Using Analytical Frameworks for Classroom Research

Collecting data and analysing narrative
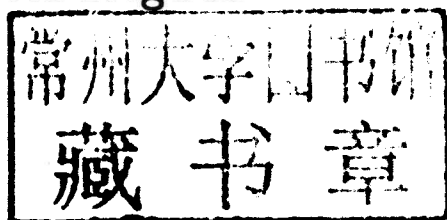
Edited by
Susan Rodrigues

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Contributors

Mary Ainley is Associate Professor in the Psychology Department at the University of Melbourne. She has considerable experience teaching undergraduate students and supervising graduate student research. Her research interests involve investigating the experience of interest and exploring the psychological processes that are involved when students engage with (and disengage from) achievement tasks. The goal of this research is to understand how to support positive educational experiences for students of all ages.

Charles Anderson is Senior Lecturer in the School of Education at the University of Edinburgh. Much of Dr Anderson's research has centred on learning and teaching in higher education (guided by a socio-cultural approach to learning). He has a particular interest in exploring talk and texts in educational settings. A central and enjoyably challenging area of his teaching is qualitative research methodologies and methods.

Keith Bishop is Senior Lecturer in the Department of Education at the University of Bath. Dr Bishop's research interest is the exploration of how the concept of 'accomplishment' might be defined within the context of science teaching and the implementation of curriculum change in sub-Saharan Africa. He also acts as a consultant to the AstraZeneca Science Teaching Trust. Currently, he is in the process of launching a new undergraduate degree in childhood, youth and education.

Sarah Buckley is Research Officer at the Australian Council for Educational Research. Dr Buckley's Ph.D. thesis examined the effects of affective factors, like motivation, and peer networks on adolescent mathematics anxiety. Her research interests include exploring social-contextual factors on students' motivation and achievement.

Lindsey N. Conner is Associate Professor and Associate Dean at the College of Education, University of Canterbury, Christchurch, New Zealand. She has a specific research focus on the teaching and learning of socio-scientific issues. She also has several projects in partnership with schools where they are investigating the alignment of pedagogy with purpose.

Paul Denley is Lecturer in the Department of Education at the University of Bath. Dr Denley's main area of research is in science education, particularly the initial and continuing professional development of secondary science teachers with a focus on knowledge bases for science teaching. His current research includes work for the AstraZeneca Science Teaching Trust, evaluating projects to support primary teachers in science and a DfID-funded project in Africa exploring the use of ICT to support science teaching. He teaches units in the department's MA programme on learning, curriculum and research methods, as well as supervising research students.

Rod Fawns is Senior Lecturer in Science Education at the University of Melbourne. Dr Fawns is a science educator with a commitment to pre-service teacher education that extends back 37 years at the University of Melbourne. He has been the principal supervisor for over 100 masters and 30 doctoral theses. His research contributions have been in social psychological and historical studies in science education and teacher education.

Bev France is Associate Professor of Science and Technology Education in the Faculty of Education at the University of Auckland. Her research focus is in biotechnology education and as a consequence she is interested in finding out how scientists and technologists work by asking them to tell their stories. These narratives provide information about how different groups of people talk to each other about biotechnology.

Divya Jindal-Snape is Senior Lecturer in the School of Education, Social Work and Community Education at the University of Dundee. Dr Jindal-Snape's research interests lie in the field of educational transitions and inclusion. A significant proportion of her work has been with children and young people with additional support needs, especially children and young people with visual impairment, autism, learning difficulties, emotional and behavioural needs. This has also involved developing social interaction through drama techniques and other forms of creative arts education.

Joseph Krajcik is Professor in the School of Education at the University of Michigan. He develops classroom environments in which students find solutions to important intellectual questions that subsume essential learning goals. He has authored and co-authored over 100 manuscripts and makes frequent presentations at international, national and regional conferences that focus on his research, as well as presentations that translate research findings into classroom practice. He is a fellow of the American Association for the Advancement of Science (AAAS) and American Educational Research Association (AERA), served as President of National Association for Research in Science Teaching (NARST) and received guest professorships from Beijing Normal University and the Weizmann Institute of Science. In 2009, Ewha Womans University in Korea named him a distinguished fellow.

Christine Redman is Senior Lecturer at the University of Melbourne, in the area of science, technology and ICT education. Dr Redman's research interests include enhancing the effectiveness of classroom science teaching through sound pedagogical uses of a diverse range of ICT. By examining teacher's practices and what factors informed their choices and effective uses of ICT, she hopes to better understand how to motivate and sustain deeper engagement in science learning experiences.

Susan Rodrigues is Professor of Science Education at the University of Dundee. She is the programme director for the Professional Doctorate in Education, Social Work and Community Education. She also contributes to the Professional Graduate Diploma of Education (PGDE) (secondary) teacher education programme. She has research projects exploring the effectiveness of context, teacher pedagogy and the use of information communication technologies in science classrooms.

