South Africa: Optimising a Feedback System for Monitoring Learner Performance in Primary Schools

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Contents

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4. South Africa: Optimising a feedback system for monitoring learner performance in primary schools

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…while volumes of data are extruded about and from schools, teaching continues without the benefits of such data. There is still a philosophy that assumes teachers know how and what data to collect to best enhance learning, and many of these assumptions are based on folk philosophies, poor measurement, and shaky data. We still teach in a manner we did 150 years ago … (Hattie, 2005, p. 11).

Abstract

This chapter describes how and education design research approach was employed to enhance a feedback system of an existing learner performance monitoring system in a number of primary schools in South Africa. The design research approach employed provided an appropriate and powerful approach to adapting, developing and optimising the feedback system and produced specific design guidelines to support other designers in developing effective learner performance feedback systems in similar contexts. The design research approach provided the opportunity to design, implement and evaluate various prototypes, which slowly started to approximate the ideal for the specific context, whilst the system functioned and served schools. The quality criteria employed in design research allowed for enhancing of specific aspects of the feedback system in a systemic manner during the various phases of the design process. The chapter deals with a number of aspects including the contextualisation, conceptualisation, each phase and cycle during the research phase, outcomes and then a reflection with the aim of illustrating the chain of reasoning for this particular design research process.

1. Introduction to the problem

This chapter highlights how an educational design research approach was employed to enhance a feedback system of an existing learner performance monitoring system thereby attempting to address problems with education quality in a number of primary schools in South Africa (SA). By using the design research approach the inquiry resulted in the optimisation of an appropriate, practical and effective feedback system for SA, as well as specific design guidelines to support other designers in developing effective learner performance feedback systems in similar contexts. This chapter outlines first the problem in its context and the need for the design research approach. Thereafter the research design is described and a discussion ensues about how the research was conceptualised, including the literature review. The development of each phase of the research, including the assessment phase, is provided in summary. Then the results are discussed in terms of the outcomes of the project followed by the reflections on this case and possible lessons for other studies.

South African education context

SA is considered an emerging economy and is an economic leader in Africa with a GNP per capita of U$ 3690, yet a third of nearly 50 million South Africans live on less than U$2 per day

(UNESCO, 2007, p.229). SA has grave infrastructural and economic disparities and the legacy of the apartheid remains apparent in the education system.

Despite significant funding and increased education enrolment, the quality of education remains a concern (Taylor, Muller, & Vinjevold, 2003) in a system of 12.3 million learners in more than 26 000 schools. Nowhere is the shortcoming of education quality more apparent than in the low learner performance, especially in subjects such as Reading, Mathematics and Science. This has been clearly illustrated in SA's poor performance on international assessment measures such as Trends in International Mathematics and Science Study (TIMSS) (Howie, 1997, 2001; Martin, Mullis, Gonzalez, & Chrostowski, 2004) and the Progress in International Reading Literacy study (PIRLS) (Howie, et al., 2008, 2012). This has been further highlighted in national studies such the Systemic Evaluations since 2000 and most recently in the 2011 Annual National Assessment for Grades 1-6 (Department of Basic Education [DBE], 2011). These results have been mostly attributed to poor teacher quality and training; lack of leadership and lack of competence at all levels in the system.

Learner performance monitoring data for evidence-based practise are required in order to understand and to address the problem of continued and sustained underperformance (Brinko, 1993; Hattie, 2005; Coe, 2002). The data can, however, only have positive impact if fed back to schools and supporting education authorities who are prepared and are competent to intervene appropriately. Not all approaches to providing feedback lead to improvement of educational delivery (Kluger & DeNisi, 1996). There may be problems in communicating the data appropriately given the experience of principals and teachers. Schools often do not know how to use data appropriately and may not understand it or be unwilling to incorporate it into their decision-making process (Hattie, 2005; Schildkamp & Teddlie, 2008; Wohlstetter, Datnow, & Park, 2008). There may also not be the appropriate levels of support to design suitable interventions. Furthermore, contextual factors such as the school culture and level of data literacy of staff play a large role in determining if a feedback system will succeed (Fullan & Dalin in Visscher, 2002, p. 52).

South African Monitoring system for Primary schools project
Given the South African context and the challenges of improving education quality in South African primary schools, a project called the South African Monitoring system for Primary schools (SAMP) project was initiated by the Centre for Evaluation and Assessment (CEA) at the University of Pretoria nearly a decade ago to research ways of supporting schools using evidence based monitoring of learning performance. SAMP was adapted, translated and contextualised from the Performance Indicators in Primary Schools (PIPS) from the Centre for Evaluation and Monitoring (CEM) at the University of Durham in the United Kingdom. For a full description of the adaptation, translation and contextualisation process please consult Archer, Scherman, Coe, and Howie (2010) and Archer (2010).

SAMP produces learner performance data on phonics, reading, mathematics, handwriting and English additional language for entry level learners (5-7 years of age) data are collected at the beginning and the end of the year. The data from SAMP are employed to inform individual learner intervention (development of individual development plans), classroom practice (introducing class wide activities such as a reading hour), and school level planning and action (motivating for appointment of support personnel such as occupational therapists). SAMP produces reliable and valid data for SA across the three languages in which it is currently employed, namely English, Afrikaans and Sepedi. Once the monitoring system was established to be valid and reliable in the South African context, it was essential to concentrate on how to

design and optimise a feedback system to schools so that they could benefit most appropriately from using the system in general and the learners' performance data in particular. The research described in this chapter pertains to research conducted in 22 primary schools in the Tshwane region of South Africa who had previously participated in the SAMP project. For a full account see Archer (2010).

2. Conceptualisation of the research

The aim of this study was to identify and understand the characteristics of an effective feedback system and the use thereof in order to design and optimise a system that facilitated the use of learner performance data in SA within the school environment. The question clearly called for a design research approach (Plomp & Nieveen, 2009). Design research is application orientated; includes the research participants as collaborators; allows for refinement of the intervention through several iterations (De Villiers, 2005), focusses on finding real-world solutions in a complex environment and contributes to knowledge building through development of design principles (Nieveen, 1997; Richey, Klein, & Nelson, 1996; Thijs, 1999; Van den Akker, 1999). Design research was congruent with the aims of this study and provided avenues to optimise the feedback system while it was in use.

