'Windows' on Teachers' Beliefs and Attitudes about School ICT Policy Statements

Dr T. Vandeyar

Department of Science, Mathematics and Technology Education
Faculty of Education, University of Pretoria
Email: thiru.vandeyar@up.ac.za

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Abstract

Evidence from research, policy and practice reveals that information and communication technology (ICT) does improve teaching and learning. Recent studies have shifted focus to acknowledge teachers' beliefs and attitudes about ICT as the factor that determines change in classroom practice. The inclusion of teachers in developing a school-based ICT policy that mirrors their beliefs and attitudes may pave the way for successful ICT integration. However, there is a death of research that explicates exactly how to develop policy that is inclusive of all teachers at a school. This study used an interpretivist paradigm to explore teachers' beliefs and attitudes about school ICT policy statements. Using an exploratory case study design that was grounded in Q-methodology provided the ideal setting for the systematic study of subjectivity of policy. Data was garnered through Q-sorts, interviews and analysed by means Q-methodology factor analysis methods. Findings were threefold: First, Q-methodology enables policy makers and practitioners to experience both real differences in discourse and consensus of opinion. Second given the opportunity, teachers have the inherent ability to deconstruct and critically engage with policy statements according to their own professional beliefs and attitudes. Third, teachers as previously excluded actors may be included in the policy decision making process and a school-based ICT policy may be formulated to represent a shared vision of all teachers. And, fourth Q-methodology offers education policy analyst an opportunity to gain insight into the beliefs, attitudes, opinions and values of different actors in policy analysis studies.

Keywords: *ICT policy; school; teacher beliefs and attitudes; Q-methodology; consensus*

1. Introduction and Background Context

Government and policymakers have placed computers in school with the intention that it will become a natural part of the instructional repertoire of teachers. However, they did not consider the contextual issues that plague teachers nor the specific needs that teachers may have for computers (Hopkins & Levin, 2000). Cuban argues that policy makers and administrators "must understand teachers' expertise", beliefs and attitudes on classroom work and engage teachers meaningfully in the "deliberations, design, deployment, and implementation of technology plans" (2001, p.183). Cuban further posits that teachers are very seldom consulted in regard to the design and implementation of technology plans (2001). Consequently, ICT will have a minimal impact on teaching and learning if teachers are not respected and acknowledged for the expertise that they bring to the teaching-learning environment.

The introduction of ICT into the South African education landscape has become commonplace in most schools, albeit at a low level of integration. ICT as a 'new' teaching tool has made its entry into a wide range of schools, particularly public schools. Much of the South African e-Education goals have not been achieved, most significantly the ideal of making all teachers and learners ICT competent by 2013 (DoE, 2004). Though South Africa has a rich culture of policy development prowess it seems to have fallen prey to poor implementation of the e-Education policy in schools (Vandeyar, 2010, 2014). Yet, in the absence of guiding policy and the lack of systemic support, schools are forging ahead by their own means and through communities of practice (Vandeyar, 2013). In the South African context it seems as though teachers' "practice" is guiding school "policy" and this evidence may provide a *window* to better understanding how ICT may be used to enhance classroom practice (Vandeyar, 2013, p. 256)

The successful integration of information and communication technology (ICT) into teachers' classroom practices is to a large extent dependent on a school's ICT policy (Vanderlinde, van Braak & Dexter, 2012). Furthermore, an ICT policy that reflects a shared vision of all teachers is more likely to be implemented in classrooms (Hew & Hush, 2007; Vandelinde et al., 2012a; Vandelinde et al., 2012b). Generally national education policies encourage schools to develop their own ICT policy however schools are often left to their own devices. Such an exercise of developing an ICT policy is taken for granted by systemic structures, but remains a challenge for most schools particularly in the absence of

guidelines on *how this is to be achieved*. Accordingly this study argues for an inclusive approach to a school's ICT policy, by understanding teachers' beliefs and attitudes as a pre-requisite to policy formulation. The research was guided by the research question: What beliefs and attitudes do teachers hold about school ICT policy statements?

The argument is presented as follows: First, a brief review of literature is presented. Second, Proudfords' (1998) emancipatory theory on how teachers negotiate and interpret policy statements is described as a theoretical framework. This is followed by a detailed description of the research method and analysis utilising Q-methodology. The paper concludes with the interpretation of findings and discussion, and recommendations for future research.

2. Literature Review

A review of the voluminous literature reveals that much emphasises is placed on the benefits of a school-based ICT policy (Sang, Valcke, van Braak, & Tondeur, 2010; Tondeur, van Braak, & Valcke, 2007; Ottestad, 2010; Vandelinde et al., 2012a). However, research on *how to achieve this phenomenon* is rather "recent and underexposed" (Fishman & Zhang, 2003; Erstad & Quale, 2009). There is a dearth of research and policy guidelines on exactly *how* schools may develop an ICT policy (Erstad et al, 2009; Vandelinde et al, 2012a). Consequently, schools are left to their own devices to develop a school ICT policy often through mimicking, normative or coercion isomorphism in an attempt to legitimise their policies (DiMaggio & Powell, 1983). Isomorphic responses to policy invariably results in policies that do not represent the vision of stakeholders and neither does it promote a participatory approach to policy formulation. The literature review unfolds as follows: an understanding of what is a school ICT policy and perspectives on ICT policy; teachers as agents of change; teachers' beliefs and attitudes. The literature review concludes with a theoretical underpinning.

