Statistical Inference

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Abstract

This research paper examines two published education articles that report the statistical results of research conducted in two education settings. The first explores middle and high school students to determine if these students value achievement and happiness more than concern for others. The second article delves into undergraduate student performance in computing and economics courses based on exposure to lecture capture technology.

Statistical Inference

This paper examines the statistical inference found in two education articles, the first is a magazine article and the second is a scholarly article from a peer-reviewed journal. According to authors of the book, *Statistics: Unlocking the power of data*, statistical inference is defined as "the process of drawing conclusions about the entire population based on information in a sample" (Lock, Lock, Lock-Morgan, Lock & Lock, 2013, p. 162). In this paper, the student researcher will describe how data is collected and tests are reported, what are the conclusions of the test(s) performed, and if the p-value range is present for both a main-stream media and scholarly article. The literature review that follows gives a deeper analysis of the two articles, which are in no way related to each other.

Literature Review

In the following Harvard magazine article, "What is success?" the researchers surveyed 10,000 diverse middle and high school students, from 33 schools in 2013 to determine if the majority of those students valued achievement and happiness above caring for others (Russell, 2014, p. 6). This ten-year study illustrates evidence of the reality gap between what parents and educators reveal their top priorities are, and the reality such messages convey to children and youth about caring and fairness for his or her personal and academic success. The study conducted used interviews, conversations and observations from parents, teachers and students. Based on this information, the researcher concludes that the study is observational. The data results aim to prove how parents' messages about grades and achievement are overshadowing their offspring's care for others. Based on the article, the range of the p-value of the test could not be determined. There is no measure of strength in evidence given for this article that supports

the existence of a p-value. The student researcher was given the *N*, which are 10,000 diverse students. The standard deviation was missing along with the mean of the student population. If these elements were given, then the p-value could be properly calculated and reported for this paper. If a significance level was provided, then the hypothesis would be easier to predict. However, it was not sufficiently established exactly what aspects of parental influence contributed to the statistical results reported among the students surveyed. Did this influence come as a result of family structure or parental involvement with the child's school work? Was there a correlation or relationship in the results between students with both parents versus those with a single parent? Although, the article writers investigated whether differences are present, the study drew a contrast between students who valued achievement and happiness over caring versus students who valued caring over achievement and happiness. The findings according to the researchers, clearly shows that caring is still valued by the students they surveyed and those students were three times more likely to agree rather than disagree with that prediction.

The conclusions of the test also yielded the following:

- About 80% of the youth indicated that academic achievement and happiness ranked highly, while the 20% remaining preferred caring for others for their ranking selection (Russell, 2014).

- More than 70% and just below 90% of school staff reported that they felt parents were more concerned about achievement over caring (Russell, 2014).

- Just of over 60% of students perceived that teachers also valued academics over caring, while 15% revealed that caring was promoted more by their teachers as a top priority (Russell, 2014).

- Students, who did not value caring and fairness, also are not concerned about ethical behavior (Weissbourd & Jones, 2014).

- 81% of students say that parents communicated that being kind to others is appropriate social behavior, but students were not certain that focusing on being happy actually made them happier (Weissbourd & Jones, 2014; Russell, 2014).

There was little evidence in this study to prove that the researchers tested their hypothesis or proved them. Therefore, the author should not make these claims because he does not prove from the research findings that the students are only likely to be influenced by parents and teachers and not by other peers. Does the data provided actually inform parents and teachers of the value of moral development in helping students to grow, thrive and achieve success as citizens? The writers arrive at a conclusion about the population of students sampled, that there is a need to change the narrative and reshape the messages that parents and educators send to youth.

"Testing the effectiveness of lecture capture technology using prior GPA as a performance indicator" tests the effectiveness of lecture capture technology (Stroup, Pickard, & Kehler, 2012). Lecture capture technology is an umbrella term that describes any technology that allows instructors to record what happens in their classrooms and makes it available digitally for later viewing and listening (Educase, 2008, p. 1). Echo 360 is the technology used to record lectures that are made available to students within two days of a class lecture. The article highlights three benefits to using this technology for students—it is a back-up for those who missed class lectures, it provides an opportunity for course review, and finally it can be used as supplementary materials for online course development (Stroup, Pickard, & Kehler, 2012, p. 42).

The student groups examined for this study are Computer Science and Economics undergraduate students. Student GPA's were used as a predictor rather than average course

grades between lecture capture and non-lecture capture classes taught by professors using the

same materials (Stroup, Pickard & Kahler, 2012, p 43). This research study discusses whether or

not lecture capture technology improves student learning of course material. What is significant

about the technology is it provides a student the opportunity to revisit material for deeper

learning and understanding for courses that are particularly challenging such as Economics and

Computer Science. Also, the statistical analysis suggests that making lecture technology

available in face-to-face lecture courses in introductory computer science classes does not have a

statistically significant impact on student performance, as measured by course grade. Even after

the researchers controlled for the possible influence of a student's GPA on his or her earned

course grade, no statistically significant difference in earned course grades between the lecture

capture and non-lecture capture courses were found.

   "Null" refers to the notion that nothing is different between the two student groups and

any observed differences are entirely due to random chance (Vickers, 2006; Vickers, 2009). The

results of the experimental test imply that the presence and availability of lecture captures had no

impact on students with high GPAs or the ability to learn the course material. However, low

GPA students in one of the lecture capture courses earned significantly lower grades relative to

low GPA students in the non-lecture capture courses. The researchers reviewed multiple studies

and found that lecture capture technology either improved or enhanced undergraduate student

performance, they also reviewed studies which proved high enthusiasm for the technology

among students and other studies showed marginal, if any, improvement. In their methodology,

the authors try to control for the difference in student learning the material across samples using

his or her GPA prior to enrollment in the course. Based on this analysis, it can be concluded that

the null is set at no difference. For example, a study (Carter as cited in Stroup et al. 2012, p. 44) found that lecture-capture technology allowed students to learn material more efficiently. However, a consensus opinion on the efficacy if lecture capture technology has yet to be formed. Although, it appears that many of the studies performed to date that support lectures have relied strongly on student surveys rather than the analysis of actual performance data. The p-value is the probability that the data would be at least as extreme as those observed, if the null hypothesis were true (Vickers, 2009, p. 57).

Conclusion

The conclusion of the study was to determine whether the two groups (non-lecture capture and lecture capture) classes created significantly different average course grades. There is no strong evidence for the study's conclusion. For this study—the researcher thinks that the null should be set at no difference because the authors could not find a statistically significant difference in student performance, even for face-to-face economics lectures and use of lecture-capture technology. The ANOVA test yielded that at the 5% level of confidence, the mean results are not statistically significant. Based on the researcher's understanding of that result, the authors could not prove there was a difference in student performance resulting from the use of lecture capture technology. However, there is a practical significance that if a student's prior GPA was high, then a high future course grades could be a trustworthy indicator.

In my opinion, the authors should not make this claim and this empirical research needs further analysis. The authors attempted to prove that lecture capture technology could have some influence on higher course grade. To conclude, the hypothesis should be formulated before data is analyzed, so the authors should not test their hypothesis using the same data that suggested the

hypothesis. For example, the authors were not able to prove or determine that lecture capture technology disables unproductive learning behaviour. This leaves the reader to infer that while high GPA students may not be affected by the presence of lecture capture technology; low GPA students' performance was not statistically significant due to lecture capture technology. The authors need to prove from the study that there is a relationship between lecture-capture technology and improved student performance.

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