The research was guided by the following question:

What are the characteristics of an effective feedback system and the use thereof for the design of an optimum feedback system to facilitate the appropriate use of learner performance monitoring in primary schools in SA?

This question has been decomposed in the following sub-questions:
1. How can an existing learner performance monitoring system be adapted, contextualised and translated appropriately to the SA context?
2. What characteristics of an optimal feedback system for use in school-based monitoring are documented in literature?
3. What pre-existing conditions need to be established in the feedback system to facilitate the optimal use of the learner performance feedback system?
4. How do schools use feedback?
5. How effective is the feedback system in enhancing classroom practices, management and planning activities?
6. Which design guidelines can be identified for the development of an effective feedback intervention for school-based monitoring?

In this study, each cycle of design research consisted of the design and implementation of a version or prototype of the feedback system. Each prototype was formatively evaluated, leading to a further cycle of development and resulting in a new prototype. The following design criteria were employed in the evaluations (see Table 1).

Table 1: Criteria for high quality interventions (Nieveen, 2009, p. 94)

Criterion	
Relevance (also referred to as content validity)	There is a need for the intervention and its design is based on state-of-the-art (scientific) knowledge.
Consistency (also referred to as construct validity)	The intervention is 'logically' well-designed.
Practicality	*Expected* The intervention is expected to be usable in the settings for which it has been designed and developed. *Actual* The intervention is usable in the settings for which it has been designed and developed.
Effectiveness	*Expected* Using the intervention is expected to result in desired outcomes. *Actual* Using the intervention results in desired outcomes.

The design research process for this research comprised three phases with multiple design cycles:

- *Preliminary phase (one cycle)*: This phase was designed to address research sub-questions 1 and 2.
  Sub-question 1 examined how SAMP was adapted to the SA context, as part of the preparation for the Preliminary Phase. Sub-question 2 was addressed by a needs and context analysis. This included a literature review and an exemplary case study of the Assessment Tools for Teaching and Learning (known as asTTle) project in New Zealand (NZ). The quality criteria for this phase were relevance and consistency. The emphasis of this phase was to conceptualise the feedback system and define the design specifications for the feedback system.
- *Prototyping phase (three cycles)*: Research sub-questions 3-4 were addressed in this phase, which consisted of the iterative research cycles during which Prototypes I-III of the feedback system were developed, implemented and formatively evaluated. The emphasis of the cycles shifted throughout the Prototyping Phase, focussing first on how to establish conditions for use in Cycles 1 (through expert evaluation reports and the Delphi technique with school users) and 2 (generated through teacher and principal questionnaires) then on how to transform these conditions for use in action in Cycle 3. Cycles 1-2 concentrated on research sub-question 3, with the evaluations concentrating on relevance, consistency and practicality. Cycle 3 examined research sub-question 4 by means of questionnaires for teachers, principals and Heads of Departments (HoDs). These were supplemented with the examination of three schools' data-use processes through observations of school meetings, reflective journals for teachers and interviews with teachers, HoDs and principals. Cycle 3 addressed the quality criteria of actual practicality and expected and actual efficacy.
- *Assessment phase (one cycle)*: This phase represented the semi-summative evaluation that examined the functioning of Prototype IV as an integrated system. The phase therefore supplemented already existing data for research sub-questions 2-4, but specifically focussed on sub-question 5. The quality criteria addressed in this phase were practicality and efficacy, both expected and actual. The semi-summative evaluation was conducted through questionnaires for school management and teachers, as well as reports from

expert evaluators. This was the final phase of the design research process described here and completed in 2010 (see Archer, 2010), although there is further development beyond this project as part of the work of the CEA.

This study incorporated various combinations of qualitative and quantitative methodologies during each evaluation cycle of the prototypes (see Figure 1). The data from each evaluation served to develop design guidelines to inform the development of the next prototype, which was also evaluated. In the next section, the conceptual framework is discussed as it framed this investigation.

3. Development of conceptual framework

It is important to keep in mind the overall research problem when discussing the conceptualisation (as discussed in the first section). In the South African education system there is a general problem with quality in primary schools. Although a feedback system, SAMP, had been implemented in the primary school in this study, no empirical data were available about the use of the data. Anecdotal evidence indicated that there were some difficulties with the system, but research was required to optimise the system of feedback to impact positively on the participating primary schools.

