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ABSTRACT

Equity, the driving force of the Kentucky Education Reform Act of 1990, serves as the underpinning for an array of initiatives including the Kentucky Education Technology System (KETS). Sparse research exists on decision-making practices relative to equity measures associated with the distributions of KETS resources. The purpose of this exploratory study was to examine the decision-making process and its effects on discretionary practices affecting technology diffusion. Four districts were selected for maximum variation with respect to size and urban/rural designation within one administrative region of Kentucky. Findings indicate that key decision makers held similar positions (the school superintendent, instructional supervisors, and district technology coordinator), all districts acknowledged the value of KETS funding, and the process of implementation was complex. Differences across districts involved the degree of programmatic latitude available, responses to resource availability, political pressures, and extant levels of technological knowledge. Regarding equity, larger districts demonstrated greater levels of technology implementation including percentage of schools connected to the Internet and better teacher workstations ration, but more students using each KETS computer. All results must be viewed with caution based on the small sample of districts. Four appendixes contain a map of the districts and cover letters and instruments used in the study. (Contains 46 references.) (SLD)

Running Head: REGIONAL DECISION-MAKING PRACTICES IN TECHNOLOGY

Regional Decision-Making Practices In Technology Diffusion

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Abstract

Equity, the driving force of the Kentucky Education Reform Act of 1990, serves as the underpinning for an array of initiatives including the Kentucky Education Technology System (KETS). Sparse research exists on decision-making practices relative to equity measures associated with the distribution of KETS resources. The purpose of this exploratory study was to examine the decision-making process and its effects on discretionary practices affecting technology diffusion. Four districts were selected for maximum variation with respect to size and urban/rural designation within one administrative region of Kentucky. Findings indicated that key decision makers held similar positions (the school superintendent, instructional supervisors, and district technology coordinator), all districts acknowledged the value of KETS funding, and the process of technology implementation was complex. Differences across districts involved the degree of programmatic latitude available, responses to resource availability, political pressures, and extant levels of technological knowledge. Regarding equity, larger districts demonstrated greater levels of technology implementation including percentage of schools connected to the Internet and better teacher workstations ratio, but more students using each KETS computer. All results must be viewed with caution based on the small sample of four districts.

Statement of Problem

Background

Although the concept of equity in education is well founded in historical precedent, the Rose decision of 1989 (as cited in Steffy, 1993, p. 1) expanded the meaning by declaring " . . . the entire system of common schools in Kentucky to be unconstitutional." This momentous court decision prompted the Kentucky Education Reform Act of 1990, subsequently known as KERA. Directing the General Assembly to re-create a "substantially uniform" system that would provide each child an equal opportunity to receive an adequate education, the court stated that " . . . the children who live in the poor districts and the children who live in the rich districts must be given the same opportunity and access to an adequate education" (Office of Educational Accountability, 1994, p. 66). Equity, as the driving force of the Kentucky Education Reform Act, appears most prominently in the Support Education Excellence in Kentucky (SEEK) funding formula for districts but also provides the underpinning for other KERA initiatives including the Kentucky Education Technology System, known as KETS (Kentucky Department of Education, 1998; Partnership for Kentucky School Reform, 1993).

While establishing minimum levels of technology resources, KETS, as an unprecedented broad mandate for acquisition and implementation of technology in Kentucky schools, does not ensure equal access or even conformity in compliance. The KETS program focuses upon improved learning and teaching, improved curriculum delivery, and improved efficiency and productivity of administrators; however, the integration of technology into instruction and administration processes are contingent

upon the availability of resources (Office of Education Technology, 1992c; Smith & Mazur, 1996). Key to examining the actual implementation of technology within the districts and the subsequent impact of the KETS legislation upon instructional practices, administrative effectiveness, and student learning is an understanding of equity as defined through KETS policy delineation.

Since court decisions of the 1960's, the issue of equity has been generally defined as fairness. The term is not to be confused with equality, which would presuppose allocating the same amount of resources for everyone. Under KETS, equity is defined by the numbers and levels of resources available and by the amount of funds required of districts to reach a predetermined level. This amount, whether presented as numbers of technology items purchased or actual dollar figures required to reach this minimum level, has been described generally as the "unmet need" (Council for Education Technology, 1992). As the school districts transition to a second phase of technology implementation, a variation of the unmet need feature defines the parameters of equity. Under girding the 2001-*2006 Master Plan for Educational Technology* (Kentucky Department of Education, 2000c) is the concept of "continuing need," a maintenance and enhancement agenda for the existing technology.

Technology implementation, when viewed as the utilization of resources, becomes dependent upon the availability of resources. Consistent as an underlying assumption of KETS is the view that providing a basic level of resources with opportunity for access by all students and educators predisposes a district to an acceptable level of implementation.

Delimitation of Topic

Although equity is fundamental to understanding the funding requirements and the unmet need for each district, the general parameters established by the *Blueprint and Selection Guide* (Office of Education Technology, 1992a), the *Master Plan for Educational Technology* (Council for Education Technology, 1992), and the *1998-2000 Update: Kentucky Master Plan for Education Technology* (Kentucky Department of Education, 1998) describe and sanction discretionary decisions. Unlike the majority of reform initiatives, the responsibility for implementation of the KETS program resides with the district rather than with the schools. The schools determine the placement of equipment, but the district determines the types of purchases, the order and rate of implementing resources, and, ultimately, whether to acquire technology moneys by matching Education Technology Funds (Kentucky Department of Education, 1994; Office of Education Technology, 1992d; 750 Ky. Admin. Regs. 2:010, 1999).

KETS regulations are subject to interpretation, and there appear to be multiple factors affecting the decisions of districts. Some districts have been unable or possibly unwilling to match Educational Technology Funds (Kentucky Department of Education, 1997a, 2000b). The inability to afford the matching funds or prioritization that relegates technology to a subordinate position in relation to other needs may explain this district inaction. Potential differences in available technologies exist because the more affluent districts can access alternate funding sources for the purchase and installation of equipment and systems. For example, property-rich districts may experience greater flexibility in expenditures of SEEK moneys, some districts may expend construction funds on infrastructure and hardware, and, because private technology purchases are

unrelated to the unmet need figures, support from the community and businesses may tend to mask the extent of available resources. Furthermore, technology competency levels of staff and the suitability of facilities for local area networks (LANS) and computer laboratories potentially influence interdistrict resource deployment. Until minimum ratios and fiscal formulas established by the state are met for the installation of equipment in all districts, variations in numbers and types of equipment are likely to exist across the districts and schools of Kentucky.

Apart from all the resource issues just noted, the motivations and proclivities of local decision makers cannot be isolated from the particular political environment that surrounds the KETS program. Thus, the purpose of this study was to analyze the issue of equity in Kentucky schools through the exploration of decision-making practices critical to the allocation of resources within a small, yet diverse sample of districts. Specifically, this study utilized a mixed methods approach to examine both decision makers' perceptions and actual practices in technology allocation and deployment under KETS. These perceptions and practices represent an accounting of equitable student access between and within public school districts.

Policy Definition

Within the area of technology and in association with issues relating to equity, the term "policy" may assume varying definitions. Because of the ambiguity and vagueness of the term, numerous philosophers have attempted to clarify the term by devising different frameworks. A useful policy framework is that of Egon Guba (1984). Guba's framework, employed because of its simplicity and straightforwardness, presents eight different definitions organized under three policy umbrellas: policy-in-intention, policy-

in-action, and policy-in-experience. Structural presentation of policy determiners, policy appearance, proximity to point of action, and impact of summarized information, as specified in this framework, facilitate the analysis of policy types and provide focus for policy research.

The policy under consideration in this study is that of the Kentucky Education Technology System, usually referred to as KETS. Initially legislated through a series of Kentucky Revised Statutes and formulated in administrative guidelines (750 Ky. Admin. Regs. 2:010, 1999), policies surrounding the KETS program are massive in that they include not only associated state laws and regulations and local boards of education policies, but also an array of state-produced documental guides. Taken together, these documents outline policy as it may be construed by the eight definitions of Guba. The administrative guidelines (750 Ky. Admin. Regs. 2:010, 1999), the *Master Plan for Education Technology* (Council for Education Technology, 1992), the *1998/2000 Update: Master Plan for Education Technology* (Kentucky Department of Education, 1998), and the *Blueprint and Selection Guide* (Office of Education Technology, 1992a), however, are sufficient to confirm that the complexity and technical nature of the KETS program allow districts a degree of latitude in decision making relative to technology. The new 1998 provisions, for example, allowed districts with no remaining "unmet need" to use up to 10% of their KETS funds for discretionary purchases for previously disallowed technologies.

