

Views on the combination of quantitative and qualitative research approaches

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ABSTRACT

This article addresses the possibility of combining quantitative and qualitative research approaches. The paradigms underlying quantitative and qualitative research (for example, positivism and postmodernism) are identified. The limitations and strengths of both approaches are highlighted, and the conclusion is reached that a combination of the two methods builds on the strengths of both. This is followed by a discussion of three combined models: (1) the two-phase model; (2) the dominant less-dominant model and (3) the mixed methodology model. Two research types that combine quantitative and qualitative methodologies and are especially useful to educators are explained. These are action research and programme evaluation.

INTRODUCTION AND BACKGROUND

Educators and other practitioners in higher education have always struggled with questions such as the following: How do students learn? What are students' perceptions of their learning material? What is the influence of diverse teaching methods on adult learning? To find answers to questions of this nature, researchers can employ a whole range of methods. Educational research has adopted two opposing views.

(1) The traditional view regards the social sciences as largely similar to the natural sciences, and the researchers who adopt this approach are thus concerned with discovering *laws* concerning human behaviour. For the formulation of laws, quantitative data are needed on which to base generalisations. (2) The more recent view, which shares the rigour of the natural sciences and the same concern to explain human behaviour, tends to emphasise how people *differ* from each other. This approach therefore studies individuals in depth, using mainly qualitative techniques such as interviews.

Since both of these studies of individuals broaden our knowledge base and deepen our understanding of human phenomena, the aim of this article is to explore the possibility of *combining* quantitative and qualitative research approaches. This challenges the mainstream belief that one cannot or should not mix methodologies or use conflicting ones (Higgs 2001:45; De Vos 2002:364; Hathaway 1995:539). If we are going to combine quantitative and qualitative approaches, it is necessary to investigate the paradigms underlying each approach as well as the history of their development.

Hathaway (1995:537–549) provides a summary of the debate on quantitative and qualitative approaches. This debate began in the 1960s, when the social sciences began to have doubts as to whether quantitative approaches, adopted from the natural sciences, could provide critical perspectives on what was happening in society, or solutions to the problems they wanted to solve. In the 1970s, the educational research community began to engage in a similar debate. The polemic included the question whether quantitative and qualitative research approaches could be combined.

DISTINGUISHING THE PARADIGMS UNDERLYING QUANTITATIVE AND

QUALITATIVE RESEARCH

A review of the literature reveals various distinctions between the paradigms underlying quantitative and qualitative approaches. Generally, authors identify *positivism* as the paradigm underpinning quantitative research. However, the paradigms that form the basis for qualitative research are classified differently by various scholars. In one example, Cohen and Manion (1996) distinguish between positivism and anti-positivism. Anti-positivism, which underlies qualitative research, includes phenomenology, ethnomethodology and symbolic interactionism.

In another approach, Hathaway (1995) uses the term *empirical-analytical* to describe the paradigm structuring quantitative research, and *interpretive* for the paradigm underlying qualitative research. The empirical-analytical paradigm is associated with positivism, while the interpretive model has a wide range of descriptors, including phenomenological, hermeneutical, experiential, naturalistic or inductive. Although there is a slight variation in assumptions, all the traditions in one paradigm generally share common assumptions about methodology, ontology and epistemology. For example, the researcher's role is different in the two paradigms: either researcher as a detached outsider in empirical-analytical research, or researcher as is part of the phenomenon of study in interpretive research. Working in the empirical-analytical paradigm, the investigator preselects categories, known as variables, and states relationships between variables as hypotheses. The hypotheses guide the research. In interpretive inquiry, there are no prescribed categories: categories are identified during the research – from the *participant's* point of view. There are also differences regarding research aims and the role of context.