2.1 School ICT policy

There are inherent conditions necessary for the successful integration of an ICT policy into teachers practice (Vanderlinde, van Braak & Tondeur, 2010) namely, it should have a shared vision of teaching, learning and integration; it should promote curriculum content and enhanced learning; it should be dynamic and constantly improved upon and it should be collaboratively developed with teachers as core participants as significant stakeholders. Hew and Brush (2007) also allude to schools having a shared vision and an ICT policy plan that may act as a lever to influence teachers' beliefs and attitudes to use ICT in their classroom practice. Teachers in schools with an ICT policy that encompassed shared beliefs were more likely to use ICT more regularly in their classrooms (Tondeur et al., 2008a, 2008b).

So what is a school-based ICT policy? In this study a school-based ICT policy refers to a document that describes a broad spectrum of components that are inherent of an ICT policy. The policy plan may include among other; mission and vision statements, goals, expectations, teacher professional development, teacher ICT skills, learner attainment standards, finance, software and hardware access, administration and management, and strategies for ICT implementation (Vandelinde et al., 2012a). More importantly, an ICT policy specifically documents the strategy to integrate ICT to facilitate curriculum delivery and how ICT is perceived as a change agent in improving teaching and learning (Baylor & Ritchie, 2002; Tondeur, van Keer, van Braak & Valke, 2008b).

Tondeur et al. (2007, p. 212) found that even when schools had ICT policies, these policies were often 'underdeveloped and underutilised'. Findings from the Impact 2007 study suggest that there is 'discontinuity' between policymakers, school managers, staff and students in their understanding of what the exact nature of 'personalising' ICT for learning really means in practice (Underwood, Baguley, Banyard, Coyne, Flint, & Selwood, 2007, p. 54). Research findings indicated that teachers merely focused on the development ICT technical skills, whereas the curriculum policy expected teachers to integrate ICT within the teaching learning situation (Tondeur et al., 2007). This gap between the proposed curriculum policy requirements and the implemented curriculum for ICT indicates there is a huge mismatch between policy expectations and classroom practice (Robertson, 2003). Fullan (1992, p.3) argues that the implementation of ICT in schools is a phenomenon that is uniquely different to minor changes in curriculum content and it is not simply a question of re-organising the knowledge base of educators but essentially getting "teachers to start from base zero".

2.2 Teachers' as agents of change

Teachers are situated at the interface where policy meets practice. In this regard the crucial role of teachers as collaborative partners in policy formulation cannot be overemphasized (Fishman & Pinkard, 2001). However, research evidence suggests that in most cases, teachers are seen as passive, non-existent or mere "conduits" in the policy making

process (Tondeur et al., 2007). Numerous studies acknowledge that ICT integration into teachers' classroom practice may only happen if teachers are included in the ICT policy formulation process (Cuban, 2001; Stoll, 2003; Vandelinde et al., 2010). Fishman and Zhang (2003) found that regardless of the benefits of a school-based ICT policy, there is a dearth of research on this complex phenomenon of planning. Literature on the exactly *how* teachers should be included in the actual process of creating a school-based ICT policy is underdeveloped (Vandelinde et al., 2010). More specifically Tondeur et al., (2008b) affirmed that the success of a school-based ICT policy depends on teachers being aware of the content of the policy, and understand its implications.

Without a school-based ICT policy coupled with the lack systemic support and pedagogic guidelines, teachers are unlikely to exploit ICT to improve the quality of teaching and learning (Mulkeen, 2003; Vandeyar, 2010, 2014). Moreover the challenge is greater in a context where teachers have been traditionally excluded from the policy decision-making process. According to Fullan (1982) teachers that are expected to make an innovation paradigm shift must have a clear understanding about both the content and theory of the educational change. In this regard if all implementers have a shared vision, agree on the need and appropriateness of the innovation will enhance the success of the innovation and a priority for change effort (Fullan, 1992). Teachers' ICT use in most cases developed independently of reform efforts (Donnelly et al., 2011; Vandeyar, 2010, 2013). Fullan (2007, p. 25) advocates that effective educational change calls for the "reculturing", which may only occur if teachers have a shared meaning of what the change process entails which "is at the heart of the matter" (Fullan, 2007, p. 42).

Teachers are less likely to engage with policy documents when challenged with educational change (Fullan, 2007). When teachers are subjected to a top-down imposed policy decision for ICT adoption, they are "unresponsive" because the policy does not align with their beliefs, attitudes, priorities and professional classroom needs (Jimoyianni & Komis, 2008, p.170).

