

Epistemological implications of a ‘convergent parallel mixed methods’ research design

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Abstract

The philosophy of an educational research project is important to reflect upon and declare but can often be left unexplained. To address this area of thought, this study discusses the implications of the epistemological paradigm of a ‘convergent parallel mixed methods (CPMM)’ research design. An actual research piece was chosen to provide a context for the study. How the epistemological paradigm impacts upon data collection and analysis techniques, and therefore the conclusions of the research, was examined. The design was then critiqued from a biblical Christian perspective, including ideas for how it might be reformulated and used within a biblical epistemological paradigm. A significant aspect of such a way of thinking is that educational research is robust and rigorous in its process with an important aspect of growing personally and professionally in an understanding of God: who He is, of His creation, including humanity, and the interrelationships between each of these.

Introduction

In educational research a paradigm is essentially the researchers’ worldviews, including the way they carry out research (Creswell & Plano Clark, 2007, pp. 20-21; Kivunja & Kuyini, 2017; Mackenzie & Knipe, 2006). According to Basit (2010), paradigms are: “models, perspectives or conceptual frameworks that help us to organise our thoughts, beliefs, views and practices into a logical whole and consequently inform our research design” (pp. 14-15). Thus,

each research design is rooted in a philosophical foundation with epistemological, ontological and axiological pre-suppositions and assumptions (Kivunja & Kuyini, 2017; Lyon, 2017). Ontology studies the nature of reality and the philosophical assumptions involved are important for knowing how to make meaning of data. Axiology studies values, thus in research these are the values that guide such studies. It involves explaining, assessing and understanding concepts of correct methodological conduct of the research. This process also includes dealing with ethical issues that need to be examined when preparing a research proposal (Kivunja & Kuyini, 2017, pp. 27-29). Creswell (2013, pp. 35-38) has adapted a table from Lincoln et al. which focuses on ontological, epistemological, axiological, and methodological stances and issues on research taken by positivists, social constructivists, postmodernists, pragmatists and critical theorists. It is clear that their thoughts on origins and being, knowledge, values and research methods is quite different to that of a biblical outlook (Beech, 2014). This study includes Christian theological foundations which are more holistic and integrated, and these will be discussed later.

The scope of this study is to focus on epistemological assumptions. Epistemology is the study of knowledge. In research, epistemology explains how one comes to know something; how one knows the truth; or in other words what counts as knowledge in the world (Kivunja & Kuyini, 2017, p. 27). In this paper knowledge is understood as justified true belief (from Theory of Knowledge), but also recognising that this definition has limitations (Van de Lagemaat, 2017, pp. 22-39). Knowledge can be described further using several aspects. For example, types of knowledge which includes: firstly

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knowledge by acquaintance – *knowledge of*, which is first-hand knowledge based on perception; secondly practical knowledge – *knowledge how*, which is skills based; and, lastly *knowledge by description* – knowledge that, a second-hand knowledge coming from language. Experiential learning is the combination of the first two types of knowledge. The knowledge acquired is used to broaden and deepen understanding in a particular research topic or field. In designing and conducting research it is appropriate for researchers to have a project section entitled ‘philosophical assumptions’ to communicate their worldview (Creswell & Plano Clark, 2007, p. 26)

The research design chosen to be studied here is the convergent parallel (concurrent triangulation) mixed methods approach (Creswell, 2014, pp. 219-223). When the following discussion requires focus, the research paper used for this purpose is one titled ‘The influence of PBL on students’ self-efficacy beliefs in chemistry’ (Mataka & Kowalske, 2015). Firstly, this study report reviews the convergent parallel research design, followed by an epistemological analysis of the research design, then finally addresses biblical Christian perspectives of the epistemological underpinnings.