However, for the purposes of this article, Thomas and Brubaker's (2000:13–18) explanation of the paradigms underlying quantitative and qualitative research will be used. Thomas and Brubaker distinguish between *positivism* and *postmodernism*, with *postpositivism* lying somewhere between the two extremes. These views differ in their assumptions about (a) the nature of reality, (b) the aim of research, (c) the question of validity, (d) the nature and function of research results and (e) how to understand reality. Very briefly, the following are typical assumptions of the paradigms:

Positivism / modernism

Reality: Positivists believe that there is an objective real world beyond the individual's body which can be known and described. All conclusions about reality are based on empirical observations that can be publicly verified (seen, heard, touched, smelled and measured).

Research aim: The aim of research is to collect evidence to formulate generalisations or laws that govern human behaviour. Thus, human behaviour can be predicted and controlled.

Validity: Validity of findings is determined by the scientific procedures of the method, in other words, by the fact that the researcher is an objective outsider and that large samples represent the characteristics of certain populations.

Nature and the function of results: A picture of reality is portrayed by means of linguistic, mathematical and graphic descriptions which can be generalised to groups similar to the sample involved in the research project.

Understanding reality: According to positivism, we can understand the nature of reality by studying researchers' empirical findings and their interpretations.

Postpositivism

Criticism against positivism included the following: (1) Research results did not lead to an improved understanding of social problems; (2) research was disconnected from the context in which it was carried out; and (3) there was a failure to accommodate human subjectivity in inquiry or the role of *meaning* in behaviour, development or social life. Thus, many critics, labelled postpositivists, revised positivism. These postpositivists adhered to the following assumptions:

Reality: Although there is an objective world "out there", postpositivists believe that researchers are necessarily influenced by their own subjective selves in their research. Conclusions about reality therefore reflect the viewpoints of both the investigator and the investigated. Moreover, the more researchers admit their own biases, the more objectively they can approach their task.

Research aim: Like positivists, postpositivists aim for generalisations to explain human behaviour. However, they are also interested in explaining how and why individual differences between humans occur.

Validity: Research studies are valid if the research: (a) generates or tests theory; (b) is based on empirical, logical evidence; (c) produces results that can be generalised to other contexts and (d) acknowledges the influence of the researcher or the research methods on the results.

Nature and the function of results: Postpositivists believe that a picture of reality can be portrayed by means of linguistic, mathematical and graphic descriptions which can be generalised to similar groups, as do positivists. However, individual differences are also portrayed. In addition, the researcher does not feign objectivity, but acknowledges personal biases in the selection of places and people to study, the questions that are chosen for interviews or questionnaires and the theory which is adopted and which necessarily influences the interpretation of results.

Understanding reality: Readers of postpositivist research learn what reality is like from the viewpoint of that particular researcher.

Postmodernism

Dissatisfaction with positivism led not only to postpositivism but also to postmodernism with all its variants in different disciplines. Broadly speaking, a mild and a radical version can be distinguished.

Reality: The positivist belief that there is an objective, real world out there is questioned or denied. Researchers' own needs, cultural traditions, training and biases filter their experiences. According to the radical version, people continually express their experiences in language and this linguistic interpretation becomes their reality. These realities are described differently by different people, which serves to confirm that there is no objective reality out there.

Research aim: For postmodernists the aim of research is political – to correct society's wrongs. Hence, the purpose of research is to address injustices that are inflicted on the

disadvantaged.

Validity: Regarding the validity of the research endeavour, there are no fixed criteria for evaluation, other than respect for subjectivity and feeling.

Nature and function of results: Uninterpreted narratives of occurrences are the most authentic accounts. No generalisations are drawn or applications recommended.

Understanding reality: In attempting to understand reality, the postmodernist assumes that each narrative is someone's reality. By reading a variety of narratives, researchers gain insight into the reality of social injustice.

Whereas positivism is a base for quantitative research, postmodernism clearly underlies a qualitative research approach. This brief description of paradigms underlying quantitative and qualitative research indicates opposing views of what scientific research entails. De Vos (De Vos & Schulze 2002:45) states: "... all scientific research is conducted within a specific paradigm, or way of viewing one's research material. Researchers must, therefore, decide within what paradigm they are working, know the nature of their selected paradigm well, and spell this out in their research report in order to keep communication with their reader public clear and unambiguous."