2.3 Teacher beliefs and attitudes

According to Ottenbreit-Leftwich, Sadik, Sendurer and Sendurer (2012) second order barriers such as teachers' beliefs and attitudes are crucial intrinsic factors to the successful integration of ICT into teaching and learning. These second order barriers pose a greater challenge to technology integration as opposed to first-order barriers, which are external to teachers, such as access to technology, training and support (Ertmer et al., 2012). Teachers' perceptions about ICT related policy has also been listed as an additional factor that influenced ICT integration (Barron, Kemker, Harmes, & Kalaydjian , 2003). A favourable policy enhances teachers' classroom use of ICT (Barron et al., 2003) and teachers' awareness of ICT policy influences classroom practice (Vandelinde et al., 2012b). The overriding argument is that if teachers are stakeholders of the values expressed in a policy and understand the policy implications for their teaching, then the policy is more likely to influence their practice.

Teachers' beliefs are viewed as a "window on teachers' decision making" and practices (Rimm-Kaufman, Storm, Sawyer, Pianta & LaParo, 2006, p.143). Several elements define the nature of teacher beliefs (Borg, 2001). First, beliefs are based on judgement and values and do not require evidence for these idiosyncratic behaviours. Second, beliefs guide teachers' thinking, sense making and behaviour. Third, beliefs may inform behaviour in a subconscious manner. Fourth, classroom practice and experience may idiosyncratically entrench beliefs. Fifth, beliefs may impede efforts or paradigm shifts that aims to change teachers' practice.

It has been found that teachers' beliefs and attitudes about the use of ICT were the main reasons attributed to the success or failure of technology use in teaching and learning (Ertmer et al., 2012; Prestridge, 2012). According to Ertmer (1999) teachers would not automatically use technology even if all first order barriers were reduced or absent. This places significant emphasis on teachers' beliefs and attitudes as a fundamental necessity for the successful integration of ICT into the classroom practices of teachers. Teachers that made the pedagogical paradigm shift to use alternative assessment practices or redefined their traditional teacher roles may more readily use ICT, and find that the inclusion of technology may fit their changed beliefs about classroom practices (Ertmer, 1999).

A number of studies present evidence that an increase in ICT use in teachers classrooms can be linked to "a favourable policy environment" (Sang et al., 2010; Barron et al., 2003). Furthermore a school-based policy improves interest by a community of practice to use ICT regularly, effectively and consistently (Hennesy, Ruthven, & Brindley, 2005). The appropriation of an ICT school-based policy will not occur unless all stakeholders are aware of a policy and understand the contents of the policy. Fullan (1991), suggest that the adoption of an innovation depends on a democratic process involving all school actors. Kennewell, Parkinson, Tanner (2000), Tondeur et al., (2008b) and Sang et al, (2010) found that successful ICT integration in schools is likely to succeed if the ICT policy reflects teachers' beliefs, attitudes and values and teachers' understand the policy implications for their classroom practice.

2.4 Theoretical underpinning

Challenges facing ICT policy implementation at classroom level are not unique to the South African context. School management have developed ICT policy with the expectation that it would be imbibed by teachers and put into their classroom practice. This perspective excludes teachers as policy decision makers and assumes teachers to be passive recipients of policy (Vandeyar, 2013). New reform or innovation often requires teachers' having to reassess their practices and beliefs. In this regard, Proudford (1998) describes an emancipatory framework for explaining how teachers cope with educational policy change. Proudford (1998) argues that teachers react to policy changes based on their professional confidence, interpretation of policy and professional consciousness.

Teacher professional confidence implies a belief in one's authority and capacity to make important decisions about how to conduct one's work. Proudford (1998) describes professional confidence, as the teacher's capacity to problematise and in so doing ask questions about taken for granted assumptions and values that support policy response and professional practice. Professional confidence also involves the feeling of being "in control" of the work in hand. Consequently, high levels of confidence may result in the teacher exercising his own professional interpretation of policy.

Professional interpretation occurs when teachers deconstruct or critically analyse policy text and interpret the text of the policy in such a manner that the policy can work in the interest of teacher professionalism and transformative educational change. To explain teachers' varying interpretations of policy texts of curriculum reform, Helsby (1995) noted that professional interpretation of educational policy text may be either "readerly" in which the teacher has minimal scope for creativity and may opt to be unquestioning and accept policy text *as is*; or "writerly" in which the teacher assumes an interpretative role by resisting, challenging or reinterpreting policy text. The heart of whether the teacher is 'readerly' or 'writerly' is not inherent within the policy text, but is vested in the interactions between the text and the teacher. Furthermore, Proudford (1998) posits that when professional interpretation of policy is evident in practice, they are supported by the teachers' own beliefs, values, attitudes and frames of reference.

This study is underpinned by an emancipatory approach which allows teachers freedom to interpret policy text according to their professional consciousness embedded in their beliefs and attitudes. This study offers a window of opportunity for teachers' voices to be heard as an enabling process for policy formulation, as it lays the foundation for policy debate by including teachers as relevant stakeholders.

