

Introduction

Methodology can be one of the most challenging aspects for doctoral researchers. When we conduct research into education and/or technology, we can be confronted with a potentially confusing array of options. This is true even for those using a well-established approach, but can be especially acute if combining approaches in a mixed-methods study or trying to develop a completely new way of doing research. It can also be hard to raise concerns about methods with supervisors and/or peers. There can be a strong sense that, by the time you are a doctoral scholar, this is something you should have mastered. After all, haven't you been learning about your chosen field for a long time by now? Not feeling confident about research methods can be a route to the dreaded 'imposter syndrome'. Arguably, methodology is an instance where we should never feel too comfortable, because we would no longer be critically engaging with those aspects of research that convey and ensure the validity and trustworthiness of the conclusions we draw. Depending on our research interests we might want to explore phenomena "horizontally" across a large quantitative dataset, or "vertically" by generating qualitative descriptions of particular cases. Choosing the right method for what we are interested in is a key part of high quality research, and this requires us to think about the scientific and philosophical foundations of what we do.

In this guide we explore some of these issues with a focus on open research, drawing on insights from researchers within the Global OER Graduate Network (GO-GN). Open practices in research can challenge assumptions about how to

create and share new knowledge. In this handbook, we draw on insights from experienced open researchers to build understanding of research in the open. The advice given applies to all research, but is of particular relevance to those interested in open approaches.

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GO-GN is a network of PhD candidates around the world whose research projects include a focus on open education. These doctoral researchers are at the core of the network; around them, over two hundred experts, supervisors, mentors and interested parties connect to form a community of practice that:

- Raises the profile of research into open education
- Offers support for those conducting PhD research in this area
- Develops openness as a process of research

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PART II

RESEARCH PARADIGMS

A lot of effort can be spent refining and calibrating a research question to fully understand what kind of data could be collected and what kind of validity analysis might offer when answering the question. Researchers rarely proceed by choosing an ontology, epistemology and axiology separately and then deciding which research method to apply. Instead, the starting point will usually be a research question framed within a particular paradigm. It's also common in practice for researchers to identify the method they will use (perhaps determined by the data that is available) and then articulate the theoretical justification behind it by drawing on a paradigm.

Kuhn's (1962) *The Structure of Scientific Revolutions* is one of the most influential works on the philosophy of science, and is credited with introducing the idea of competing paradigms (or "disciplinary matrices") in research. Kuhn investigated the way that scientific practices evolve over time, arguing that we don't have a simple progression from "less knowledge" to "more knowledge" because the way that we approach inquiry is changing over time. This can happen gradually, but results in moments of change where our understanding of a phenomenon changes more radically (such as in the transition from Newtonian to Einsteinian physics; or from Lamarckian to Darwinian theories of evolution).

There are four stages in the cycle of science in Kuhn's approach. Firstly, a pre-paradigmatic state where competing approaches share no consensus. Secondly, the "normal" state where there is wide acceptance of a particular set of methods and assumptions. Thirdly, a state of crisis where anomalies that cannot be solved within the existing paradigm emerge and competing theories to address them follow. Fourthly, a revolutionary phase where some new paradigmatic approach becomes dominant and supplants the old. Schnieder (2009) suggests that the Kuhnian phases are characterised by different kinds of scientific activity.

Newer approaches often build upon rather than replace older ones, but they also overlap and can exist within a state of competition. Scientists working within a particular paradigm often share methods, assumptions and values. In addition to supporting specific methods, research paradigms also influence things like the ambition and nature of research, the researcher-participant relationship and how the role of the researcher is understood.

For studies that look into paradigmatic change within open education research, see Bozkurt (2019) and Weller et al. (2018). Next we will go on to look at methods associated with different research paradigms.

Positivism/Post Positivism

Positivism has its roots in the scientific revolution of the Enlightenment. Positivism is based on the idea that we can come to know facts about the natural world through our experiences of it. The processes that support this are the logical and analytic classification and systemisation of these experiences. Through this process of empirical analysis, Positivists aim to arrive at descriptions of law-like relationships and mechanisms that govern the world we experience.

Positivists have traditionally claimed that the only authentic knowledge we have of the world is empirical and scientific. This was partly a response to the historical primacy of metaphysics as a way to explain the world. Essentially, Positivism downplays any gap between our experiences of the world and the way the world really is and takes it that we determine objective “facts” through the correct methodological combination of observation and analysis. Data collection methods typically include quantitative measurement, which is supposed to overcome the individual biases of the researcher.

Positivism aspires to high standards of validity and reliability supported by evidence, and has been applied extensively in both physical and social sciences. The advantage of such approaches lies in an iteratively expanding evidence base, and a deep epistemological separation between “the knower” and “what is known” which supports the idea that what has been discovered is “true” and not just the opinion of a researcher. However, the criticism often made of Positivism with regard to human and social sciences (e.g. education, psychology, sociology) is that Positivism is scientific; which is to say that in pursuit of “hard” science it fails to recognise that many aspects of human experience don’t conform to this way of collecting data. Similarly, it’s hard to guarantee that research design is ever completely free from human bias.

Kivunja & Kuyini (2017) describe the essential features of Positivism as:

- A belief that theory is universal and law-like generalisations can be made across contexts
- The assumption that context is not important
- The belief that truth or knowledge is ‘out there to be discovered’ by research
- The belief that cause and effect are distinguishable and analytically separable
- The belief that results of inquiry can be quantified
- The belief that theory can be used to predict and to control outcomes
- The belief that research should follow the Scientific Method of investigation
- Rests on formulation and testing of hypotheses
- Employs empirical or analytical approaches
- Pursues an objective search for facts
- Believes in ability to observe knowledge
- The researcher’s ultimate aim is to establish a comprehensive universal theory, to account for human and social behaviour
- Application of the scientific method

Many quantitative researchers now identify as Post-Positivist. Post-Positivism retains the idea that truth should be considered objective, but asserts that our experiences of such truths are necessarily imperfect because they are ameliorated by our values and experiences. Post-Positivists are more likely to use mixed methods and triangulation of quantitative and qualitative data, accepting the problematic nature of “objective” truths. A popular form of Post-Positivism is Critical Realism, which lies between Positivism and Interpretivism.

Positivist Methods: Document coding; Experimental & Quasi-experimental design; Isolating & measuring variables; Statistical analysis; Structured interviews; Surveys

Interpretivism

Often contrasted with Positivism is Interpretivism. The starting point for Interpretivism – which is sometimes called Anti-Positivism – is that knowledge in the human and social sciences cannot conform to the model of natural science because there are features of human experience that cannot objectively be “known”. This might include emotions; understandings; values; feelings; subjectivities; socio-cultural factors; historical influence; and other meaningful aspects of human being. Instead of finding “truth” the Interpretivist aims to generate understanding and often adopts a relativist position.

