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The excerpt below is from pp. 4-6 of Galvan and Galvan (2017), cited above.

Journals in the social and behavioral sciences abound with original reports of empirical research. The term *empirical* refers to *observation*, while the term *empirical research* refers to *systematic observation*. Research is systematic when researchers plan whom to observe, what characteristics to observe, how to observe, and so on. While empirical research is the foundation of any science, one could reasonably argue that all empirical research is inherently flawed. Hence, the results obtained through research should be interpreted with caution. For instance, the following is a list of three major issues that arise in almost all empirical studies and the problems they pose for reviewers of research.

- *Issue 1: Sampling*. Most researchers study only a sample of individuals and infer that the results apply to some larger group (often called the *population*). Furthermore, most researchers use samples with some kind of bias that makes them unrepresentative of the population of interest. For instance, suppose a professor conducted research using only students in his or her introductory psychology class, or suppose a researcher mailed a questionnaire and obtained only a 40 percent return from recipients. Clearly, these samples may or may not be representative of the population of interest. In the first instance, the professor may be interested only in describing the behaviors of students in his class; but if his interest is in generalizing to a wider population the limitations of his population need to be noted.

  Problem: A reviewer needs to consider the possibility of errors in sampling when interpreting the results of a study. Deciding how much trust to put in the results of a study based on a flawed sample is a highly subjective judgment.

- *Issue 2: Measurement*. Almost all measures in empirical research should be presumed to be flawed to some extent. For instance, suppose a researcher uses a self-report questionnaire to measure the incidence of marijuana use on a campus. Even if respondents are assured that their responses are confidential and anonymous, some might not want to reveal their illegal behavior. On the other hand, others might be tempted to brag about doing something illegal even if they seldom or never do it. So what are the alternatives? One may conduct personal interviews, but this measurement technique also calls for revelation of an illegal activity. Another alternative is covert observation, but this technique might be unethical. On the other hand, if the observation is not covert, participants might change their behavior because they know they are being observed. As you can see, there is no perfect solution.

  Problem: A reviewer needs to consider the possibility of measurement error. Ask yourself whether the method of measurement seems sound. Did the researcher use more than one method of measurement? If so, do the various methods yield consistent results?

- *Issue 3: Problem identification*. Researchers usually examine only part of a problem—often just a very small part. Here is an example: Suppose a researcher wants to study the use of rewards in the classroom and their effect on creativity. This sounds manageable as a research problem until one considers that there are many kinds of rewards—many kinds and levels of praise, many types of prized objects that might be given, and so on. Another issue is that there are many different ways in which creativity can be expressed. For instance, creativity is expressed differently in the visual arts, in dance, and in music. Creativity can be expressed in the physical sciences, in oral expression, in written communication, and so on. No researcher has the resources to examine all of these forms. Instead, he or she will probably have to select only one or two types of rewards and only one or two manifestations of creativity and examine them in a limited number of classrooms.

  Problem: A reviewer needs to synthesize the various research reports on narrowly defined problems in a given area, looking for consistencies and discrepancies from report to report while keeping in mind that each researcher defined his or her problem in a somewhat different way. Because empirical research provides only approximations and degrees of evidence on research problems that are necessarily limited in scope, creating a synthesis is like trying to put together a jigsaw puzzle for which most of the pieces are missing and with many of its available pieces not fully formed.

Considering the three issues presented, you might be tempted to conclude that reviewing original reports of empirical research is difficult. Undoubtedly, it sometimes is. However, if you pick a topic of interest to you and thoroughly read the research on that topic, you will soon become immersed in a fascinating project. On the vast majority of topics in the social and behavioral sciences, there are at least minor disagreements about the interpretation of the available research data, and often there are major disagreements. Hence, you may soon find yourself acting like a juror, deliberating about which researchers have the most cohesive and logical arguments, which have the strongest evidence, and so on. This can be a difficult, but interesting, activity.

You also might incorrectly conclude that only students who have intensively studied research methods and statistics can make sense of original research reports. While such a background is very helpful, this book was written with the assumption that any intelligent, careful reader can make sense of a body of empirical research if he or she reads extensively on the topic selected for review. Authors of reports of original research do not present statistics in isolation. Instead, they usually provide discussions of previous research on their topic, definitions of basic concepts, descriptions of relevant theories, their reasons for approaching their research in the way they did, and interpretations of the results that are moderated

by acknowledgments of the limitations of their methodology. Thus, a skilled author of a report on original empirical research will guide you through the material and make it comprehensible to you even if you do not understand all the jargon and statistics included in the research report.