The conceptualisation of the study took place during the Preliminary Phase of this study. The quality criteria focused on for this phase were relevance and consistency. Schools participating in the existing feedback system prior to 2006 expressed a need to receive feedback more quickly and that the data be presented in such a manner that it is easier to use for planning, decision-making and action in the school environment. It was necessary to develop design guidelines and criteria for the global design of the feedback system to facilitate use of the data. In order to accomplish this, a number of approaches were employed, including literature review and investigation of selected international School Performance Feedback Systems (SPFSs). This was supplemented with an exploration of an exemplary case in the form of the asTTle in NZ. The preliminary phase also resulted in the development of the conceptual framework for this study.
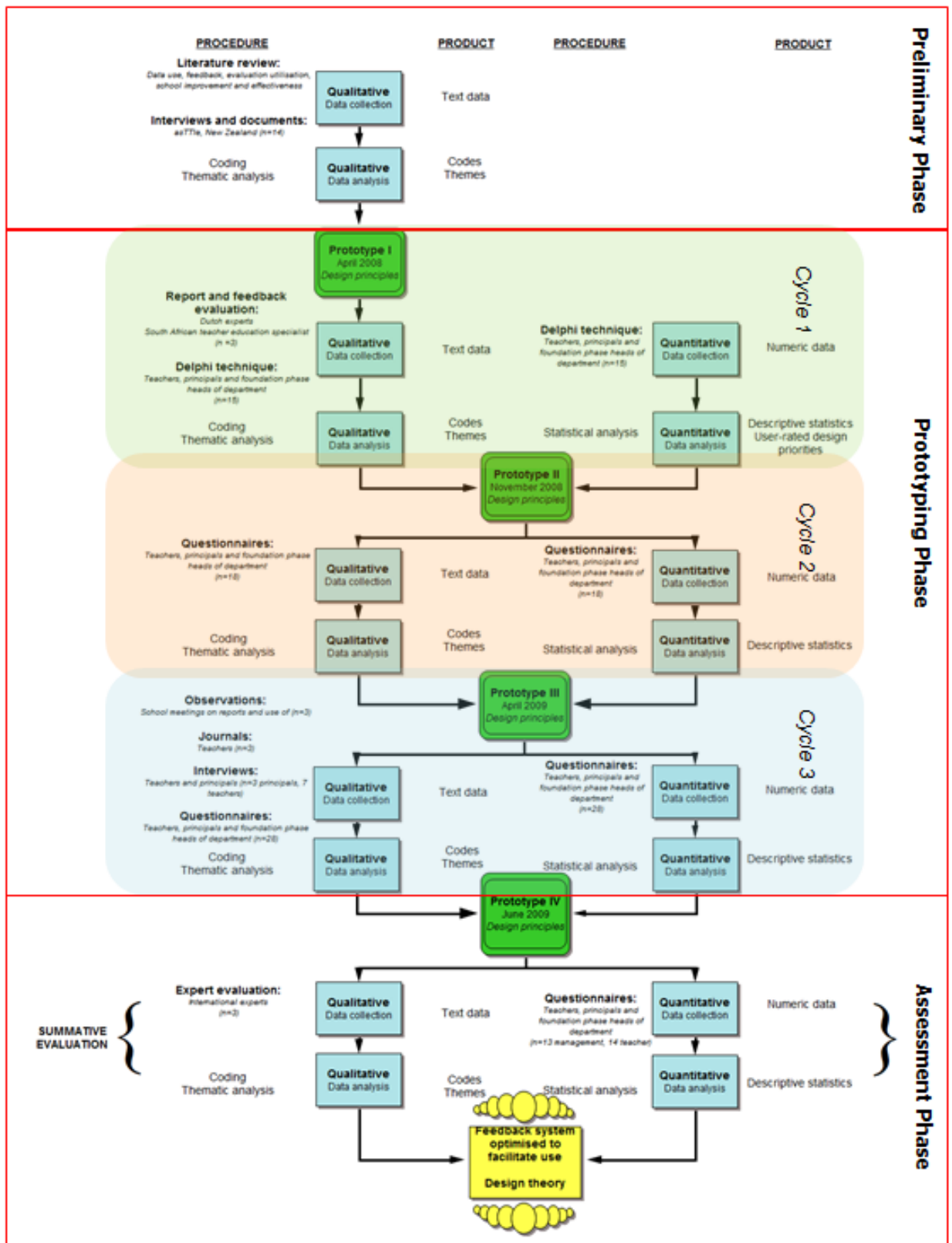
PROCEDURE   PRODUCT   PROCEDURE   PRODUCT

Literature review:
Data use, feedback, evaluation utilisation, school improvement and effectiveness

Qualitative Data collection   Text data

Interviews and documents:
asTTle, New Zealand (n=14)

Coding
Thematic analysis   **Qualitative** Data analysis   Codes Themes

Prototype I
April 2008
Design principles

Report and feedback evaluation:
Dutch experts
South African teacher education specialist (n=3)

Qualitative Data collection   Text data   **Delphi technique:** *Teachers, principals and foundation phase heads of department (n=15)*   **Quantitative** Data collection   Numeric data

Delphi technique:
Teachers, principals and foundation phase heads (n=15)

Coding
Thematic analysis   **Qualitative** Data analysis   Codes Themes   Statistical analysis   **Quantitative** Data analysis   Descriptive statistics User-rated design priorities

Prototype II
November 2008
Design principles

Questionnaires:
Teachers, principals and foundation phase heads of department (n=18)

Qualitative Data collection   Text data   **Questionnaires:** *Teachers, principals and foundation phase heads of department (n=18)*   **Quantitative** Data collection   Numeric data

Coding
Thematic analysis   **Qualitative** Data analysis   Codes Themes   Statistical analysis   **Quantitative** Data analysis   Descriptive statistics

Prototype III
April 2009
Design principles

Observations:
School meetings on reports and use of (n=3)

Journals:
Teachers (n=3)

Interviews:
Teachers and principals (n=3 principals, 7 teachers)

Qualitative Data collection   Text data   **Questionnaires:** *Teachers, principals and foundation phase heads of department (n=28)*   **Quantitative** Data collection   Numeric data

Questionnaires:
Teachers, principals and foundation phase heads of department (n=28)

Coding
Thematic analysis   **Qualitative** Data analysis   Codes Themes   Statistical analysis   **Quantitative** Data analysis   Descriptive statistics

Prototype IV
June 2009
Design principles

SUMMATIVE EVALUATION

Expert evaluation:
International experts (n=3)

Qualitative Data collection   Text data   **Questionnaires:** *Teachers, principals and foundation phase heads of department (n=13 management, 14 teacher)*   **Quantitative** Data collection   Numeric data

Coding
Thematic analysis   **Qualitative** Data analysis   Codes Themes   Statistical analysis   **Quantitative** Data analysis   Descriptive statistics

Feedback system optimised to facilitate use

Design theory

Cycle 1   *Cycle 2*   *Cycle 3*   Prototyping Phase   Assessment Phase

Figure 1: Research procedures

Analysis of the context of the problem

The problem and context analyses for this study involved an investigation of the pre-existing feedback system employed for SAMP prior to 2006. The pre-existing system incorporated a baseline and follow-up assessment period, each of which had a paper-based report and feedback session with the schools participating in the project. The school-users (principals, teachers and HoDs) of the pre-existing SAMP system indicated that the feedback was particularly useful in terms of:

- individual learner results to compare to their own standard of marking;
- early identification of exceptional learners and learners at risk for additional support;
- having contact with the feedback system facilitators as a resource in the university context;
- supporting their understanding of the data.

A number of shortcomings were also identified, including:

- comparative data between schools was not provided on all scales;
- reporting categories were too wide to observe small changes;
- data was not detailed enough to support interventions, e.g. poor early reading scores did not indicate which aspects of early reading were of concern;
- some data presented, while interesting, had no application value;
- no recommendations were made;
- turnaround time from assessment to reporting was too long;
- individual results were not aggregated in such a way that classroom wide interventions could take place;
- communication between the schools and the previous feedback system facilitator was not optimal.

