Article Critique

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The study of the effect of graphic format on the interpretation of quantitative data was experimental in nature. The study involved two independent variables (type of graphic and type of recall) and one dependent variable (interpretation of quantitative data). The researcher manipulated the independent variables to determine their impact on the dependent variable, a distinguishing characteristic of experimental studies (Fraenkel & Wallen, 2009, p.261). The study also attempted to explore a cause-and-effect relationship as to whether cognitive style correlates with student ability to interpret information in any chart format.

The researcher's view of prior studies on the topic resulted in a convincing case for performing this particular experimental study. While prior literature generally supported the use of graphics in instructional materials, no extensive studies were found to investigate how graphic formats impact learner recall. Since it is in the interest of both instructional designers and instructors to know how particular instructional materials impact the learner, it seems that the impact of graphic formats on recall is an important concern. Furthermore, several advantages of presentation graphics are identified in previous literature; however, the lack of supporting research provided rationale for this experimental study.

There are two research questions in this study. First, does the type of graphic format (bar, line, table, and line-table graph) impact learner interpretation of numerical data? Second, what is the correlation between cognitive style (field dependence/field independence) and learner interpretation of information presented in any chart format? The implied hypothesis of the study is that learners will have a higher level of interpretation of quantitative data when that data is presented in graphical formats as opposed to tabular form. With the exception of line and bar graphs used on amount questions (in which the researchers saw the predicted results since the respondents only needed to read the data from the table), the research hypothesis is that certain graphic formats lead to greater data interpretation than others.

The study was performed on a sample of 96 undergraduate students in introductory educational psychology classes or professional education classes. The subjects were randomly assigned to four groups that are implied to be of equal size, resulting in 24 subjects per group. Because it is generally recommended that an experimental study be done on a minimum of 30 subjects per group (Fraenkel & Wallen, 2009, p.102), this study would have been enhanced with a greater sample size. The target population of interest is not clearly defined in the study, but is identified using the broad term *students*. This population would be made up of a much more diverse group of individuals than the narrow sample size; therefore, the sample should have been expanded, or the target population should have been more narrowly focused. The study also discusses potential future enhancements to better emulate conditions in a business meeting and mentions that the results are inconclusive in terms of recommendations for application in business, thus implying that *business* is another target population. This again calls adequacy of the sample into question, not only in terms of size, but with regard to the study being limited to educational psychology and professional education students. Indeed, perhaps

business students should have been included as well if the findings were intended to be generalized to the business population as well.

It appears that the study has an adequate level of internal validity because of the standardized conditions under which it was deployed. Additionally, all of the subjects were from the same two classes and were treated under similar conditions, minimizing a location threat. These consistent conditions and treatments provide evidence of internal validity. However, there is a potential subject characteristics threat, since it is possible that subjects differed on extraneous variables related to level of interpretation, such as intelligence, reading level, vocabulary, and attitude. It is also unclear how the time factor of seven seconds was established and, although the time limit was the same for every learner (further evidence of standardized conditions), this could represent an implementation threat because it could have a different impact on different subjects, influencing the results of the study.

Since the study involved less than the recommended per-group sample size, it should have been replicated before drawing conclusions. Furthermore, even with replication, the conclusions drawn can only justifiably be generalized to undergraduate college students in introductory educational psychology classes or professional education classes in the College of Education, or other very similar groups. It would be improper to generalize the results to the broader, more-ambiguous group referred to in the study as *students*, since such a group would be made up of many more ages, experience levels, learning styles, and cognitive abilities. Nonetheless, what the study did make clear is that all of the graphic formats, as well as tabular data, are effective for learner interpretation of quantitative information. Because the results did not provide clear support for a specific recommendation in terms of which graphic format should be used to support student interpretation, more studies should be conducted to further explore the topic. The conclusions are warranted, but have few direct implications for educational practice, except that additional research needs to be done.

References

Fraenkel, J. R., & Wallen, N. E. (2009). *How to design and evaluate research in education* (M. Ryan & D. S. Patterson, Eds., 7th ed.).