Review of the ‘Convergent Parallel Mixed Methods’ research design

There have been numerous definitions for mixed methods research (MMR), each with different foci, such as research design, purpose, philosophy, and research processes (Creswell & Plano Clark, 2011, pp. 2-6). A currently popular definition is one that Johnson, et al. (2007) established from a composite of nineteen different definitions:

Mixed methods research is the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration. (p. 123)

However, since any definition of MMR has a variety of very different viewpoints a suitable alternative proposed by Creswell and Plano Clark (2011) is one based on core characteristics of MMR:

- collects and analyses, both persuasively and rigorously, qualitative and quantitative data (based on research questions);
- mixes (or integrates or links) the two forms of data concurrently by combining them (or merging them), sequentially by having one build on the other, or embedding one within the other;
- gives priority to one or to both forms of data

- (in terms of what the research emphasizes);
- uses these procedures in a single study or in multiple phases of a program of study;
- frames these procedures within philosophical worldviews and theoretical lenses; and
- combines the procedures into specific research designs that direct the plan for conducting the study. (pp. 2-6)

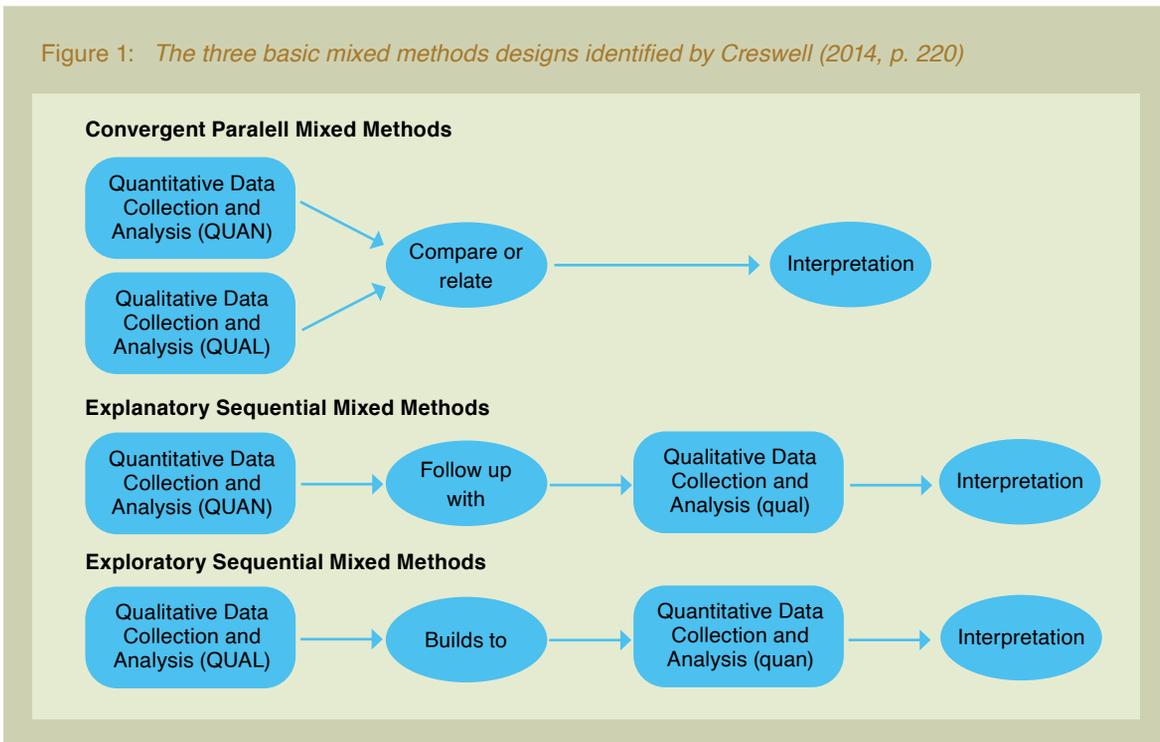
Therefore, the basis of mixed methods research (MMR) is that a combination of quantitative and qualitative data develops a more complete understanding of the research problem than research using either quantitative or qualitative data alone (Creswell & Plano Clark, 2007, p. 5). A convergent parallel mixed methods (CPMM) design enables the researcher to converge quantitative and qualitative data using any of the approaches included in Figure 1 (Cohen, et al., 2018, p. 39; Creswell, 2014, p. 15). The data is collected and analysed independently and in parallel with each other, so that there is a comprehensive analysis of the research problem, question or issue being investigated. Thus, there is triangulation of data and the results of the separate analyses are compared to see if the tentative conclusions support each other. MMR does not improve reliability or trustworthiness, however, complementary data on the problem is hopefully produced which increases legitimacy or believability (Herschell, 1999; Onwuegbuzie & Johnson, 2006; Shenton, 2004).