Researchers' choice of a research paradigm in which to work is influenced by various factors.

CHOOSING A PARADIGM

According to the literature reviewed (Gersten, Baker & Marks 1998:29), many researchers choose a research paradigm early in their careers. This choice may be based on the above-mentioned assumptions of the paradigms underlying quantitative and qualitative research, in other words, on their convictions about knowledge and reality and the correct method to measure both. These philosophically inclined colleagues are purists who will use either quantitative or qualitative research methods and will not contemplate combining the two approaches or alternating between them (Hathaway 1995:539).

However, many researchers ignore philosophical grounding when choosing a research approach. For them, the choice of approach is made at the *method* level. Their decision to use quantitative rather than qualitative research methods exclusively may be based on a natural inclination towards numbers, or on a single characteristic of quantitative research, such as its presumed objectivity. Other colleagues opt for qualitative research methods since they enjoy being immersed in the research as a subjective partner and derive pleasure from the insights into human phenomena they gain in this way.

There are also those researchers for whom the choice of research method may be based simply on the fact that they were schooled in either quantitative or qualitative research approaches. The ignorance or expertise of the researcher's mentor, acting in the capacity of either supervisor or experienced colleague, may have been the primary influence that prompted the researcher to prefer one paradigm over the other.

Other researchers, known as situationalists, are willing to alternate between quantitative and qualitative research methods, depending on the situation that requires investigation. For them, the research problem and data available determine the choice of method (Rossman & Wilson in Hathaway 1995:539). For yet others, the driving forces behind the choice of method

may be time, money, resources, staff, and the preferences of those requesting the study.

LIMITATIONS AND STRENGTHS OF QUANTITATIVE AND QUALITATIVE RESEARCH

In evaluating the limitations and strengths of quantitative and qualitative research approaches, Hathaway (1995:554) states that empirical-analytical (quantitative) research systematically overlooks critical features of human phenomena so that results are often of limited value. Such features include the definition of human action in specific settings, the human interest of the actor, and the historical context of the situation. Hence, this approach has often been criticised as being dehumanising. In the words of the poet, William Blake, "... life cannot be weighed and measured on a physical scale" (in Cohen & Manion 1996:23). Critics of quantitative studies concluded that these studies restrict our views of human beings because they concentrate on repetitive and predictable aspects of human behaviour (Cohen & Manion 1996:25). Qualitative research techniques can overcome these shortcomings.

On the other hand, interpretive (qualitative) research may appear to be fraught with subjectivism and questionable precision, rigour or credibility. It has also been stated that although behaviour patterns may be the result of the meanings individuals attach to situations, these individuals may be *false*ly conscious – there may be an objective perspective which is different from that of the individuals themselves. We should therefore not restrict ourselves to the meanings attached to situations or phenomena by the participants themselves (Rex in Cohen & Manion 1996:34). In addition, generalisations are often useful. Administrators frequently need to make decisions based on what is "typical" or "average" across various departments or faculties. Such decisions are then based on large samples rather than on a limited number of case studies or interviews.

Quantitative research is suited to theory testing and developing universal statements. It provides a "general" picture of a situation. Quantitative studies thus produce results that are generalisable across contexts, although they neglect the reality of situations. Qualitative inquiry, on the other hand, provides the researcher with in-depth knowledge, although this is usually not generalisable. Qualitative research is more useful for exploring phenomena in specific contexts, articulating participants' understandings and perceptions and generating tentative concepts and theories that directly pertain to particular environments. Thus, policies and decisions based on qualitative information may be more directly suited to the specifics of the milieu from which they were derived.

