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ABSTRACT

            This study reports on the formulation of educational
technology policy in three Illinois K-12 school districts (n=36). Major
findings included: (1) educational policy formulation in the districts
focused on collecting the objects of technology, such as computers, modems,
networks, rather than viewing educational technology as a systematic process
of achieving goals; (2) active leadership from a superintendent was essential
in each school district; (3) formulation of the plans was more than an
empowered committee or executive blessing--it required active participation
by a superintendent. Findings also revealed that some of the school
districts' planning ideas had omissions, such as detailed plans for staff
development, finances, evaluation, and school culture issues. The flow of a
technology initiative starts with a vision and includes technology goals,
development of instruction, implementation, evaluation, and
recycling/revision. Using this systems approach and adding the omissions
observed in the research, a planning template, the "Technology Planning Web,"
was developed to be used at the goal and development steps of the technology
initiative. At the center of the web are educational technology goals and
learning activities; other components include evaluation protocol, staff
development, hardware, finances, research and development, physical
infrastructure, and political/cultural infrastructure. (Contains 33
references.) (AEF)

How Do Local School Districts Formulate Educational Technology Policy?

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Abstract

This study reports on the formulation of educational technology policy in three Illinois Unit (K-12) School Districts. The major findings of the study include: (a). Educational technology policy formulation focused on collecting the objects of technology, such as computers. modems, networks, and the like, rather than viewing educational technology as a systematic process of achieving goals. (b). Active leadership from a superintendent was essential in each school district. (c) Formulation of the plans was more than an empowered committee or executive blessing. It required active participation by a superintendent. Other discussion includes a planning template was developed as insight developed from the study.

School districts are seeking ways to incorporate the latest trends of hardware and software into their classrooms. Frequently, the proponents who promote the attributes of hardware in classroom promise prosperity, school restructuring, and reformation of schools (Fiske, 1993; Reigeluth, Annelli & Otton, 1992; Stanzione & Thompson, 1993); improved attendance (Reigeluth et al., 1992); increased learning gains (Doyle & Levinson, 1993b; Fiske, 1993; Gates, 1993; Guthrie, Garms, & Pierce, 1988); improved motivation (Kendl & Liberman, 1988; Reigeluth et al., 1992); development of higher order thinking skills (Rockman, 1993); higher teacher and administrator productivity (Guthrie et al., 1988; Doyle & Levinson, 1993a, 1993b); and the "[relief of] teachers from some of the more time-consuming and inefficient aspects of their traditional role (Schlechty, 1991, p. 75).

Frequently, technology proponents and enthusiasts view technology as hardware only, and frequently microcomputers and their peripherals. However, the educational technology community views the subject as a process, such as the one these writers frequently use. "Educational technology is the systematic means of achieving stated goals." The process includes people, instructional design models, organizational and management theories and practices, research and evaluation techniques, and equipment and materials. For the purposes of this report, the terms "technology" and "educational technology" will refer to the process. When objects, such as microcomputers and their peripherals, are points of discussion, generally they will be referred to as "hardware."

Prescriptive literature describes how school districts should plan to bring hardware and software into their districts (Barkman, 1989; Burrus, 1993; Crow & Rariden, 1993; Dormant, 1992; Doyle & Levinson, 1993a, b; Dyrili & Kinnaman, 1994a, b; Kinnaman, 1991; Missouri School Boards Association, no date; See, 1992). However, little studies exist to document the actual practice, the subject of this report.

The Study

During late 1994 and early 1995, the principal investigator interviewed 36 human subjects from three Illinois Unit (K-12) School districts to investigate the nature of technology planning in their district. The subjects were from the districts' planning committees, such as the superintendent, central office administrators, principals, technology coordinators and teachers, and others who influenced the planning process. Participating school districts were selected from a population of nearly 50 Unit districts. The researchers chose to work with districts that varied in demographics. The study took its foundation from qualitative research to develop case studies to answer the research question based on Huberman and Miles (1994), Marshall and Rossman (1989), Merriam (1991), Stake (1994) and Yin (1994). The data for the study were gathered through interviews with technology planners and others who affected the planning process and inspection of relevant documents to triangulate on the facts of each case. Interview questions were developed from policy studies (Spitzer, 1992; Quinn, 1992) and general questions about the participants views and use of educational technology.