The core idea with this CPMM design is to collect all forms of data ‘using the same or parallel variables, constructs or concepts’ (Creswell, 2014, p. 222). A major challenge in this design is to converge (merge) the accessed and analysed data, as well as to collect differential data on similar issues and questions so that different but complementary analyses of the data can be undertaken, sustained and reliably synchronised and concluded. The following are potential approaches to ultimately forming *merged* data: side-by-side comparison, data transformation, and joint display of data. The interpretation of the data using this design is usually written in the discussion (Creswell, 2014, p. 223). Creswell compares the data sets and identifies whether there is overlap between them. Usually there are some differences in results on particular themes, issues, and concepts. These could be stated as limitations in the study, but a better solution would be to resolve the differences by returning to the data and undertake more detailed analyses, as well as possibly collecting additional information.

In the reference paper the quantitative data was collected from a Chemistry Attitude and Experiences Questionnaire (CAEQ) and the qualitative data from

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Figure 1: *The three basic mixed methods designs identified by Creswell (2014, p. 220)*



a semi-structured interview schedule (Mataka & Kowalske, 2015, pp. 931-932). Both forms of data were collected addressing the concept of self-efficacy belief (SEB). In this paper the data merging process most closely resembled a side-by-side comparison where firstly the quantitative data was analysed, closely followed by the qualitative data (themes), and then the researchers compared and contrasted as well as interpreted in their discussion section (pp. 932-936). The researchers' triangulation of data collection methods revealed that the qualitative findings supported the quantitative statistical results on the relationship between problem-based learning (PBL) and students' SEBs (p. 936).

Epistemological analysis of the research design

After the initial formative period (1950s – 1980s) of mixed methods research there began the quantitative-qualitative paradigm debate which was prominent in the 1980s and 1990s (Creswell & Plano Clark, 2007, pp. 13-18). The paradigm debate was essentially about whether quantitative and qualitative data can be combined. It is known that the paradigmatic roots of quantitative research is positivism, post-positivism and the scientific paradigm, while qualitative research has its roots in the interpretive paradigm (Cohen et al., 2018, p. 34). Although the paradigm debate continues, pragmatism is typically recognised as the philosophical foundation for mixed methods research (Creswell

& Plano Clark, 2007, p. 15). Pragmatism is "the philosophical position that what works in particular situations is what is important and justified or 'valid' " (Johnson & Christensen, 2014, p. 32). The attention or focus is on the outcome(s) of the research and on the significance of the research question, instead of the methods. So multiple methods are desirable to more comprehensively address the research problem, question or issue (Creswell & Plano Clark, 2007, pp. 23-24). Pragmatism rejects the incompatibility stance of MMR (Cameron, 2015). Shannon-Baker lists three other mixed methods paradigms (Shannon-Baker, 2016):

- Dialectics: multiple paradigms are used and different features of the research study relate to different (contradictory) paradigms
- Transformative-emancipation: provides a mechanism for addressing the complexities of research in culturally, socially and historically complex settings
- Critical realism: views quantitative and qualitative research as accepted conditionally, subject to validation through triangulation, and it is based in the belief that theories on reality are partial, thus emphasising the significance of a variety of viewpoints.

A useful way of looking at the paradigmatic debate is that although MMR involves incompatible paradigms, methods can be combined if it is for

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complementary purposes (Sale, et al., 2002). Thus, while the phenomenon is the same for different methods, different kinds of data are collected on the phenomenon which can complement each other. Shannon-Baker (2016, p. 332) sensibly advises not to argue for a single best paradigm (or perspective) for MMR, but the particular paradigm(s) is left to the discretion of the researcher as long as they justify its selection and use.