Qualitative methods are preferred as ways to investigate these phenomena. Data collected might be unstructured (or “messy”) and correspondingly a range of techniques for approaching data collection have been developed. Interpretivism acknowledges that it is impossible to remove cultural and individual influence from research, often instead making a virtue of the positionality of the researcher and the socio-cultural context of a study.

One key consideration here is the purported validity of qualitative research. Interpretivism tends to emphasize the subjective over the objective. If the starting point for an investigation is that we can't fully and objectively know the world, how can we do research into this without everything being a matter of opinion? Essentially Positivism and Interpretivism retain different ontologies and epistemologies with contrasting notions of rigour and validity (in the broadest rather than statistical sense). Interpretivist research often embraces a relativist epistemology, bringing together different perspectives in search of an overall understanding or narrative.

Kivunja & Kuyini (2017) describe the essential features of Interpretivism as:

- The admission that the social world cannot be understood from the standpoint of an individual
- The belief that realities are multiple and socially constructed
- The acceptance that there is inevitable interaction between the researcher and his or her research participants
- The acceptance that context is vital for knowledge and knowing.
- The belief that knowledge is created by the findings, can be value laden and the values need to be made explicit
- The need to understand the individual rather than universal laws
- The belief that causes and effects are mutually interdependent
- The belief that contextual factors need to be taken into consideration in any systematic pursuit of understanding

Interpretivism as a research paradigm is often accompanied by Constructivism as an ontological and epistemological grounding. Many learning theories emphasize Constructivism as an organising principle, and Constructivism often underlies aspects of educational research.

Interpretivist Methods: Case Studies; Conversational analysis; Delphi; Description; Document analysis; Interviews; Focus Groups; Grounded theory; Phenomenography; Phenomenology; Thematic analysis

[INSERT Figure 2]

methodological aspects of Positivism and Interpretivism.

Positivism Interpretivism

Ontology

Being in the world Direct access (Naturalism) Indirect access (Idealism)

Reality Objective, accessible Subjectively experienced

Epistemology

Relation between knowledge
and reality

Objective knowledge of the
world is possible supported by
appropriate method

Objective knowledge of the world is possible supported by appropriate method	Epistemological goals Generalisation, abstraction, discovery of law-like relationships
Knowledge of specific, concrete cases and examples	Basic approach Hypothesis formation and testing
Describing and seeking to understand phenomena in context	Methodology
Focus Description and explanation	Understanding and interpretation
Research Perspective Detached, objective	Embedded in the phenomena under investigation
Role of emotions Strict separation between the cognitions and feeling of the researchers	Emotional response can be part of coming to understanding
Limits of researcher influence	Discovery of external, objective reality – minimal influence
Object of study is potentially influenced by the activity of the researcher	Valued approaches Consistency, clarity, reproducibility, rationality, lack of bias
Insight, appreciation of context and prior understanding	Fact/value distinction Clear distinction between facts and values
Distinction is less rigid, acknowledges entanglement	Archetypal research methods Quantitative (e.g. statistical analysis)
Qualitative (e.g. case study)	

Figure 2. Ontology, Epistemology and Methodology across Positivism and Interpretivism
(adapted from Carson et al., 2001)

Critical / Transformational

This paradigm is most closely associated with the intellectual history that includes Critical Theory, Marxism, Feminism, Critical Pedagogy, and Critical Realism. Within critical approaches, axiology, positionality and values are foregrounded. In contrast with the detached, “objective” observations associated with the positivist researcher, critical approaches make explicit the intention for research to act as a transformative or emancipatory force at a social level. This might involve the way a research project is framed (for instance, as motivated by an interest in social justice) or the kind of data that is collected (e.g. metrics on age, gender, sexuality, or race that can be used to illuminate inequality). Methods used by critical researchers are often interdisciplinary, combining Positivist and Interpretivist techniques to describe contextual and historical factors. In addition, there are some methods which belong distinctively to the critical paradigm (see below).

Critical Methods: Action research; Critical ethnology; Deconstruction; Dialectics; Field research; Textual analysis

Causal Comparative (Explain variation, regression based)

Correlation Based

(Relation between variables)

Data Mining & Analytics

Experimental &

Non-experimental

Longitudinal Analysis

Meta-Analysis

Random Controlled Trials

Quasi-experimental

Survey

Convergent Parallel

Embedded Design

Explanatory Sequential

Exploratory Sequential

Interdisciplinary

Multidisciplinary

Multiphase

Transformative

Mixed Methods

Survey

Action Research

Case Study

Cognitive Interviews

Content Analysis

Design-Based Research

Ethnography

Grounded Theory

Historical

Iterative Design

Meta-synthesis

Narrative

Phenomenology

Survey

Figure 3. The Spectrum of Research Approaches and Paradigmatic Research Methods

Moving from a research paradigm to a specific research design can be a challenging process. In practice, research projects will often involve striking a balance between different elements of data collection and synthesis. It's also important to ensure that the approach taken reflects the research question.

See Ryan (2018) and Pham (2018) for more on the advantages and disadvantages of different paradigms.

Devise idea

Use of blogs, social media etc can be useful to test out ideas and get early feedback. Also can conduct lightweight pilot studies, surveys and find possible collaborations. We developed an Open research agenda through this method.

Situate in field

Open access has been one of the great successes of open research, it means researchers can have access to literature you might not otherwise. Use of open data can also be useful to test viability. A search through openly available research bids can be productive.

Choose appropriate method

New methods based on open approaches are available such as crowdsourcing, data visualisation, or network analysis. There may be different ways to approach the problem than the traditional ones. For example, Weller et al. (2018) used citation analysis to produce an Open Education Guide. Creswell (2014) provides simple criteria for selecting a research approach, based on problems and questions, research experiences, and audience.

Conduct research

The concept of “guerrilla research” (Weller, 2013) begins from the idea that there is lots of free, open material which means it is possible to conduct “lightweight” research without permission. This is often smaller scale work that can be undertaken by an individual, it effectively condenses the whole research cycle: researcher has the idea, finds open data, undertakes some analysis, then blogs it: all without the need for funding or permission. When doing this kind of research it’s important to maintain standards in research ethics.

An open approach which communicates through social media throughout the process can raise profile and lead to collaboration. Katy Jordan’s work with MOOC completion rates was done using open data, which she blogged and visualised using open tools. This was picked up in the USA and led to an invite from Gates Foundation to bid for further work (Jordan, 2017).

Disseminate

Disseminating work via open access brings greater visibility, citations and downloads “open access citation advantage”. But beyond this there are other approaches to dissemination, including blogs, social media and video to get across messages. Development of other outputs beyond the traditional papers, such as infographics, MOOCs, and open tools. The Open Education Research Hub developed an Open Researcher Pack and Open Researcher Handbook as an output to be used by open researchers to increase capacity.

