UNDERSTANDING STUDENTS LEARNING STATISTICS: AN ACTIVITY THEORY APPROACH

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DEDICATION

I dedicate this thesis to my beloved parents, husband and children

My late father:	Rolf Melchiker
My mother:	Minnie Melchiker
My husband:	Hilton Gordon
My sons:	Brian Gordon
	Michael Gordon

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PREFACE

The following publications and conference papers are related to this thesis.

Crawford, K., Gordon, S., Nicholas, J. & Prosser, M. (1994a). Conceptions of mathematics and how it is learned: The perspectives of students entering university. *Learning and Instruction*, 4, 331-345.

Crawford, K., Gordon, S., Nicholas, J. & Prosser, M. (1994b). Students' reports of their learning about functions. In J. da Pont & J. Matos (Eds.), *Proceedings of the Eighteenth Conference of the International Group for the Psychology of Mathematics Education*, (Vol. 2, pp. 233-239). Lisbon: University of Lisbon.

Crawford, K., Gordon, S., Nicholas, J. & Prosser, M. (1995). Patterns of meaning of students' mathematical experiences at university. In B. Atweh & S. Flavel (Eds.), *Proceedings of the Eighteenth Annual Conference of the Mathematics Education Research Group of Australasia*, (pp. 203-209). Darwin: Mathematics Education Research Group of Australasia.

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Gordon, S. (1997b). Students' orientations to learning statistics — profiles of experience. In F. Biddulph & K. Carr (Eds.), *People in Mathematics Education. Proceedings of the Twentieth Annual Conference of the Mathematics Education Research Group of Australasia Incorporated*, (Vol. 1, pp. 192-199). Hamilton, New Zealand: Mathematics Education Research Group of Australasia Incorporated.

Gordon, S. & Nicholas, J. (1992). An investigation of students' attitudes to and beliefs about mathematics and statistics. *Australian Senior Mathematics Journal*, 6(2), 103-107.

Gordon, S., Nicholas, J. & Crawford, K. (1996). Psychology students' conceptions of a statistics course. In L. Puig & A. Gutiérrez (Eds.), *Proceedings of the 20th Conference of the International Group for the Psychology of Mathematics Education*, (Vol. 3, pp. 11-18). Valencia: Universitat de València.

ABSTRACT

In this project I investigate university students' orientations to learning statistics. The students who participated in my research were studying statistics as a compulsory component of their psychology course. My central thesis is that learning develops in the relationship between the thinking, feeling and acting person and the social, institutional and cultural contexts surrounding him or her. How students orient themselves or position themselves to learn statistics is reflected in their engagement with the learning task — their activities. These activities determine the quality of their learning and emerging knowledge. To understand student learning I draw on the powerful theories of Vygotsky (1962, 1978) and Leont'ev (1978, 1981). In particular, I extend and apply Leont'ev's construct of activity (Leont'ev, 1981). This suggests that individuals act in accordance with their purposes and needs which are shaped by and reflect histories and resources, both personal and cultural.

My investigation consists of two studies. Study One is a qualitative exploration of the orientations to learning statistics of five older students. These students sought help with statistics at the Mathematics Learning Centre where I work. My case studies of these students are inseparable from my efforts to help them learn statistics. Study Two is grounded in Study One. The main source of data for this broader study is a survey which was completed by 279 psychology students studying statistics. In keeping with the theoretical framework, my methodology involves a holistic analysis of students and the milieu in which they act. My findings suggest relationships among students' affective appraisals; their conceptions of statistics; their approaches to learning it; their evaluations and the outcomes of their actions. In Study One the relationships emerged from the students' descriptions. In Study Two I quantified the ways in which variables related to each other. Structure for the data was provided by means of correlations, factor analysis and cluster analysis. For this study I also interviewed students and teachers of statistics. My data support the systemic view of teaching and learning in context afforded by my theoretical perspective. Learning statistics involves the whole person (Semenov, 1978) and is inseparable from the arena of his or her actions.

The goal of statistics education is surely to enable students to develop useful, meaningful knowledge. My findings suggest that for many of the participants in my project this goal was not being met. Most of these students reported their

reluctance to learn statistics and described adopting primarily surface approaches to learning it. A range of conceptions of the subject was expressed, but for many of the students statistical meaning was evidently reduced to performance on assessment tasks. Such orientations to learning statistics may lead to it becoming irrelevant and inert information. For a few students, however, the experience of learning statistics led to self development and enhanced perspectives on the world in which we live. My project indicates the diversity of students' experiences. It raises issues as to why we teach statistics today and how the teaching and learning of statistics is being supported at university.

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