It follows logically from the above that educational researchers need both modes of inquiry to advance their understanding of teaching, learning and other human phenomena. Mouton and Marais (1990:169–170) see such a bridge as necessary, since a single approach cannot succeed in encompassing human beings in their full complexity. Only by using *both* quantitative and qualitative approaches can the breadth, depth and richness of human life be grasped. For example, we might survey the benefits of a new departmental focus and find that the new approach is not increasing student performance on particular skills. However, we will not know precisely *why* there is no improvement. In-depth interviews with students could provide the information necessary to begin to explain the finding of "no improvement".

The time has therefore come to contemplate adopting a pragmatic perspective on research, a rational form of bargaining that considers the pros and cons of quantitative and qualitative approaches. Combining the two approaches builds on the strengths of both and concurs with Lötter's (1995:4) view that quantitative and qualitative research is, in fact, a complex continuum. The remainder of this article is an explanation of possible models of combination.

MODELS OF COMBINATION

Three models of combination come to mind (Creswell 1994:173–190):

(1) Two-phase model

In the *two-phase model* a quantitative phase is followed by a qualitative phase or vice versa. Thus, the two paradigms are clearly separate and the researcher can thoroughly present the assumptions underlying each phase. In an example of this model Moyana, a doctoral student designed and implemented an intervention programme to improve the self-concepts and attitudes of prospective primary school teachers (Moyana 2000). In the first phase of the research, he designed a questionnaire to determine the effectiveness of the programme by means of a pretest, posttest design. Although there was an improvement in the self-concepts and attitudes of the prospective teachers, it was not significant. Thus, it was decided to add a second, qualitative phase to the investigation. In this phase, focus group interviews were conducted with the participants to determine their experience of the programme and how they would recommend improving it. Finally, an improved version of the programme was recommended.

Another option would be for students to follow one approach in their master's study and the other approach, on a different aspect of the same topic, in their doctoral research. In such an example, a master's student investigated the relationship between adolescent depressive symptomatology and substance abuse quantitatively (Blore 2002). For her doctoral studies, this same student could possibly focus on one of the theme clusters that emerged from the first study, for example, a phenomenological study of the experiences of adolescents with depression in interaction with their peers or their families.

(2) Dominant less-dominant model

In a *dominant less-dominant* model, the researcher conducts the study within a single, dominant paradigm. Only a small component of the overall study is undertaken from the alternative paradigm. In an example of this model, a predominantly quantitative approach was followed to determine distance education students' perceptions of their postgraduate supervision in the Faculty of Education at Unisa (Lessing & Schulze 2002) The investigation concluded with a small qualitative component. For this, students had to describe the most *rewarding* and *frustrating* aspects of their studies and what they would *recommend* regarding future postgraduate supervision.

In another example a student, working within a mainly qualitative paradigm, is currently investigating the use of dream analysis by psychologists working with adolescents with emotional problems. To gather data, the researcher made use of diaries that the adolescents keep of their dreams, followed by interviews. Finally, the data obtained will be supplemented with quantitative data generated by a standardised test, the Emotional Profile Index, which determines whether or not the adolescents have emotional problems.

(3) Mixed methodology model

A *mixed methodology* design is possibly the most problematic since it may link the two paradigms in ways that are unacceptable to some scholars. According to Creswell (1994:177–178), one of the ways in which the paradigms may be mixed is their use of theory or methods. Since the researcher may alternate between the two paradigms, this methodology is better suited to the experienced researcher with a sophisticated knowledge of

both paradigms. Two research types that combine quantitative and qualitative methodologies and are especially useful to educators are *action research* and *programme evaluation*.

Action research

Action research entails deliberate *cycles of planning, acting, data collecting and reflecting* (Carr & Kemmis 1991:185). This is done carefully, systematically and rigorously. The action research cycles stem from practical problems that arise, for example, from teaching. The assumption is that the natural surroundings in which the problem occurs is the best place to study the problem. Thus, it bridges the gap between practice and research so that the educator becomes a researcher (Zuber-Skerritt 1992:67). As an example, action research can be undertaken by educators in a distance education context to assess *the effectiveness of their teaching methods to promote learning*. Data collection includes qualitative and quantitative methods, such as observation, interviews and questionnaires.