A review of the literature

Based on this initial analysis of the pre-existing feedback system, a literature review was conducted to identify and possibly determine tentative design guidelines for the optimisation of the pre-existing feedback system. The literature review encompassed several knowledge domains including: School Performance Feedback Systems (SPFSs), evaluation utilisation, feedback, data-use school effectiveness and school improvement (Black & Wiliam, 1998; Hattie, 2005; Schildkamp, 2007; Schildkamp & Kuiper, 2010; Schildkamp & Teddlie, 2008; Visscher, 2002). As no feedback system existed in SA at the time of the optimisation, international SPFSs that had been documented over an extended period of time were reviewed. The four cases included the Centre for Evaluation and Monitoring (CEM) Suite (UK), the assessment Tools for Teaching and learning (asTTle) system (NZ), Zebo (*Zelf Evaluatie in het Basis Onderwijs) (*Netherlands) and School Analysis Model (SAM) (Louisiana, USA).

Although these cases have varying approaches to SPFSs, there are some common principles that emerged:

1. The data must *not be viewed as part of unfair high-stakes accountability practices* (Hattie, 2005; Tymms & Albone, 2002).
2. *School and educator expertise should be utilised in the development* and improvement of the feedback system to ensure contextual appropriateness and a sense of ownership (Hendriks, Doolard, & Bosker, 2001; Tymms & Coe, 2003).
3. The feedback system must *provide tools to support school improvement-driven practices* and support greater school autonomy (Angelle, 2004; Hendriks, et al., 2001; Teddlie, Kochan, & Taylor, 2002).

4. Data must allow for *comparison of a school's performance to other groups* (Angelle, 2004; Crooks, 2002; Hattie, 2005; Hendriks, et al., 2001; Tymms & Coe, 2003).
5. A *short turn-around time* from assessment to reporting is essential to ensure the data is still relevant.
6. *Use of ICT is important to improve turnaround time* and increase the school's sense of autonomy (Angelle, 2004; Hattie, 2005; Hendriks, et al., 2001; Teddlie, et al., 2002).

The literature on SPFSs and examination of the pre-existing system provided a rich source from which to develop initial design guidelines for the components of the feedback intervention. However, investigating contextualised processes and logistical issues through literature alone was insufficient. A case study of an exemplary feedback system, asTTle, in its context was conducted to gain deeper insight and knowledge.

An exemplary case study of the asTTle project in New Zealand
The asTTle system has been described extensively elsewhere (Brown, Irving, & Keegan, 2008; Crooks, 2002; Hattie & Brown, 2008; Hattie, Brown, & Keegan, 2003) so only a brief overview is given here. AsTTle provides the autonomous, decentralised schools of NZ an educational technology resource that provides data for school, classroom and learner improvement by assessing student performance in reading, writing, and mathematics in either English or Maori. The test-users can select from a suite of graphical reports (including an online catalogue of curriculum-aligned teaching resources) that allow interpretation of the performance of individuals and cohorts relative to norms, standards, and objectives (Hattie, Brown, Ward, Irving, & Keegan, 2006).
Data for the NZ case study were collected through document analyses as well as interviews with school users, NZ Ministry of Education officials, asTTle development team members, professional developers and researchers using asTTle. Data were thematically analysed to identify the design specifications. The analysis of the exemplary case study proved to be a successful tool to identify design guidelines for the optimising of the SAMP feedback system in South Africa. The following guidelines were identified:

- The system must include: a trusted assessment system, clear reporting (e.g. reports, feedback sessions), support to understand the data, support to use the data and school relationship management.
- All aspects have to be supported by a congruent paradigm of assessment for learning (assessment to support learning, not mainly for reporting) as opposed to assessment of learning (Gardner, 2006).

The global design guidelines from the literature and the exemplary case study are summarised in Table 2.

Table 2: Combined design guidelines from the preliminary phase

Component	Case study	Literature review
Instruments	Use of school and educator expertise in development, to ensure contextualisation and engender trust.	Use of school and educator expertise in development, to ensure contextualisation and engender trust.
Reporting	• Use multiple forms of data presentation to accommodate the needs and preferences of users. • Data presented in clear and easy manner, not require high level of data-literacy. • Short turnaround time from assessment to reporting. • Detailed diagnostic data. • Comparative elements. • Allow for further independent analysis.	• Provide comparative data for evidence-based decision-making. • Short turn-around time between assessment and reporting. • Use of ICT to decrease turn-around time and increase autonomy.
Support to understand the feedback	• Multiple forms to support understanding to suit user needs and preference may include live support, professional development and also ICT resources and printed media. • Some support must be available 24 hours, e.g. ICT resources or printed media.	
Support to use the feedback	• Multiple forms to support use of the feedback to suit user needs and preference. • Some support must be available 24 hours. • Congruence between the infrastructure, feedback and support delivery modes to ensure sustainability and accessibility.	• Resources to support school improvement based on the feedback must be provided.
School relationship management	• Essential and continuous process. • Open face-to-face communication with users engenders trust. • Some support should be available around the clock, even if only in printed form. • Must be responsive to user input. • Feedback facilitator reputation and persona affect the trust in the system.	• The quality of interaction between facilitator and users impact on sense of trust, ownership and credibility. • Communication must be honest, open, clear and respectful.
Supporting paradigm shifts	• System should operationalise assessment for learning to facilitate action in schools. • Encourage triangulation of data. • The feedback system must not be so technical or data-literacy demanding.	• Not be viewed as part of high-stakes accountability.

Conceptual framework

The literature review and case study culminated in a conceptual framework for the feedback system for monitoring learner performance. The global design guidelines discussed in the previous section relate to the feedback system component of the conceptual framework. The conceptual framework (see Figure 2) employs a systems theory approach (Greene in Johnson, 1998, p. 97; Johnson, 1998; Patton, 1997). For a fuller description, see Archer (2010).

Feedback and use are entrenched in the _external environment and context_ (Shulha & Cousins, 1997). This includes the _historic, economic and political influences_ such as the legacy of a highly segregated educational system and variable school infrastructure (Howie, 2002). The _educational context_ relates to the educational system itself and in SA may include availability of support services, high administrative demands and a shortage of educators (Department of Education, 2006).

