Chapter 36
Critically Evaluating Non-Scholarly Sources Through Team-Based Learning

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Introduction

Non-scholarly sources of information (e.g., non-peer-reviewed popular press and mass media articles) have been shown to shape individual opinions about global climate change (GCC) and subsequently isolate individuals from dissenting viewpoints via a "reinforcing spiral" (Feldman et al. 2014; Chap. 39, this volume). The diversity of non-scholarly material surrounding the public GCC debate provides an opportunity to critically evaluate these sources and demonstrate the dangers of citing non-scholarly sources. There is strong evidence that students' citation behavior can be redirected toward scholarly sources via the implementation of penalties (Davis 2003; Robinson and Schlegl 2004, 2005), but this approach does not teach students why they need to use scholarly sources. Alternative teaching strategies (peer teaching, cooperative learning groups, games, etc.) may increase the use of scholarly sources and result in increased awareness of the importance of citing them. For instance, in a recent example, Markey et al. (2012) showed that the use of a game can increase the quality of student citations. Through the use of a modified team-based learning (TBL) activity (Box 36.1), the goal of the exercise presented here is to use non-scholarly reports about GCC as a tool for students to discover that non-scholarly sources must be critically evaluated, especially when the topic may be controversial to the public (also see Chap. 35, this volume). In this activity students will be assigned readings as homework, answer questions about the readings individually and with a small team, and then work with their teams to understand broader issues raised by the readings.

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Learning Outcomes

After completing this activity, students should be able to:

- Know that non-scholarly sources need to be critically evaluated because they may not be reliable.
- Recognize that all sources of information are potentially biased.
- Discuss, in a general sense, how and why GCC science can be misreported and/or misconstrued by non-scholarly sources.

Course Context

- Originally designed for an upper-level undergraduate biology course on global climate change
- 90 min in one class period but easily adaptable to shorter meetings
- Used with three to ten teams of three to ten students each (for a range of 9–100 total students)
- Students complete readings at home but no other student background is necessary
- All components are non-technical; high school and undergraduate students of any major should be able to engage with the activity

Instructor Preparation and Materials

Before the activity, the instructor should become familiar with the current state of global climate change research. An excellent summary is provided by the "What We Know" website hosted by the American Association for the Advancement of Science (AAAS 2014). The instructor should then review the set of seven readings that will be assigned to students (mass media articles; ESM-A). The readings have been chosen to reinforce that critical reading of non-scholarly sources is essential and all sources of information are not equal in terms of their reliability and bias. To maintain "timeliness," the instructor may want to update/alter the readings/questions as the state of GCC research and the public debate about it progresses. When making updates, ensure that the readings/questions support the discussion points listed at the end of the section "Activities." Also review the six iRAT/gRAT questions and five application questions (defined in Box 36.1), editing them as needed to meet the course context and needs (ESM-B). Answers and related discussion points for these questions are given in ESM-C. The iRAT/gRAT questions are not directly related to the goals and learning outcomes of the activity per se; they are designed to ensure that students have carefully read the assigned material.

The activity requires that the students be placed into at least three teams of at least three students each and that the teams be as diverse as possible in terms of demographics and student backgrounds (based on recommended practices for

Box 36.1. Team-Based Learning (TBL)