All MMR paradigms have seven common elements: ontologies, epistemologies, research purposes, practical orientation, designs, data, and methods (Biesta, 2012, as cited in Cohen et al., 2018, pp. 36-37). Each paradigm takes different views on these elements. Table 1 displays the epistemologies of four ways to classify MMR paradigms and highlights that the research designs differ considerably. Rather than forcing a coherent research paradigm, it is better to welcome the differences and make sure there is a good argument for the selected paradigm that fits with the researcher views and research focus.

The epistemological position (or general philosophical assumptions) of the reference paper has not been explicitly disclosed (Mataka & Kowalske, 2015). However, a philosophical view of constructivism has been described (p. 930) for problem-based learning (PBL), the student-centred pedagogy at the heart of this study (Yew & Goh, 2016; Hillman, 2003). The researchers' design is based on the assumption that 'neither quantitative nor qualitative designs give a full picture of the problem and its analysis, hence the need to combine both to complement each other' (Mataka & Kowalske, 2015, p. 930). It appears that the researchers in this paper follow a pragmatic paradigm as the focus is on answering a research question ('What changes in self-efficacy beliefs in chemistry occur when students participate in a PBL laboratory unit?') (p. 930). A few further epistemological aspects of pragmatism suggested in the reference paper are noted as follows:

- Qualitative data (interviews) is gathered to supplement the quantitative data to address the research problem (p. 936)
- The emphasis of the methods is to get a deeper understanding of the problem (pp. 930-931)
- Combining of data sets only occurs at the interpretation stage to ensure triangulation (p. 930)
- Inferences infer relevance of results to other contexts (pp. 936-937)
- Conclusions strengthen existing information on the relationship between PBL and the affective domain (pp. 929, 936)

- A critique of this epistemology from a biblical perspective is given below.

Biblical Christian perspectives on epistemological underpinnings **Christian epistemology**

To help begin this section some characteristics of a biblical Christian epistemology (paradigm) must be introduced. The difference between the paradigms predominantly lies in the defining of true knowledge and how such knowledge is to be interpreted and used (Beech, 2014, p. 4).

In the Bible the Hebrew word for 'knowledge' comes from the root *yada*' which posits that knowledge is starting a relationship with the experienced world, and this requires not only understanding, but also commitment (a dynamic process) (Marshall, et al., 1996, pp. 657-658). Furthermore, although the Hebrew concept is generally retained in the New Testament, the Hebrew thought is modified by the fact that the Gentiles were initially ignorant of God's existence. This enhances the earlier description of knowledge from a Christian perspective, while the common understanding of knowledge is rather loosely defined as thought and transfer of knowledge.

Similarly to knowledge, 'truth' has two meanings in the Old Testament: intellectual (facts which may be true or false) and faithfulness (Marshall et al., 1996, p. 1213; Ramsdell, 1951). The latter meaning is much more common. In the New Testament 'truth' can have the Old Testament meanings or an intellectual meaning derived from classical Greek. Thus, 'truth' in the Bible is more than an intellectual abstract truth (passive), but sees truth as related to life (dynamic) (Knight, p. 183). There are different truths coming from a variety of knowledge sources. These truths originate from God (and Christ), the Creator of everything, and the source of all truth or knowledge (John 1:1-3; Colossians 1:15-17). The statement 'All truth is God's truth' is an important principle, although some have reservations (Sproul, 2009; Mathison, 2012). Augustine, Aquinas and Calvin have all expressed similar ideas. However, it is important to not only know 'All truth is God's truth', but also to live what Piper said 'All truth exists to display more of God and awaken more love for God' (Piper, 2009).

