

Moving on: Linking Research Questions to Research Design

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Research Questions for Funded Research

My starting point is that education is an engaged social science. That is, that educational phenomena are best researched by those who understand the field as well as understanding the social science that enables them to make sense of the field. I therefore want to see education research achieving a greater share of research funding. This premise means that in this presentation I will be focusing on generating research questions and producing designs that have some chance of surviving the scrutiny of funders. I am not going to discuss the personal research that can produce a good PhD, but would anyway expect that what satisfies funders should also inform the design of a doctoral study.

A key theme will therefore be coherence. The public scrutiny of a proposal entails an examination of its internal logic. There may be evidence of paradigm wars around the table when bids are discussed, but usually proposals are examined in terms of their own integrity and their focus on the research questions. Achieving such integrity demands self-awareness, knowledge of the field and strength in the branch of social science where your interests lie. In the end you need to offer funders a robust study that can be trusted. They need to be able to follow your argument through the research proposal.

I have three broad categories of funders in mind. They all have slightly different priorities. The Research Council funds projects which demonstrate the highest quality in social science research and which may impact on practice or policy. Central and local governments and their agencies have usually identified their questions and want you to interpret but not change them and to deliver answers. The charities and other similar funders usually offer broad themes where the social relevance of the study may be as important as the intricacy of the social science. But all have high standards and well-informed reviewers. When identifying the actual research questions and the resultant design of the study you need to work to the expectations of the funders.

Educational research is frequently disadvantaged in the search for funding because it is an interdisciplinary field of study. Researchers' engagement with the field means that some researchers avoid the use of robust social science methodologies and simply try to answer questions which arouse their curiosity. Equally the interdisciplinarity sometimes means that educational researchers appear to be borrowing less than cutting edge ideas from other disciplines and therefore not offering anything new. The challenge is to demonstrate good social science, of whatever genre, alongside a sound understanding of the field. This holds true whether one is applying for research council, government or charitable funding.

The research question is therefore not the starting point of the research proposal. Instead we need to begin with an examination of assumptions about the field and about social science which underpin the study. These assumptions subsequently shape the questions.

What do Research Questions Reveal?

- *What is the impact of setting or tracking on the patterns of results achieved by pupils in mathematics?*
- *Has a growing policy emphasis on accountability and standards in English schools brought pressures for performativity?*
- *What are young people's experiences of post school education?*
- *Are student teachers developing expert ways of seeing while learning to teach in classrooms? How are their mentors assisting their learning?*

These questions are all taken from a recent issue of the *British Educational Research Journal*. They each demand a different research design and they all reveal purposes for the studies which in part have their roots in beliefs about the nature of knowledge and therefore social science, reflect different stages in a programme of work and demonstrate an engagement with the field of study. Three (the first two and the last) could be presented as null hypotheses, but throughout this paper I'll discuss questions rather than hypotheses.

Crudely, the mathematics impact study is asking the question is x better than y at achieving outcome z? It draws on work on the usefulness of groupings in learning and is asking a question about causality that further refines our understanding of the

impact of selection. The second question could sound like a 'when did you stop kicking the cat?' query. But is saved from that criticism because in earlier work the researchers had proved that there was a growing policy emphasis on accountability and standards. The question was the final one in a longitudinal comparative study of primary schooling in Europe. In some ways it is, like the first question, asking is x better than y, but is able to compare changes over time within the same group rather than differences between groups. Moreover, despite its wording, it is aiming at revealing association and not impact.

The third question is an open exploration of a phenomenon in order to unearth patterns which could be later explained through the application of theory. However, the evidence gathered could also be organised into sets of variables and explored subsequently in a larger scale longitudinal study. It is worth noting that the 'what is going on here?' questions of case study research are not confined to designs which only draw on qualitative methods. They can also be the starting points for both experimental and large-scale descriptive designs. The final set of questions are also asking 'what is going on here?', but in this example the actual questions reveal a strong theoretical base to the study, for example a particular view of expertise and mediated learning. Here the study is drawing on the researchers' previous work within the field and is now questioning the rationale for school-based training in the light of that work.