Pauline Sangster is Senior Lecturer and Deputy Director of post-graduate studies in the School of Education at the University of Edinburgh. Dr Sangster's current research is on language learning and teaching (particularly on listening and its development within the socio-cultural contexts of classrooms), trainee teachers' developing reflexivity and reflective practice and the linguistic demands of national tests and examinations. She teaches on both general research methods courses and on courses where the key focus is researching language.

Namsoo Shin is Assistant Research Scientist in the School of Education at the University of Michigan. Dr Shin's interests are focused on the impact of constructivistic learning environments on student learning, especially everyday problem-solving skills, among K–12 students. She specialises in using quantitative and qualitative methods to document the effectiveness of instructional materials and learning technologies. She is currently a principle investigator of the National Science Foundation (NSF) project 'Developing an Empirically tested Learning Progression for the Transformation of Matter to Inform Curriculum, Instruction and Assessment Design'.

Shawn Y. Stevens is Research Investigator in the School of Education at the University of Michigan where her work focuses on assessing and improving student and teacher learning. In association with the National Center for Learning and Teaching Nanoscale Science and Engineering (NCLT), she is developing a learning progression for the nature of matter as it relates to nanoscience. In addition, she is characterising how new elementary teachers develop pedagogical content knowledge for science teaching, which is funded by the Center for Curriculum Materials in Science (CCMS).

Keith Topping is Professor of Educational and Social Research in the School of Education at the University of Dundee, where he mainly researches peer learning. He has published over 130 peer reviewed journal papers, 40 chapters and 17 books. His work has been translated into 11 languages.

Nicos Valanides is Associate Professor of Science Education at the University of Cyprus. His research interests include teacher education, methodology of teaching and curricula for science education, the development of scientific reasoning skills, the utilisation of ICT in science education, distributed cognition and the design and implementation of educational interventions.

Preface

Susan Rodrigues

I had three reasons in mind when I invited colleagues to contribute chapters to this book. First, from my knowledge of their work and of them as people, I believed they would provide chapters which would be of use to researchers who, having decided on their research question, were considering what approach to adopt to help them peruse, analyse and interpret data they would collect. Second, the authors were all active researchers using well-established approaches which are likely to remain relevant for some time and they were fully conversant with the realities of educational research. Third, I wanted to include an international dimension and so this book has chapters from colleagues from six countries.

I asked the authors to focus their contribution on the theory underpinning the approaches they deployed – not so much the tools used, but the assumptions, nature, scope and application of the analysis they used when exploring classroom-based or educational research. As a consequence, the individual chapters may to some extent limit the degree to which the book can examine any of the areas in any great detail; thus it may be argued that the book does not provide the depth required for sustained study. However, because each chapter illustrates use through a description of a research study the book provides a useful and detailed example for each analytical approach. In addition, the chapters show how narrative can be explored in different ways through different emphases; this helps knit the book together. The position adopted by each author illustrates the traditions from which they come, the literatures they draw upon and the milieus in which they live and research. Their reporting of their position also helps to show how this informs, influences and shapes how they address particular issues in educational research.

The chapters are presented in a sequence that begins with theoretical approaches for a macro perspective (including the social structures, organisations, etc.) and concludes by considering these for a micro perspective (i.e. the concrete actions and interactions of individuals). For example, the initial chapters describe approaches that support the analysis of cross, longitudinal or multiple data sets (studying the forests, so to speak) while the concluding chapters focus on exploring details within conversations or narrative (looking at the trees).

In Chapter 1, Mary Ainley and Sarah Buckley describe Bronfenbrenner's (1986) three analytic paradigms: social address model, a process-context model and a

person-process-context model to show how each provides a general schema for conceptualising and understanding various elements of a research question or a research design/investigation. Mary and Sarah illustrate some quantitative analysis tools that are often used in educational research. They describe several of their projects and they show how different types of analyses pose different basic questions (for example, how variables operate or combine and whether a variable- or person-centred approach (or both) is the best fit). Mary and Sarah also suggest that one simultaneous advantage of Bronfenbrenner's structure is that it provides a structure for synthesis across disparate research programmes.

In Chapter 2 Divya Jindal-Snape and Keith Topping describe observational analysis in the context of case study designs. A case study approach might be of relevance and interest if you are a researcher who is keen to get detailed insight with regard to what is happening, why it is happening and the effects of what is happening. Divya and Keith use two empirical studies: one involves a single case baseline design and the other involves longitudinal data across multiple cases. In the single case design they describe a study undertaken to look at the effectiveness of an intervention, where a participant is observed several times prior to the intervention (to establish a baseline of their performance or behaviour) and then observed later to ascertain the effectiveness of the intervention. This allows a researcher to draw inferences by comparing behaviour during different intervention conditions. In contrast, the basic gist for a multiple baseline design involves an intervention being applied to one setting/behaviour/participant while the others continue in baseline. After a time interval, the intervention is applied to the other settings/behaviours/participants and graphs are compiled and examined to see if there are improvements correlating to the intervention period.