Consideration of the broad scope of technology policies, ranging from the Kentucky Revised Statutes passed by the legislature to the possible client constructions, indicates that numerous definitions presented by Guba's (1984) framework are applicable

to the KETS program. This study has targeted policy-in-intention as a definitive category. Guba Definition 3 states, "Policy is a guide to discretionary action" (p. 68). The amorphous nature of the KETS program is given shape through those policies that guide the behavior of implementers. Because equity is an underlying theme of KETS, the discretionary actions of the decision makers and the latitude that those decision makers perceive to be appropriate determine the type and amount of technology diffusion. Those discretionary decisions potentially impact student access to technology.

Definition 2, which is similarly classified as policy-in-intention, describes policy as "a governing body's standing decisions by which it regulates, controls, promotes, services, and otherwise influences matters within its sphere of authority" (Guba, 1984, p. 67). In the spirit of KERA, the Kentucky Department of Education and divisions such as the Office of Education Technology have spawned voluminous guidelines containing directions on a profusion of topics ranging from purchase of equipment, to technical standards, role definition of implementers, and planning tools (Kentucky Department of Education, 1997b, 1998, 2000a, 2000c, 2000d; Office of Education Technology, 1992a, 1992b, 1992c, 1992d; Smith & Mazur, 1996).

Although the Guba 2 Definition is particularly relevant to equity in the allocation of resources as mandated by KETS, for the purpose of this study Guba 3, administrators' discretionary action, is apropos. Distance from many policy determiners and numerous massive guides preclude a lengthy study. Instead, interest and time permit exploratory investigation of the variations within the latitude of district policy that occurs in the distribution of technology resources and the reasons for those differences.

Political Considerations

Equity in the allocation of resources is a widely-held value, one that is strongly supported by KETS. The level of opportunity that exists, however, may be contingent upon who makes the decisions impacting equity issues and what factors contribute to those decisions. Interpretations of decentralization may determine the appropriateness of decision making at different levels (e.g., school or district) (David, 1994). If, however, "unmet need figures," those amounts of technology items and dollars needed to reach a minimum amount of resources, are calculated by district rather than by school, the districts, not the schools, must assume the responsibility for compliance with the KETS guidelines. The district will retain its previous authority over decision making relative to equity during the "continuing need," phase of KETS implementation (Kentucky Department of Education, 2000c). On the surface, the complexity and technical nature of the KETS Program appear to require that districts exert considerable latitude in decision making relative to technology.

The various stakeholders may compete for the still scarce technology resources. Technology planning at both school and district level invite the possibility of broad-based committees. The roles of central office administrators in the area of technology and of technology coordinators are yet to be clearly defined (Kentucky Department of Education, 2000c; Office of Education Technology, 1992a). There exists the need to evaluate the discretionary measures used in purchasing and placement decisions that impact the equitable distribution and quality of technology diffusion.

Research Questions

When considering the political ramifications and resulting program quality of a

given issue, Guba (1984) frames a policy question for each separate policy lens; the question for Definition 3 is, "What is the scope of discretionary action that can be tolerated in implementing the Kentucky Education Technology System?" (p. 67). Politicization of equitable allocation of technology resources imposes upon professional decision makers standards acceptable to, if not congruent with, those of the public; and it exposes to public scrutiny local as well as state decisions impacting technology. Within the parameters of, and specific to, this larger policy question, the following empirical questions apply:

1. What positions do those who make decisions hold?
   a. What is the relationship of these positions to the district hierarchy?
   b. What is the relationship of these positions to school organizational structures?
2. How do these decision makers perceive their roles and the latitude of those roles?
3. What factors have affected decisions regarding technology in the areas of
   a. Resources?
   b. Political decisions?
   c. Knowledge?
   d. Policies (State, Local)?
4. To what extent are the four target districts different from regional mean values for the equity measures of technology implementation:
   a. Student workstations?
   b. Teacher workstations?
   c. Percent of schools connected to the Internet?

d. Level of implementation?

5. To what extent are the demographic factors for the four target districts different from regional mean values:

   a. District ADA?

   b. Number of schools?

6. What is the relationship between the demographic factors and the equity measures of technology?

Definition of Terms

The multiplicity of interpretations and technical nature of key terms utilized in this study suggest the need for clarification of politicized interpretations and terminology unique to the KETS program. Equity is the most global term requiring definition appropriate to the parameters of this study; furthermore, equity as defined by KETS can be understood only through a clear definition of the "unmet need" requirement.

Equity is not synonymous with equality, the same opportunity or resources for everyone. Rather, equity constitutes the amount and potential of resources available and/or the amount of funds required of districts to reach a minimum level designated by the state. The amount of resources, ratios of hardware and established number of technology items or funds required to reach this minimum level is termed the "unmet need." The unmet need is determined per line item of the budget by both financial calculation and amount of equipment needed to reach this minimum level that is expected of all districts. The actual dollar amounts represent funding support for the program. Expenditures in excess of any line item predispose the district to meet the remaining requirement through local funding. All components critical to technology

implementation are included in this calculation of a minimal number of unit acquisitions. Beyond these basic requirements, standards have been established to provide a level of capability for equipment and infrastructure (Architectural Standards Working Group, 1992; Office of Education Technology, 1992b; Kentucky Department of Education, 2000d). Implications for discretionary actions are apparent with all purchases of KETS standard equipment. Regardless of the public funding source, KETS standard equipment reduces the unmet need and thereby reduces the amount of funding support that is available through the Kentucky Education Technology Funds.

Although the projected *2001-2006 Master Plan for Education Technology* (Kentucky Department of Education, 2000c) addresses "continuing need," all districts will continue to operate under the present purchasing directives until full implementation as defined by "unmet need" is effected on a district-by-district basis. District discretionary powers are evident whether meeting "unmet needs" or addressing "continuing needs." Districts lagging in technology implementation and operating under the "unmet need" category may still opt to purchase varied types and levels of equipment. Sanctioned purchases for the fully implemented districts are projected to include various types of maintenance and professional services as well as peripheral technologies. The Kentucky Educational Technology System in transition appears to support district discretionary actions.

A brief explanation of KETS equipment is necessary because deployment of resources determines the unmet need. Equipment includes workstations, which are minimally celeron computers with 128 megabytes of memory. The numbers of these types of machines are indicators of opportunities in technology. Although KETS funds

would be insufficient for acquiring the minimum number of computers to meet state requirements, an affluent district might still be able to purchase all maximum level Pentium 4 desktop workstations. The cost of the more desirable items would exceed those line items in the budget (Kentucky Department of Education, 2002). The term "network connections" is also pertinent to understanding equity as defined by KETS. Capabilities for connectivity to the Internet and e-mail can be measured by the numbers of networked workstations in classrooms, schools, and district offices (Kentucky Department of Education, 1997b, 1998, 2000b, 2000d).

Review of Literature

Legal Basis for KETS

Kentucky statutes (Ky. Rev. Stat. Ann. § 156.666, 156.670, 157.655, 1999) set forth the basis for the massive body of guidance that has been developed for implementing KETS. The Kentucky administrative regulation (750 Ky. Admin. Regs. 2:010, 1999), which directs district administrators in accessing technology funds, is supplemented by a series of Kentucky Department of Education-produced documents designed to detail purposefully every aspect of the technology program. This mass of direction presents a somewhat convoluted map for implementation. A brief review of these documents illustrates the complexities involved in compliance as well as the possibilities for varied interpretations in implementation. *Building and Wiring Standards* (Office of Education Technology, 1992b), and *Architectural Standards and Technical Specifications* (Architectural Standards Working Group, 1992) elaborate standards that are updated regularly and define potentials for opportunity. District decision makers have relied on these documents despite their technical nature. The most complete

discussion to date of the formation and roles of technology committees appears in the *Blueprint and Selection Guide* (Office of Education Technology, 1992a); however, districts have flexibility in establishing committees and in determining the functions of those committees. The roles of the district technology coordinators and school technology coordinators are identified but not clearly defined. The absence of definitive instructions for coordinating district technology programs has prevailed despite state guides, such as the *Implementation Plan* (Office of Education Technology, 1992c), the *KETS Workbook* (Office of Education Technology, 1992d), and the annual district funding applications, which required the development of school action plans and necessitated the inventorying of each district item that meets KETS standards. The more recently mandated District and School Consolidated Plans, which include strategic planning for both levels, support a flexible coordination of state and federal resources (Kentucky Department of Education, 2000a). (The District and School Consolidated Plans were revised and renamed as District and School Improvement Plans effective 2003.)