- Farrow, R., Perryman, L.-A., de los Arcos, B., Weller, M. & Pitt, R. (2016). OER Hub Researcher Pack – a toolkit for open education researchers. Open Education Research Hub. <https://oerhub.pressbooks.com/>

Ethical Issues

If you are doing research within an institution there will be regulations and guidelines to follow to ensure that your work meets required ethical standards. The standards are usually set by a local body (e.g. an ethics committee or Institutional Review Board) to meet generally accepted guidelines. Conforming to their guidelines is usually an institutional requirement, but it is also good practice. Even if you are doing research without an institutional affiliation it's a good idea to meet these standards. For instance, CITI certification is a USA standard for conducting human subject research: (<https://about.citiprogram.org/en/homepage/>).

Since it can take several months to get formal ethical approval for a project, it's essential to start the process as soon as possible so this does not impact on your data collection schedule. Auditing the ethical aspects of a project can also be a useful way of refining your research and anticipating issues that could arise downstream.

- See Farrow (2016) for an overview of research ethics in open education
- Consider taking the research ethics training offered by your local institution, or by the National Institutes of Health (USA) <https://ethics.od.nih.gov/training.htm>

You can also approach members of the GO-GN team and wider network for advice on dealing with ethical issues or other matters that arise.

Managing Risk

Risk is part of all kinds of activities. Doing research carries risks characteristic of all projects which require adequate time, money and quality in the final product. Some of these overlap with ethical issues, such as ensuring that people who participate in your research aren't exposed to unnecessary harm and ensuring that consent is informed. These are usually addressed when writing the protocols for a study and included in IRB or ethics committee applications, who will often want to see an ethics plan and copies of the proposed research instruments. Ethical considerations are foregrounded since minimising the risk to people is the most important mitigation. Aside from these, there are interrelated operational issues to consider throughout the research lifecycle.

- Costs: For a lot of doctoral researchers making sure they have adequate funding throughout can be a challenge. This can be a matter of a grant not covering all of the activities required for a project; or can result from overrunning in time. Failure to correctly estimate costs when you start a project can lead to problems downstream. Managing the financial aspects is a key element in successful projects.
- Time: It's common for people writing PhDs or EdDs to feel the pressure of time, especially if they have to balance their studies alongside personal and professional commitments. Doctoral study also involves more self-regulation than other degrees. Managing your time and finding ways of being productive when you need to are important skills for researchers.
- Scope: Doctoral projects can start with a well defined research question but, as the literature is reviewed, the essence of the project begins to evolve. This is no bad thing as it shows that the ideas and concepts are being developed, but if the definition of the project starts to change then care must be taken to ensure that it can still be delivered with the resources available.
- Quality: Quality refers to the standard of the work being delivered, and is to some extent dependent on the other factors. At a practical level, the most important quality consideration is convincing your examiners that you meet your institutional requirements for the award of a doctorate.

At its most general level, risk management is about anticipating problems before they arise and adapting to unforeseen situations. What happens if things don't go as anticipated? You might lose access to a data source that you were relying on. Do you have a plan B? Plan C? What happens if you fall ill and are unable to work on your project? When focused on the academic parts of a project it can be easy to overlook these kinds of considerations.

Ideas for risk mitigation:

- A better research design can mitigate more risk, or build in more contingency.
- Practising agile approaches develops the ability to adapt to changing circumstances while maintaining overall vision.
- Writing a log of risks and their mitigation as a project is underway to record further issues that arise so you can get better at anticipating and solving problems.

Using Technologies

Many modern research techniques use specific software programs to support the process of analysis. Some of these are listed in the table below along with examples of software commonly used in different parts of the research cycle.

This table is intended to be illustrative, not exhaustive or exemplary. There are many hundreds of software options available to researchers, and different packages can appeal for different reasons (such as licensing, relevant to task, user interface, versatility, etc.)

Purpose	Categories	Examples
Search & Discovery	Search Engines	Duck Duck Go
Firefox		
Google		
Google Scholar Alerts		
Internet Explorer		
RSS		
Bibliographic Search	Google Scholar	
Subject-specific databases (e.g. EBSCO, JSTOR, etc.)		
Data Collection	Google Forms	
SurveyMonkey		
Data Analysis	Statistical	Microsoft Excel
SPSS		
Stata		
R		
Qualitative Data Analysis (CAQDAS)		
ATLAS.ti		
Coding Analysis Toolkit (CAT)		
Dedoose		
MAXQDA		
NVivo		
qcoder		
Data Visualization	Blender	
Datawrapper		
QGIS		
Shiny		
Tableau		
Reference Management	Endnote	
Mendeley		
RefWorks		
Zotero		
Manuscript Preparation	Word processor	Google Docs
LateX		
Libre Office		
Microsoft Word		
OpenOffice		
Dissemination	Academic Social Networks	Academia.edu

Google Scholar
Mendeley
ResearchGate
Presentations Google Slides
Microsoft PowerPoint
Prezi

Figure 7. Examples of software used in parts of the research lifecycle

Having to learn how to use new software can be intimidating, and time may need to be set aside for this. Sometimes it's worth undertaking some formal training in the use of software (particularly for data analysis). Effective technology enhanced workflows can make research more efficient as well as enhancing the agency and reach of the researcher.

that I was on the right path. When these data disagreed, I returned to the literature, and method descriptions to develop explanations and further refine my contexts and the contexts of my participants. Action research (similar to design based research) is grounded in practice and the design of experiences. It is personal and contextual and is therefore impossible to describe as objective or replicable. It is often used by educators to examine and improve some element of their teaching practice or the systems in which they work.”

Francisco Iniesto used action research within a Person-Centred Planning (PCP) perspective, designed to empower disabled learners to make their own choices and decisions by placing the individual at the centre of the planning process for improving accessibility in MOOCs:

“Learners were a useful source of data to explore the accessibility barriers and their solutions in using the technology and the learning designs they come up against when interacting with MOOCs. The data from the interviews helped to understand their motivations, the current accessibility barriers they have found, how they reacted to them, and their suggestions for desired solutions”.

Useful references for Action Research: Caruth (2018); Danermark et al. (2002); Freire (1994); Heron & Reason (1997); Ivankova (2015); Kemmis, McTaggart & Nixon (2013); Lewis & Sanderson (2011); Mertler (2014); Smith (1999). Warschauer (2003); Whyte, Greenwood & Lazes (1991)

Case Study

A Case Study is a research method involving a detailed examination and in-depth description of a particular empirical case. This can be done in many different ways, and the unit of analysis can vary (a person, an institution, a country, etc.). Case Studies can include both quantitative and qualitative evidence (Stake, 1995) and typically rely on bringing together many different articles of evidence from various sources to illuminate the case as a whole.