3. Q-methodology as the Research Method of Choice

The research was conducted within an interpretivist paradigm to explore and understand the beliefs and attitudes of teachers about a school-based ICT policy. Using an exploratory case study design (no theory or priori notions being tested) that was grounded in Q-methodology provided the ideal setting for the systematic study of subjectivity, which is a key construct of qualitative research (Brown, 1993, p. 93). Q-methodology is a technique that incorporates the benefits of both quantitative and qualitative research methods (Dziopa & Ahern, 2011). This mixed method approach affords the researcher rigorous quantitative means to validate participant subjectivity with precision (Brown, 1993). Q-methodology is concerned with individual viewpoints of participants and measurement of their own values and attitudes (Donner, 2001; Wright, 2013). Q-methodology offers the qualitative researcher a well-defined methodological structure to explore the beliefs and attitudes of participants using statistical outputs to guide a qualitative interpretative task.

Q-methodology can be used to explore perceptions around specific educational questions, and more significantly it that gives "shape to policy discussions, in an educational context" and "elucidate views of stakeholders in much broader context than the classroom" (Wright, 2013, p.157). Q-methodology provides a foundation for the systematic and robust study of participants' beliefs, attitudes or viewpoint (Brown, 1993;Dziopa & Ahern , 2011; Watts & Stenner, 2012; Cross, 2005; Deignan, 2009).

Having grounded Q-methodology as a rational method of choice, a detailed explanation follows of the five phases used in this study. The first phase of involves defining the concourse and describes the formulation and development of policy statements that constituted the Q-sample. Phases two and three describe the selection of the participants (P-set) and the Q-sorting process respectively. Phases four and five, gives and account of the analysis and interpretation of the data.

3.1 Phase 1: The development of the Q-Sample

Concourse in Q-methodology refers to the conversations, commentary and discourse with respect to a particular topic (Brown, 1993). In this study the concourse was determined through a collection of statements that emerged from a

detailed review of empirical literature on ICT policy for schools. According to Van Excel and de Graaf (2011, p.4) "the gathered material represents existing opinions and arguments, things lay people, politicians, representative organisations, professionals, scientists have to say about the topic". Various sources of data was garnered from school web-sites, school-based policy plans, non-government organisation, national ICT in education policy, school ICT policy guidelines, online schools' ICT policy and education portal guidelines. Wright (2013, p. 154) describes a concourse as a "collection of statements that encompass all views about the subject under scrutiny". In this study the concourse analysis yielded 159 policy statements from the literature review as the raw data. The statements were sorted and grouped into fourteen themes which were determined by identifying the relevance and frequency with which they occurred in the various document sources.

According to Brown (1980), the selection of statements from the concourse for inclusion in the Q sample is crucial as a subset of these raw statements drawn from the concourse need to be presented to the participants. To achieve this, the 159 statements were subjected to expert review to refine for clarity. Furthermore statements that were redundant were removed to enhance uniqueness and single value judgement. Thus to improve content validity the policy statements were submitted to experts in the field of ICT in education. Several experts in the field of educational ICT at both international and national levels were purposefully selected to validate the statements. Some experts were identified through literature sources and were solicited for participation through e-mail communication. An Excel spreadsheet was form-designed for the 159 policy statements to be ranked on a Likert scale ranging from -5 to +5. The experts were requested to rank the policy statements according to their opinion of the importance on what they considered to be 'important policy statements' for inclusion in an ICT policy for school. Five experts responded and their responses were further subjected to content validity by selecting ICT policy statements with a high degree of consensus. Thus only policy statements with an experts' consensus ranking of +4 or +5 were selected from the Q-Sample. This process of sifting, editing, and sorting resulted in 78 policy statements in fourteen themes which constituted the *Q-sample* for teacher sorting.

3.2 Phase 2: The selection of participants (P-Set)

The P-set describes the selection of the teachers participants that were subjected to the sorting of the policy statements (Q-sample) according to their own beliefs and attitudes. The research was conducted at Riverside Primary School, being representative sample of a public school within the South African context. The entire teaching staff of twenty three teachers which included six members from school management participated in the study and constituted the principal unit of analysis.

Riverside Primary School is a public primary school located in a suburb in Pretoria[1], South Africa. The school was established in 1980 originally to serve an Indian community during the apartheid[2] period. Approximately 90% of the 846 learners are Black, 9% Indian and 1% Coloured. All twenty three teacher staff participated in the study, eighteen of which are of Indian (five males and thirteen females), two are white female teachers and three black teachers (two females and one male).

The school has two computer centres. One centre was developed and funded from school finances which had 40 computers and a data projector. This centre had a network server and was equipped with basic Microsoft Office software obtained under the Microsoft School Agreement policy. The school introduced computer literacy as an integrated time-tabled subject across all grades, from grade one to grade seven. This centre was also use for teacher computer literacy development. A second computer centre, which had 25 computers, was developed through a provincial initiative called "Gauteng-on-line" (GOL). Even though the GOL laboratory had internet access it was not used by teachers due to a number of reasons. Firstly, teachers were not adequately trained on networked computers and refrained from using the computer centre. Secondly, the computers were protected and end users could not download any software, not even Adobe (pdf reader) software. Third, internet connectivity lacked sufficient bandwidth and teachers experienced constant connectivity problems which frustrated the few teachers that did used the facility. Thus the GOL soon became a white elephant and gained the nickname of "Gauteng-off-line" because of unstable internet connectivity.