Competing information in SA includes data from international studies e.g.TIMSS and PIRLS, systemic evaluations, data from the Internal Quality Management System (IQMS) (Education Labour Relations Council, 2003), other research and monitoring activities, everyday knowledge and media reports. Either competing data sources may be integrated or selectively ignored (Hattie, 2005).

The _internal feedback context_ incorporates the constantly interacting characteristics of the monitoring and feedback system, monitoring facilitator and users. The _monitoring and feedback system characteristics_ include whether the methodology is appropriate for the users and context. This choice impacts how users are viewed as informants, participants or co-researchers (Cousins & Leithwood, 1986). The choice directly influences the sense of ownership of the process. If the users are uncomfortable with the methodology, it may increase resistance to use of the feedback system. Users also examine the quality of the monitoring and feedback and though they may not focus on traditional qualitative norms, they often foreground issues of relevance (Schildkamp & Kuiper, 2010).

Monitoring and feedback facilitator characteristics: the monitoring facilitator may take on various roles e.g. expert, facilitator, planner, or educator (Alkin & Daillak, 1979; Rossi, Lipsey, & Freeman, 2004). The facilitator's skills, social competence, contextual knowledge and technical knowledge interact with personal attributes including language spoken, culture and background to influence the facilitator's perceived competence. These characteristics often have a greater influence on use of feedback than technical competence (Taut & Alkin, 2003).

User characteristics include characteristics of the school and individual people in the school. School characteristics influencing use include problem solving approach and attitude towards change. The individual's approach to change, preferences of interaction style, personal motivations and how data is valued also impacts the use of feedback. As do previous experiences with monitoring and feed both personal and through vicarious learning. A common characteristic is that monitoring aimed at accountability is more likely to evoke resistance than feedback aimed at improvement (Plomp, 2009).

Relationship flux characteristics are a result of the user-facilitator interaction. The perception of the credibility of the researcher is constantly being evaluated and adjusted, as is the user's sense of ownership. Trust concerns are a major determinant in data use (Taut & Alkin, 2003).

The *feedback system* referred to in the figure encapsulates the idea of dialogue. Nevo's (2001) concept of dialogue highlights the interactive, two-way flow of information on a continuing basis in this case between the school users and the feedback facilitator. Substantive feedback issues include the quality of the communication products, the timeliness of reporting, quality of communication as well as the accessibility of the data.

Process use (Cousins & Leithwood, 1986) refers to the use of monitoring and feedback during the process of monitoring prior to final feedback of results. *Findings use* relates to use of results, recommendations and findings. Both types of use commence with enlightenment[1] (Owen (in Johnson, 1998, p. 103)). Enlightenment takes place through decision accretion where the user's existing knowledge is supplemented by new knowledge (Weiss (in Patton, 1997)). This information is subjectively coloured by the *political demands* such as the accountability pressures from the Department of Education. Knowledge gained may be distorted into misuses such a symbolic use, purposeful undermining of the process, legitimative use (Owen in Alkin & Taut, 2003, p. 5) or purposeful non-use of the data.

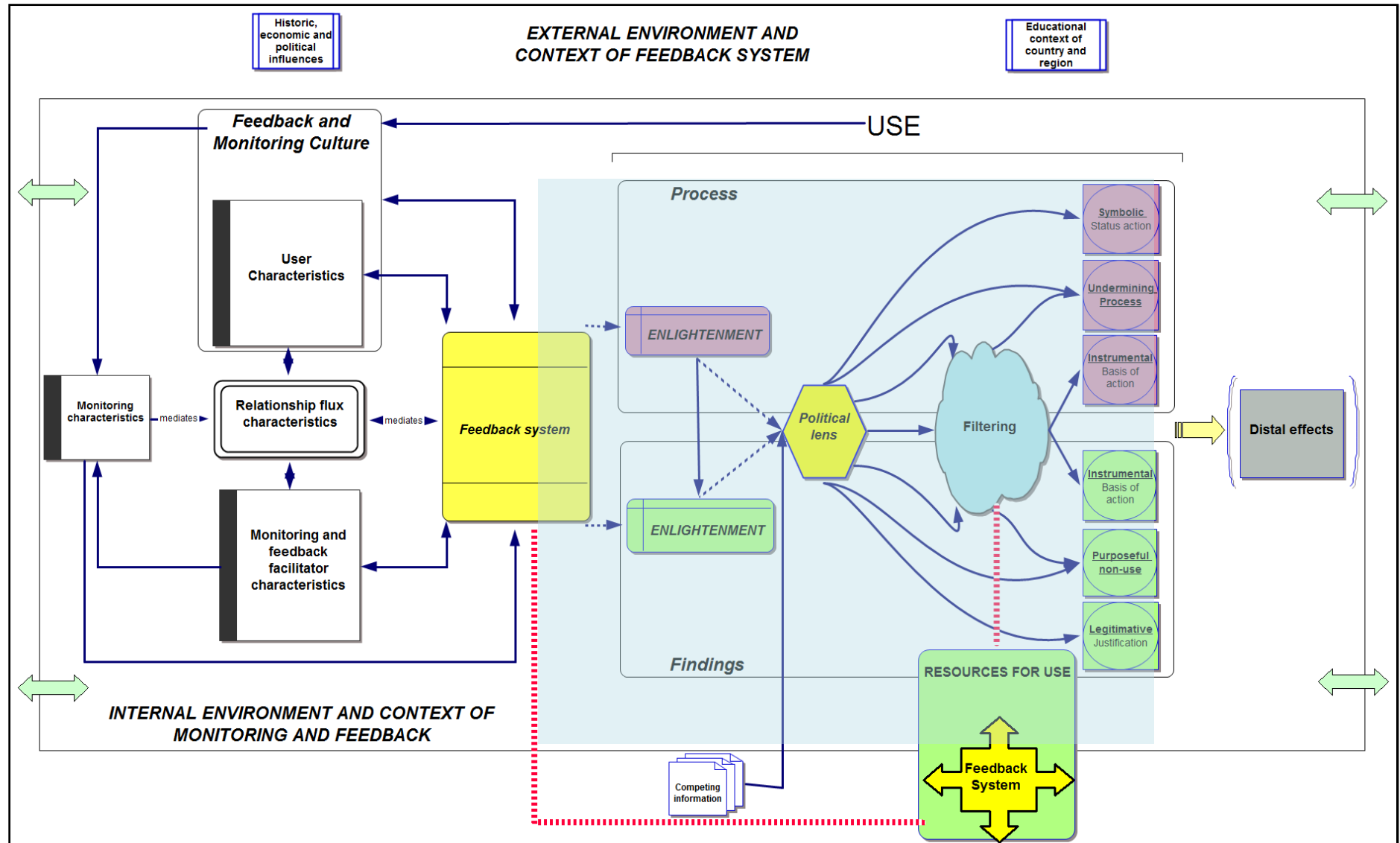[1] Enlightenment is also referred to as conceptual use.

