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Christopher J.E. Anderson

*University of Wisconsin-Milwaukee*

Emily A. Mueller

*University of Wisconsin-Whitewater*

Alana C. Schneider

*University of Wisconsin-Milwaukee*

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**GREAT IDEA FOR TEACHING**

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**Heroically Protecting Our Arguments: Using Superheroes to Teach Inductive and Deductive Reasoning****Christopher J. E. Anderson<sup>1</sup>**

Associate Lecturer

University of Wisconsin-Milwaukee

**Emily Ann Mueller**

Master's Student

University of Wisconsin-Milwaukee

**Alana C. Schneider**

Undergraduate Student

University of Wisconsin-Milwaukee

**Abstract**

Barkl, Porter, and Ginns, (2012) explain the importance of reasoning as it relates to fluid intelligence and an individual's capacity to broaden their understanding of knowledge. With the difficulty many students find in recognizing examples of reasoning, this teaching activity uses student descriptions of superheroes to teach inductive and deductive reasoning skills. Educators are provided with the instructions to conduct a 50-minute lesson to explain these skills, allow students to form and recognize their own examples of inductive and deductive reasoning, and variations on how to conduct this assignment in both the physical and online classroom environments.

**Courses**

Public Speaking, Persuasion, Critical Analysis, Argument and Debate

**Objective**

- To increase students' ability to recognize examples of, and the differences between inductive and deductive reasoning.
- To provide students a greater understanding of how to implement and employ inductive and deductive reasoning.

**Introduction and Rationale**

The teaching of inductive and deductive reasoning remains a crucial component in communication curriculums. The use of these critical reasoning skills strengthens the quality of student thinking inside of and beyond the classroom. Inductive and deductive reasoning have been found to be two contributing factors to fluid intelligence; strengthening these reasoning skills leads to increased performance in making connections, inferring relationships, and

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<sup>1</sup> Correspondence concerning this article can be addressed to Christopher Anderson, Department of Communication, University of Wisconsin-Milwaukee, Milwaukee, WI 53211. Contact email: [ander973@uwm.edu](mailto:ander973@uwm.edu)

extrapolating knowledge to broader concepts (Barkl, Porter & Ginns, 2012). However, comprehending and employing the nuances of both inductive and deductive reasoning can be challenging to students.

Most models examining through process make the argument that people have two ways of processing information: intuitive and analytical (Klaczynski, 2005; Reyna et al., 2005; Stanovich, 1999). Although inductive and, to a lesser extent, deductive reasoning often are used intuitively, direct instruction that leads to the analytical recognition of, and ability to intentionally use, these reasoning skills is a high-level task.

Students can struggle in learning the ability to recognize examples of reasoning, which naturally creates an issue in retaining the ability to intentionally utilize these skills for future application.

Inductive reasoning is the process of deriving general conclusions from multiple premises considered to be true, or consistently found to be true. If the premises are found to be true, and the reasoning flows in a clear direction, it stands to reason that the conclusion generated will also be true. At the core of inductive reasoning is a procedure that compares the likeness of characteristics and relationships between certain qualities, which can then be extrapolated upwards to make a general conclusion, proposition, argument, or claim (Barkl et al., 2012 and Oliveira & Brown, 2015). Ifenthaler and Seel (2012) highlight that inductive reasoning moves up from multiple small premises to a generalized, reasoned outcome.

In comparison, deductive reasoning is derived down from a single, broad statement of truth, or major premise (A). Following the major premise is a minor premise (B), created to further specify and narrow the truth outlined in the major premise (A). Finally, a conclusion (C) is drawn from the major and minor premises, offering a new conclusion that is *known to be true* based on the major and minor premises (Aldisert, Clowney, & Peterson, 2007). Deductive reasoning is the process of deriving down to a conclusion strictly bound and contained by known facts, such that because the major premise (A) and minor premise (B) are true, the conclusion (C) must simply also be true. (Aldisert, Clowney, & Peterson).