The school had an internet use policy which merely indicated some informal rules for students on the use of the computer equipment. This informal policy was developed by solely by the principal through internet sources. The school had no formal ICT plan or policy and neither did it have a vision for ICT integration into the curriculum or for teaching and learning. All teachers attended a very basic compulsory ICT literacy course over two days. The principal of the school

[1] *Pretoria is a major metropolitan town in the province of Gauteng in South Africa*
[2] *Apartheid – Afrikaans term meaning 'separate development' areas based on race classification*

introduced in-house training for teachers to develop their use of ICT, but mainly for administrative purposes. Two desktop computers and a printer were made available in the staff room for teacher use.

3.3 Phase 3: The Q-Sorting process

Teachers were required to rank-order the 78 policy statements (Q-sample) according to their own beliefs, values and attitudes. The process is carried out by each teacher making an idiosyncratic judgement about the how the policy statement appeals to them by ranking the statements from "most agree" to "most disagree" or "most characteristic" to "most uncharacteristic". The prearranged frequency distribution (Figure 1) forces participant to make a value judgement of one policy statement over another. This prearranged frequency distribution also enhances standardisation of the data. The figure illustrates the forced-choice frequency distribution which simulates a quasi-normal distribution as a "pragmatic means of facilitating the subjective evaluations and policy rankings on which Q-methodology depends" (Watts & Stenner, 2012, p.17).

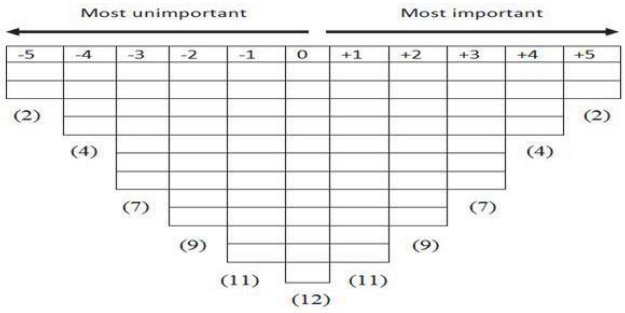

Figure 1 The prearranged (forced-choice) distribution for the Q-sort was designed for the ranking of the 78 policy statements (Q sample). Numbers in brackets represent the number of policy statements per ranking scale.

After the Q-sorting of the policy statements, each teacher's distribution was captured as a unique digital image using a digital camera (see example in Figure 2). The rationale for digital data capture of each teacher's ranking and distribution was for follow-up ease of data access and analysis. Each participant's Q-sort was assigned a unique number to identify the participant (See Figure 2 – Example of Teacher 19's sort). To enhance data triangulation a brief face-to-face interview was conducted to give teachers an opportunity to revisit their Q-sort distribution as a form of member checking. During the interview teachers' preferences particular to policy statements that were ranked +5 and -5 were discussed. The interview also focussed on demographics with respect to teaching experience, subject, qualifications, teaching phase (foundation phase, intermediate or senior specialisation) and ICT literacy.

Figure 2: Example of a completed Q-sort by teacher (T19)

-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
34	23	14	75	43	3	24	40	53	22	46
10	32	36	12	50	76	26	51	63	71	61
	1	29	27	73	67	21	48	59	38	
	18	35	66	65	28	58	49	7	19	
		78	64	70	13	62	4	2		
		68	44	60	17	69	72	9		
		25	20	77	30	56	57	37		
			41	55	42	74	15			
			16	6	54	47	39			
				45	52	31				
				11	33	8				
					5					

3.4 Phase 4: Data analysis

Analysis of data was done using WebQ, a JavaScript freeware software application package that was used for entering each teacher's Q-sort online. Each teacher's Q-sort data is then captured in a data file for subsequent use in a MS-DOS based application called PQMethod (Schmolck & Atkinson, 2002). PQMethod is a statistical application program, structured to satisfy the requirements of Q-studies. It allows the researcher to enter Q-sort data in the manner that it was collected. After selecting the desired factors, the analysis produces an extensive report with a variety of tables on factor loadings, statement factor scores, discriminating statements for each of the factors as well as consensus statements across factors.

In Q-methodology a *by-person* factor analysis was achieved through the correlation and factorisation of the same matrix of data and in which rows and columns were transposed (Watts & Stenner, 2012). The by-person factor analysis also requires standardisation of scores *by row* to be achieved "relative to the entire population of scores for a single person". By row standardisation was achieved through the very nature in which data is gathered. Thus, in Q-methodology matters are inverted, individual teachers are the variables and the Q-sample policy statements are the observations (Watts & Stenner, 2012).

As explained above by applying correlation statistics to the rows of a matrix of data, it becomes possible to establish the degree of agreement or disagreement, between the entire set of policy statement rankings produced by any two persons. In this manner we can ascertain a "direct and holistic" comparison of all teachers' respective sorts. The correlation matrix enabled the observation of associations "between persons" (Watts & Stenner, p. 18).