Observation

Observation yields mainly qualitative data, which may be supplemented with quantitative information. Examples of how observation is used in a distance education context include the following:

- Educators could make notes when marking *assignments* or reading through completed activities. They would focus on one aspect, for example, the extent to which activities in the text promote a deep approach to learning.
- Educators could also observe events during *discussion classes* and make notes immediately afterwards. This could be complemented by video or tape recordings. Since action research should preferably be done in teams, a fellow researcher could observe discussion classes and make tape or video recordings or take detailed notes. These observations are then followed by in-depth discussions between the observer and the lecturer. Checklists may be used quantitatively and qualitatively when observing students during discussion classes to assess their level of active participation, by keeping tally of the number of times a particular behaviour occurs, or by describing behaviour at set time intervals. Categories of checklists might refer to lecturer and student verbal and non-verbal behaviour.
- Teams might also evaluate *work manuals, study guides* or *tutorial letters*. This would include a qualitative appraisal of the following: in-text activities and the extent to which they enable learners to relate learning content to their own environments; textual features such as tick-box exercises, line drawings and advance organisers; visual stimuli such as different typological features; an A4 versus an A5 page size; language (tone, level of proficiency required, explanation of key concepts); features which enable materials to articulate better with the known diversity among students; integration of print with audiovisual media; question feedback; and so on.
- A quantitative review of drop out and success rates may also be useful.

Interviews

In a distance education context, telephone interviews could be conducted, often in combination with questionnaires (Thorpe 1995). Face-to-face interviews may also be useful if a small subset of students is available, for example, during discussion classes or by special

invitation to local students (Bergh, Van Wyk, Lemmer, Van der Linde & Van Niekerk 1996). As students may respond in a way they think educators want them to when structured responses are obtained in face-to-face interviews in a quantitative approach, semi-structured or unstructured interviews to collect data qualitatively are useful. Open-ended questions such as the following may elicit valuable data:

- How do you feel about? (for example, activities or language)
- How understandable is the content? What helped you to understand the content? What confused you?

Questionnaires

In a distance education context, feedback is often obtained by means of questionnaires. Educators should decide on the response format. Open-ended questions are one of the possibilities in a qualitative approach. However, some type of rating system in a quantitative approach is useful and the results are quicker to analyse.

Assignments could also be used to obtain feedback from students since the return rate is better than with postal questionnaires. For example, on the subject of the role of assignments in promoting reflective learning, students were required to respond to the following questions:

- Which changes (if any) in this assignment design would have made it more productive for you?
- Reflect critically on what you have learnt from doing this assignment.

Example of an action research project at Unisa

In an action research project conducted at Unisa, the Bureau for University Teaching (as it was then called) presented a series of nine lectures and workshops on instructional design (Heese 1995). The nine topics offered included *establishing a project team*, *analysing learner needs* and *determining course content*.

During the first cycle of the project undertaken in the Faculty of Arts, evaluation of the series was carried out qualitatively using participant observation. Comments, criticisms and suggestions during workshops were noted. Thus it was determined that although the series was very valuable, it did not really enable lecturers to write materials suitable for student development. The timing of the lectures was also inconvenient.

Subsequently, a second cycle, offered to members of the Department of English, was presented at a more suitable time. Comments obtained previously were studied and the topics were adapted accordingly. For example, "know your target group", "teaching study skills" and "setting assignments and exams" were added, while "establishing the project team" was omitted and other topics were combined. In addition to participant observation, an evaluation form with a number of open-ended questions was used to evaluate the presentations qualitatively. Feedback indicated a preference for a pure workshop over a lecture-cum-workshop format.