The excerpt below is from pp. 58-59 of Galvan and Galvan (2017).

✔ Guideline 6: Look for Methodological Weaknesses

Remember that you should note any major weaknesses you encounter when reviewing research literature. The same process you used in identifying strengths should be used when you are identifying weaknesses. For instance, you should determine whether the author's research method has provided new insights into the research topic. Particularly, if an innovative methodology is used, does it seem appropriate, or does it raise the possibility of alternative explanations? Has an appropriate sample been used? Are the findings consistent with those of similar

studies? Is enough evidence presented in the article for a reasonable person to judge whether the researcher's conclusions are valid?

Here again, it may be preferable to critique groups of studies together, especially if their flaws are similar. Generally, it is *inappropriate* to note each and every flaw in every study you review. Instead, note major weaknesses of individual studies, and keep your eye out for patterns of weaknesses across groups of studies. For instance, if all the research reports on a subtopic you are reviewing are based on very small samples, you might note this fact in your spreadsheet.

As an example, the author of Example 5.6.1 points out a weakness in the study of homework completion and accuracy rates with autistic children.

Example 5.6.1[11]

A weakness in a study

The study lacked the comparison of Student S's and Student J's homework completion and accuracy behavior with their class work completion and accuracy behavior. Additionally, duration for homework and class work completion could have provided additional information for analysis.

The excerpt below is from page p. 61 of Galvan and Galvan (2017).

✔ Guideline 9: Identify Gaps in the Literature

It is every graduate student's dream to discover a significant gap in the literature, especially one that can form the crux of the student's thesis or dissertation study. In fact, gaps often exist because conducting research in some areas presents considerable obstacles for researchers. These gaps should be noted in a literature review, along with discussions of why they exist. If you identify a gap that you believe should be addressed, make note of it, and take it into consideration as you plan the organization of your review.

You will often find gaps mentioned in previous literature reviews, as in Example 5.9.1.

Example 5.9.1[14]

Points out gaps in the literature

The research discussed previously was mainly based on findings from Western literature conducted in the area of adolescent coping and the gender differences that existed in their coping styles. In comparison, there is a dearth of research in adolescent coping and the role of gender in predicting their choice of coping styles in Asian countries. Therefore, the aim of this study was to examine the coping behaviors of a sample of academically advanced students in an Asian context . . .

The excerpt below is from p. 47 of Galvan and Galvan (2017)

The following is an example of a gap found in the literature regarding memory of auditory clues associated with the commission of a crime.

Example 4.3.1[3]

Noting a gap found in the literature review

Several gaps in the current research literature regarding auditory memory and earwitnesses are evident. Long retention intervals between encoding and questioning are described as a specific practical challenge in crime investigation (Deffenbacher, Bornstein, McGorty, & Penrod, 2008). Most previous studies test memory performance the same day as encoding, often only minutes after initial presentation of the stimuli. There are very few studies that have utilized longer delays of up to one week (Huss & Weaver, 1996; Lawrence et al., 1979).

The excerpt below is from p. 76 of Galvan and Galvan (2017).

✔ Guideline 13: Presume That All Quantitative Studies Are Flawed

All quantitative studies are subject to errors of various kinds, so no one study should be taken as providing the definitive answer(s) to a given research problem. In fact, that is why you are combing through the evidence contained in original reports of research—to weigh the various pieces of evidence, all of which are subject to error—in order to arrive at some reasonable conclusions based on a body of literature. This brings us to an important point: Never use the word *prove* when discussing the results of empirical research. Empirical studies do not offer proof. Instead, they offer *degrees of evidence*, with some studies offering stronger evidence than others. While analyzing research articles, make notes on how convincing the evidence is in each article. Other things being equal, you should emphasize in your literature review the research articles that present the strongest evidence.

This guideline leads to another important principle. Namely, you will not be expected to dissect and discuss every flaw of every study you cite because flaws abound in studies. Instead, you should make notes on major flaws, especially in studies that you plan to emphasize in your review. In addition, you should critique the methodology of studies in groups whenever possible. For instance, you might point out that all of the studies in a particular group you are reviewing have common weaknesses. Good note-taking while you are reading the articles will help you to identify such commonalities.