Principal component analysis (PCA) was done as a form of factor extraction, as this was an exploratory case study without the need to test theoretical or priori constructs. Factor analysis on the data matrix also reduced the number of factors, by "loading" (participants having statistically significant agreement with one of the factors derived through analysis) as many participants onto the one of the three factors. According to Brown (1993), reliability of each factor is enhanced when at least 4-5 participants make up each factor and there are no more than seven factors. In this factor analysis "groups of persons" who have ranked ordered the policy statements (Q-sample) in a very similar way were determined. Varimax Rotation of the factors allowed for maximising the differences between the factors in this exploratory study. The analysis yielded three factors (groups) of teachers who have a similar mind-sets, viewpoints, beliefs or attitudes about ICT policy statements for a school.

The three factors (groups) are defined and described in Table 1 (the three factors that are optimally determined by the researcher). The loading of each participant onto a particular factor is marked with an "X" to indicate factors to which they are strongly affiliated. For example, teacher (T09) loads significantly onto group or factor one.

Table 1: Factor Analysis - yielding three factor loadings.

P-Set	Factor loadings Factor 1 (8 Teachers)	Factor loadings Factor 2 (6 Teachers)	Factor loadings Factor 3 (6 Teachers)
Teacher (T01)	-0.1228	0.4764X	0.3889
Teacher (T02)	0.2954	0.3785	0.3199
Teacher (T03)	0.5569X	0.0367	0.3122
Teacher (T04)	-0.0724	-0.1633	0.7423X
Teacher (T05)	0.0826	0.5278X	0.3979
Teacher (T06)	0.1663	0.005	0.4870X
Teacher (T07)	0.4817	0.6053X	0.0822
Teacher (T08)	0.1589	0.3398	0.4796X
Teacher (T09)	0.7048X	-0.2409	0.1476
Teacher (T10)	0.4447	0.5035X	0.0347
Teacher (T11)	0.2718	0.3872	0.3485
Teacher (T12)	0.3949	0.5356X	-0.0338
Teacher (T13)	0.5336X	0.1343	0.1074
Teacher (T14)	0.3081	0.1748	0.5564X
Teacher (T15)	0.6058X	0.2755	0.1502
Teacher (T16)	0.4832X	0.1609	0.1284
Teacher (T17)	0.3662	0.5044X	0.3904
Teacher (T18)	0.088	0.0599	0.3521X

Teacher (T19)	0.0532	-0.645	0.0791
Teacher (T20)	0.6304X	0.1814	0.2654
Teacher (T21)	0.4249X	0.1462	-0.08
Teacher (T22)	0.2414	0.2877	0.3958X
Teacher (T23)	0.6564X	0.0702	0.2242

The X next to a loading indicates how significant a teacher loads onto a particular factor. Example Teacher (T17) loads significantly (0.5044) onto Factor 2 (Group 2). Note also that teachers T02,T11, and T19 did not load significantly onto any factor.

The above analysis process allows for the researcher to gain insight into the teachers' mind set. The analysis of the teachers' subjective Q-sorts may elicit an understanding of the topic being researched. In this Q-methodology study teachers were correlated across a sample of statements that they ranked in some order. The correlations reflect the degree of similarity in the way the statements were sorted, while the factor analysis of the correlations identifies the groups of like-minded teachers. Table (below) illustrates the Factor Q-sort of a sample of 9 policy statements.

Table 2: Factor Q-sort (Sample)

Q-sort no	Policy statement	Factor 1	Factor 2	Factor 3
		n=8	n=6	N=6
1	The strategic planning component of the school's ICT policy should be strategically linked to the school development plan.	2	1	1
2	The general component of the school's ICT policy should provide for periodic review and revision.	-3	0	0
3	The curriculum development component of the school's ICT policy should include procedures to integrate technology so as to support and enhance learning and teaching in various subjects.	2	2	0
4	The finance and funding component of the school's ICT policy should address the training needs of teachers, support and administrative staff.	4	2	1
5	The management of resources component of the school's ICT policy should identify measures for ICT management and ICT sustaining provision in regard to access/accommodation/technical support and disposal of equipment.	-4	-2	-2
6	The access and equity component of the school's ICT policy should state guidelines for equity of access to technology for all students.	-3	-2	1
7	The general component of the school's ICT policy should be integrated into the broader school development policy and other policies.	-3	-1	-1
8	The professional development component of the school's ICT policy should outline how ICT could be applied to support teaching and administration.	3	3	-2
9	The curriculum development component of the school's ICT policy should stipulate methods for the development of appropriate content which could be used to enhance and support learning, teaching and management.	2	2	-1

Donner (2001, p.34) suggests that the factor Q-sort table values gives a "snapshot" of the "voice" of each group. This table represents the Z-scores (for Group 1) that have been translated back to their original scale (from Q-sort). The table above is sorted by statement order and then by degree of agreement between the groups. For example, Factor 1 teachers ranked statement "2" as (-3) indicating that the statement is relatively less important to them than other groups. Factor 2 and Factor 3 teachers ranked this statement as "0" indicating a neutral position..