During the third cycle, the workshops were again adapted after noting the responses made during the previous cycle. In addition, at the start of the series, participants were requested to complete a questionnaire by answering two open-ended questions to determine their needs. The questions were: *Please list the three most important issues that you would like this course to cover*; and *Please list the three most pressing problems connected to designing /*

improving the course(s) with which you are involved.

Evaluation of the workshops was again carried out qualitatively by means of participant observation. However, this time a quantitative component was added by requesting participants to complete an evaluation form for every workshop. This form contained 18 statements to which participants responded on a four-point scale, and there were also two open-ended items: *Name the most interesting aspect of this workshop, giving reasons*, and *Name the aspect you disliked most, and say why*. This format made it possible to quantify some reactions while the responses to the open-ended questions were summarised separately. Thus, the combination of qualitative and quantitative data enabled the presenters to develop an excellent programme in course design for lecturers at Unisa.

Beside action research, *programme evaluation* offers an opportunity for bridging the gap between the quantitative and qualitative approaches.

Programme evaluation

Higher education offers numerous learning programmes. Often, we as university educators or practitioners develop and present the programmes ourselves. Sometimes we inherit them from a colleague. If we are satisfied with the programmes we offer and generally receive positive feedback from students and co-presenters, evaluation of the programme has already taken place. Programme evaluation is thus an ever-present fact of a educators' life and the issue is not *whether* a programme should be evaluated, but *how* it should be evaluated. Both formative and summative evaluation are important to programme presenters. Formative evaluation helps to improve programmes at those points where the programme does not seem to meet the criteria set by its designers. On the other hand, summative evaluation is needed when there is doubt as to whether a programme should continue or be discontinued (De Vos 2002:377).

Programme evaluation may use quantitative and qualitative methods during six possible phases, starting with a needs assessment and ending with an evaluation of the programme utilisation. Each of the six phases will briefly be explained by means of concrete examples and the combination of methods will be highlighted.

Phase 1: Needs assessment

In the first phase a needs assessment is carried out. This can be done by either tapping existing sources or by gathering new information. Annual reports of organisations and other public reports can be utilised in needs assessment research. Enumerations of who was served also indicate who was *not* served (De Vos 2002:377). Census data, available in most libraries, can provide the researcher with estimates of the needs of the population. For example, census data can help the researcher plot a map of those areas in the community with the highest concentrations of illiterate adults in need of adult basic education or HIV-infected persons in need of special programmes on diverse aspects of the issue.

If new data on needs are to be gathered, this can be done by means of community forums or key informants at local schools. Small discussion groups where parents or key informants are probed to determine their needs are a valuable starting point for programme design. Such qualitative endeavours have been followed by the development of programmes in reading skills, study skills and computer literacy.

However, quantitative surveys are the most useful method of determining the needs of

various groups. In a well-designed questionnaire samples of identified populations could be asked what their needs are so that these could be addressed. In one example, Crous (2002) surveyed the needs of students with disabilities at Unisa and at two residential universities. These needs could then be considered in the development and presentation of programmes at the institutions involved.

Phase 2: Evaluability assessment

Evaluability assessment determines whether the nature of a programme is such that it could be systematically evaluated in future. Successive rounds of data collection, primarily by means of interviews and other qualitative techniques involving programme administrators, policy makers and major stakeholders, help researchers to broaden their knowledge of the programme and the ways in which it can be assessed.

Phase 3: Programme monitoring

When monitoring programmes three key questions need to be answered:

- Is the programme reaching the appropriate target population?
- Is service delivery consistent with design specifications?
- What resources are being drawn on to run the programme? (De Vos 2002:381)

An example of *target population evaluation* is the following: Unisa may decide to develop television programmes designed to benefit students at risk of failing. An evaluation of the programme to determine whether it did in fact help the at-risk students may find that the gap in cognitive skills increased between at-risk students and the other students who also viewed the programme. Although viewing the programme may have had a positive impact on *all* students, it may not have provided the *special* support to academically weak students that was the fundamental goal of the programme. To carry out such an evaluation, a quantitative research design with carefully controlled groups is required.