Figure 2: Preliminary conceptual framework for monitoring feedback use

Data that successfully negotiates the political lens (distortions due to pressures from the school and Department of Education) is further *filtered* through reasonability and feasibility testing. These concepts are linked to truth- and utilities testing introduced by Weiss and Bucuvalas (in Patton, 1991, p. 291). *Reasonability testing* is conducted when users quickly examine results and information to establish whether these results can reasonably be accommodated within the user's current understanding of the context and phenomena. The term *feasibility testing* relates to determining if the information gained could practically be used to bring about change. If the feedback fails either one of these tests, misuse may occur. It is only if the reasonability and feasibility testing are passed that instrumental use can take place[2]. After the study was concluded, the empirical data and reflection revealed that the feedback system could impact on the process of use directly at the filtering process by providing links to resources, which could positively influence whether or not the schools felt it was feasible to act on the data (this represents an additional impact of the same feedback system during a later stage of the use process).

The systems view of use acknowledges that all systems inherently strive towards a state of homoeostasis (a state of stability and balance) and tend to resist change. For Fullan, (2006) the key to overcoming this resistance to change is motivating the people in the system, thus working on numerous parts of the system at once. The principle of *equifinality* also applies where changes in the system are not necessarily predictable due to the complexity of the various interacting factors and conditions and the complex feedback loops in the system (Voster, 2003).

Once the identification of the global design guidelines and development of the conceptual framework were completed, the study moved into the Prototyping Phase.

4. Prototyping phase

Three cycles of design, implementation and formative evaluation resulted in three Prototypes I-III of the feedback system during this phase. The entire design research process with the various cycles and prototypes are illustrated in Figure 3. Cycles 1 and 2 focussed on how to establish conditions for use (sub-question 3), while Cycle 3 focussed on how to transform these conditions for use into action (sub-question 4).

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[2] The term instrumental use was first introduced in 1977 by Rich (in Johnson, 1998, p. 93) and refers to direct action based on data gained from monitoring feedback.
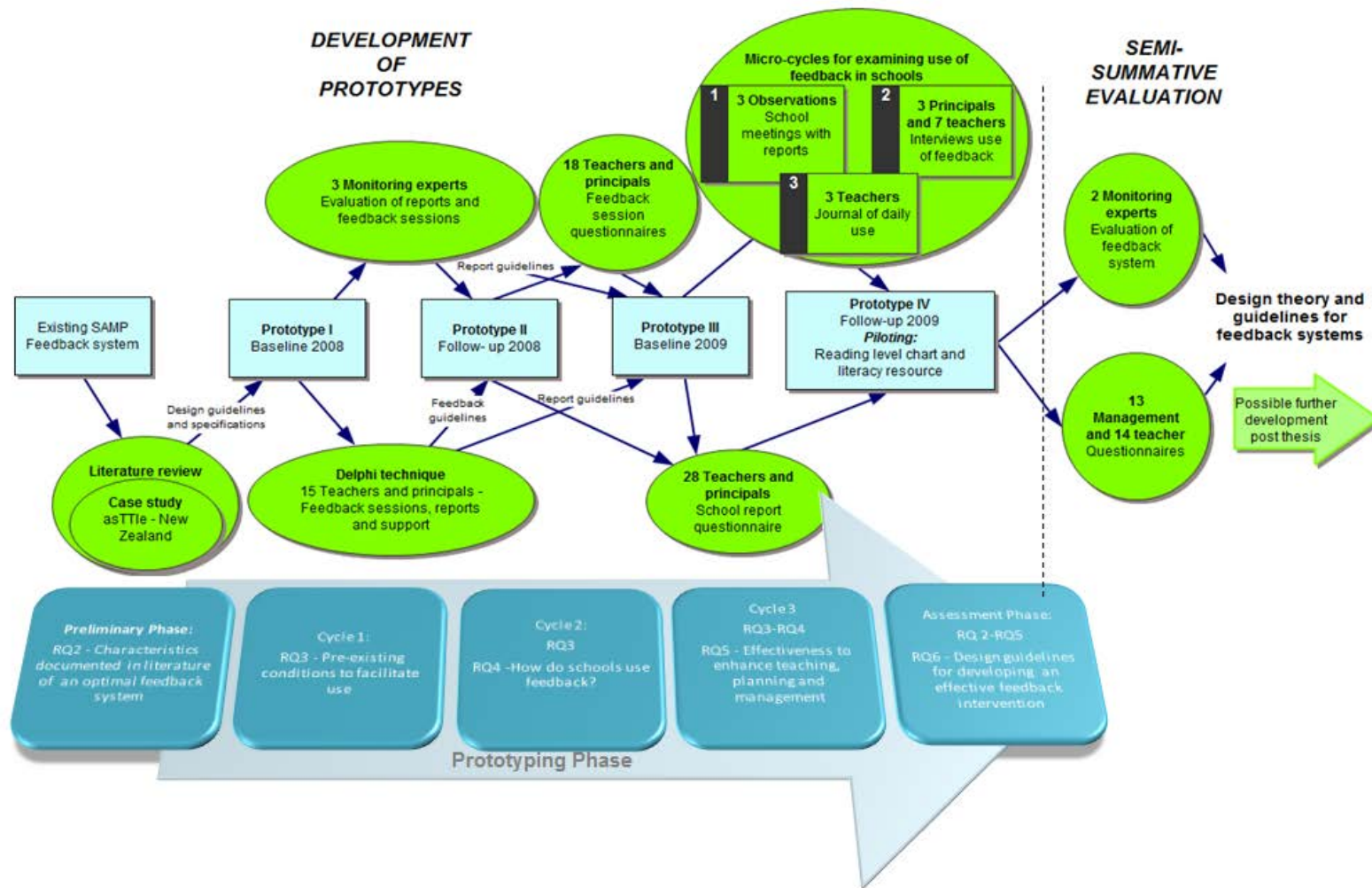
Figure 3: Design research process

Cycle 1 (Prototype I - Baseline 2008)

Feedback on Prototype I was based upon the learning from the Preliminary Phase to establish the conditions for use of the feedback. The design and quality criteria for this cycle (relevance and consistency) centered on the reports and feedback session elements of the feedback system.