Case Studies benefit from having a developed theoretical framework before data collection begins (Yin, 2003). At the same time, the Case Study approach allows flexibility and can be used in exploratory contexts. This can be attractive to the researcher because it allows data collection to begin immediately (though there remains a need to impose a theoretical structure in the analysis phase). Consequently, Case Studies can be conducted at different levels of formality and replicability (Hetherington, 2013).

The case study research design can be used to test whether theories and models work in real contexts of application (Shuttleworth, 2008) and, conversely, to generate hypotheses and theories.

Case Study: GO-GN Insights

Sarah Hutton used a hermeneutic phenomenological case study to illuminate a direct connection between undergraduate student participation in courses with a participatory OER authorship or open access publishing of student artefacts model, to the development of internal goals and deepened engagement:

“Participatory OER development and an open pedagogical model provide the potential for students to have autonomous control over the development of course content, fostering greater intrinsic motivation, and therefore more successful and transferable learning outcomes. The resulting analysis creates a compelling case for the adoption of OER materials beyond the affordability argument, further advocating for the engagement of students in open scholarship at the undergraduate level.”

Viviane Vladimirschi explored evidence-based guidelines in the context of Teacher Professional Development (TPD) for Brazilian fundamental education public school teachers by undertaking an intervention in one school. The main goal of the OER Development Program was to raise awareness and build teachers' knowledge regarding OER adoption and use:

“The case study methodology used in this research is a very common approach within Educational Studies. It is also a fairly easy method to use and the analysis of multiple sources of data have the potential to not only generate new insights throughout the case study but also generate new theory. Theory-building is very well-suited to new research areas, which was the case of this research. However, there are some disadvantages to using this methodology. First, it is not possible to generalize the findings from a single case study. Second, achieving the balance between producing an overly complex theory or a narrow idiosyncratic theory is quite challenging. Theory generated by case studies must be testable, replicable and coherent. The TPD guidelines generated by this research are testable, replicable and pretty straightforward so I am confident I managed to achieve this balance. The Design Thinking for Educators approach (please note that it is not a method) that I used in this research for the face-to-face workshops I highly recommend to any researcher who wishes to undertake an intervention, especially in the K-12 sector. This approach not only enables researchers to gain more insight into potential solutions for introducing new professional practices, but also affords teachers multiple opportunities to participate in the process of determining how innovation may be best implemented. Its only

3. Design-Based Research and Interventions

Design-Based Research (DBR) is a research methodology used by researchers in the learning sciences. DBR is a concentrated, collaborative and participatory approach to educational inquiry. The basic process of DBR involves developing solutions or interventions to problems (Anderson & Shattuck, 2012). An “Intervention” is any interference that would modify a process or situation. Interventions are thus intentionally implemented change strategies (Sundell & Olsson, 2017). Data analysis takes the form of iterative comparisons. The purpose of this research perspective is to generate new theories and frameworks for conceptualising learning and instruction.

One positive aspect of DBR is that it can be employed to bring researchers and practitioners together to design context-based solutions to educational problems, which have deep-rooted meaning for practitioners about the relationship between educational theory and practice. DBR assumes a timeframe which allows for several rounds of review and iteration. It might be seen as a long-term and intensive approach to educational inquiry which is not really suitable for doctoral work, but increasingly there are examples of this approach being used (Goff & Getenet, 2017).

DBR provides a significant methodological approach for understanding and addressing problems of practice, particularly in the educational context, where a long criticism of educational research is that it is often divorced from the reality of the everyday (Design-Based Research Collective, 2003). DBR is about balancing practice and theory, meaning the researcher must act both as a practitioner and a researcher. DBR allows the collection of data in multiple ways and encourages the development of meaningful relationships with the data and the participants. DBR can also be used as a practical way to engage with real-life issues in education.

DBR & Interventions: GO-GN Insights

Roberts (2019) used a design-based research (DBR) approach to examine how secondary students expanded their learning from formal to informal learning environments using the open learning design intervention (OLDI) framework to support the development of open educational practices (OEP).

“We took some methods and research classes in my EdD program. I took Design-based research (DBR) and found it confusing and overwhelming. As such, I decided to take an extra course on case study research because it seemed to speak to me the most. In my mind I thought I could compare and contrast a variety of secondary school teachers integrating open ed practices. Through my initial exploration, I discovered that in my school district (30,000 + students), there are many teachers using OEP, but they were not interested in working “with” me, they wanted me to watch and observe them teach – then write about it. I began to understand that not only did I want to consider focusing my research on an emerging pedagogy (OEP) I also realized that I wanted to consider newer participatory methods. I did not think of DBR in this context when I took the initial course.

“I knew I wanted to work with a teacher and complete some kind of intervention in order to support them in thinking about and actually integrating OEP. DBR was suggested to me multiple times, but I kept pushing it away. At the same time many of my supervisory committee and my peers did not think I should even consider DBR. I discovered that many researchers don’t know about it and are fearful of it. As I learned, when you do choose DBR, it is kind of like being an open learner in that you believe in the philosophy behind the DBR process. You just “are” a DBR researcher and educator.

“It took many hours of reflection, reading about different examples of DBR, going to workshops and webinars about DBR in order to really see the possible benefits of DBR (collaborative, iterative, responsive, flexibility, balance between theory/ practice and relationships based) to get me to take the plunge...” (Verena Roberts)

Literature Review, Systematic Review and Meta-analysis

Literature reviews can be a good way to narrow down theoretical interests; refine a research question; understand contemporary debates; and orientate a particular research project. It is very common for PhD theses to contain some element of reviewing the literature around a particular topic. It's typical to have an entire chapter devoted to reporting the result of this task, identifying gaps in the literature and framing the collection of additional data.

Systematic review is a type of literature review that uses systematic methods to collect secondary data, critically appraise research studies, and synthesise findings. Systematic reviews are designed to provide a comprehensive, exhaustive summary of current theories and/or evidence and published research (Siddaway, Wood & Hedges, 2019) and may be qualitative or quantitative. Relevant studies and literature are identified through a research question, summarised and synthesized into a discrete set of findings or a description of the state-of-the-art. This might result in a 'literature review' chapter in a doctoral thesis, but can also be the basis of an entire research project.

Meta-analysis is a specialised type of systematic review which is quantitative and rigorous, often comparing data and results across multiple similar studies. This is a common approach in medical research where several papers might report the results of trials of a particular treatment, for instance. The meta-analysis then statistical techniques to synthesize these into one summary. This can have a high statistical power but care must be taken not to introduce bias in the selection and filtering of evidence.