The second question in programme monitoring: *Is service delivery consistent with design specifications?* can be answered by process evaluation of programme strategies and activities. For example, if university educators or other practitioners present workshops for school teachers or students, feedback can be obtained for the immediate refinement of the programme. Relevant questions to pose are:

- Did the scheduled venue and times suit the participants?
- Did the participants accept the presentation methods (hands-on workshops and/or lectures) of the programme?
- Did the content address the needs of the participants?

Examples of quantitative and qualitative methods for answering these questions include:

- written statements by all participants in which they describe what was experienced after each session or after the whole programme had been completed; or the completion of a simple quantitative evaluation form
- non-participant observation that delivers (primarily) qualitative data
- participants' achievements assessed qualitatively and/or quantitatively at the end of each session or the programme as a whole
- skills measured quantitatively after each session.

The third question concerning *programme monitoring* investigates the resources that are used to conduct the programme. This question comprises a quantitative approach, namely a calculation of the input the programme required in terms of staff time and costs. (I shall

address cost-effectiveness again in a subsequent section.)

Phase 4: Outcome evaluation

In a fourth phase of programme evaluation, the outcomes of programmes implemented are evaluated. For example, in his doctoral research, Dr Happy Jabulani Nukeri (2000) designed a programme to improve the attitudes of learners towards the physical sciences in order to encourage more learners to enrol for physical science. The effectiveness of this programme could only be measured after he had been implementing the programme for several months with an experimental group. Quantitatively, by means of pretests and posttests, he determined that the experimental group and not the comparison group had significantly improved attitudes towards physical science. In addition, significantly more learners in the experimental group than in the comparison group were motivated to further their studies in physical science.

Phase five: Cost effectiveness evaluation

Cost-effectiveness refers to the *efficiency* with which the programme was carried out. In other words: How do the programme outcomes compare with its costs? How does the cost compare with the benefits? Numerous programmes are presented annually at Unisa. The Faculty of Education presents a number of programmes for the professional development of lecturers and for students. These include a faculty seminar, bi-annual seminars for master's and doctoral students and a faculty lecture. Similarly, Unisa offers an induction programme for new staff at the beginning of each year. To evaluate the cost-effectiveness of these endeavours, the following should be considered: the number of telephone calls that have to be made, hours of meetings attended, the number of faculty members who attend the meetings, distances covered by participants, time spent during the service itself, cost of handouts or other resources and refreshments, gratuities to visiting speakers and so forth. In cost effectiveness analysis, inputs are calculated quantitatively in monetary terms and outcomes are estimated in terms of the actual impact of the programme (De Vos 2002:385). This outcome can be determined quantitatively and/or qualitatively.

Phase six: Utilisation evaluation

The final step in programme evaluation is to judge the utility of a programme. This can be illustrated by the following example: In South Africa, the number of learners who have specialised in physical science has declined and their achievements have deteriorated. A cause cited is lack of science practical work in schools. Thus, Shingwedzi Continuing Professional Development Centre designed a grade 12 school support programme in chemistry, involving practical and laboratory work. After schools with poor science grade 12 results had been identified and a needs analysis had been done, 11 schools participated in the programme. Schools attended the programme one at a time. Learners were expected to conduct 21 different experiments in small groups, monitored by their teachers. Although a quantitative assessment indicated that the matric results for participating schools had improved, teachers indicated qualitatively in an open-ended questionnaire *how* the programme could be further enhanced (Nukeri & Schulze 2003). These evaluations were then *directly* used to improve the programmes.

CONCLUSION

To conclude: This article has argued that how the adoption of a pragmatic approach to research enables us to bridge the separation between quantitative and qualitative research

approaches. By combining quantitative and qualitative research methods, researchers can simultaneously conform to and transcend dominant research conventions, making use of the most valuable features of each. Viewing life through different paradigms as required enables educators to develop a comprehensive knowledge base and an understanding of teaching, learning and other human phenomena.

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