Some types of question are missing from these examples. They include interventionist research, both experimental and participatory, critical analyses, complex modelling of association and controlled trials. But what the examples do show is that the research question itself is not the starting point. It rests on a set of assumptions and previous research and is linked to purposes which usually include improving the life chances of those who are involved in the processes being examined.

When I first began to work as a researcher in education I was trained to start any research proposal with a rationale for the study which concluded in a set of aims, which in turn informed the wording of the research questions. The rationale would start with a short summary of the research on which I was building, which would include the theoretical stance taken. It would then discuss how the study would develop that work, the social relevance and timeliness of the study and what the study intended to produce, both in terms of outcomes and outputs. In short the

rationale would reveal the assumptions and the purposes of the study and oblige me to consider its feasibility.

The argument for this process is that each element can be scrutinised and adjusted until there is satisfaction that:

- the assumptions are robust, i.e. it is not a kicking the cat question
- the purposes are clear
- the purposes relate to the research questions
- matters of feasibility, such as ethics and time-scale start to get addressed

Arguably, self-aware examination of the rationale of the study is the most important part of the research design process. Get that clear and the rest of the design process will unfold from it. Key themes are the strength of the foundations of the study, clarity of purpose, coherence and feasibility. These will drive the tradeoffs that need to be made when one moves from research question to research design. You will have noticed, that I have not mentioned any affiliation to a particular research method at this point. Research methods and associated forms of analyses are the tools and not the purposes of research.

Tradeoffs

Moving from rationale to research questions and then on to design is an iterative process. For example, there will be limits to the amount of funding available, to access to key informants, to your own skills as a researcher. You need to be clear about what really matters to the integrity of the study, and what might be compromised without damaging the internal logic.

For example, while you may want to obtain a randomised probability sample in order to allow you to make strong claims for external validity, difficulties in access and limited funds may mean that you have to opt for cluster sampling. You then have to set up criteria for the cluster sampling which would allow you to generalise from it. In more interpretative research there may be ethical difficulties in gaining access to key informants, which may lead to a refocusing of the questions, or the selection of a different research site. In a quasi experimental design it is likely to be difficult to match groups with the result that the validity of the study could be threatened and it may seem wise to opt for a single group time series design instead. Tradeoffs are

always part of the research design process when working in natural settings, but you need to be able to offer a reason for them.

The Design Implications of Research Questions

There are two super-ordinate research questions which are not always mutually exclusive. They are:

- what is going on?
- is this better than that?

That is, research studies are either geared at description and perhaps explanation or at judgement. These questions do not produce a simple binary clustering of methodologies associated with different beliefs about knowledge. For example, the 'what is going on?' question can lead to large-scale descriptive studies where the intention is to generalise and a probability sample is necessary. At the same time the second question can be answered by action research. We therefore need to return to the purposes of the research and construct the research question so that it reflects the scope of the study and so that the internal logic of the study can be preserved.

Design Options that Answer 'What Is Going On?'

Case Study Designs

Some research questions calling for case study

- *How are girls' gendered identities negotiated in two primary schools?*
- *What happened to TVEI over five years in one school?*
- *How does reflection on life history promote the recreation of self?*

These have in common that they are studies with clear boundaries, even though data analyses are informed by analyses of conditions beyond the case. They focus on a limited number of sites or people and seek to capture and interpret the sense-making of participants over time. But case study design is not only used in hermeneutic or interpretative research studies. It can also be seen as the starting point for experimental studies, action research and large-scale descriptive studies as it allows for the identification and refining of variables and ensures that these studies are grounded in the field of study. It may also have a purpose later in both experimental and large-scale descriptive designs if close examination of particular phenomena is

important. For example one may be interested in how teachers actually use the new materials that have been introduced to raise pupil achievement.