While inductive reasoning is an implicit, natural mode of thinking, deduction requires more conscious effort, making it a more explicit process (Evans & Over, 1996). Inductive reasoning premises are drawn from multiple observations or analyses of concepts, whereas deductive reasoning generates principles from premises of absolute truths that do not contradict one another. This distinction allows inductive reasoning to be formed from generalizations and observations of events and circumstances widely understood to be true with the purpose of shaping conclusions that are also generally understood to be true. Because conclusions derived from deductive reasoning must be true in a more concrete sense, conclusions drawn from inductive reasoning are sometimes not held to the same level of credibility. Scenarios where students are able to reason “up” intuitively through induction can be manipulated to enable “downward” reasoning via deduction. Such a manufactured scenario can help students immediately recognize the differences between the two.

Allocating classroom time for the teaching of reasoning skills through examples allows students to talk through problems, contemplate questions and verbalize solutions, and leads to a higher quality of understanding. Oliveira and Brown (2015) note that while teaching through exemplification is consistently noted to be at the core of pedagogical theory, how instructors employ such tactics receives little attention from researchers. The development of extended examples relating to the interests of students can facilitate the practice of inductive and deductive

reasoning, and can simplify and accelerate understanding of the subtle but complex differences between the two.

Inductive reasoning is related to other cognitive processes such as categorization, similarity judgment, probability judgment, and decision-making (Feeney & Heit, 2007). In the classroom, deductive reasoning generally appears less often than inductive reasoning until students are given appropriate instructions. Using deductive reasoning in the classroom as a research tool helps students develop critical thinking skills and assists in strategy selection and development. Student research including the use of deductive reasoning can potentially be of importance to the communities they will become a part of beyond the classroom (Siegler, 1996; Siegler & Jenkins, 1989).

With the recent meteoric rise of popularity in superhero themed movies, incorporating superheroes in classroom activities has become a useful method for relating to students. Reily (2015) compares the current stories and cultural mythos of Batman and Superman to the way in which years ago cultures told stories of Zeus, Thor, Gilgamesh, and Beowulf. Superman is depicted, depending on what form of media and/or what author is writing for the character, generally as having near invincibility, super speed, x-ray vision, and a variety of other powers accompanied by a strong sense of morality. Batman, while possessing no innate superpowers, fights for justice with physically trained skills and a variety of advanced gadgets and vehicles. The next section explains how to examine these two heroes, among others, to lead students in an engaging discussion relating to inductive and deductive reasoning.

## Description of the Activity

This activity can be completed in a 50-minute class period. Students should be prepared with materials that will facilitate note-taking, such as a laptop or a writing utensil and paper. Instructors should have materials that allow them to write upon a white board, chalk board, or large poster that is visible to the entire class.

## Preparation

To begin, each student is tasked with creating a list of qualities that they attribute to a superhero. It may be beneficial to provide students with examples of various heroes and villains to help with the creation and augmentation of these lists such as the four listed here:

- Superman: near invincibility, super speed, x-ray vision, strong sense of morality.
- Batman: no innate superpowers, fights for justice with physically trained skills and a variety of advanced gadgets and vehicles to fight crime.
- Wonder Woman: enhanced physical and mental abilities, resistant to physical damage, able to individuals from lying with the use of her lasso, protects the weak and innocent from those that intend to exploit them.
- Lex Luther: no innate superpowers, wealthy and charismatic businessman and frequent philanthropic contributor to local and national charities, desires world conquest, uses vast intellect and advanced weaponry to subdue adversaries.

Instructors should remind the students that possessing superpowers is not the only measure of a superhero, however, as supervillains can also possess superpowers. Thus, a separate list of

qualities should be created for the separate words of “*super*” and “*hero*”. After students have created their individual lists they form small groups. With one student selected to record results, groups compare their individual lists to determine the common traits of superheroes that have been identified. Students should be instructed not to confine themselves to the literal interpretation of their lists, as descriptive terms such as “*compassionate*” and “*kindhearted*” carry similar denotative and connotative definitions. Once a common list has been established in each group, one student from each group should write their group’s common qualities on a marker board or chalkboard to develop a common list of qualities for the class.