The Bible is the primary source of Christian epistemology and a major source of truth obtained through special revelation (Knight, 2006, pp. 178-180). As well as revelatory knowledge other sources of knowledge are used in seeking truth: intuitive knowledge, authoritative knowledge, logical knowledge (reasoning), and empirical knowledge (Knight, 2006, pp. 22-25). Furthermore, although revealed knowledge is God communicating His

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Table 1: *Epistemology of four mixed methods p-paradigms*
 [Modified from Shannon-Baker's table (2016, pp. 323-324) with other sources included]

Mixed Methods Paradigm (insightful source)	Epistemology
Pragmatism (Morgan, 2009)	<p><i>Data Collection</i></p> <ul style="list-style-type: none"> • Researchers collect data by what works to address the research question (practicality) (Creswell & Plano Clark, 2007, p. 24) <p><i>Methods/Analysis Techniques</i></p> <ul style="list-style-type: none"> • Theory is connected to data both before and after data collection (abduction) • The emphasis involves identifying practical results • The researcher can pursue objectivity and/or subjectivity depending on the research context <p><i>Conclusions</i></p> <ul style="list-style-type: none"> • The exchangeability of results can be examined by determining the level of context-specificity and the generalizability of the study • It can be concluded that MMR combines features of quantitative and qualitative approaches and establishes practical solutions
Dialectics (‘dialectical pluralism’) (Mertens, 2012)	<p><i>Data Collection</i></p> <ul style="list-style-type: none"> • Data sets are collected that may have an element of conflict <p><i>Methods/Analysis Techniques</i></p> <ul style="list-style-type: none"> • There is an emphasis on connections and differences between theory and data sets • Analysis highlights comparisons between data sets • During analysis the researcher is reflective, looking for connections between theories, data sets and results <p><i>Conclusions</i></p> <ul style="list-style-type: none"> • Produced by combining diverse viewpoints/data sets • Directly addresses divergent results and highlights both convergence and divergence in data sets
Transformative-Emancipation (‘transformative’) (Romm, 2015)	<p><i>Data Collection</i></p> <ul style="list-style-type: none"> • Data collection is focused on supporting transformative change (Romm, 2015, p. 414) <p><i>Methods/Analysis Techniques</i></p> <ul style="list-style-type: none"> • Theory and data are connected by using a theoretical framework from the community's perspective • Includes community in design and the application • The researcher has a healthy relationship with the community involved and retains objectivity to avoid potential bias • Communities of practice define what counts as acceptable ‘ways of knowing’ and the researcher and the communities being researched form partnerships based on equality of power and respect (Cohen et al., 2018, p. 53) <p><i>Conclusions</i></p> <ul style="list-style-type: none"> • Conclusions are within relevant community socio-historical contexts and power dynamics • Give comprehensive social justice associated goals and issues to guide the research process
Critical Realism (Maxwell & Mittapalli, 2010)	<p><i>Data Collection</i></p> <ul style="list-style-type: none"> • Collection of reflection and perception-based data is encouraged <p><i>Methods/Analysis Techniques</i></p> <ul style="list-style-type: none"> • Identifies the partial and incomplete nature of theory to describe/capture data • The methods highlight perspectives and perspective taking and is process-oriented • Relationships are highlighted throughout and it is believed that complete objectivity is not possible • Knowledge constructed through individual opinions and perceptions (constructivist) • Retrodution is a central analytical tool used in critical realism (Olson, 2007). It is the ‘reasoning about why things happen including why the data appear the way they do’ (p. 1). <p><i>Conclusions</i></p> <ul style="list-style-type: none"> • Causal conclusions can be made when emphasizing the context • Provides an approach to establishing context-based validity and highlights the significance of mental aspects and perception

divine will, these are all God-given sources of knowledge (Isaiah 48:17; Proverbs 2:6). However, even though God-given, knowledge can unfortunately be used for evil. All the sources of knowledge are complementary, with the Bible and its worldview giving a ‘foundation and a context’ for all knowledge (Knight, 2006, p. 226). In other words, as the Bible is from God and He is the origin of all truth, the Bible contextualises by guiding and unifying (or integrating) all knowledge. The other sources of knowledge are related to the framework of Scripture (p. 182). Arthur Holmes’ classic publication “All Truth is God’s Truth” (1983) discussed these matters in detail. The unified truth cannot be in conflict as all truths have the same author, God. It is human knowledge which is incomplete and limited (‘For now we see in a mirror dimly, but then face to face. Now I know in part; then I shall know fully, even as I have been fully known.’ – 1 Corinthians 13:12, ESV). Therefore, there is extensive room for humility in the epistemological endeavour (Ephesians 4:2-3). Only God knows the absolute truth. Research is often regarded as an activity which searches for knowledge and the Christian researcher can see this as discovering, or being exposed to, God’s knowledge.