Crucially case studies need to be able to claim strong internal validity. That is that the account of the case which is produced is trustworthy. Such claims for trustworthiness usually rest on producing a multifaceted representation of the case. Importantly the trustworthiness of internal validity does not mean that external validity or generalisability is easily claimed (see Gomm, *et al* 2000 for a cautious counter argument).

There are of course exceptions to my injunction, particularly where accumulated case study can help to enrich theoretical accounts. For example, Burton's seventy case studies of practising research mathematicians has powerfully informed thinking about the pedagogy of mathematics (Burton, 2001). However, I would suggest, following the need for internal integrity in research design, that it is usually unwise to work within the hermeneutic genre and make claims that are meaningful only within the experimental or large-scale descriptive research genres. To do so is to present a reviewer with the opportunity to downgrade the application on the basis of evidence of what can be seen as a naïve understanding of social science. I am aware that this is an instrumental response and am not suggesting that more complex arguments should not be developed. But the current funding world is not eager to receive them.

Large-Scale Descriptive Studies

Some research questions calling for large-scale descriptive studies

- *What do parents think about mixed and single sex secondary schools?*
- *Do teachers model causal understanding in their discourse when teaching primary science?*
- *How do children's understanding of the past change between the ages of seven and eleven?*

The first two of these questions can be seen as snap-shot studies, while the third is longitudinal. The latter may involve the following of the same cohort of children over four years, but could equally well be addressed by a cross-sectional design if a four year study is not feasible.

One design pitfall that could arise from a question like the first one listed is the suggestion that the findings from the survey are generalisable simply because a

large number of respondents were involved. The findings can only be generalised to the population from which the sample was selected and that generalisation usually demands a probability sample. The questions just listed therefore need to be modified to reflect the populations from which the respondents were sampled, and sampling needs to be taken seriously if external validity is to be claimed. Though, arguments for external validity can be made from samples that attempt to represent key features of the population being sampled. Here we return to purposes, feasibility and tradeoffs.

Studies that Seek Associations

Some research questions calling for association designs

- *What is the connection between self esteem and performance in school?*
- *Are variations in pupil performance systematically related to differences in teaching approaches, school processes and organisational characteristics?*
- *Are effective preventative services for children associated with particular forms of organisation of child welfare services and processes of service commissioning?*

These questions recognise the complexity of the social world and the extent to which linear causality is difficult to trace. The first may call for a fairly simple correlation study, but could involve a more complex factor analysis. The latter two questions demand multilevel modelling, where associations between data from each level of the situation are explored. They belong to the 'what is going on?' category of question because they are not claiming to trace impact. Instead they are producing a complex picture from which inferences may be drawn.

The Value of 'What Is Going On?' Studies

- They can have their own intrinsic value and tell us what we need to find out. They can therefore destabilise our explanations of the world, confirm or enrich them.
- They can be seen as the first stages in a more complex design process through revealing salient variables or by modelling complex inter-relationships of variables (MRC, 2000).

How you value them will depend on your own beliefs about the nature of knowledge and the purposes of social science.

Design Options which Answer 'Is This Better Than That?'

Quasi Experimental Designs

Some research questions calling for quasi experimental designs

- *Does training in social skills and variable group size affect programme outcome and social interaction during an ICT task?*
- *Does the involvement of parents in children's reading improve reading performance in six year olds?*
- *Does the use of music in classrooms increase children's engaged time on task?*

Quasi experiments often fairly small-scale and involve the use of an experimental group and a control group, where both are tested prior to the intervention which is then given to the experimental group and then both tested again afterwards. There is a vast literature on the threats to validity, such as difficulties in matching the groups, that occur in these designs (see e.g. Robson, 1993). There are also considerable ethical issues to be overcome within the designs. However, if your research claims to be able to offer evidence of impact on the group with which you are working then you may find yourself obliged to consider this design. We will look at claims for external validity from experimentation when we examine randomised controlled trials. Quasi experiments in natural settings can rarely achieve probability samples.