Whichever type of review is employed, the process is similarly linear. The first step is to frame a question which can guide the review. This is used to identify relevant literature, often through searching subject-specific scientific databases. From these results the most relevant will be identified. Filtering is important here as there will be time constraints that prevent the researcher considering every possible piece of evidence or theoretical viewpoint. Once a concrete evidence base has been identified, the researcher extracts relevant data before reporting the synthesized results in an extended piece of writing.

Literature Review: GO-GN Insights

Sarah Lambert used a systematic review of literature with both qualitative and quantitative phases to investigate the question "How can open education programs be reconceptualised as acts of social justice to improve the access, participation and success of those who are traditionally excluded from higher education knowledge and skills?"

"My PhD research used systematic review, qualitative synthesis, case study and discourse analysis techniques, each was underpinned and made coherent by a consistent critical inquiry methodology and an overarching research question.

"Systematic reviews are becoming increasingly popular as a way to collect evidence of what works across multiple contexts and can be said to address some of the weaknesses of case study designs which provide detail about a particular context – but which is often not replicable in other socio-cultural contexts (such as other countries or states.) Publication of systematic reviews that are done according to well defined methods are quite likely to be published in high-ranking journals – my PhD supervisors were keen on this from the outset and I was encouraged along this path.

"Previously I had explored social realist authors and a social realist approach to systematic reviews (Pawson on realist reviews) but they did not sufficiently embrace social relations, issues of power, inclusion/exclusion.

Ethnography

Ethnography is an explanatory account of life experiences in a social system based on detailed observations of what people do and express (Marcus, 1995). Ethnography aims to study social and cultural aspects of a society and the researcher focuses to collect information for that. It focuses on behaviour of people with respect to the social setup they live in. This approach is highly immersive and provides one with a highly transparent and original account of information allowing the culture to speak for itself (Khan, 2018). The behaviour of the participants in each social situation is examined along with the group members' interpretation of such behaviour (Wolff, 2015). Ethnography uses both qualitative and quantitative research methods when studying specific groups that form a part of a larger complex society (Falzon, 2005).

Ethnography: GO-GN Insights

Chtena (2019) has developed a multi-sited ethnographic design including interviews, observations and a system analysis approach to track the development and implementation of open textbooks in Californian higher education. What makes multi-sited ethnography attractive is the prospect of systematically linking observations seemingly distant geographical, institutional, organisational, cultural, technological and cognitive settings. In this case, multi-sited ethnography does not set out from a particular site, but rather from the construction of specific social practices and phenomena within a relational network that connects several places (e.g., institutions, people, objects, projects and discourses).

"The study demonstrates that binary conceptualizations of openness (i.e., "open" vs "closed") based on formal characteristics (e.g., licensing) are not reflective of how people "do" openness in practice, and that different needs, values, priorities and interpretations of "open" give rise to different artifacts in different disciplines and institutional settings. Moreover, the study shows how the frictions of open textbook production, circulation, and maintenance belie the fantasy of open textbooks as a dynamic interface prime for adaptation, modification and remix. What makes multi-sited ethnography attractive is the prospect of systematically linking observations from seemingly distant geographical, institutional, organizational, cultural, technological and cognitive settings. The promise of multi-sited ethnography is, far beyond the simple multiplication of field-sites, a new way of describing systemic relationships and the interdependency of the many 'parts and subparts' of the sociotechnical infrastructure in which technology, such as open textbooks, is embedded. A concern with multi-sitedness, on the other hand, is that by spreading the ethnographer too thinly across space, it jeopardizes anthropology's commitment to depth and thick description. If, especially, the overall duration of the fieldwork remains the same as in single-sited research, it will only be possible to visit and investigate each site comparatively briefly, and build relatively superficial relationships with key informants. Thus, one of the key strengths of ethnography is in danger of being lost. While this is an important corrective, I believe that, in the context of this study, the benefits of multi-sitedness outweigh the potential disadvantages. Since I followed the movement of content and ideas through the open textbook ecosystem, a systemic, multi-locale, multi-entity and multi-platform approach is fitting.

"My advice for anyone interested in multi-sited ethnography is to make sure they have a really good grasp of ethnographic methods, as well as systems theory. It is a lot harder, in many ways, than single-sited ethnography – harder to plan and harder to execute, so be strategic and be prepared to get outside your comfort zone. I wouldn't recommend this method to anyone who's trying to finish their project in a very short amount of time. I also believe that it necessitates a highly interdisciplinary outlook and training."

Walter Butler used Netnography (online Ethnography) to support research into virtual communities of practice and

not speak of the intimate as his sensation, but speaks of his social "I". Our methodological approach also integrates the virtual ethnographic method (Hine, 2000), also called digital ethnographic methods, which make use of Internet and digital technologies for the collection and analysis of research data. Digital ethnography allows us to take advantage of the potential that technologies are offering to project knowledge about reality in contemporary society in greater depth, both in terms of the definition of the object of knowledge itself and the methodological design to access it. It is in this sense that digital ethnography techniques are incorporated into the design of my research. Within the framework of high technological availability scenarios, methods of the data collection techniques typical of the ethnographic methodology can be expanded to include web conferences, chat, videoconferences, forums, among others. From the use of this type of resources, digital narratives can be obtained, stories by subjects conceived as spokespersons or social representatives of the groups and communities."

Hélène Pulker followed Constructivist Grounded Theory methods of data collection and analysis to conduct an inductive qualitative study into the impact of reuse and adaptation of OER among language teachers.

"Regardless of the chosen method, there are no absolute rules or formula for attending to qualitative data analysis or any ways to replicate perfectly the researcher's analytical thought processes. The available guidelines and suggestions are not rules and therefore each qualitative researcher will have to find their own way through the data. As a result, each qualitative analysis is unique and therefore makes your research original. However, it relies on the researcher's skills, who constantly has to make judgements and exercise creativity while applying the guidelines.

"The analysis depends on the analytical intellect and flair of the researcher and the human factor is the great strength and the fundamental weakness of qualitative enquiry. The great advantage is the flexibility. Throughout my data collection and analysis, I continuously analysed and questioned data through coding, re-coding, comparing codes, and finding sub-categories to arrive at the final analysis. This process allowed me to look for the emergence of unexpected trends and to make connections between the codes. As I observed and questioned the data, it became clear that participants were experiencing OER reuse in different ways. I could identify some similarities across a number of participants and was able to identify three different types of OER users, each having different characteristics. From that point onwards, I was able to explain the categories by comparing data from each type of user's point of view and I arrived at a more comprehensive analysis of the reuse process that emerged from my study. The robustness of the data analysis lies in the cross comparison of categories and types of user, as I explain in my thesis.