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The questions were formulated and used to develop rapport with the participants and to determine reasons for hardware and software usage, as well as to help develop insights that are explored throughout the case reports (Hunt, 1995). The questions were:

1. Tell me about yourself, your background, and your current position with this school district.
2. How do you define educational technology?
3. How would you like to see emerging equipment like multimedia computers, CD-ROMs, laser discs, the information super highway, and the like used in your school district?
4. What differences do you see in the current equipment just described as compared to traditional audio visual equipment, such as overhead and film strip projectors, and audio tape players?
5. What are your sources within the district for information about technology?
6. What are your sources outside the district for technology information?
7. Do you make an effort to look for technology developments from these external sources, or is the technology news secondary?
3. How do you (individually) use technology at work and at home?

The first question was asked to learn about the educational background and educational experiences of the participants. The second question was developed because of many informal discussions with interested educators, coursework in the researcher's curriculum, participation in the educational technology planning process in his own school district, and reading about various definitions of technology and educational technology. The researcher was curious about how policy planners defined the term educational technology and whether their definition itself might impact how they developed technology policy.

The popular press repeats the promises that technology will make our lives better. The third and fourth questions were used to probe participants' perceptions of the general promises -- collected through informal discussions and reading -- that newer equipment would make students better learners and schools better places than had happened with traditional audiovisual equipment and other educational initiatives. It was the researcher's intent to probe the participants' reasons for the use of technology. From his own reading and discussions with educators and other technologists, the researcher hypothesized that technology planners would focus on hardware, technology promises, and planning literature that had no research foundation. Did they repeat and apply the mass-marketed technology promises in their own school districts or challenge and examine them? Did planning committees use prescriptive literature to develop their technology policies? The researcher hypothesized that this study would answer these questions in the affirmative.

Questions five, six, and seven were developed to investigate the sources of technology information that policy planners used to make their decisions. As stated above, much of the information flow about technology is not research-based. Is this raw, opinion-based, unfiltered, mass-market information reaching the policy planners? If so, how do they react to it?

The final question in this series was asked to seek the level of hardware and software use by the participants. Were the participants users of hardware and software or were they non-users with opinions about how hardware and software should be used?

To investigate the nature of policy planning, Spitzer's (1992) and Quinn's (1992) questions formed the basis of further inquiry. Spitzer, writing from an HPT perspective, offered ways how to design and study effective interventions in the business community. Quinn designed a major evaluation study for the Chicago Public Schools. Quinn's questions appear to be similar to those of Guba and Lincoln (1981). These sources provide the foundational questions for a complete evaluation study, but they were molded together and applied to this study to investigate the planning process in detail. The questions were:

1. What is the need for the technology policy?
2. Who is the sponsor (champion, originator)?
3. What are the expectations and commitment of the sponsor?
4. What other key decision makers in the organization have an interest in this policy?
5. What are their expectations?
6. What is the scope of the policy?
7. What are the goals of the policy?
8. What documents have been supplied to others in the organization to implement the plan?
9. What is the time frame of the project?

10. What other individuals or groups may be affected by the technology policy? What is the impact of the policy? Did they have any input on this policy? If so, in what ways?
11. What are their expectations?
12. What related policies or plans have been implemented in the organization?
13. What were the results?
14. What sources of support exist for the policy?
15. What are the constraints on the formulation of this policy?
16. What other economic, political, or cultural factors affected the formulation of this policy?
17. What individual ideas do you have about the formulation of this technology plan?

These questions were investigated through the dialog of semistructured interviews with the primary participants and by inspecting the technology policy and related school district documents. These interactions raised new questions, which led to follow-up inquiries with some participants. Furthermore, interviews with primary participants revealed issues that generated interviews with additional individuals about specific topics. Normally those individuals did not experience the full interview process; rather, the interview focused on specific details.

For example, in one participating school district, teachers were encouraged to write grants. During one interview, a primary participant mentioned how two teachers in her building wrote a technology-related grant. Those teachers were then interviewed about their grant-writing ideas and the culture of grant writing in the district.

Furthermore, at the beginning of the 1994-95 school year, new principals in one district influenced their district's planning process. They became part of the planning committee, but just before its final revision. These individuals were asked for their input since they had been previously employed by school districts that had made considerable use of hardware and software. They raised questions about why a certain computer platform was chosen and why computer networks were not part of the plan. This led the planning committee to reinvestigate and explain its platform decision and to investigate networks. It was necessary to interview these newcomers, even though their participation had been limited.

In another district, a former superintendent's influence showed in the plan, making it vital to interview him. His activities while superintendent of that school district had long-lasting impacts on its technology culture.