Team-based learning (TBL) is a flexible form of cooperative/group learning where students are assigned to a team (group) and then work with that team to solve complex problems or answer complex questions (Michaelsen et al. 1982). The teams need to be large and diverse enough (in terms of gender, age, background, race, etc.) that multiple points of view will be represented. The groups are referred to as teams because there can be an element of shared grades and because TBL activities can be chained together throughout a course with the teams maintained. An element of competition is naturally introduced by the formation of teams such that teams may try to "win" the day's activity by answering the most questions correctly. This behavior is desirable because it reinforces learning outcomes; the "winning" team is the one that has done the best collective job of learning the assigned material. However, the instructor should be careful about acknowledging "winners" so as not to demotivate those that did not "win." A typical TBL class activity involves an individual readiness assessment test (iRAT), group readiness assessment test (gRAT), and a series of application questions (all of which can be graded). The goal of the iRAT is to ensure that individual students read and understand the assigned material. The goal of the gRAT is for the members of the team to come together with their answers from the iRAT, discuss why they answered the way they did, and (hopefully) come to the correct answer while at the same time reinforcing the usefulness of their teammates in determining the correct answer. Because the same questions are used for the iRAT and gRAT, the questions are intentionally difficult. The application questions are where the "real" learning is intended to occur. Students should work through the application questions one at a time. Once all teams have finished a question, the instructor then leads a short discussion with the whole class about which answer is the correct one and why. A good way to do this is to allow the students to explain why they answered the way they did before revealing the correct answer and explaining why it is correct. More information about group learning techniques can be found in Davidson et al. (2014). More information about TBL (including best practices for writing TBL questions) can be found in Michaelsen et al. (2002) and at http://www.teambasedlearning.org.

TBL; see Box 36.1). The instructor will need to print a sufficient number of the iRAT/gRAT questions (one set for each student and at least one set per team). The application questions could be printed out (one set per group), provided electronically, or displayed with a projector, but it is recommended that each question be provided one at a time given the structure of how they are to be discussed.

The activity, as outlined below, should take 75–90 min. It could be shortened by eliminating one or both of the iRAT/gRAT components (which each take about 15 min) and/or the instructor could simply lead a short class discussion of the

application questions without breaking the class into teams. Alternatively, the activity could be lengthened to any desired time through the addition of iRAT/gRAT or application questions or extending discussion.

Activities

Students should have completed the reading assignments as homework. In class, students are given 10–15 min to individually answer the iRAT, their answers are collected, and they are placed into predetermined teams to collaboratively complete the gRAT (15–20 min). The remaining time is used for working through the application questions in teams and integrated whole-class discussion. It is important that the application questions be worked through one at a time. Each team discusses a question, comes to a consensus on the correct answer, and then waits for the other teams to do the same. While this may leave teams with some "downtime" as they wait, in practice it often leaves time for the team to rethink their answer as they overhear the discussion other teams are having around them, and discussion may be rekindled (though "espionage" should not be encouraged). If a team comes to a conclusion too quickly, the instructor could challenge the team's conclusion (e.g., play devil's advocate) or ask follow-up questions.

After all teams have finalized their answer for a question, the instructor asks each team to reveal their answer to the rest of the class. If there are a large number of teams, the instructor may want to tally the answers on a board to visualize the level of agreement between teams. If there is disagreement among teams, each should be asked to defend its answer and why they think that answer is correct before the instructor reveals the correct answer and leads a relevant discussion (talking points to guide this discussion are provided in ESM-C and summarized below). The class then moves on to the other questions in turn. The discussion of each application question (1–5) should highlight at a minimum: (1) how special interest groups, lobbyists, and politicians spin the facts about GCC toward whatever conclusion is most convenient or profitable for them; (2) that the best method to combat bias or conflicts of interest is to acknowledge those issues, not artificially "balance" bias by introducing opposing viewpoints; (3) motivations for misrepresentation of content; (4) mistakes vs. misrepresentation; and (5) the authority and reliability of different types of information relative to the peer-reviewed primary literature (see ESM-C for more detail).

Follow-Up Engagement

- Ask students to read a peer-reviewed paper and then read a non-scholarly summary of that paper. Compare/contrast how the authors of both works present the topic (see examples in Chaps. 14 and 15, this volume).

- Assign a climate change myth that is perpetuated by non-scholarly sources and either write a paragraph about why it is a myth or give a short presentation to the class. An extensive list of climate change myths (and scientific explanations for why they are myths) is provided by Cook (2015).
- Provide students with a list of online readings and ask them to rank them on scales of authoritative and non-authoritative, biased and non-biased, or scholarly and non-scholarly. Discuss how authority, bias, and scholarship are interlinked and the influence of these factors on the necessity for critical reading.

Connections

- Discuss the reliability of the non-scholarly literature for providing information about other controversial topics (e.g., biodiversity conservation, genetically modified organisms).
- Recall this lesson when referencing online material and news in discussions of other topics.

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