3.5 Phase 5: Discussion of findings

The Q-methodology process of data capturing and the ease of quantitative data analysis coupled with the opportunity to write qualitative descriptions of the subjective "points of view" of participants. This study explored the subjective responses teachers that share common characteristics in relation to their perceptions of an ICT policy for a school. Q-methodology was an appropriate choice and is a reliable measure of the subjectivity of participants.

The factor analysis of policy statements with respect to consensus led to the clustering of unique groups. Three distinct groups of teacher "point of view" patterns emerged (See Table 3). These groups of teachers were clustered by

virtue of their beliefs about distinct policy statements and the categories that these groups affiliated to. The three groups of teachers were given pseudonyms that reflect group members' preferences for particular distinguishing categories of an ICT policy, which identified them as uniquely different from any other group. Three teachers did not load significantly into any of the three factors and were not grouped into any particular category. Seemingly their interpretation of policy statement did not place them into a unique group. Furthermore they did not convincingly 'fit' into any of the other groups, thus no significant correlation existed for including them into any of the three distinctive clusters.

Factor 1 teachers were given the pseudonym "Curriculum and Technical Support" and consisted of a group of eight teachers. The second group (Factor 2), was named as "Professional Development" which consisted of six teachers. The third cohort (factor 3) was named the "Human Rights" group, which also consisted of six teachers.

Table 3: Factor Groups

Original factor	Number of teachers in cluster	Factor pseudonym
Factor 1	8	Curriculum and technical
Factor 2	6	Professional development
Factor 3	6	Human rights

A brief description of each factor as a unique group is discussed below

3.5.1 Factor 1: "Curriculum and technical Support" teachers

This group's beliefs and attitudes about ICT policy statements focused mainly on the categories of 'curriculum development' and 'technical support' to teachers. Uniquely all members of the school management team were in this cluster. A majority of teachers in this cluster had some basic computer literacy skills. The demographics of this cluster are indicated in Table 4 below.

Table 4: Factor 1 – Teachers

Teacher	Age	Gender	Professional Designation	Phase currently teaching	Professional Experience in years	ICT literate?
T03	28	Female	Teacher	Foundation	7	Yes
T09	33	Female	Teacher	Foundation	11	Yes
T13	39	Female	Head of department	Intermediate & Senior	17	Yes
T15	45	Female	Head of department	Foundation	23	No
T16	55	Female	Principal	Senior	26	Yes
T20	29	Female	Teacher	Intermediate & Senior	8	Yes
T21	40	Male	Deputy principal	Senior Phase	17	Yes
T23	45	Female	Acting head of department	Intermediate & Senior	23	No

This group strongly favoured the ICT policy statements that will impact on curriculum delivery and the need for ICT technical support to teachers. Members of the group had concurring views about the quality of curriculum content and the contribution of ICT to cross-curricular needs. This group focused on policy statements that fostered a learner-centred curriculum and aimed at developing the critical skills and competencies required for using ICT to enhance teaching and learning.

Some examples of policy statements that were concurrent with these teachers' beliefs and attitudes were policy statements that related to curriculum and technical support:

- specify what is expected from teachers and the support they would receive in curriculum delivery
- outline the contribution of ICT to cross curricular needs
- set mechanisms in place for on-going technical support at different levels: teachers, help facilities, contracts, local technicians and companies
- set out structures for the provision of technical support at all levels
- outline methods for access to levels of technology that are appropriate to the needs of teachers.
- stipulate methods for the development of appropriate content which could be used to enhance and support

learning, teaching and management

- include procedures to integrate technology to support and enhance learning and teaching in various subjects
- specify guidelines to ensure that common core software is used by all learning area/subject departments.
- reflect on the ICT skills audit of current staff

Teachers in this cluster had firm beliefs and attitudes concerning ICT policy statements that outlined "technical support" systems relating to basic ICT infrastructure and a safe and secure environment for the school. These teachers preferred an ICT policy that defines ongoing "technical support" at all levels within the school hierarchy. They also favoured ICT policy statements that promoted the provisioning of technical support to teachers.

3.5.2 Factor 2: "Professional development" teachers

This cluster of teachers' beliefs and attitudes focused mainly on ICT policy statements that cater for the "professional development" of teachers. This group of six teachers consisted exclusively of those teachers who taught in the intermediate and senior phase. Most teachers in this group were not computer literate (see Table 5).

Table 5: Factor 2 – Teachers

Teacher	Age	Gender	Professional Designation	Phase currently teaching	Professional Experience in years	ICT literate?
T01	58	Male	Teacher	Intermediate & Senior	32	No
T05	37	Female	Teacher	Intermediate & Senior	15	No
T07	34	Female	Teacher	Intermediate & Senior	11	Yes
T10	25	Female	Teachers	Intermediate & Senior	4	No
T12	26	Male	Teacher	Intermediate & Senior	4	No
T17	27	Female	Teacher	Intermediate & Senior	5	Yes

Teachers in this cluster demonstrated preference for policy statements that provide for participation of teachers in relevant, accredited and professional training programmes that would enhance their skills to integrate ICT in their classroom practice. The "professional development" group was predisposed to policy statements that fostered the professional development of teachers. They also affiliated to policy statements that prioritised ICT professional development and collaborative working, good practice strategies and building teacher capacity.