Equity in Resources

Equity is the key issue in understanding the deployment of technology resources through the KETS program. State statutes have defined equity in technology as equal access to funds and "equal buying power for every dollar" for all districts regardless of district income level (Kentucky Department of Education, 1998, p. 6). Adequate resources have been found to further the implementation of technology. Jones, Valdez, Nowaksowski, and Rasmussen (1994) contended that for every student to have access to technology, the state must bear the burden of funding. In a study of effective implementation by principals, Beach and Vacca (1985) found that monetary support was

the only demographic factor that was related to successful implementation of technology.

The extant, sparse research, while elusively quantifiable, indicates considerable variation in technology diffusion levels across and within districts (Fabry & Higgs, 1997). The increase in computer use has often only resulted in richer schools buying more equipment and more expensive equipment than poorer schools (Sutton, 1991). According to Behney, Dougherty, Andelin, and Carson (1994), the 1987 U.S. Office of Technology Report indicated a wide range of student-computer ratios in the United States with fewer computers in the poorer, urban schools. Inequitable access to technology has also resulted from choices of equipment location and substandard capabilities for connectivity (Jones et al., 1994). Milone and Salpeter (1996) cited more recent data to support contentions that the gap in technology diffusion, while still present, is narrowing between schools with varying socioeconomic and ethnic differences. In a survey of 21 participating states (response rate = 54.3%), the Milken Family Foundation (1998) reported state and local governments as primary sources of funding for technology. When limited to computers with Internet capabilities, a national overall student-computer ratio of 36:1 existed among responding states.

Little research pursued in Kentucky has addressed equity in technology diffusion or implementation. However, Mazur (1995) summarized findings which indicate a wide variation in the extent of implementation in a study sample of 24 schools. Mazur stated that the available technology in the majority of schools was consistent with the technology diffusion described in the district technology plans; this finding suggested that approved planning documents and processes did not support a substantial amount of uniformity in the deployment of resources. The same researcher found that most schools

reported limited access to networking resources and telecommunication tools. If there exists sparse research to date on equity in technology diffusion and implementation, several studies have generated actual dollar amounts and inventory figures which offer insight into the topic. In 1996 Smith and Mazur cited 16 indicators of infrastructure, which included the total expenditure in support of KETS by both state and local technology and the total number of workstations installed. A report by the General Accounting Office (Smith & Mazur) revealed an average of 10.2 students per workstation, which ranked Kentucky as seventh in the country in number of computers per student. Smith and Mazur noted, however, that one-third of the schools indicated they did not have sufficient computer networks. In 1995 the Office of Educational Accountability had already prepared a draft report of the *1995 Kentucky Education Technology System Update* which indicated that the goal of 1:6 workstations to students could not be met at the present funding level.

Both the *1998/2000 update: Kentucky Master Plan for Education Technology* (Kentucky Department of Education, 1998) and the *2001-2006 Master Plan for Education Technology* (Kentucky Department of Education, 2000d) recognize that varying levels of technology implementation and diffusion exist among districts. A recent national study of the implementation and use of technology in 21 states indicated that the percentage of Kentucky schools with classrooms connected to Local Area Networks (LANS) and to the Internet was substantially above average. Kentucky also ranked above average in percent of expenditure for technology implementation per student (Milken Family Foundation, 1998). Despite comparably high statewide diffusion levels, progress across districts remains uneven. Variations in reported distributions of technology

resources suggest the need for an examination of possible causes of these phenomena.

Decision Making

The Milken Family Foundation (1998) found a strong relationship between support from district superintendents and teachers and increased support for funding and improving student-computer ratios. Nevertheless, limited research exists on decision making with regard to KETS. A few studies have focused on the roles of the schools in this regard. Evans-Andris (as cited in Smith & Mazur, 1996) examined the roles of the school technology coordinators in Jefferson County and reported that following the appointment of a coordinator, administrators and other teachers left technology to that individual. No evidence existed that the school technology coordinators were involved in deployment of technology resources, however. Mazur (1995) found that at least one-half of the schools surveyed reported that technology committees had some input into the functioning of school-based decision making.

Summary

Sparse, extant research on the overarching principle of equity in association with technology diffusion indicates that variations in access to technology may exist across a broad spectrum nationwide. Kentucky policies and procedures, while designed to ensure the equitable diffusion of technology to public school students, offer flexibility for KETS implementation. State documents outlining the technical nature of program components and sanctioning latitude in decision-making practices regarding technology create conditions conducive to program variations between districts. Limited research on decision-making practices related to KETS implementation provides little insight into those practices and the relationship of those practices to the levels of opportunity across

the state.

The profusion of official state-generated documents provides a framework for studying technology implementation in association with the designated diffusion of equipment and resources as requisite to instructional uses of technology. Although the principle of equity under girds these policies and procedures, existing studies of equity issues revealing variations in access to technology suggest the need for further investigation of resource deployment. Previous studies of technology diffusion have focused primarily on sources of funding, access to technology, associated socioeconomic factors, and program support by school personnel. In consideration of prior interest areas, an exploratory study of decision-making practices that may affect technology diffusion appears to be a next logical step toward developing an understanding of factors contributing to the characteristics of technology programs.

Methodology

Type of Study

The research design is primarily a descriptive qualitative study of the discretionary decisions that determine the allocation of technology resources as defined by the Kentucky Education Technology program. In addition, four quantitative measures of levels of technology diffusion designate it as a mixed design. The limited amount of research available on the topic implies that any study of the equity issue be of an exploratory nature. Planned as a multi-site study, interviews conducted with the superintendents from four districts within one of the eight administrative regions established by the Kentucky Department of Education (Appendix A) served as the primary means of data collection. The scope of this study prevented extensive

triangulation. District practices were analyzed for congruence with levels of technology diffusion as measured by student and teacher workstation ratios, percent of schools connected to the Internet, and level of implementation. These measures delineate the quantitative data analysis within the study.

Data Sources

The population for the study is represented by all school districts comprising one targeted Kentucky Department of Education administrative region. Interviews were conducted during April and May of 2001, while the state reports were based on data from the 99-2000 school year. Data collection began with purposeful sampling of four school districts reflecting a maximum variation demographically by size and urban/rural designation within the designated region (Census, 1990; Kentucky Department of Education, 1999). While the district is the unit of analysis for the study, the person from whom the data were collected was the superintendent. Selected study sites were of two types, urban and rural districts, with each type represented by one small and one large site. Sampled districts were dispersed throughout the administrative region of interest.

Research involved two sources of instrumentation: interviews with superintendents in targeted districts and demographic data available on the Kentucky Department of Education Website. Semi-structured questions were used to gain insight into who makes decisions, how those individuals perceive their roles and the accompanying latitude in decision making, and what decision-making practices have affected technology resource allocation. No appropriate interview forms could be located for this purpose; however, a review of helpful forms and information concerning development of the interview was available in studies (Mazur, 1995; Winkler, Stasz, &

Shavelson, 1986) and methodological sources (Babbie, 1990; Creswell, 1994; Fowler, 1993; Patton, 1980). Lortie's (1975) four criteria for eliciting participants' perspectives guided question development. Interview questions for the superintendent (Appendix B) are included in this document. State reports available on the Internet provided basic demographic information on targeted districts and four descriptive measures of technology diffusion (Kentucky Department of Education, 1999).

Procedures

Planned research procedures involved a number of defined steps. Superintendents were contacted through a letter requesting participation from the junior researcher (Appendix C). Upon agreement, the second author conducted interviews with the superintendents from the four targeted districts, following the interview schedule, which maps to Research Questions 1-3 (Appendix B). Each interview was approximately one hour in length and was held at a time and location of mutual agreement.

