# Chapter 10
# Learning Statistics with a Multimedia Resource

**Olusola O. Adesope**
*Washington State University-Pullman, USA*

## EXECUTIVE SUMMARY

*Researchers have often reported the negative attitude and low performance of students in statistics (Francis, 2002; Gordon, 1995; Ograjenšek & BavdažKveder, 2003). While considerable efforts and research have been undertaken to remedy this situation, researchers, educators, and policy makers have admitted a degree of failure in the teaching and learning of statistics and advocated a radical rethinking in the way statistics education is implemented (Cobb & Moore, 1997; Moore, 1997, 2005; Weldon, 2005). One approach that has been advanced is the use of multimedia instruction. Nolan and Lang (2006) observed that the potential for multimedia to enhance the statistics curriculum is clear, but there are challenges to developing instructional materials that take advantage of the riches of multimedia. It requires more than a simple translation of textbooks into the computer in order to obtain a tool that is effective for learning statistics. While statistical tools like SPSS have improved analyses of data, it has not significantly improved the learning of statistical concepts (Hawkins, Jolliffe, & Glickman, 1992). This has necessitated recommendations that technologies should not only be used as a computational tool, but also as a means for providing students with opportunities to explore conceptual ideas (Franklin & Garfield, 2006). It seems plausible that effectively-designed multimedia resources may help alleviate some of the difficulties students face in learning statistics. This chapter describes a prototype digital resource (StatConquer) for learning about correlation of bivariate data[1], an important topic in many introductory statistics courses. The Chapter also explains how application of some principles in cognitive*

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*load theory and multimedia learning theory might facilitate students' understanding of correlation. It is expected that by delineating the pedagogical approach of StatConquer, educators, researchers, policy makers, and instructional designers may adapt this design framework for developing other learning tools.*

## DESCRIPTION OF THE LEARNING RESOURCE (STATCONQUER)

*StatConquer* is a digital learning resource for learning introductory statistics. User interface design ideas from an existing statistical tool for teaching correlation are used in developing some aspects of this resource (Puranen, 2007). However, *StatConquer* draws on powerful multimedia and cognitive load principles and significantly extends the functionality of many existing statistical tools for learning basic descriptive statistics. *StatConquer* builds on an existing tool by incorporating some instructional design principles to enhance learning. This section of the Chapter describes how *StatConquer* can be used to learn about correlation, an introductory topic in Statistics.

## BACKGROUND: CONTEXT AND GOALS OF THIS LESSON

In this Chapter, I present a case study (lesson) on correlation targeted at undergraduate students learning introductory statistics although it is designed in such a way that high school students can also benefit from using it. This prototype lesson on correlation is designed for low domain knowledge students who have high spatial ability. However, students need to have acquired appropriate prior knowledge with different measures of central tendency, like mean, median, mode and measures of variation like variance, standard deviation and standard score ($Z$). Researchers and statistics educators have found that students have misconceptions about different aspects of correlation, especially the misconception that negative correlation does not indicate relationship between variables, difficulty in interpreting strength of correlation and equating correlation with causation (Estepa & Batanero, 1996; Morris, 2001; Thomason, Cumming & Zangari, 1994).

In this lesson, *StatConquer* uses animation and narration to teach correlation between two variables through diagrams and narrated human voice. The major goals of this lesson are to correct students' misconceptions about correlation and to teach students how to calculate Pearson's correlation coefficient ($r$) and coefficient of determination ($r^2$) through worked examples. Table 1 shows a prototype case description of the multimedia describing how *StatConquer* is used to teach correlation[2].