The formative evaluation for this cycle employed the judgements of monitoring experts (n=3) and school users (n=15). The monitoring experts were asked to evaluate the reports and feedback sessions and to provide a brief evaluation report. Teachers, HoDs and principals were asked to comment on reports, feedback sessions and support materials. Data was collected through the Delphi technique.

The Delphi technique is s a group problem-solving and decision-making approach that does not require face-to-face interaction (Michigan State University Extension, 1994). A specific problem is posed and participants contribute their ideas, in this case by fax and email. This is followed by a series of carefully designed questionnaires that incorporate summaries and comments from the previous rounds to generate and clarify ideas. The process concludes with a voting round in which the participants can indicate the priorities for the specific project (Dunham, 1995; Illinois institute of technology, ND; Michigan State University Extension, 1994; Williams & Webb, 1994). In this cycle participants were asked how the use of the feedback system could be improved with specific references to the feedback sessions, reports and support for understanding the reports.

The cycle resulted in the separation of the baseline report (traditionally given to schools at the beginning of the school year after testing) into a report and separate manual. The report concentrated on the data for the specific school in contrast to the manual which focussed on the interpretation of the data and explanation of the assessment relevant for all schools. Further expansion of the manual took place, with particular reference to analysis and interpretation at subtest level, curriculum links, reliability and validity of the data from the feedback system, as well as interpretation and use of data. The feedback session with the schools was also shortened from two hours to one and some report automation (replacement of manual graph production and data transfer) took place to facilitate improved reporting turnaround time.

Cycle 2 (Prototype II - Follow-up 2008)

The formative evaluation of Prototype II was more directly focussed on the feedback session and employed school-users as evaluators. The guiding research and evaluation question for this cycle was therefore still question 3 (establishing pre-existing conditions for use of data), but with a focus on the feedback sessions (evaluative criteria: relevance, consistency and practicality). The second cycle's data were generated through teacher and principal questionnaires (n=18 questionnaires).

The guidelines that were emerged from the formative evaluation for Cycle 2 all related to the feedback session. Improved turnaround time was called for in order to increase the relevance, usefulness and efficacy of the feedback. It was suggested that feedback be linked to resources (materials to support intervention, such as pamphlets and websites) and suggestions for action, while opportunities for two-way conversation between feedback administrators and school users was advocated. This could be facilitated by creating an atmosphere that is non-judgemental, constructive and invites participation. It was suggested that feedback should be clear, concise and simple (for example using bar graphs with which most teachers were familiar) so that conversation could focus on interpretation and application, not only understanding of the data.

Cycle 3 (Prototype III - Baseline 2009)

For the third cycle, questionnaires (n=28) were again employed for teachers, principals and HoDs. This was supplemented with the examination of three schools' data-use processes through observations of school meetings (n=3), reflective journals for teachers and interviews (n=10) with teachers, HoDs and principals. The formative evaluation examined the functioning of the new report format and how well the feedback system facilitated the transformation of the feedback into action in schools. The aim was thus to determine how schools were interacting with the feedback and what the barriers or facilitating/enabling factors were to employing feedback in each school's specific context. The quality criteria were therefore actual practicality and expected efficacy with specific reference to the reports and manner in which feedback is used in schools.

The design guidelines for the report for this cycle advocated further improvement of turn-around time through automation, links to resources that facilitate use of data and inclusion of additional variables such as pre-school attendance to allow for additional analysis of the data. The observations illustrated that the whole system must embody assessment for data-based planning and learning. Data presentation should be such that understanding the data is easy and resources can rather be allocated to implementation. For instance, data presentation incorporated mean scores as opposed to regression lines and graphic presentations were also not complicated with measures of variation, which could prove confusing for school users. Curriculum links were intended to support data-based action as well as target setting for improvement actions and the triangulation of various data sources such as classroom assessments and SAMP data.

5. Assessment phase

The final cycle incorporated the learning from all the previous cycles in order to evaluate the functioning of the feedback system as a whole. It therefore consisted of a semi-summative evaluation (Plomp, 2009) of Prototype IV. The evaluation was conducted by means of reports from expert evaluators (n=2), a questionnaire for teachers (n=14) and a questionnaire for school management (n=13). This cycle focussed on research questions 5 and re-addressed questions 2-4. The evaluation information served to provide design guidelines relating to the development of a functioning feedback system that facilitates use of the feedback, in other words, for the entire intervention. The quality criteria were on practicality and effectiveness, both expected and actual.

Prototype IV, which was implemented and evaluated in this cycle consisted of the Follow-up 2009 (report provided during the second half of the reception year which documented changes in results from the start of year or baseline assessment). All components of the SAMP feedback system were assessed for practicality and effectiveness, including the assessments themselves, the reports, instrument manual, electronic resource, support website and feedback sessions. All components were rated highly by users and expert evaluators on all aspects (appearance, clarity, need for the content, importance of the content, accessibility, ease of use and effectiveness). The cycle thus established that all the quality criteria, namely relevance (content validity), consistency (construct validity), practicality of the system, e.g. ease of use of the different components of the system such as the reports and resources and perceived effectiveness (catalytic validity in this case related to the perception of users that the feedback positively translated into improvements in their schools, class and individual support) as perceived by the users were met.

6. Yield of the project

Design guidelines were developed throughout all three phases of the design research process, based on the various evaluations. The design guidelines, which encompass the characteristics of an effective feedback system and the use thereof, can be clustered according to guidelines for: instruments, reporting, support to understand data, support to use data, school relationship management and support for paradigm shift. The guidelines can also be classified as either product-related (related to the intervention itself) or process-related (related to the design process). The detailed design guidelines can be found in Archer (2010) and are only summarised here.