### **Inductive Reasoning**

The list created can now be used to explain inductive reasoning to the class. If a majority of the class has designated a similar characteristic, then through the process of inductive reasoning, it is deemed a quality of a superhero. For example, if “*self-sacrificing*”, “*compassionate*”, “*inspiring*”, and “*exhibiting extraordinary powers*” are qualities agreed upon by the class, it could be argued via inductive reasoning that an individual who is kind, brave, giving, and smart is a superhero. Additional examples should be given to help students understand inductive reasoning in a variety of contexts.

### **Deductive Reasoning**

With the list of qualities agreed upon by the class, the instructor can begin to build a deductive reasoning argument. The agreed upon qualities provide the structure of the major premise (A): that a superhero is “*self-sacrificing*”, “*compassionate*”, “*inspiring*,” and “*exhibiting extraordinary powers*”. The instructor should then provide the qualities of popular comic figures (such as Superman, Batman, Lex Luthor, and/or Wonder Woman) to create minor premises (B). Students can be asked to compare the major and minor premises to determine whether or not the figure is concluded to be a superhero through deduction (C). Characters such as Superman and Wonder Woman should easily pass requirements since their qualities as the minor premises (B) are in line with qualities listed of the major premise (A). Lex Luthor should easily fail since his qualities as the minor premise (B) are out of line with qualities listed in the major premise (A). Batman, however, may provide the class with an interesting debate due to his lack of extraordinary powers, which is one of the qualities listed in the major premise. Should conversation dwindle, additional examples should be given to students to help view deductive reasoning in a variety of contexts.

This activity may easily be implemented in online teaching environments. The students still create lists of qualities they attribute to superheroes, and then create common lists in discussion groups consisting of 8-10 students. The instructor uses the lists to create a combined list for the class as a whole. This combined list allows the instructor to explain inductive reasoning in a lecture post, or a follow-up discussion can be assigned where the students explain inductive reasoning through the process of the combined list creation. Similar to the physical classroom, a discussion of deductive reasoning flows naturally from the inductive reasoning conclusions provided by the instructor or formed by the students. Finally, the activity should be used in preparation for an assignment or task in which students will be expected to use inductive and/or deductive reasoning.

## Debriefing

The combination of theory and popular culture may help students to better comprehend and retain the knowledge taught through the entertainment value of combining the lesson with the current interest in popular culture. Savage (2008) argues that instructors unwilling to utilize popular culture in the classroom may lose the ability to relate to the reality of youth popular culture. Evans (2012) insinuates that curriculum can be improved if instructors take time to link learning to the personal interests of their students. As an activity like this comes to an end, it is important to reinforce the lesson by asking the students questions or presenting them with a challenge to decipher similar to the two examples provided below:

- Lex Luthor is not ethical, and superheroes are always ethical. It follows that Lex Luthor is not a superhero. Explain why this is an example of either inductive or deductive reasoning.
- Hal Jordan is a member of the Green Lantern Corps and must be a superhero because almost every other member of the Green Lantern Corps is a superhero. Explain why this is an example of either inductive or deductive reasoning.

While two examples appear in this paper, the use additional examples should be may be considered. The use of superheroes in examples may be discontinued at this point to begin drawing students toward using inductive and deductive reasoning in future assignments and projects.

## Appraisal

This active learning approach works well by helping students bridge the gap between what they already understand about the world and the theoretical applications of these different methods of reasoning. An increased ability to reason encourages development of other aspects of fluid intelligence such as extrapolation, classification, identifying relationships, and generating and testing hypotheses (Barkl et al., 2012). Overall, as a student's reasoning ability increases, so too does their ability to produce quality work in the classroom and beyond.

This activity should be used in preparation for an assignment or task in which students will be expected to use inductive and/or deductive reasoning. A follow up quiz, homework assignment, or the preparation of an argument will help students to remember the materials. Regardless of the method of follow up work, use of inductive and deductive reasoning in a larger paper or presentation should be the end goal. Further, when creating assignments, it is important to create question sets that involve a deeper understanding of where concepts and ideas belong in the greater scheme of the world.

Students enjoy this activity for a variety of reasons. With the meteoric rise in popularity of comic book based films, the inclusion of superheroes in a lesson plan helps students to become engaged in new materials. Further, the simplicity and quickness of the activity helps students to see the ease of forming arguments through the use of inductive and deductive reasoning that can be applied to their coursework and personal lives.

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