Data Analysis

Interview responses resulting from the qualitative design component were organized for maximum descriptive and comparative data. A contact summary form (Appendix D) was used as a tool to help identify themes inherent in the data collection from interviews. All data segments, which consisted of each question and corresponding participant response, were coded utilizing a thematic system with categories derived from the summary contact forms. Because of the exploratory nature of this study, interpretational analysis with categories grounded in the data collected provided an appropriate vehicle to the presentation of findings. Interview responses permitted presentation of a "thick description" of the discretionary practices that exist within

districts of the research study, relative to Research Questions 1-3.

It should be noted that this coding procedure is consistent with qualitative practice in the tradition of emergent data and "grounded theory" (Glaser & Strauss, 1967), i.e., basing researcher conclusions on patterns that exist within the data rather than a priori formulations that could "bias" the findings. However, the position taken here is consistent with that of Washington (2002), that the entire emergent design perspective is an exaggeration of the objectivity of the process. If facts or themes "emerge on their own," they represent a reification. Only researchers can discern meaning and all researchers have their own set of values and predispositions (Berger & Luckmann, 1967; Mannheim, 1956). This is the basic premise of the sociology of knowledge: *Émile* to the contrary (Rousseau, 1762/1955), researchers, unlike infants, do not come to a study with a "tabula rosa." In fact, as the last sentence in the previous paragraph states, there is a pre-existing bias inherent in this study, that being the framework established by the research questions that guide this study (cf. Washington, Chapter III). They, in turn, are based on the set of prior studies upon which this study builds. This being said, the researchers made every effort to do the coding as objectively as possible, consistent with the standards outlined in Anfara, Brown, and Mangione (2002).

Instrumentation for Research Questions 4 and 5 comes from the Records Analysis Protocol, a form for the collection and analysis of quantitative data appearing in Appendix E. Demographic data regarding district sizes and technology diffusion was obtained from the Kentucky Department of Education Home Page (Kentucky Department of Education, 2000). Quantitative data measuring technology diffusion were analyzed for opportunity levels. Descriptive statistics were used to study relationships of four equity

measures (Student-Workstation Ratio, Teacher-Workstation Ratio, Percentage of Schools w/Internet, Level of Implementation) and three demographic variables (District ADA, Number of Schools, and the rural/urban designation). (See Appendix F for operational definitions for the qualitative measures.) However, no effort was made to analyze that data using inferential statistics because of the small *N*. Research Question 6 was addressed by construction of a correlation matrix (see Table 1).

The selection of the regional mean rather than the statewide mean was specified for data analysis. The selection was based upon significant variations among the eight regions due to the distinct differences in funding potential and availability of resources existing across the state. Document analysis was used to obtain current quantitative data on demographics and levels of technology diffusion within the four targeted districts (Kentucky Department of Education, 1999). The cross-sectional analyses combined qualitative data on decision-making practices with quantitative data on levels of technology diffusion.

Generalizability

On the surface, the study appears low in generalizability. The exploratory nature, however, points to a primary objective of producing information conducive to further research. Only limited research on technology under KETS exists among the broad spectrum of topics possible; moreover, available research generally focuses upon implementation, rather than upon equity. No research studies related to discretionary decisions involving technology deployment under KETS have been found. Study results promise direction for further qualitative as well as quantitative research.

Results

Introduction

The specified analysis of the KETS program as implemented was consistent with Guba's (1984) Definition 3, which has the larger policy question, "What is the scope of discretionary action that can be tolerated in implementing the Kentucky Education Technology System?" Within the four target districts the identification of overarching characteristics, processes, commonalties, and dissimilarities in association with technology diffusion, relative to the six research questions, guided subsequent analysis of actual decision-making practices.

More specifically, participant responses to the interview questions, mapped to Research Questions 1-3 (Appendix B), constituted the qualitative data. Use of the Contact Summary Form (Appendix D) helped organize responses on district implementation relative to decision makers, district variations in the interpretations or applications of procedures guiding the KETS program, and peripheral or intervening factors affecting technology diffusion. For Research Questions 4-6, the quantitative data, as derived from the study protocol (see Tables E1-E2, Appendix E) provided demographic and equity measures of differences among the four districts studied. For purposes of confidentiality, the researchers will subsequently refer to the districts involved in the study as District A (large rural), District B (large urban), District C (small urban), and District D (small rural). The sections below report results relevant to the stated research questions.

Research Question 1

1. What positions do those who make decisions hold?

    a. What is the relationship of these positions to the district hierarchy?

    b. What is the relationship of these positions to school organizational structure?

Findings indicate the existence of divided responsibilities among an array of district and school personnel for the deployment of resources and associated issues. Superintendents from the target districts described, often in detail, their district's extant hierarchical structures which frame program implementation. Additionally, external support, including community and parental involvement, appear to impact the technology programs to varying degrees within the four districts. Variations reportedly exist among the districts of interest with respect to numbers and roles of individuals and groups who actually make the decisions regarding technology diffusion.

Commonalties relative to central office and school personnel support for the implementation of technology also emerged from all four districts. The district employee positions most frequently mentioned by superintendents as key to implementation were those of instructional supervisor and district technology coordinator. All superintendents claimed an active role in technology implementation within their respective districts and cited the local board of education as the supporting agency for the technology program. One interviewee expressed ownership in the technology program, ". . . I've been a very strong advocate and have urged and pushed and encouraged what we were doing."

The district technology coordinator was generally perceived as having a great amount of input into establishing program direction. In most instances that influence is reportedly shared by other personnel, including additional technology staff and building principals. In one district a technology committee makes all purchasing decisions, but the district technology coordinator facilitates meetings, offers suggestions, and ensures purchasing compliance with KETS guidelines and standards. In one small school system the district technology coordinator was described as wearing "many hats" but has the

support of two full-time staff.

District support for technology implementation was generally described as broad-based. The superintendent in District C noted expanded district, school, and community input resulting from the changing role of the district technology coordinator. Initially, the district technology coordinator in that district had worked unilaterally while consulting with the superintendent regarding the deployment and acquisition of all technology components. The Board's subsequent adoption of a strategic plan for allocating all types of resources transitioned local decision making from an isolated process to one of systemic management. In that district the superintendent, finance officer, assistant superintendent, director of pupil personnel, elementary and secondary supervisors, and personnel of the technology department employ a team approach supportive of the daily operational level of the technology program. In another district, regular district central office meetings involve district directors at times addressing technology issues. Several associate superintendents in District B, who met every week, were described as supporting "the goals for the overall district wonderfully together so that we all know where we're going and what we're trying to do . . . ."

Within the four target districts the roles and positions of technology support staff appear to vary considerably from district to district. All superintendents reported having support personnel despite demographic variations relative to district size (ADA), the number of schools, and urban/rural designations. For example, District D employs two full-time staff, respectively, to maintain equipment and support teachers in the utilization of technology for instruction. At the school level, school technology coordinators, or resource persons of similar nomenclature, were generally regarded as influential

decision-makers. Conspicuous differences among the districts studied emerged relative to the degree of parental and community input and support for technology. Superintendents from urban districts mentioned more extensive community and business involvement than did rural principals. Underpinning the daily operations in the small urban district is a strategic plan developed through a process involving 175 community members. One superintendent participant from a large district related that a local Educational Foundation with a technology focus supplements KETS allocations. Both urban and rural district superintendents mentioned the importance of donations in enhancing technologies beyond the scope of the KETS allocations.

Roles of decision makers relative to community participation varied among schools within districts as well as among the four districts. One superintendent from a rural district noted differences existing among parent and community involvement across the schools of his district. District C superintendent reported that two schools in his district experience a "tremendous amount of parent involvement..." which results in those schools exceeding requirements of the district technology plan. That superintendent observed that such involvement had created new challenges for the district:

> They [the schools] are constantly being offered large amounts of equipment, large amounts of software, and we have to be very careful to make sure that those donations, while desirable, meet our district standards. So it's a different struggle in those schools than in the rest of my schools. It's a pleasant struggle, but it still is a real issue.

Superintendents reported four internal groups contributing to technology diffusion: school-based decision making councils, boards of education, and district and

school technology committees. The composition and access to membership on the district technology committee appear to vary from district to district (e.g., teacher representatives appointed by principals of each school; a structured committee consisting of teachers, principals, assistant principals, central office staff and community people). In one district the technology committee made all the decisions on KETS purchases--both hardware and software.