Quasi experiments are of course not entirely without virtue. Such studies are often detailed and add to understandings. They may be one element in larger scale explorations or may be part of a process of building a more coherent model to be tested more rigorously later. However, they do need to be treated with caution and claims from them made very tentatively.

It is possible to find quasi experiments occurring naturally. They can be carried out where it is possible to make comparisons with data collected on similar groups at equivalent points in time in previous years. Here the increased amount of school assessment data available to researchers can allow for natural experiments with cross cohort comparisons. However all the caveats around threats to validity still apply to the comparison. Large-scale natural experiments through, for example, evidence collected through large cohort studies are, however, more robust. There, groups can be more carefully matched and differences controlled so that the impact of, for example, social investments in particular communities can be gauged by cross group comparisons.

Single Group Time Series Designs

Some research questions calling for single group time series designs

- *What is the effect of groups or rows in classrooms on pupil performance?*
- *What is the effect of increased teacher wait time after questions on the length and quality of children's responses?*
- *What is the impact of teachers' involvement in informal play on the cognitive quality of subsequent play activities among four year olds?*

Like quasi experiments these seek to assess the impact of an intervention. However, they do not require a different comparison group. Instead the study is designed so that the intervention is at times introduced and at times withheld so that the same group is both experimental and control. These studies need to be run so that the intervention occurs more than once. Also there are dangers of erosion of the usefulness of the control phase as, for example in the second and third questions listed, pupils may sustain their changed behaviours even without the reinforcement of the intervention. However, these designs do overcome some of the ethical concerns associated with quasi experimentation and do ensure that the experiment and control groups are matched.

Randomised Control Trials

Some research questions calling for randomised control trials

- *Do vitamin supplements increase IQ?*
- *Does two hours physical education a week reduce obesity in children?*
- *Do child behaviour contracts with parents lead to increased school attendance?*

Randomised control trials (RCT), unsurprisingly, are rarely used in the social sciences. They are more widely seen in medical research where, for example, the efficacy of drugs versus placebos is assessed. They are often presented as the gold standard of those who believe that research-based knowledge can be applied, like paint to a wall, in a range of settings. As their label suggested they are large-scale experiments where participants are allocated randomly to the experimental and control groups. While the examples given may lend themselves to such trials, the majority of educational research questions need to take more account of context and meaning making than can occur in RCT.

The Value of 'Is This Better Than That?' Studies

- They attempt to answer impact questions.
- Those who invest, whether time or money, in education want to know what works.

Participatory Intervention Studies

I'm including these as a separate category because they can be seen to meet some of the criteria of both types of super-ordinate question. In the context of this paper I will merely note that done well they have the potential to become a useful design option in educational research as a close-to-the-field engaged social science. I will also emphasise that I am not talking primarily about action research, but about growing understandings of ethically engaged participatory research in complex settings. Perhaps the RCBN might like to consider them as a focus of another session.

Research Questions and Planning the Research

Having examined the implications of the research questions selected, the next step is to revisit them and perhaps rework them in ways that acknowledge their limitations. Particularly in relation to claims for external validity and the capacity to assess impact.

The next action is to sequence the questions so that the study achieves an internal coherence by each phase building on the previous one. At this point you need to develop a rationale for each phase of the study, be clear about its intended outputs, how these will inform the subsequent phase and underpin the questions to be asked next. I'm advocating that you present a fixed design to funders, but build in flexibility through highlighting the knowledge building processes of the study. One way of increasing the chances of satisfying a scrutiny committee is to select a mixed design. That is, one that allows for assessment of association or impact, but which also examines process.

During the planning of the study you will further refine your questions and perhaps lose those that are redundant. When you have finished this process you need to do a final check on assumptions, purposes, coherence and feasibility. Then cross your fingers and hope that justice is done.

References

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