In two cases, additional individuals were interviewed about specific issues to corroborate what primary participants said. These individuals became secondary participants because they had little or no knowledge of the planning function, but they had influenced or been influenced by the process.

For this report, the participating school districts' names have been changed because of the promise of anonymity by the researchers. Furthermore, pseudonyms were not developed for participants. Rather, they are identified by their job titles.

The River View Technology Policy

At the time of this study, River View School District was comprised of six schools, enrolling about 4,500 students. The population was largely White (91%) and the attendance rate was high (95%), as stated on the School Report Card. The district's single high school graduated 89% of the students who enrolled as freshmen. The faculty was almost all White (a School Report Card category), very experienced, and the average teacher was paid nearly $2,500 above the state average. The school district spent about $1,000 per pupil less than the state average.

The context of technology planning and the school climate in general was flavored by a major funding issue and political fallout related to previous shifting of money between funds in the school district's budget because of failed referenda. This resulted in a slow drain of financial resources from activities that directly affected students in classrooms, such as acquisition of hardware and software, hampered technology planning, and negatively influenced school climate, in general.

Participants in this study (Superintendent, Assistant Superintendent Curriculum,Technology Coordinator, four teachers, former superintendent, two principals, and director of the public library) were the most-spirited among the three districts studied. They spoke passionately about bringing technology into their school district. Some of the teachers had strong characters, and they did not seem to accept leadership well. This appeared to cause chaos at times in technology committees activities, and a disjointed educational technology policy resulted, rather than a cohesive, insightful policy.

At the time of this study, educational technology was being considered again after a period of dormancy. A former superintendent had placed computers in the main office and into classrooms. He believed that students should use computers to learn. However, his initiative was sidetracked by the financial and public relations problems

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in the school district, which eventually led to his resignation. Following his departure, the district had two superintendents in two years, which put the technology initiative into a dormant state. At the time of the study, the district was still recovering from its financial problems, which had prohibited the district from updating equipment and implementing the plan. Teacher participants appeared cautiously optimistic that the plan would be implemented at some future date when the district could afford to fund it.

Technology planning in River View took place in three areas: formal planning through committee, informal communication caused by personal agendas, and independent action in each school that is funded outside the review process. The district's previous financial problems and changing two superintendents within two years affected the district's progress in many areas, especially in technology and its proposed implementation.

The previous superintendent's initial actions toward a district-wide technology initiative in the mid-1980s continued to affect the district. He purchased computers that were discontinued models at the time of the purchase, and they are still used in the elementary schools. His vision of technology applications continued to get mixed reviews by veteran teachers. His positive attitude toward technology was transferred to his technology coordinator who was the sponsor of the written plan discussed in this chapter.

Planners were concerned about purchasing up-to-date equipment, maintaining it, and purchasing replacement equipment. Other planning issues were parity and equity, training, and adoption of a platform, which itself was a small issue, but its discussion required considerable time.

In the informal mode, decisions and purchases were made and donations were received without formal review of the committee or guidance from an established procedure. The local public library donated modems to the schools so students could view the library's holdings via computer. In addition, principals attempted to secure hardware and furniture through building-wide fund raisers, while individuals influenced the expenditure of Chapter 1 funds without consultation of the committee.

The plan was constrained by the financial state of the school district, politics, the participant's views of the administration's commitment to technology, definitions of educational technology, and communication of the committee with its community.

The Orchard Heights Technology Policy

At the time of this study, Orchard Heights School District was comprised of 15 schools, enrolling about 8,500 students. The population was 60% White, 19% Black, and 20% Hispanic; it had a 93% attendance rate. The high school graduated 82% of the seniors who enrolled as freshman. The faculty was largely White (91%), very experienced, and the average teacher was paid nearly $2,000 above the state average. The school district spent about $1,000 per pupil less than the state average.

The participants in this study (Superintendent, Technology Coordinator, four principals, nine teachers, and Mayor's assistant) expressed commitment to technology applications in their school district. Although the researcher did not see the lively spirit as in the previous school district, the participants spoke with conviction of their ideas and trust in the technology planning process and the potential of technology in their school district.

During the study the school district passed a referendum to finance its technology initiative. The participants were convinced that the district did not have financial resources to fund a technology initiative because the state had placed a cap on annual property tax increases in the school district's county at a 5% increase or the actual cost of living increase, whichever was lower. The voters dispelled that concern.