Although funding capacity of the districts apparently varied, support for technology by members of the boards of education was perceived as being tied to funding. In one small rural district, the superintendent expressed satisfaction that the district, through board approval, had been able to match enough of the state funds to move to another phase of technology implementation. In another district the board of education annually augments the technology allocation received through the KETS program with local funding amounts ranging from one-half million to one million dollars.

In relation to decision making within the district hierarchical structure, the dilemma of categorizing and thereby treating technology as either a district program or a school-based program appears problematic in theory but workable in practice. District-school lines appear to blur under the mandate that Consolidated Planning derive input from both levels, school and district, as well as from the outside environment. One respondent considered his district ". . . more school-based than district-based." Conversely, another respondent described the hierarchical structure of decision makers as moving downward from the superintendent to the instructional supervisor. Still another participant stated that decisions were made at both levels, district and school.

Research Question 2

2. How do these decision makers perceive their roles and the latitude of those roles?

To a considerable extent, the unique characteristics of each district of interest serve to distinguish district goals of the four target school systems and of the subsequent choices made in support of those goals. One rural superintendent viewed technology as a tool from which students could quickly access information. To that end, the respondent explained his district's support of the connectivity aspect of technology, which he regarded as essential for Internet capabilities. The provision of additional funds for connectivity maximized access capabilities for that district. Conversely, the superintendent of a small rural district that struggles to match the KETS dollars found that "the commitment's there. It's just with our limited resources how much we can pull off and allocate each year." Yet, the superintendent of the large urban district with supplemental funding for technology likened technological possibilities to "chasing a shooting star." That superintendent anticipated a technology program in the future where students would access information from their homes as well as from their schools. In pursuance of that vision, a district-business and industry initiative has facilitated placing computers in the homes of some of the district students.

Even in a district where local moneys complement the KETS allocations, one superintendent expressed frustration in acquiring the anticipated high levels of equipment:

> It's [technology] a moving target, every time I think I have a handle on it, it changes. But, I guess, in general our goal has been to make technology available to every child, to support the instructional programs they're involved in at the

> moment they need it with no wait time. And I think that's the optimum . . . . I would add as a correlate, I don't know if there's enough money in the world to achieve that. It just seems like you can not nail it down.

All superintendents interviewed recognized the need for technology to support instruction by providing for the integration of technology into instruction through such means as establishing writing labs and ensuring high functionality of equipment.

Structurally, the technology programs in the four districts of this study appeared to vary most noticeably in relation to decisions impacting funding priorities, purchase choices (e.g., hardware, software), and the degree to which various influential individuals have provided direction. The superintendent of the large urban district regarded KETS as a catalyst for setting standards and expectations and helping districts with priorities. KETS plans were considered a "vehicle to move forward" by another superintendent. For that superintendent the KETS program is significant for the funding, "first and foremost." The superintendent of the large rural district identified as a priority the funding of software and hardware.

Two districts experienced high levels of support for technology implementation through the involvement of the community and business and industry. The superintendent of District B acknowledged having the latitude to supplement KETS purchases with equipment obtained through (a) grants supported by businesses and (b) moneys supplied through a foundation. One district looked internally to the district technology committee to provide the impetus for technology implementation. In that district, decision makers "elevated" technology by establishing a separate facility for the technology department. Two superintendents indicated that their districts had expanded

and supplied substantial funding for technology staff.

All superintendents interviewed expressed somewhat varying opinions of the role of the School Council in technology decision making. One district superintendent estimated the influence of the school council input into decisions regarding technology at almost one hundred percent. Another superintendent speculated that districts struggle with the roles of the council in relation to a program that is standardized. "[H]ow do you adhere to a district plan that involves some standards . . . and still allow school determination under SBDM?" That superintendent dispatched technology staff to meet with school personnel and establish communication regarding district goals and program standards. In another district, the superintendent emphasized that their schools have allocations that must be spent in compliance with standard equipment and bid lists. One superintendent indicated that "It's not been a struggle or a push-pull . . . ." Only one superintendent described technology as "truly a district-wide program . . . where decisions are pretty much made by the district staff." In that district, school councils do not receive direct technology allocations but present requests based upon identified needs.

All superintendents varied in their specific sources of pride related to technology implementation in their respective districts, but all respondents acknowledged the possibilities inherent in promoting student success through technology. One urban superintendent was "happy for the student who has the vocational technology opportunity . . . ." Another superintendent contended that a computer-based alternative school program in his district, which allowed high school students to complete academic courses, has the potential of improving self esteem and preventing dropouts. One

superintendent expressed pride in a recently established technology training center for district staff.

Research Question 3

3. What factors have affected decisions regarding technology in the areas of

    a. Resources

    b. Political decisions

    c. Knowledge

    d. Policies (State, Local)?

Participants identified numerous factors, internal and external, which impact technology diffusion in their districts in both a positive and a negative fashion. The availability of adequate resources appears to be a major factor. At least two of the participants mentioned feeling constrained by such limitations as existing facilities and inadequate local funding capabilities. District A superintendent stated that conditions of facilities such as lack of space and ease of networking had impeded progress. Inadequate funding was frequently cited as a barrier to technology implementation.

There appeared to be some concern among the superintendents regarding political decisions made beyond the scope of their influence. When asked to what extent state and federal decision makers influenced the technology program in the local district, one superintendent responded, "Zero. As far as leadership." Conversely, another superintendent acknowledged that his district had used federal funds to establish a technology-based schoolwide Title I Program. District B superintendent suggested that federal and state decision-makers have provided leadership by goal setting, "setting the bar between a mark on the wall as to where we should achieve and drawing attention to

the issue."

The acquisition of knowledge in association with student learning needs was identified as a factor in the decision-making processes. One superintendent participant from an urban district related that learning needs of ESL students had prompted additional expenditures in technology. He stated that meeting the language needs of those students "forced us to integrate technology instruction in a way that we might not have done."

Teacher technology-usage needs were also identified as having impacted decisions associated with the deployment of technology resources. Professional development associated with technology training for staff, as described by participants, includes the provision of formal settings, such as a technology training center, and a structured program designed to facilitate teacher proficiency in technology usage.

Superintendent participants expressed varying interpretations regarding the function of KETS rules and regulations. While one superintendent evaluated the KETS requirements as having impeded the latitude of local decision makers, he quickly noted financial benefits of the program: ". . . we have to have the KETS money to meet the purchases. We don't have the resources to do it on our own." Another superintendent viewed KETS regulations as a means to the standardization of technology. That superintendent noted that KETS guidelines were useful in establishing the same level of technology at all schools within his district.

For two of the four districts studied for technology diffusion, equity in relation to KETS guidelines was a non-issue because of their districts' ability to exceed KETS requirements. One superintendent expressed a comfort level with KETS: "Seems there

was more concern early on . . . . I think we're comfortable with the regulations now and I think there's been some reasonable realization so that they're more workable than they were, perhaps, at the very beginning."

Research Question 4

4. To what extent are the four target districts different from regional mean values for equity measures of technology implementation?

   a. Student workstations?

   b. Teacher workstations?

   c. Percent of schools connected to the Internet?

   d. Level of implementation?

For this comparison (student workstations, teacher workstations, percent of schools connected to the Internet, level of implementation) no inferential statistics were calculated because of the small *N*.

Table 1 presents the descriptive data for equity measures from the sampled region. Inspection of these figures reveals only small mean differences between the four districts and the overall Region. These small differences would seem to be well within the realm of random differences. The district mean differences slightly exceeded those of the Region in three of the four measures of equity: Teacher-Workstation Ratio, Level of Implementation, % of Schools w/Internet. (The protocol for both the ratio of teachers to workstations and the ratio of students to workstations specifies that the larger descriptive number be interpreted as the lower equity measure, e.g., 6:1 equals six students for every one computer; 8:1 equals eight students for every one computer.)

Table 1 also shows measures of dispersion (standard deviation and range). These

descriptors indicated some variations for levels of equity measures among the four sampled districts. The most pronounced variations in those statistics appeared in the Teacher-Workstation Ratio (the standard deviation for the Region was almost double that of the four target districts) and in the % of Schools w/Internet in the four districts (here the standard deviation of the four districts is considerably larger than the Region, despite a smaller range).

