the inclusion of technology complicate or simplify lesson plans and time resources?</li> </ol>	What messages are these basal reading programs sending to students in regards to gender and social roles?	<ol style="list-style-type: none"> <li>1. Do formative assessments motivate students to study harder?</li> <li>2. Do formative assessments reduce test anxiety for students?</li> <li>3. Do formative assessments improve summative assessment scores?</li> <li>4. Do formative assessments improve class morale?</li> </ol>
Locus of control	Yes	Yes	No Jeanette has no control over the district's choice of basal reader. However, the findings of her study could lead to changes in her own instructional strategies, critical thinking, and questioning skills.	Yes

*(Continued)*

table 10-1 ■ (Continued)

	Doug	Jureen	Jeanette	Rachelle
Data collection	Grade book Classroom observations Pre and post student surveys	Student surveys Student performance tasks Student self-evaluations Classroom observations	Analysis of basal reader series <i>Reading Street</i> for first, third, and fifth grades using the Bem Sex Role Inventory (BSRI).	
Ethics	Informed consent	Informed consent	Did not follow ethical guidelines and faced an ethical dilemma when confronted by the principal.	Informed consent
Reflective stance	Yes	Yes	Yes	Yes
Action	The results of the study suggest that when teachers include expressed interests and goals in instruction, there is a positive impact on student motivation.	The results suggest that increased access and exposure to technology can promote student confidence, leading to the desire for further computer usage and increased student engagement and motivation.	The analysis of the basal readers suggests that there were more male main characters than female characters and that masculine traits were more frequently represented than feminine traits. The intended action at this point is to make a more concentrated effort to discuss gender bias and stereotypes in literature with my students, to expose my students to more authentic characters that depict a truer complexity of human emotions and experiences.	The results of the study suggested that formative assessments are valuable for several reasons: (1) formative assessments have a positive impact on summative test scores, (2) formative assessments motivate students to study on a more regular basis, (3) formative assessments help to reduce students' test anxiety, and (4) formative assessments positively affect class morale.
Action-data connection	Yes	Yes	Yes	Yes

impediments of time and resources. However, if you believe in what you are doing, you will find a way to make it happen. Call me an idealist if you will, but I am constantly impressed by the positive nature of teachers who, faced with adversity and challenges, are able to find ways to make a positive difference in children's lives. Make no mistake, that is what this action research journey has been about.

Armed with your knowledge, skills, values, and attitudes about action research, the work now begins as you routinize the practice and continue to monitor the effects of your innovations on students' learning, openly accepting the credo for professional practice and living the life of a lifelong learner. What you are learning about your practice will ultimately enhance the lives of the children in your care. If you are now motivated to continue with the action research process, the next logical step is to "Get the word out!"

## SUMMARY

---

### Criteria for Evaluating Action Research

1. *Area of focus*—Does the area of focus involve teaching and learning?
2. *Research questions*—Does the researcher state questions that were answerable given the researcher's expertise, time, and resources?
3. *Locus of control*—Was the area of focus within the researcher's locus of control?
4. *Data collection*—Did the researcher use appropriate data collection techniques (qualitative and/or quantitative) to answer the study's research questions?
5. *Ethics*—Did the research face any ethical challenges? If so, how were they resolved?
6. *Reflective stance*—In what ways has the action research effort contributed to the researcher's reflective stance on the ways teaching and learning are viewed?
7. *Action*—Did the outcomes of the study lead to action?
8. *Action-data connection*—How is the proposed action connected to the study's data analysis and interpretation?

## TASK

---

1. Apply the criteria for evaluating action research to your own action research report.