"However, the big downside is the complexity of finding your way through the data because there are no preconceived codes or theoretical framework you can rely on. The codes developed in the analysis are largely provisional to start with and very often subject to much change. The principles of interpretative coding are not as straightforward a procedure as I had originally imagined. Coding for meaning is nebulous and has posed challenges. The gradual formation of codes and categories was, in my analysis, rather a tentative process whereby I could see that putting different 'pieces' together would yield different meanings. Thus, my experience was often one of going round and round the data. A further contributory factor to the difficulty in deciding on the label for a code was the absence of an overarching framework for looking at the data. In other words, I did not have an overarching view of which concepts might be included in the schema. I would recommend students who wish to do grounded theory to think about the differences between inductive and deductive analysis and be very sure that they do not want to rely on theoretical framework to start with, because the grounded theory analysis takes a long long time, and when the researcher has possible avenues to explore to start with, it is easier to handle a set of data. I would also recommend the use of a data analysis software, even though the Constructivist grounded theorists advise against this for epistemological reasons."

phenomenography, it is the phenomenographic focus on variation of experience, rather the focus on essence of experience made by phenomenologists, that made a difference to which methodology and methods I chose.”

Marjon Baas conducted interviews in both the first and the fourth study of her research. In the first study, interviews were used to explore teachers' current practices with OER and their need for support. The questions in the interview guide were based on the different layers of the OER Adoption Pyramid. Baas used additional interviews to gain more insights into teachers' perceived value of an OER Community of Practice.

“A mixed method approach was adopted in which a questionnaire was sent out to examine the current state of affairs within the context of my study. Afterwards, interviews were conducted to explore teachers' current practices with OER and their need for support. The instruments were designed based on the different layers of the OER Adoption Pyramid (Cox & Trotter, 2017). We used additional interviews to gain more insights into teachers' practices because previous research showed that there is still a lot of ambiguity around the term OER and so-called ‘dark-reuse’ could be prevalent which cannot be measured in quantitative measurements alone.

“The second study was a qualitative study to improve our understanding how teachers assess OER and how they move from initial assessment to adoption. In this qualitative study teachers were asked to collaboratively assess OER within their teaching subject. The aim of our study was to characterize what elements teachers take into account when assessing OER quality and not to generalize what defines a quality OER. We also explored by asking teachers to create an association map before and after the three months in which teachers could explore OER, if their perception changed during. We choose this qualitative design because it provides rich insights into the elements teachers' take into account when assessing OER rather than a quantitative measurement in which teachers are asked to self-reflect how they assess OER.

“The follow-up study focuses on a subject community in which we will make use of a mixed-methods design. Qualitative data will be collected through interviews with teachers based on the five phases of the OER re-use process as defined by Clements and Pawlowski (2012). This data will be used to analyze how teachers make use of the subject community.”

Viviane Vladimirschi used focus groups to assess the overall effectiveness of the intervention in her research. These focus group conversations consisted of semi-structured, open-ended questions.

“Focus groups are excellent for gaining new insights and assessing interventions. In my opinion, the biggest challenge is knowing what questions to ask in order to obtain useful data. I used Guskey's (2002) Multilevel Evaluation Framework to guide the semi-structured, open-ended interview questions. In my opinion, Guskey's model is effective and straightforward for educational interventions.

“Although the use of mixed methods can be excellent to collect and compare different sources of data enhancing the quality of data and promoting convergence and confirmation of findings, the researcher must feel comfortable with and be knowledgeable with both quantitative and qualitative data collection and analysis. I would also not recommend quantitative data methods for small sample populations.”

Useful references for Interviews & Focus Groups: Ayres (2008); Bailey (1994); Bloor (2001); Morgan (1996)

“Although my personal tendency is toward qualitative methods, I found the requirement of a mixed method approach for my research extremely beneficial as a novice. I was required to learn and practice skills of both approaches and to learn how different types of data interact and combine to magnify insight. When qualitative and quantitative data agreed, this generated confidence for me that I was on the right path. When these data disagreed, I returned to the literature, and method descriptions to develop explanations and further refine my contexts and the contexts of my participants.”

Virginia Power is investigating the social, cultural and technical factors that mediate the relationship between social media affordances and the use of repositories for OER (ROER) using ‘cultural probes’ to collect data from 45 participants.

“I wanted to find a method that would provide evidence of the psychology involved in using social media affordances (likes, ratings, reviews) and felt that a largely qualitative method would be useful. I had wanted to undertake some socio-technical system design but this is likely to happen once the thesis is finished to test out findings.

“A largely qualitative approach was used, with cultural probes selected as the method for data collection. Cultural probes (Gaver et al., 1999) utilise tools and tasks enabling the participant to reflect on their working environment (either physical or virtual) facilitating a deeper insight into motivation and use of the environment with limited researcher influence. Consequently, two elements were chosen as potentially suitable for data collection – a research journal for self-reflection and screencasts that would elicit both audio and video recordings from each participant.”

“Cultural probes if properly designed will often give users the opportunities to record their thoughts and feelings in their own particular context. They also provide users with independence and minimal interference from the researcher. Often cultural probes can be used to triangulate against other independent data, such as focus groups or usability studies with the aim to improve reliability. Users need to be clearly briefed on the purpose of the research and exactly what they need to do and the amount of time needed to transcribe the data should not be underestimated.”

Paula Cardoso included interviews and surveys in her research conducted to understand the perceptions and practices of faculty in public higher education institutions in Portugal towards OERs.

“We understood it was advantageous to articulate qualitative and quantitative techniques, as it may reveal or deepen the study of some dimensions of the same reality. In this research, the mixed methods approach, with sequential character, was useful in a double perspective: on the one hand, it allowed us to articulate different techniques to deepen the study of some dimensions in analysis, and on the other hand, it also presented advantages in terms of data triangulation. Finally, using mixed methods allows the study of a given phenomenon in a broader and deeper perspective, in order to obtain richer and more varied data, which can be better explored, giving greater strength and rigor to research.”

Useful references for Mixed Methods: Creswell (2009); Dominguez & Hollstein (2014); Edwards (2010); Ivankova (2015); Morgan (2014); Shorten & Smith (2017); Tashakkori & Teddlie (2010)

Phenomenography

Phenomenography is a qualitative research methodology that investigates the qualitatively different ways in which people experience something or think about something (Bowden et al., 1997; Ashworth & Lucas, 1998). Phenomenography aims at studying the variation of ways people understand phenomena in the world. In simpler terms, phenomenography explores the variation in how different people conceive of learning experiences (Akerlind, 2005). Those who design and deliver professional learning can use empirical research rather than anecdotal evidence to inform the development and delivery of meaningful professional learning experiences.

Phenomenography: GO-GN Insights

Penny Bentley used phenomenography to explore the experience of professional learning through open education (PLOE) from the perspective of teachers as adult learners. The study was conducted to inform the design and delivery of meaningful professional learning to other teachers seeking to learn about STEM education on the open Web.

