Reasoning About Covariation With T*inkerPlots*

Noleine Fitzallen
University of Tasmania

Field of Research Code - 130208

Covariation is recognised as an important aspect of statistical thinking and reasoning and is used to explore the relationship between two attributes. Often, covariation is determined from the interpretation of scatterplots that display the correspondence of two numerical attributes and is described as a trend in the data. Scatterplots are utilised when conducting exploratory data analysis (EDA). The translation of EDA strategies into innovative software packages, such as *TinkerPlots: Dynamic Data Exploration*, has placed student learning about data analysis in technological environments and there is a need to investigate the way in which students learn in these contexts.

The first objective of the inquiry was to further understanding of the factors that influence student learning when working with software packages. This is through the development of a conceptual framework for learning in EDA graphing environments. The second objective was to explore the intersection between the students' thinking and reasoning about covariation and the influence of *TinkerPlots* on that process, as students explore data sets to determine the relationship between variables and identify trends.

The inquiry employed an educational design research methodology within a pragmatist paradigm to facilitate the development of a systematic iterative study. It was implemented with 12 students working in pairs on data analysis, graph creation, and graph interpretation activities, twice a week for 45 minutes, over a period of 6 weeks. At the end of the sequence of learning the 12 students were interviewed as they work through an activity using *TinkerPlots*. The data from the student interviews are presented as Student Profiles that characterised the way in which they used *TinkerPlots* to develop not only an understanding of covariation but also develop other data analysis skills and strategies.

Through the evaluation of *TinkerPlots* and its subsequent implementation in the inquiry, it was identified that *TinkerPlots* provides a powerful learning environment for supporting students' understanding of covariation. In terms of student understanding of covariation, the inquiry identified that young students are able to reason about covariation and display three levels of reasoning. The results also suggest that students adopt three different strategies when accessing the features of *TinkerPlots* while creating and interpreting graphs. These strategies are: *Snatch and Grab*, *Proceed and Falter*, and *Explore and Complete*.

Outcomes of the inquiry are presented in relation to the thesis-developed *Model of Learning Behaviour in EDA Graphing Environments*. Within the framework of the model the students' development of covariation reasoning is revealed and discussed in terms of the potential of the results to inform the teaching and learning of covariation within EDA software environments and future curriculum development.