Instruments

The data generated and to be provided through the feedback system must be shown to be reliable and to allow for valid inferences in order for a feedback system to be effective (product-related). User involvement in adaptation, translation, contextualisation, development or evaluation of instruments is strongly advised to encourage trust, credibility and sense of ownership (process-related). Data must be differential (discriminate well between high and low performing learners for each of the measured subtests) to have diagnostic value and be curriculum-aligned to facilitate using data for decision-making and planning (product-related).

Reporting

User preferences should be accommodated through different modes of feedback (for example face-to-face, written and electronic) and incorporate various data representations (for example tables, graphs and text) (product-related). Data must have comparative elements (for instance measuring a school's result against those of other schools) and should be confidential (product-related). Reporting should include both positive and negative feedback and include interpretations and recommendations to support evidence-based improvement practice (product-related). Employing these guidelines decreases the demands on the statistical-literacy of the users, provides opportunities for users to improve their data-literacy and increases the school's receptiveness and responsiveness to the feedback.

Support to understand the data

Incorporating various formats of data representation facilitates understanding of data, but should be accompanied by explanations, examples and support material (product-related). Support must be provided in a variety of manners such as written manuals, electronic support, web support and live interaction through feedback sessions and telephonic support, some of which should be available around the clock (product-related). This type of support provides users with the opportunity to select the most appropriate support form for them and accommodates users with different levels of data-literacy skills.

Support to use the data

Once users understand the data, the next step is to use the data for improvement action in the schools. This can be supported by including interpretations, recommendations and links to tools for action in the feedback (product-related). This type of support should again be represented in a variety of modes with some support being available constantly, e.g. printed materials, electronic resources and web-based support.

School relationship management

Every interaction with the schools provides an opportunity to alter perception about assessment and feedback systems and increase the receptiveness of the school users to the feedback (process-related). The quality of interactions is more important than the frequency of interactions (process-related). Communications, whether written or verbal should be clear, concise, respectful and encourage two-way communication that values user input (process-related). Fieldworker training is an essential component of school relationship management (process-related). The fieldworkers during the research project were located in the research team, once school begin to use the system independently, school users will have to be trained in a similar fashion to conduct assessments in future. A record keeping system of communications is essential to prevent duplication of communication by other team members (process-related). Professional execution of logistical matters provides an opportunity to show respect for users and improve the relationship flux characteristics between the feedback facilitator and users (process-related).

Support for paradigm shift

A learner performance feedback system can be a powerful tool to facilitate paradigm shifts. In this case, the feedback system aimed to entrench certain concepts within the users: use of data for evidence-based practice; the need for differential teaching; assessment for learning as opposed to assessment of learning and greater understanding of the curriculum. Whatever the underlying paradigm of a feedback system, all the elements of the feedback system should embody this and be congruent with the other elements. For example, modeling the approach to interpretation, planning and action based on the data, can be a powerful tool to embody the paradigm and support process use of these skills in the schools (process-related).

The study showed that an effective feedback system facilitates appropriate use through a gradual process of enlightenment; is flexible and responsive to user inputs; values collaboration and includes instrument, reporting and support components in its design. An optimum feedback system also positively influences school feedback and monitoring culture by providing opportunities for positive experiences with feedback and increasing data-literacy. This improves the chances of feedback being used for planning, decision-making and action in the schools. An effective feedback system must also offer a comprehensive package of different reporting levels and modes to accommodate different users, with various levels of data sophistication, functioning in diverse contexts. The research also showed that an effective feedback system mediates thinking about educational instruction and curriculum and can therefore be a potent change agent. Use of clear, simple, intuitive data presentation in the feedback system allows for experiential learning to increase user data-literacy.

The design research approach employed in this study offers an appropriate and powerful approach to adapting, developing and optimising a feedback system. User involvement in design research ensures greater contextualisation and familiarity with the system, while engendering trust and a greater sense of ownership, all of which increase the receptiveness and responsiveness of users to feedback. Involvement of school users in this particular design research process also allowed improvement of statistical literacy skills, an opportunity to evaluate personal assessment standards and a deeper understanding of the curriculum links to particular skill sets. Finally, the research also contributed design guidelines for other developers of feedback systems, an integrated conceptual framework for use of monitoring feedback and a functioning feedback system that is now employed by 22 schools in the Tshwane region of SA.

Although the study took place in a specific region in SA with emphasis on primary schools, the design guidelines provide the opportunity for other researchers to replicate the research in other contexts. The rich descriptions of the research process (see Archer, 2010) provide the opportunity for design researchers to transfer the knowledge to different contexts. This may include replication within, for instance, different levels of the schooling system, different languages of instruction, different countries and different education systems. If the replication proves successful, analytical generalisability may be achieved, wherein it can be concluded that the results are applicable to all the successful replication contexts (Yin, 2003).

7. Reflection

Currently the SAMP feedback system is being further developed by the CEA to include more grade levels. A similar design research process is being followed for the further development. The use of a design research approach was highly effective for the design and adaptation of the feedback system. The design research approach allowed the opportunity to design, implement and evaluate various prototypes, which slowly started to approximate the ideal for the specific context, whilst the system functioned and served schools. This flexible iterative design process ensured that the design process remained responsive to input from user and experts alike. The need for responsiveness does however place high demands on the researcher to embrace emergent research design, which may call for adjustments in the originally planned research approach. Design research includes representatives of the target users in designing the interventions. This meant that users could feel a greater sense of ownership of the feedback system, making them more receptive and responsive to the data. The design research philosophy of viewing the users as true partners and collaborators in the design process was congruent with the collaborative approach used in the feedback system. The participation in the design research process also afforded users the opportunity for process learning about evaluation processes and furthered data-literacy of the participants. The quality criteria employed in design research allowed for enhancing of specific aspects of the feedback system in a systemic manner during the various phases of the design process. This not only ensured that all the criteria enjoyed attention during the design process, but also that there was a shift in which evaluative criteria were the focus during the various evaluative cycles. The design research approach resulted in design principles to support other feedback system designers, ensuring that the research had value beyond the context for which it was designed.

Key source

Archer, E. (2010). *Bridging the gap: optimising a feedback system for monitoring learner performance.* Pretoria: University of Pretoria. Unpublished doctoral thesis. Retrieved from http://upetd.up.ac.za/thesis/available/etd-02022011-124942/.

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