“Phenomenography is not a widely used methodology. There is variation in literature on phenomenography around aspects of theory, methodology and method. This made it difficult for me, as a novice, solo researcher to comprehend and discuss with my supervisors who are not experts in the field. It is time consuming to conduct phenomenographic data analysis on a huge amount of data.

“I wanted to explore, understand and describe the different ways teachers experienced PLOE, from their perspective. This was an interpretive activity, situating my research in the interpretive paradigm. Also, describing the perspectives of teachers, in terms of what PLOE means to them, was research of a qualitative nature. However, there are a range of methodologies within the interpretive paradigm, such as ethnography, grounded theory, phenomenology and phenomenography.”

In order to justify my choice for this study I needed to consider the differences between these methodologies. I was not studying the culture of a group of teachers using the open Web to learn about STEM education (ethnography), although culture may be an aspect of how the phenomenon of PLOE is experienced. Nor was I generating a theory to explain the cause of social processes and interactions when teachers engaged in PLOE (grounded theory), although I was interested in understanding and describing the different ways these processes and interactions are experienced. Even though human experience is the focus of phenomenology and phenomenography, it is the phenomenographic focus on variation of experience, rather the focus on essence of experience made by phenomenologists, that made a difference to which methodology and methods I chose.

“Phenomenography enables me to describe variation in the lived experiences of PLOE from the perspective of teachers experiencing this phenomenon. This is important since much of the literature on professional learning does not include the different views of teachers, but focuses on aspects of professional learning that others consider important. It is this focus on variation of experience, particularly the meaning of experience, that I see as having a practical application to the professional learning of Australian teachers of STEM subject areas.

“If you are new to research, and working alone, I would advise you not to conduct a phenomenographic study unless you have people who are familiar with this methodology to support you. Give yourself plenty of time and limit the number of participants what is recommended in the literature. If you don’t know any phenomenographers in your institution, seek out networks of practice on social media. Read the seminal literature on phenomenography, then read it again.”

A phenomenographic data collection was conducted by Chrissi Nerantzi using a collective case study approach to gain

means to them, and provide a comprehensive description while recognizing the importance of social structure and context (Moustakas, 1994). Social structures are represented through the individual's interpretation and construction of meaning in the world, and this social meaning construction can be studied empirically by the researcher (Aspers, 2009). The phenomenological approach aims to understand the general or typical essential structures of individual experience, based on the descriptions of those experiences. In doing so, I seek to understand not what 'is' in the world but to understand why conscious individuals say that something 'is' (Giorgi, 1997).

"Trialing research questions can strengthen a phenomenological study as it allows one to engage with and become familiar with the research space, learn about the context in which individuals of interest work, and gather feedback from potential participants or those operating in similar situations (Aspers, 2009). The interview questions, conducted using the Zoom synchronous meeting service, were trialed first with my supervisor, who uses open educational practices in her undergraduate and graduate teaching. My supervisor was able to provide some feedback on the questions from her perspective as a faculty member. As a result of this process, we adjusted some of the language and sequencing of the questions."

Jessica O'Reilly includes an interpretivist phenomenological analysis (IPA) methodology in her study of OER enabled pedagogy.

"The idiographic focus of the IPA approach fits very well with my research question, which is interpretivist, emergent, and very focused on contextualized individual experience and sensemaking. One clear advantage that I see is the combination of psychological, interpretive, and idiographic "lenses" within the approach. IPA is well-suited, I think, to questions concerned with the experiences of a fairly concentrated and homogenous participant sample. A potential disadvantage to my IPA study will be the reliance upon interview data and the huge amount of work involved with transcription and analysis."

Useful references for Phenomenology: Clandinin & Connelly (2004); Friesen, Henriksson & Saevi (2012); Giorgi (1997); Gray (2014); Manen (2018); Maxwell 2013); Smith, Flowers & Larkin (2009)

Social Network Analysis

Social media analytics is the process of gathering and analysing data from social networks. (Scott, 2000). Social Network Theory is the study of how people or groups interact with others inside their network. The three types of social networks are ego-centric networks, socio-centric networks, and open-system networks (Borgatti, & Lopez-Kidwell, 2011).

The objective of social network analysis (SNA) is to understand the interactions between each of the members of the network. These connections, called relationships or ties, are at the heart of what this analysis seeks to study and understand. The reasons why the individuals interact and how they interact their level of closeness (Borgatti et al., 2009). SNA provides both qualitative and quantitative data of online learning communities.

Social Network Analysis: GO-GN Insights

Aras Bozkurt used SNA to track digital footprints of online participants and map and visualize online learning community.

“For data collection and analysis, social network analysis, interview, observation and document analysis was used. Research findings were interpreted with the perspectives of connectivism, rhizomatic learning and social network theory.

“According to the demographic findings of the research, learners in connectivist massive open online networks are distributed globally in time and place, many participate from English spoken countries, and 89% of the learners come from low-context cultures while 11% comes from high context cultures. Participants are individuals that are somehow connected to the education field; or students or instructors in higher education. When examined in terms of interaction patterns, unified-tight crowd community pattern was observed in connectivist massive open online course networks. The nodes in this kind of networks have strong connections to one another and significant connections that bridge sub-groups. Learners of this type of networks tend to communicate with each other frequently and share a common interest. These networks are composed of a few dense and/or densely interconnected groups where conversations usually swirl around and increase its density towards the center, involving different people at different times.

“Research findings additionally demonstrated that connectivist learning environments require relatively few hops to communicate and interact with the learning community, and confirmed the theses proposed in the Small World Phenomenon and the Global Village. SNA provides both qualitative and quantitative data of online learning communities. However, it fails to provide phenomenological qualitative data.”

Some researchers collect this phenomenological data separately. For example, in addition to analysing network structures, Katy Jordan held co-interpretive interviews with 18 participants, to understand the significance and construction of their academic social networks.

“My PhD study addressed the question of how academics use dedicated social networks through mixed methods social network analysis. First, an online survey was conducted to gain contextual data and recruit participants ($n = 528$). Second, ego-networks were drawn up for a sub-sample of 55 academics (reflecting a range of job positions and disciplines). Ego-networks were sampled from an academic SNS and Twitter for each participant. Third, co-interpretive interviews were held with 18 participants, to understand the significance of the structures and how the networks were constructed.

“My methods changed direction (subtly) twice during the course of my PhD. The focus was always on the

structure of academic online social networks, but the level at which I looked at the networks changed. Originally I had planned to look at networks at a larger scale – such as the entire UK HE sector on Academia.edu. I changed tack to focus on academics' individual (personal, ego-) networks instead, for two reasons. First, ethically, it is a lot more sound to capture an ego-network – at this level, you can get the participants' consent. Second, in order to be able to understand the structures involved. For example, I could see interesting structural features in the OU networks, but network metrics can only tell you so much. By sampling personal networks, the structures could be meaningfully discussed with the participants themselves, in order to understand the significance and characteristics of different network features from their perspective. Combining digital (scraped) data with co-interpretive interviews offers much greater insight into the digital, open practices behind the network structures.”