A core of technology planners -- led by the superintendent, technology coordinator, and technology committee co-chair -- formed a nucleus of policy makers in the district. However, some planners identified other influential faculty members as important players in the plan's formulation.

Before the formulation of the plan that was the subject of this study, the district's efforts in technology planning and implementation were irregular. Planning and equipment acquisitions were made by a district computer committee in various forms. Three grants from the regional telephone company created disparity because it focused only three of the district's schools

The plan that was investigated in this study contained philosophical and visionary statements, student goals and hardware requests. Essentially the plan attempted to level individual and school initiatives that were encouraged by administration because the school district did not provide financing for a consistent, district-wide initiative.

The views of the technology, such as technology is an enhancement, affected the formulation of the plan. Participants appeared to view computer-based technologies in differently from traditional equipment like movie and slide projectors.

The committee that formulated the plan was composed of teachers from schools and administrators. The committee focused on acquiring equipment to enhance education. Other planning issues the committee considered were parity, networking, and staff development.

The high school principal appeared to influence the contents of the final plan as he sent detailed letters to the planning committee's sponsors. He was successful in getting networks and mobile computer labs for his school into the plan. The principal's influence was noted by participant's in all levels of the planning committee.

The planning process was constrained by the district's lack of defined leadership because no individual or group appeared to want to take the lead on planning issues. The long-term culture of freedom produced pockets of hardware that the plan attempted to acquire and distribute to all schools. Politics, especially those associated with the principal's push to make his school the technology showcase, constrained formulation. The plan was limited by the committee's perceived view of community commitment. They stated that the they thought the community would not fully support a technology initiative to provide full technology opportunities for children. In addition, the plan was limited by the lack of communication with the school community.

During this study, the school district was working with the city to establish a city-wide network with other public entities and private university in the city. This network was to have been the backbone for large-group learning in the Orchard Heights schools.

The State Park Technology Plan

At the time of this study, State Park School District was comprised of 14 schools, enrolling about 5,500 students. The student population was the most diverse of the three school districts in this study. Thirty-seven percent of students were White, 57% were Black, and 5% were Hispanic. Over half of the students were low income, but the attendance rate was 92%. The high school graduated only 67% of the seniors who enrolled as freshmen. The faculty was 83% White, 16% Black, and 1% Hispanic; averaged nearly 15 years of experience; and were paid about $1,000 below the state average. The school district spent about $100 per pupil less than the state average. The current superintendent noted that one of the district's main problems was that the district had a high mobility rate, in that about one-third of the students in the school district either enrolled or left the district during each school year. The Assistant Superintendent for Business Affairs related that the district was poor financially and that it received most of its operating revenue from state (50%) and federal (17%) sources.

Before the current plan, the district's technology initiatives were limited to labs in each attendance center. The plan that was the subject of this study was sponsored by a superintendent who, as a new employee in the school district, brought high energy, new ideas, and a technology vision and experience to the district. Because of his task of reorganizing and re-energizing the school district, he turned to an outside consultant -- IBM Corporation -- for assistance. An IBM facilitator led a district planning committee through a two-day planning session based on an IBM process, known as a metaplan, to develop the plan. Before the actual planning session, the planning committee visited schools that were thought to be in advanced stages of technology implementation; counted the computers in their own district; and surveyed their district's teachers on computers, although it is unknown if the survey results actually were used during planning. During the session, the planners developed a mission statement, identified problems and solutions, and proposed an action plan in a dynamic and positive group interaction. The plan was constrained by the accelerated planning process and communication with the school community.

The plan was developed in 1992 and essentially placed on the shelf, because of funding. Planners returned to their regular duties, and the sponsor retired from the school district and education on June 30, 1993.

Cross-Case Comparison

In all three districts, nearly every participant gave definitions or descriptions of educational technology that were related to what Saettler (1990) called the "physical science approach" (p. 5).