Examples of policy statements that this group associated with are:

- outline how ICT could be applied to support teaching and administration
- make provision for the participation of teachers and support staff in relevant, accredited and professional learning programmes that enhance their ability to integrate ICT in their classrooms
- The professional development component of the school's ICT policy should create opportunities for teachers to work collaboratively, plan, prepare and share successful good practice.
- The professional development component of the school's ICT policy should identify ways to use ICT to improve teacher capacity.
- The strategic planning component of the school's ICT policy should be strategically linked to the school development plan.
- The professional development component of the school's ICT policy should illustrate how ICT could be integrated into teaching systems and pedagogical models.
- The monitoring and review component of the school's ICT policy should state procedures to monitor staff development needs.

3.5.3 Factor 3: "Human rights" teachers

Based on their beliefs and attitudes this cohort of teachers identified with policy statements that emphasised the protection of "human rights" issues for inclusion in the ICT policy. Significantly, all foundation (early childhood) phase teachers were in this group. It seems appropriate that these teachers place priority on ICT policy statements that entrenches ethical and moral values. Most teachers in this group were not computer literate (see Table 6)

Table 6: Factor 3 – Teachers

Teacher	Age	Gender	Professional Designation	Phase currently teaching	Professional Experience in years	ICT literate?
T4	28	Female	Teacher	Foundation Phase	6	No
T6	35	Female	Teacher	Foundation Phase	12	No
T8	30	Female	Teacher	Foundation Phase	8	No
T14	31	Female	Teachers	Foundation Phase	9	No
T18	22	Female	Teacher	Intermediate & Senior	0	Yes
T22	27	Female	Teacher	Intermediate & Senior	5	No

The members of the "human rights" cluster of teachers were distinguishable from the other teachers by their beliefs and attitudes concerning ICT policy statements pertaining to "ethics", "safety and security" and "access and equity". Policy statements that had meaning to this group were:

- include a statement to commit to creating equal opportunities
- state guidelines for equity of access to the technology for all learners
- state guidelines to promote gender issues
- ethical issues in regard to the school's ICT policy should define guidelines to protect learners from undesirable materials which can be accessed through the Internet.
- The security and safety component of the school's ICT policy should provide measures to prevent computer abuse.
- The access and equity component of the school's ICT policy should list measures to encourage learners in all learning areas to gain access to ICT as an integral part of teaching and learning programmes.
- The access and equity component of the school's ICT policy should indicate guidelines to cater for the access to ICT of disabled and special needs
- The access and equity component of the school's ICT policy should include a statement to commit to creating equal opportunities.
- outline measures for the protection of individual privacy of learners

This cluster of teachers seemed to affiliate to statement of ICT policy that related to inclusion, learners with special educational needs, protection of learners from undesirable internet material, equal opportunities for all learners and the prevention of computer abuse. The group also seemed to be concerned about copyright, the protection of intellectual property, support for gifted learners and the protection of learners' privacy.

4. Conclusion

The above discussion illustrates how unique teacher clusters were formed by virtue of their 'consensus of opinion' on their view of particular ICT policy statements. The variance of teacher interpretation of policy text suggests that teachers mediate their understanding of policy texts through their own beliefs, attitudes and professional capacity (Proudford, 1998; Helsby, 1995). Attention is drawn to the way teachers, as previously excluded actors may be included in the process of policy decision making and contribute to the debate in developing an ICT policy that will be representative of all stakeholders in a school. Such a participatory approach to the formulation of an ICT policy would lead to a more effective implementation in teachers' classroom practice. A consensus approach also suggests that teachers appropriate or 'take-up' elements of policy into their own "schemes of interest, motivation, and action" (Levinson, Sutton & Winstead, 2009).

This study adds to the body of literature by informing practice in several respects. First, the fills the gap in the literature study by providing an innovative approach understand teacher's beliefs and attitudes about ICT policy for a school. Thus it is a process that includes teachers in ICT policy decision making and planning for a school. Second, it affirms the notion that given the opportunity, teachers have the inherent ability to deconstruct and critically engage with policy statements according to their own professional consciousness. Third, Q-methodology enables policy makers and stakeholders to experience both real differences in discourse and consensus of opinion, contributing to an inclusive approach to policy planning. However, it should not replace the policy debate itself (Eden, Donaldson, & Walker, 2005).

This study adds value by informing policy and research as well. First Q-methodology offers policy analyst an opportunity to gain insight into the different perspectives, beliefs, attitudes, opinions and values of different actors in *policy analysis studies* (Durning, 1999). Second, the study adds to the body of literature by utilising Q-methodology in

education research to understand "and not simply count" the beliefs and attitudes of teachers towards a particular topic of interest (Durning, 1999, p. 406). Further research is needed and should focus on how schools actually formulate their ICT policy that is facilitated by a consensus approach. Research is also required to explore how teachers' implement a school-based ICT policy in their classroom practice.

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