Useful references for Social Network Analysis: Borgatti & Lopez-Kidwell (2011); Borgatti et al. (2009); Dominguez & Hollstein (2014); Edwards, G. (2010); Hansen, Shneiderman & Smith, (2010); Jordan (2018); Kozinets (2015); Newman (2018); Scott (2000); Wenger, Trayner & de Laat (2011)

Surveys & Questionnaires

Surveys involve asking a series of questions to participants. They can be administered online, in person, or remotely (e.g. by post/mail). The data collected can be analysed quantitatively or qualitatively (or both). Researchers might carry out statistical surveys to make statistical inferences about the population being studied. Such inferences depend strongly on the survey questions used (Solomon, 2001) meaning that getting the wording right is crucial. For this reason, many test out surveys in pilot studies with smaller populations and use the results to refine their survey instrument.

Sampling for surveys can range between self-selection (e.g. where a link is shared with members of a target population in the hope they and others contribute data and share the survey) through to the use of specialised statistical techniques (“probability sampling”) that analyse results from a carefully selected sample to draw statistical conclusions about the wider population. Survey methodologies therefore cover a range of considerations including sampling, research instrument design, improving response rates, ensuring quality in data, and methods of analysis (Groves et al., 2011).

One common question format is to collect quantitative data alongside qualitative questions. This allows a more detailed description or justification for the answer given to be provided. Collecting ordinal data (e.g. ranking of preferences through a Likert scale) can be a way to make qualitative data more amenable to quantitative analysis. But there is no one superior approach: the crucial thing is that the survey questions and their phrasing aligns with the research question(s) correctly.

Surveys are widely used in education science and in the social sciences more generally. Surveys are highly efficient (both in terms of time and money) compared with other methods, and can be administered remotely. They can provide a series of data points on a subject which can be compared across the sample group(s). This provides a considerable degree of flexibility when it comes to analysing data as several variables may be tested at once. Surveys also work well when used alongside other methods, perhaps to provide a baseline of data (such as demographics) for the first step in a research study. They are also commonly used in evaluations of teaching & learning (i.e. after an intervention to assess the impact). However, there are some noteworthy disadvantages to using surveys. Respondents may not feel encouraged to provide accurate answers, or may not feel comfortable providing answers that present themselves in a unfavourable manner (particularly if the survey is not anonymous). “Closed” questions may have a lower validity rate than other question types as they might be interpreted differently. Data errors due to question non-responses may exist creating bias. Survey answer options should be selected carefully because they may be interpreted differently by respondents (Vehovar & Katja Lozar, 2008).

Surveys & Questionnaires: GO-GN Insights

Marjon Baas collected quantitative data through a questionnaire among teachers within an OER Community of Practice to explore the effect of the activities undertaken to encourage the use of the community on teachers’ behaviour in relation to OER.

“I used several theoretical models (Clements and Pawlowski, 2012; Cox and Trotter, 2017; Armellini and Nie, 2013) to conceptualise different aspects (that relate to) OER adoption. This enabled me as a researcher to design my specific research instruments.”

Judith Pete had a deliberate selection of twelve Sub-Saharan African universities across Kenya, Ghana and South Africa with randomly sampled students and lecturers to develop a representative view of OER. Separate questionnaires were used for students (n=2249) and lecturers (n=106).

“We used surveys to collect data across three continents. Online survey tools were very helpful in online data

collection and, where that was not possible, local coordinators used physical copies of the survey and later entered the information into the database. This approach was cost-effective, versatile and quick and easy to implement. We were able to reach a wide range of respondents in a short time. Sometimes we wondered, though, whether all those who responded had enough time to fully process and understand the questions that they were being asked. We had to allocate a significant amount of time to curating the data afterwards."

Samia Almousa adopted Unified Theory of Acceptance and Use of Technology (UTAUT) survey questionnaire, along with additional constructs (relating to information quality and culture) as a lens through which her research data is analysed.

"In my research, I have employed a Sequential Explanatory Mixed Methods Design (online questionnaires and semi-structured interviews) to examine the academics' perceptions of OERs integration into their teaching practices, as well as to explore the motivations that encourage them to use and reuse OERs, and share their teaching materials in the public domain. The online questionnaire was an efficient and fast way to reach a large number of academics. I used the online survey platform, which does not require entering data or coding as data is input by the participants and answers are saved automatically (Sills & Song, 2002). Using questionnaires as a data collection tool has some drawbacks. In my study, the questionnaire I developed was long, which made some participants choose their answers randomly. In addition, I have received many responses from academics in other universities although the questionnaire was sent to the sample university. Since I expected this to happen, I required the participants to write the name of their university in the personal information section of the questionnaire, then excluded the responses from outside the research sample. My advice for any researcher attempting to use questionnaires as a data collection tool is to ensure that their questionnaire is as short and clear as possible to help the researcher in analysing the findings and the participants in answering all questions accurately. Additionally, personal questions should be as few as possible to protect the identity and privacy of the participants, and to obtain the ethical approval quickly."

Olawale Kazeeem Iyikolakan adopted a descriptive survey of the correlational type. The author research design examines the relationship among the key research variables (technological self-efficacy, perception, and use of open educational resources) and to identify the most significant factors that influence academic performance of LIS undergraduates without a causal connection.

"The descriptive research design is used as a gathering of information about prevailing conditions or situations for the purpose of description and interpretation (Aggarwal, 2008). My research design examines the relationship among the key research variables (technological self-efficacy, perception, and use of open educational resources) to identify the most significant factors that influence academic performance of Library & Information Science undergraduates without a causal connection. Ponto (2015) describes that descriptive survey research is a useful and legitimate approach to research that has clear benefits in helping to describe and explore variables and constructs of interest by using quantitative research strategies (e.g., using a survey with numerically rated items).

"The reason for the choice of descriptive survey research instead of ex-post-facto quasi-experimental design is that this type of research design is used to capture people's perceptions, views, use, about a current issue, current state of play or movements such as perception and use of OER. This research design comes with several merits as it enables the researcher to obtain the needed primary data directly from the respondents. Other advantages include: (1) Using this method, the researcher has no control over the variable; (2) the researcher can only report what has happened or what is happening. One of the demerits of this type of research design is that research results may reflect a certain level of bias due to the absence of statistical tests."

Useful references for Surveys & Questionnaires: Aggarwal (2008); Fowler (2014); Groves et al., 2011); Lefever, Dal &

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