Table 1

Descriptive Statistics for Equity Measures by Sampled Districts and by Region

Equity measure	*M*	*SD*	Range
	Four target districts		
1. Level of Implementation	68.25	9.43	23.00
2. % of Schools w/Internet	85.00	30.00	60.00
3. Student-Workstation Ratio[a]	7.38	.96	2.10
4. Teacher-Workstation Ratio[a]	2.88	2.78	6.00
	Overall regional values		
1. Level of Implementation	66.77	11.90	46.00
2. % of Schools w/Internet	83.60	22.73	83.00
3. Student-Workstation Ratio[a]	7.31	1.68	7.80
4. Teacher-Workstation Ratio[b]	2.96	5.06	27.80

Note. $N = 4$; 30 districts constitute sampled administrative region.

[a]Lower ratio equals greater access to computers.

Research Question 5

5. To what extent are the demographic factors (District ADA, Number of Schools)

for the four target districts different from regional mean values?

Table 2 presents the descriptive statistics for demographic factors. Again, consistent with the small *N*, no inferential statistics were conducted to test for differences between the four sites and the overall Region. Inspection reveals that the means for both the District ADA and Number of Schools were considerably larger than for the Region as a whole, undoubtedly due to the size of District B (large urban). Likewise, the standard deviation was considerably larger for the four districts, although the range was close to the same. The overall mean of 2,955 for District ADA reflects the generally rural-small town make-up of school districts in Kentucky.

Table 2

Descriptive Statistics for Demographic Factors by Sampled District and by Region

Factor	*M*	*SD*	Range
	Four target districts		
District ADA[a]	5,047.80	4,634.03	10,361.30
Number of Schools[b]	11.00	8.16	18.00
	Overall regional values		
District ADA[a]	2,954.63	2,689.02	11,705.10
Number of Schools[b]	7.40	5.31	22.00

Note. $N = 4$; 30 districts constitute sampled administrative region.

[a]District ADA = average daily attendance.

[b]Number of separate schools in the district(s).

Research Question 6

6. What is the relationship between the demographic factors and the equity measures

of technology?

Because only four districts were targeted in this exploratory study, the level of significance was established at $p < .10$. Within the four target districts, both District ADA and Number of Schools in the district correlated positively and significantly with Level of Implementation and Student-Workstation Ratio as shown in Table 3. However, the signs for all correlations involving the Student-Workstation Ratio and Teacher-Workstation Ratio must be interpreted with caution. As noted above, the correlation is based on the computed figure for the two ratios, but the protocol specifies that a larger ratio of students (or teachers) per computer reflects a lesser measure of equity (fewer computers available). Thus the positive correlations for the Student-Workstation Ratio actually indicate larger districts are associated with more students sharing each computer.

Table 3

Correlations between Demographic Factors and Equity Measures for Sampled Districts

Variables	1	2	3	4	5	6
1. District ADA	--	.9885**	.9257*	.5113	.9567**	-.3215
2. Number of Schools		--	.9005*	.4899	.9826**	-.4501
3. Level of Implementation			--	.7954	.8040	-.0812
4. % of Schools w/Internet				--	.3285	.2342
5. Student Workstations					--	-.5785
6. Teacher Workstations						--

Note. $N = 4$.

*$p < .10$. **$p < .05$.

Several other relationships in Table 3 show high correlations but were not

statistically significant. (A correlation has to be exceptionally high to be significant when $N = 4$.) Level of Implementation (based on the state's data) correlated at about .8 with both % of Schools w/Internet and Student-Workstation Ratio (again the caution about the lower equity for a higher workstations ratio). Also intriguing were the negative correlations for the Teacher-Workstation Ratio with District ADA, Number of Schools in the district, and Student-Workstation Ratio. Given the negative meaning of the ratios, these correlations suggest that larger districts have fewer teachers per computer (better access). On the other hand, these large districts have more students per computer (less access). None of these trends were statistically significant, yet the direction on the ratios are consistent with the significant correlations for size of district and the Student-Workstation Ratio (see preceding paragraph). Although studies with larger N are needed, these somewhat surprising directions clearly are worth further attention.

(The figures for student-workstation ratios in this table are based on the report of all computers purchased with school moneys. However, computers which are donated may not be included in official counts. This varies from district to district across the state. These "unofficial" computers would change the student workstations ratios such that districts that receive more donations could have a lower ratio than is officially recorded, i.e., greater equity. This separate equity issue--to what extent does the rate of donation of computers to school districts vary across districts--is not addressed in this study.)

Summary

Both qualitative and quantitative analysis revealed differences and similarities among districts relative to technology diffusion. Four districts were selected for

maximum variation with respect to size and urban/rural designation within one administrative region of Kentucky. Findings indicated that key decision makers held similar positions (the school superintendent, instructional supervisors, and district technology coordinator), all districts acknowledged the value of KETS funding, and the process of technology implementation was complex. Differences across districts involved the degree of programmatic latitude available, responses to resource availability, political pressures, and extant levels of technological knowledge. Regarding equity, larger districts demonstrated greater levels of technology implementation including percentage of schools connected to the Internet and a better teacher-workstation ratio, but more students using each KETS computer. All results must be viewed with caution based on the small sample of four districts.

Discussion

Policy Analysis

The findings of this study are considered vis-à-vis the larger policy question specified by Guba's (1984) Definition 3: "What is the scope of discretionary action that can be tolerated in implementing the Kentucky Education Technology System?" Six separate empirical research questions guided the collection of data, focusing on positions and organizational relationships; role perceptions of district decision makers; district-school governance and policy issues; equity measures of technology implementation; district demographic characteristics; and the relationship between demographic factors and equity measures of technology implementation.

Respondents' descriptions of district-specific technology initiatives along with variations in the perceptions of roles and responsibilities of decision makers lend

credence to the perceived complexity of the KETS program. Considerable programmatic latitude leads to differences in interpretations by the four target districts and helps to explain variations in the deployment of technology programs. By describing factors impeding technology diffusion and by identifying available local funding and community support, superintendents provided additional clues for understanding variations in district technology programs.

District discretionary actions with regard to the diffusion of technology are sanctioned by such recent KETS policy and procedural documents as the *1998-2000 Update: Kentucky Master Plan for Technology* (Kentucky Department of Education, 1998) and the *2001-2006 Master Plan for Education Technology* (Kentucky Department of Education, 2000c). Descriptive statistics indicating varying levels of those equity measures identified in this study (Student-Workstation Ratio, Teacher-Workstation Ratio, Level of Implementation, and % of Schools w/Internet) for the four target districts and the region subsuming those districts support the assumption that districts operate within the latitude permitted by KETS. Equity measures for the four districts studied and for the Region reflect some variations in implementation. Descriptive statistics within the four districts confirm the participants' recognition of the need for, and probable use of, prioritizing district needs.

Prioritization may account for variations in the presence of equity measures. For example, while 100% of the schools of three target districts are connected to the Internet, the fourth district, having fewer schools connected to the Internet, claims the second lowest student-to-workstation ratio. The primary restriction as indicated by participants remains the necessity of using local funds to match the KETS allocations for purchasing

state-approved technologies. This restriction, however, is not necessarily viewed negatively because it has ensured, through the standardization of technologies, a level of functionality among districts. Particularly problematic, however, is the difficulty of maintaining technologies with perpetually expanding capabilities. Districts have adopted circular planning to address the short-lived standards and subsequent updates.

The notion that KETS is a district program--that district leadership determines the direction and nature of program implementation--has become convoluted as a result of state-mandated Consolidated Planning, which requires input from the school and the community. From a procedural perspective, the district maintains official inventories and assumes the responsibility for purchasing technologies through the KETS allocations. Decisions and requests of school-based decision making councils, with respect to the types and uses of technologies desired, connect district purchases to instructional needs. As the roles of schools have expanded, districts have focused on intra-district communication to meet both school needs and required state standards. District hierarchical patterns within the four target districts, without exception, have identified the district technology coordinator as a key facilitator in establishing and maintaining program quality and standards.

The addition of technology support staff for teacher training and maintenance at the school level reflects a growing recognition by the districts and/or the schools of the significance of matching the level of implementation with instructional needs. Conflicts potentially resulting from the observed absence of clear governance boundaries between the districts and schools in regard to KETS were unrealized in the districts studied. Implications for district-school cooperation are present in the targeted districts' increased

emphasis upon communication between the two levels.