In Chapter 3 Namsoo Shin, Shawn Y. Stevens and Joseph Krajcik describe the construct-centred design as an appropriate methodology for the study of the development of learning over an extended period of time. Namsoo, Shawn and Joseph describe an approach to the study of learning phenomena in real contexts with a view to producing evidence-based claims for particular theoretical questions. They show how the use of learning progressions in science education can help illustrate students' conceptual growth over time. They suggest that although the example they use is within science education, the construct-centred design approach and the associated analysis can be applied to other research areas by those interested in exploring the long-term development of ideas.

In Chapter 4 Nicos Valanides outlines how different coding procedure steps are used in the constant comparative analysis method (or grounded theory) approach. This approach involves a cyclical process of induction, deduction and verification, as well as distinct strategies for analysing qualitative data. One key differentiator between the comparative analysis method approach and other methods lies in the fact that in the approach the general constituent unit of analysis is the incident rather than the people or participants. Nicos uses a case study involving primary-aged pupils (who were investigating the functioning of an improvised device) to show how incidents can be identified, coded and organised

to provide a comparison of the different incidents. Nicos also describes how qualitative data can be quantified for statistical analyses purposes.

An approach that enables multiple sources of data to be triangulated when analysing students' learning processes is presented by Lindsey N. Conner in Chapter 5. She uses a constructionist epistemology and her theoretical perspective of interpretive phenomenology. She describes her use of a range of interconnected interpretive methods to explore and report on the experiences of students in a high school class. Lindsey shows how various data sources were analysed and combined for each student in the form of metamatrices. These metamatrices enabled her to visually compare data sources and students to try to identify trends in learning characteristics across the group(s) and to recognise individual subtleties and peculiarities.

In Chapter 6 Bev France moves us into the area of narrative analysis. Bev describes how she used narrative enquiry in her research with scientists and teachers when she explored their accounts of school memories. Her writing outlines the assumptions she made as well as the factors that influenced the nature and application of the analytical approach she adopts. Bev's writing signals the tradition she used to locate her research and work. She shows how her situation and belief system informed and shaped the way she addressed particular issues in educational research through the use of narrative enquiry.

Paul Denley and Keith Bishop continue with the field identified by Beverley France. They consider the use of stimulated recall in teacher thinking in Chapter 7. However, where Beverley used accounts constructed by scientists to trigger teacher reflection, Paul and Keith discuss the use of other strategies (for example, audio and digital records). Paul and Keith describe a study in which they used stimulated recall to examine the way in which 'accomplished teachers' ameliorated different knowledge bases to support their teaching. Paul and Keith also explore how the teachers' thinking influenced decisions before, during and after their lessons. They go on to discuss whether stimulated recall provides a reconstruction of an event drawing on stored memory or a re-interpretation of the event drawing on a variety of stored memories.

In keeping with the theme to explore teacher practice and teacher behaviour through an analysis of talk and action, Charles Anderson and Pauline Sangster describe the approaches they took to analyse discussion talk in Chapter 8. The discussions took place between Pauline and ten students training to be teachers of English. The discussions took place after the students had given a lesson at various points during their teacher education year. Apart from reporting on the reasoning and theoretical models that informed the analysis of the data they collected, Charles and Pauline also freely discuss issues that arise as a consequence of Pauline being researcher, observer and tutor, as well as the positions of Charles and Pauline as the two researchers.

While the preceding three chapters report on the theoretical positions colleagues adopted when they collected and analysed transcribed talk, the next two chapters take a further microanalytical step when it comes to analysing talk. They show how

the quest to explore language, talk and discourse usually results in a search for methodologies that allow us to focus on specific aspects of the communication process.

In Chapter 9, I use facets of Halliday and Hasan's work to show how classroom talk can be analysed. I show how the notion of register, coherence and cohesion can be used to illustrate and interpret classroom interactions, whether they are dialogues or monologues. I use transcripts from various classroom studies to show how classroom talk can be analysed in terms of its influence on the negotiation of meaning and its influence on shaping the nature of learning in classrooms.

Similarly, Christine Redman and Rod Fawns show how talk can be analysed with regard to a specific aspect of communication in Chapter 10. They show how Harré's positioning theory can be used as an informing analytic approach when considering what they call 'data sets that are gathered in the lived moments'. Christine and Rod describe how positioning theory has informed the development of pronoun grammar analysis as an objective coding tool for the fine-grained analysis of talk. They discuss how they analysed their teacher talk data through the window of positioning theory to illustrate the concept of 'oughtness'; they suggest that oughtness shapes why and how people determine what they *should* chose to adopt. Christine and Rod describe how positioning theory can help a researcher develop a deeper understanding of a community's values and practices, as well as help identify the community member's relations with these values and practices.