Participants in River View called technology "a tool" or gave examples of hardware and software. In Orchard Heights, the "enhancement" view was similar to River View's tool description. Examples of hardware and software were given in State Park. The Orchard Heights superintendent was the only participant to give a process-oriented definition:

> It's far more than the hardware and software. I believe that it's almost the process of exploration. Technology is really a step-by-step process of problem solving. . . . It's not necessarily what it is, but what it can do.
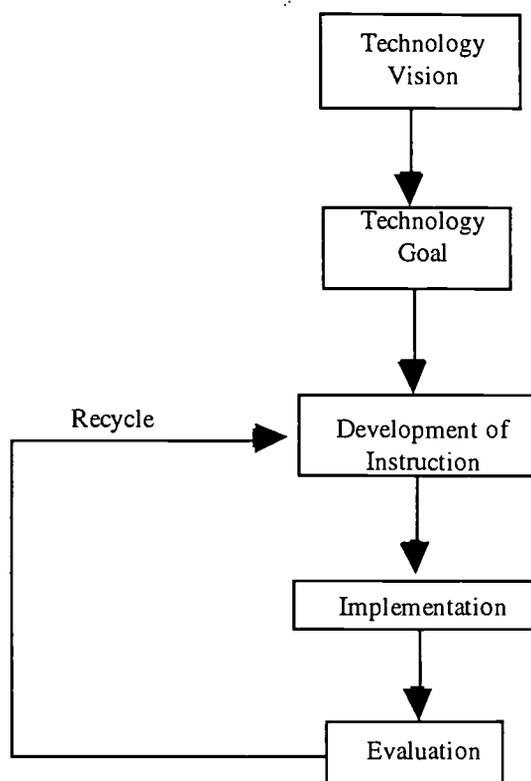
Furthermore the following points can be extracted from the study.

1. Educational technology policy formulation focused on collecting the objects of technology, such as computers. modems, networks, and the like, rather than viewing educational technology as a systematic process of achieving goals.
2. Active leadership from a superintendent was essential in each school district. Formulation of the plans was more than an empowered committee or executive blessing. It required active participation by a superintendent.
3. School districts developed educational technology policies regardless of their financial state.
4. Educational technology policy formulation occurred without regard for student demographics.
5. Applied technology or technology education -- including electronics, robotics, video production, industrial technology and metals technology -- was part of educational technology policy formulation in two of the three school districts.
6. While planning focused on the objects of educational technology, planners took little action on other elements of educational technology planning, such as staff development, finance, evaluation, and school cultural issues.
7. Technology planners did little to communicate aspects of their educational technology plan to their school communities.
8. Educational technology policy was a political process. Whether it was new superintendent pushing his technology agenda or a teacher influencing a computer purchase, politics were part of the process.
9. The planning committees were not representative of the school community.

Technology Planning Web

From listening to the technology planners from the three school districts describe the technology-related issues, examining their documents, and studying their plans, the researcher observed that some of their planning ideas had omissions, such as detailed plans for staff development, finances, evaluation, and school culture issues. From this research he developed a planning template focused on the planning aspects of educational technology.

The flow of a technology initiative starts with a vision. A single goal or a series of goals should flow from this vision. Learning activities are then developed and implemented. These events are followed by an evaluation, either formative or summative. In a systems approach, evaluation is followed by a recycling component to revise portions of the learning experience that do not meet the evaluation criteria. Figure 1 shows the general flow of a technology initiative.

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        │                      │   Instruction     │
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Figure 1. Flow of a Technology Initiative

Using a systems approach and adding the omissions observed in the participating school districts' planning activities, the researcher proposes a technology planning template that would be used at the goal and development steps. It is called the "Technology Planning Web" and is shown in Figure 2. The components of the web are evaluation protocol, staff development, hardware, finances, research and development, physical infrastructure, and political/cultural infrastructure. Each component offers its own challenges and systematic design solutions. Most important is that each component needs detailed planning and not just a mere mention in the educational technology policy.
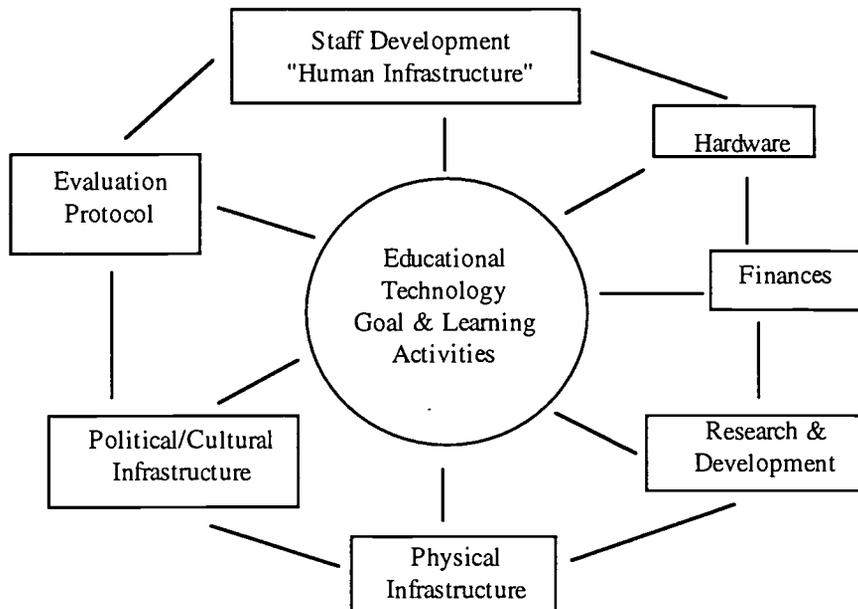
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                    ┌─────────────────────┐
                    │  Staff Development   │
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   │  Protocol    │         ┌─────────┐       └──────────┘
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                            │Technology │     │ Finances │
                            │Goal &     │     └──────────┘
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   │Political/Cultural│     └─────────┘       │ Research &   │
   │Infrastructure│                           │ Development  │
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                    │      Physical        │
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Figure 2. Technology Planning Web