Regulations, policies, and procedures associated with KETS have provided no specific program configurations mandating that local districts identify local decision makers and their roles relative to the implementation of technology. Instead, early recommendations through the *Blueprint and Selection Guide* (Office of Education Technology, 1992a) and, later, the need to establish committees commensurate with strategic planning, may have contributed to the number of decision makers associated with technology within the four districts studied. At the inception of the KETS Program in 1992, the positions of district technology coordinators and school technology coordinators were identified but not defined. Relative to the participating superintendents' descriptions of leaders and their roles, the assumption of "natural" leadership roles of the superintendent, central office personnel, and school principals, and the traditional funding role of the local board of education certainly could not be discounted as impacting program implementation.

Within this study the demographics and fiscal characteristics of each district are, perhaps, most germane to the impact of KETS on the issue of equity as it relates to the diffusion of technology. There appears to be a relationship between the location (urban/rural) and the capabilities of districts to provide supplemental funding for technology. Among the four target district technology programs, superintendents of urban districts described the most non-mandated technology initiatives and the most fiscal support for such initiatives from funding sources beyond the KETS allocation. Unique district characteristics (e.g., conditions of facilities or specific student needs) have implications for connectivity and district spending capacity. Both funding level and

district priority for technology implementation can be affected by such factors.

Recommendations

Policy

Findings from this study contribute specifically to understanding the practices and roles of decision makers within the scope of their influence as determined by the latitude and restrictions inherent in KETS. Within the small sample of districts selected for maximum variation, the data reveal both diversity and similarity of program implementation. In accordance with KERA's philosophical underpinnings, supporting district/school decisions based upon identified needs and accompanied by appropriate responsibilities, recommendations gleaned from this study suggest policy modifications in the following areas: strategic planning and provision for increased communication, perceptions of decision makers' roles, and continuing and/or expanded support for technologies, including change over time.

Based upon participant responses, superintendents and schools need increased guidance and support in bringing the management of technology under the umbrella of the Consolidated Plan. The use of strategic planning for a standards-based program, which must also meet school needs, has appeared to work effectively in the target districts as a result of the frequently intense communication established by the district leadership. Revised state procedures and program guidelines with increased information regarding the parameters of authority for each level, both district and school, would facilitate mutual understandings of the extant responsibilities and obligations, respectively. Improved public relations might also be served by these understandings.

The roles of district and school decision makers in technology implementation

appear to be constantly redefined in relation to changing conditions. These evolving roles have been described as workable by the superintendent interviewees. Since the duties of the district technology coordinators varied considerably within the districts, a non-mandated sample job description for the district technology coordinator and supporting technical staff might be useful to districts in comparing the duties and responsibilities of their technology personnel to those of corresponding personnel in other districts.

A third recommendation for policy associated with technology, offered with caution, is for continued and/or expanded support of technologies as requirements continue to change. The *Master Plan for Education Technology: FY 2001 - FY2006* (Kentucky Department of Education, 2001) provided for the limited purchase of previously disallowed technologies. Such technologies may enrich school programs but should not be allowed to override the needs for basic equipment and software or for replacement items. At the same time, access to optional and optimal technologies should not be limited to affluent districts or districts with substantial external funding.

Research

Findings from this and other extant studies suggest the need for further research in the area of technology implementation as it relates to the diffusion of technologies across districts, regions, and the state. Because of the exploratory nature of this study and the limited number of related studies on technology diffusion, recommendations for additional research include the use of alternate methodologies, participants, and samples. In order to gain a broader perspective, future research might include the use of survey methods, in which randomly selected participants would provide samples from which inferences could be made to the general population.

This research study identified the district as the unit of analysis and the superintendent as the respondent. Obvious limitations for the triangulation of data are inherent in gathering all qualitative data from the perspective of one individual within a district. Future researchers may wish to use member checking by interviewing individuals who occupy other positions as decision makers, perhaps those identified in the present study.

A final recommendation for future researchers would be to design a project, whether quantitative or qualitative, extended in scope to include more districts and produce data reflecting a statewide perspective. The analysis of existing longitudinal data might provide insight into variations in KETS implementation across the state.

Conclusions

The overarching characteristic of the Kentucky Education Technology Program is its complexity, both perceived and real. However, the foundation for program implementation, including the diffusion of technology, is equity, a concept that has been defined and can be easily understood as the amount and potential of resources available and/or the amount of funds required of districts to reach a minimum level designated by the state. Implicit in that definition is equitable student access to technology. Massive compilations of state documents, which outline standards, establish funding procedures, and suggest district practices, provide only a skeletal frame for program implementation. This exploratory study provides evidence of district latitude in accessing and using KETS allocations in a manner that defines a technology program that may be quite different from technology programs in other districts.

Kentucky has, according to the Milken Family Foundation (1998), exceeded the

average state level for technology implementation. According to respondents in the present study, districts have as a primary focus the integration of technology into instruction. A relaxation and/or expansion of technologies available for purchase under the more recent KETS rules offer promise for student access to state-of-the-art technologies. Underlying these positives, however, are apparent differences in the present levels of technologies existing within districts. Districts whose superintendents can cite either larger amounts of local funding allocated to technology or community support providing supplementary funding may be able to offer initiatives unavailable to districts with less funding capacity. Program variations resulting from increased funding capacity may provide greater benefits associated with technology to the students in those districts. Diffusion of technology, as established by KETS parameters, offers a rich field for researchers; variations in programs, decision making, and level of implementation as well as student benefits and progress are all important topics. Policy research in the area of technology is sparse, and additional studies may provide insight into program improvement and more effective selection and use of technology.

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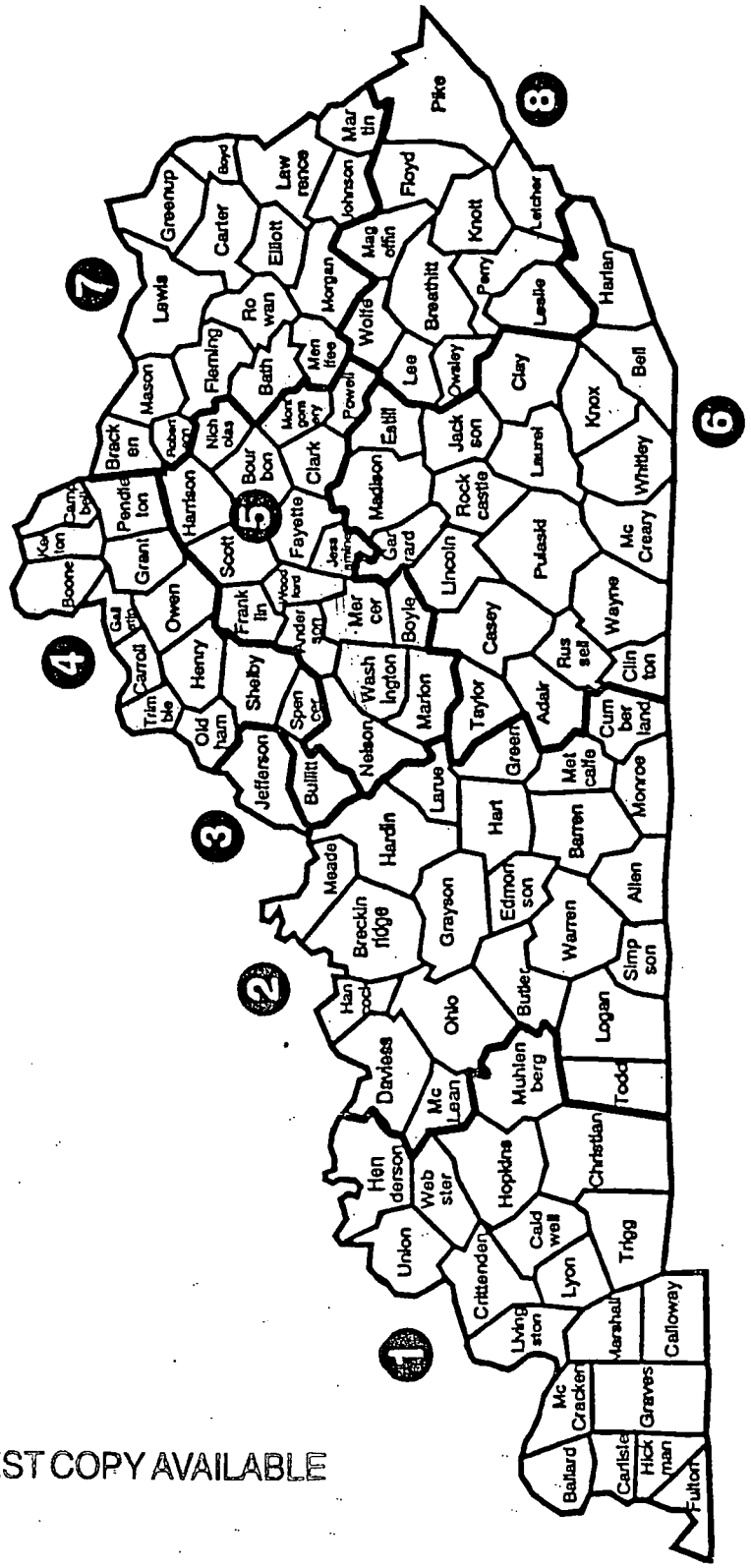
APPENDIX A

KENTUCKY DEPARTMENT OF EDUCATION

ADMINISTRATIVE REGIONS



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APPENDIX B

MAP OF INTERVIEW SCHEDULE TO RESEARCH QUESTIONS

RQ #1 What positions do those who make decisions hold?