The final chapter, Chapter 11, revisits some of the key ideas and considers elements that help to ensure the data are trustworthy.

This edited book of chapters, addressing particular forms of analysis, is intended as a sampler. It is an introductory guide for those who are interested in the theoretical underpinnings of some commonly used analytical approaches. Each chapter identifies an approach, outlines some of the theoretical assumptions and constraints that underpin the approach, signals the traditions in which these approaches are located and provides data to show how this analysis manifests when deployed in educational research. Thus I believe that the book will be relevant to teachers, researchers, academics, postgraduate students and other academic professionals who conduct their research in educational settings or support others in doing so.

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Understanding educational achievement and outcomes

Person, process and context

Mary Ainley and Sarah Buckley

Introduction

Finding answers to educational problems is a complex undertaking. Whether awareness of the problem arises as a result of classroom observation, the reading of learned journals or armchair theorising, there is always a range of perspectives that can be brought to bear on a problem. In this chapter, we explore a number of models and analytic approaches that can be applied to investigate specific issues that are part of the complex mix of person, process and context that feature in education at all levels.

In the first part of this chapter, we take the basic components of person, process and context as described by a prominent theorist in developmental psychology and examine how they can be used to describe the basic components in a wide range of educational research. In the second part of this chapter, we describe some of the quantitative analysis tools used in educational research and show how different types of analyses pose different basic questions; questions about how variables operate and questions concerning combinations of variables, identified as personal profiles or as developmental trajectories. Using a variety of educational research examples, we intend to demonstrate that these are complementary approaches; each approach provides a slightly different lens on the educational issue driving the research. The approaches we describe are not limited to educational research but represent perspectives that are currently being applied to find answers to a wide range of behavioural questions.

A model of person, process and context

Urie Bronfenbrenner's (1979) ecological theory of development, which in later formulations becomes a bioecological model (Bronfenbrenner, 2001), has had a major influence on modern developmental and educational psychological thought. One way these models have influenced thinking is through the conceptualisation of a child's developmental contexts as a multilayered system. At the core are the microsystem processes in which the child is actor. Surrounding layers consist of more indirect, but no less important, influences on the child's development. The

relationship between the home and the school manifests itself in issues such as: attitudes and expectations concerning homework; the influence of parental employment arrangements on family life; and the overarching cultural norms and community legal system providing both affordances and constraints on family interactions. Although not the only theorist to draw attention to this complex network of interacting systems, many of the insights from Bronfenbrenner's perspectives on research into children's development provide useful ways of looking at research into children's educational achievement and development.

Awareness of the multiple layers and interacting systems flows through to consideration of the different components or levels of analysis that are adopted in research designs. Bronfenbrenner (1986) outlines a useful way to understand the structure of specific research investigations. He describes three analytic models or paradigms, which he refers to as: a 'social address model'; a 'process-context model'; and a 'person-process-context model'. Each model provides a general schema for conceptualising the elements of a research question or a research design. At the same time, the specific questions, which can be addressed within these general paradigms, offer a wide range of possibilities for investigating and understanding aspects of the education process. One of the examples cited in Bronfenbrenner's paper demonstrates the differences between these three models. The example is from the developmental literature and concerns early attachment processes between infant and mother. This is not unrelated to a number of questions considered in the early childhood education literature where it has been shown that early secure attachment status is predictive of children's early school adjustment. A study by Crockenberg (1981) reported that in a sample of middle-class and working-class mothers the level of social support the mothers received from their social network at the time their infants were approximately three months old was a significant predictor of the mother–infant attachment relationship at 12 months of age. There are a number of contextual factors operating here, including the social address defined as social class membership (i.e. middle-class and working-class families) and the mother's membership of a social network.

At the process level, the study has identified the significance of specific interactive processes within the social network, namely, social support defined as help and support from 'husband, extended family, other children, friends and neighbours, and professionals . . . an assessment of the affective and material assistance experienced by the mother in her mother role, relative to the stresses experienced by her' (Crockenberg, 1981: 859). The outcome variable is also a process variable in that attachment status defines a particular pattern of interactive behaviour between mother and infant. However, it was also found that the beneficial effects of social support processes were related to the infant's temperament (a person variable). The strongest effects of social support processes occurred for mothers and infants where the infant was identified as having an 'irritable' temperament, while effects were described as minimal for infants with a 'calm' temperament. In this investigation the child behaviour of interest (attachment status at 12 months) was predicted by a network of interacting variables that included input from the