Christian epistemology is concerned with committed and justified belief (Sellars, 1992, pp. 154-155; Wolfe, 1982). It is important that a faith position is well-grounded and can endure testing. This relates to the Theory of Knowledge definition of knowledge presented earlier as justified true belief (Van de Lagemaat, 2017, pp. 22-39).

A critique of the design from a biblical perspective

This critique highlights the limitations of a design without a biblical perspective, while appreciating the authors of the reference paper aim is to address the research question not discover ‘truth’. As was foreseeable, the CPMM research design in the reference paper (Mataka & Kowalske, 2015) does not use the Bible as a primary source of epistemology. The data used (quantitative and qualitative) tend to only acquire empirical knowledge, which may limit the completeness of addressing the research problem by not including other knowledge sources. There is no recognition that human knowledge is deficient (i.e. humanity is sinful and fallible). Human beings are the discoverers, not the originators, of truth, and that scientific inquiry is built upon presuppositions (Gaebelein, 1964, cited in Knight, 2006, p. 181). As previously indicated, the reference article’s research design seems to hold to a pragmatic paradigm and restricts the epistemology to this paradigm, rather than allowing for epistemological diversity (Beech & Beech, 2016, p. 4). However, this research design provides a more holistic view of the research

problem, in that multiple factors are investigated, and a fuller picture of the problem is obtained. This is a typical example where MMR is more about the mixing of data and sources.

Proposed design from a biblical Christian epistemological paradigm

Such a biblical Christian design has ‘an epistemology that credits God as the source of all knowledge and acknowledges the mandate God has given us to unhide His knowledge’ (Beech & Beech, 2016, p. 12). Faith in the God of the Bible and His creation provides a pre-suppositional start for the development of a comprehensive epistemology (p. 9). In order to have a more complete set of conclusions, including epistemological viewpoints, a study will ideally acquire knowledge through data from all sources (or as many as possible): intuitive, authoritative, logical, empirical, and revelational (cf. ways of knowing in Van de Lagemaat, 2017). The Christian worldview has an open-mind to a variety of epistemological perspectives (Herschell, 2019a). Thus, a ‘paradigm of inquiry’ based in a Christian worldview is introduced and identifies that there is a number of important ways of inquiring in order to acquire new knowledge. It is worth noting that other worldviews may also come to this open-minded perspective. When expressing a Christian epistemology, it is important to consider the qualities of alternative ideas of truth or knowledge, such as relative/absolute, objective/subjective, collective/individual, internal/external. Rather than saying only one perspective is correct, it is important to recognise that they all have an element of correctness depending on the context. “That is, the nature of ‘truth’ is found as you identify when to apply which perspective, rather than in trying to identify which perspective is correct.” (Herschell, 2019b, p. 4).

Given that the relational epistemology and background for research comes from the Old Testament meanings for ‘knowledge’ and ‘truth’, it can be said that:

From the Christian perspective, the aim and end of research is not merely to gain knowledge for the sake of knowledge creation. Rather, it is to advance our knowledge of God through the development of a greater understanding of Him, of His Creation, of His created beings and of the relationships that bind them together. This becomes, then, the first purpose, for research. (Beech & Beech, 2016, p. 9)

Conclusion

Within the context of educational research, a Christian epistemological paradigm, which is holistic and relational, is important as it guides research design. A Christian epistemology recognises God as

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the source of all knowledge and humanity has the task of discovering or unfolding this knowledge which then leads to worship. If this Christian paradigm is not deliberately used then the knowledge acquired in a study will be misrepresented as it fails to acknowledge a divine agency. At the foundation of every educational theory and system is an epistemology which gives it structure and interpretive meaning (Knight, 2006, p. 182).

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