- **a. What is the relationship of these positions to the district hierarchy?**
- **b. What is the relationship of these positions to school organizational structures?**

1. Describe the roles of individuals and groups who have been most influential in implementing the technology program in your district with respect to (a) deployment of technology resources, (b) types and quality of technology resources, and (c) other related areas.

2. What provisions have your district and schools made to include parents and the public in decision-making processes involving technology in your district?

3. Imagine that you have just employed a new district technology coordinator who will be responsible for all major integrative and technical program responsibilities. The new employee is familiar with the KETS program, but is unfamiliar with the district practices and school personnel positions associated with the program. Describe to that individual the decision-making process as it relates to technology diffusion in your district.

a. How does the program operate?
b. Which decisions are made by various decision makers relative to the program?
c. How are responsibilities divided between the district and the schools?

RQ #2 How do these decision makers perceive their roles and the latitude of those roles?

4. Describe what you think your district will be like when you have sufficient technology resources to support the best possible technology program. What will exist? Where will it exist? What impact do you hope it will have on your students and personnel?
   a. What steps have you taken to achieve this goal?
   b. In what ways does the KETS program support your goals for technology in your district?

5. To what extent have local decision makers influenced the technology program in your district?
   a. Describe the practices of any decision makers who you feel have been most influential in the distribution of technology resources and in the implementation of the program in your district when viewed in its entirety?

(Probes: input from district and school employees, input from parents/community, organized groups)

b. What decisions do you think these local individuals/groups would identify as having influenced the district technology program? (Probes: distribution of technology resources, curriculum decisions, teacher training in use of technology, strategic planning for use of technology, community/parent participation in technology program)

6. What is the extent of school council input in the decision-making process as it relates to technology diffusion in your district?

7. Earlier in the interview, I asked you to reflect on the resources needed for the best possible technology program for your district. All programs change over time. To date, what are the contributions to the district technology program made during your administration by which you would most like to be remembered?

RQ #3 What factors have affected decisions regarding technology in the areas of

a. Resources?

b. Political decisions?
c. Knowledge?

d. Policies (State, Local)?

8. To what extent have state and federal decision makers influenced the technology program in your district?

9. In what ways do you think the local decision makers in your district would say their roles have been affected by KETS rules, regulations, and requirements? In what ways would they say their roles have been affected by long-range planning? By training in technology?

10. How do you use the KETS directives and guidelines on equity to implement the KETS Program in your district?

11. What are the district criteria for distribution of technology resources within your district? Across your schools?

12. What do you perceive as barriers to implementing technology in your district?

APPENDIX C

PARTICIPANT CONTACT LETTER

Researcher's Address

Dear :

You are being invited to participate in a research study. The purpose of this study is to examine decision-making processes regarding technology implementation and the relationship of those decisions to discretionary action. The study utilizes qualitative interviews and quantitative data available from the Kentucky Department of Education (KDE) Web-site. This study is being conducted with the sponsorship of Dr. Stephen Miller and the Department of Leadership, Foundations and Human Resource Education at the University of Louisville.

Please remember that your participation in this study is voluntary. If you agree to participate, you will be interviewed regarding decision-making practices relating to technology diffusion within your district. The interview will be taped and should take approximately one (1) hour to complete. You may decline to answer any particular questions that make you uncomfortable or which may render you prosecutable under law. Because of the limited number of participants, there is the risk that interviewees and the districts they represent might be identified. Beyond this, there are no reasonably foreseeable risks to you. There are no direct benefits to you for participation; however, the knowledge gained may benefit district leaders in examining their district decision-making practices. A copy of the results will be available to you upon request.

Individuals from the Department of Leadership, Foundations, and Human Resource Education and the University Human Studies Committee may inspect these records. While absolute confidentially can not be guaranteed, the data will be held in confidence to the extent permitted by law. Your completed interview script and tapes will be stored in a filing cabinet at my home. Should the data be published, your identity will not be disclosed.

By signing this letter you are agreeing that all present questions have been answered in language you can understand. You may refuse to participate without being subject to any penalty or losing any benefits to which you are otherwise entitled. You may discontinue participation at any time without incurring or losing any benefits to which you are otherwise entitled. If you have any questions about this study, you may contact the

principal investigator at (502) 852-6475. All questions will be posed in understandable language. Any questions that you may have about the research or the research process can be addressed to the principal investigator, Dr. Stephen Miller at the University of Louisville, School of Education 334, Louisville, Kentucky 40292. You may contact the University Human Studies Committee at (502-852-5188) and will be given an opportunity to discuss any questions about your rights as a research subject, in confidence, with a member of the Committee. This is an independent committee composed of faculty and staff of the University of Louisville and its affiliated hospitals, as well as lay members of the community not connected with these institutions. The Committee has reviewed this study.

By signing this letter, you acknowledge that you have been given a copy of the Informed Consent Form and that you have agreed to participate.

I will be contacting you in the near future to arrange an interview.

_____

_____

Co-Investigator Date of Signature

_____

_____

Participant Date of Signature

APPENDIX D

CONTACT SUMMARY FORM

Date & Time of Interview:	Location & Site:	Date Coded:

Page # in text	Salient Point #	Salient Points of Interview	Themes/Aspects
	1.		
	2.		
	3.		
	4.		
	5.		
	6.		
	7.		
	8.		
	9.		
	10.		

	11.		
	12.		

APPENDIX E

Table E1

*District Equity Measures of Technology**

District	Student Workstations	Teacher Workstations	% Schools w/Internet	Implementation Level
A				
B				
C				
D				

*Source: Kentucky Department of Education. (1999, December 14). *99-2000 student & teacher workstations.* Retrieved April 25, 2000 from the World Wide Web: http: kde.state.ky.us/oet/planning/techplans.asp

APPENDIX E (CONT.)

Table E2

District Demographic Factors

District	rural/urban**	ADA*	# Schools*
A			
B			
C			
D			

*Source: Kentucky Department of Education. (1999, December 14). *99-2000 student & teacher workstations.* Retrieved April 25, 2000 from the World Wide Web: http://www.kde.state.ky.us/oet/planning/techplans.asp

**Source: Census: Kentucky Profiles (1990). Retrieved November 14, 2000 from the Kentucky State Data Center on the World Wide Web: http://cbpa.louisville.edu

APPENDIX F

OPERATIONAL DEFINITIONS OF QUANTITATIVE MEASURES

Level of Implementation: Percentage of the funding necessary to achieve full implementation of technology, as defined by the KETS program, that has been spent by a district or KDE Administrative Region.

% of Schools w/Internet: Percentage of schools in a district (or KDE Administrative Region) that are connected to the internet.

Student-Workstation Ratio: The ratio created by dividing the number of students by the number of computers, for the district or KDE Administrative Region. The resulting number is read as a ratio. For example, 7.38:1 is interpreted as 7.38 students for every one computer.

Teacher-Workstation Ratio: The ratio created by dividing the number of teachers by the number of computers, for the district or KDE Administrative Region. The resulting number is read as a ratio, as in Student-Workstation Ratio, above.

Average Daily Attendance (ADA): the average number of students in attendance on a daily basis, for the district or KDE Administrative Region.

Number of Schools (# Schools): the number of schools in each district or KDE Administrative Region.

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