The web can be used by a school district committee to consider how to address technology planning. This web would be applied after the planning committee has constructed a mission, vision, or philosophy statement. Goals should be derivatives of the declarations of the committee's preferred future state of the school district. As each technology goal is composed, the web should be used to remind the planning committee of other issues that exist for that goal. Each goal should have its own web so that a complete plan will have a detailed web for each goal. Specific learning activities then can flow from the goal statements, such as those related to keyboarding, group learning, or literacy issues.

One omission that was noted in the technology planning of the three school districts in the study was that no evaluation protocol existed for the plans. The participants offered various measurements of success: purchasing all of the equipment in the plan, use of the equipment, and integration into the classroom. However, these were not aligned with their preferred future states. Only a few participants mentioned impacting the learning of children as a success factor.

Many instructional design models specify writing the evaluation protocol at the time the goal statement is written (e.g. Jonassen, 1988). One distinct advantage of writing the evaluation at that time is that the human energy required to reach consensus about a goal can be used immediately to construct the evaluation protocol. The procedure is continuous and the evaluation is developed in the same context as the goal and not at some later time by another committee that wonders about the origin or reason for the goal statement.

For technology planning, Herman (1994) suggests that evaluations should be based on quantitative and qualitative data. She notes that educational technology initiatives are nearly impossible to evaluate when teachers are encouraged to adapt the technology to their own classrooms. Doyle and Levinson (1993b) and Dyrli and Kinnaman (1994a) advocate that planners develop curriculum activities that can be uniformly applied across the district, not adapted for individual classrooms.

If a technology goal states, "Students will be engaged learners," the next immediate question should be, "How would we know when we have engaged learners?" The committee could then write the necessary protocols that could be revisited at some future date to check on progress toward reaching that goal. At some future date, when the school district writes its annual report, "We are a community of engaged learners," then it could describe

the justification for the statement. Once the goal and evaluation protocol are developed other issues become evident that are not necessarily linear, but are interrelated as in a web.

Three elements of the web are inanimate: hardware, physical infrastructure, and finances. Once the goal and evaluation protocol are developed, the committee should make recommendations for hardware, its related software, and necessary wires -- the physical infrastructure -- to make it operate. The infrastructure needed could be as basic as extra electrical outlets in a room to power a computer or as sophisticated as a district-wide fiber-optic system. The Missouri School Boards Association (no date) suggests that planners should survey hardware possibilities early in technology planning. However, many instructional design models specify hardware requirements later in the planning (e.g., Heinich, Molenda, & Russell, 1989). Hardware should be selected in accordance with the design models.

The hardware element in the web should account for obsolete equipment. How will the district decommission old equipment? Will equipment be placed in other places in the school or district when it is replace or should it be disposed of when it is obsolete for its original purpose?

Finances are another non-human element in the web. Why develop a sophisticated technology plan when funds are not available to implement it? Certainly, the sponsor of the State Park technology policy should be congratulated for energizing the planning activity, but money did not exist and little hope existed that it would. The planning facilitator stated that the process she used helped communications within the group -- a powerful and positive side-effect of such a group effort -- but with the funding issues in the school district, why even start building a plan with no attempt to search for funds? An attempt to assure funds from regular budget lines, partnerships, or referenda, should be occurring at least in parallel with a district planning process.

Human issues of politics/culture and staff development are also key elements of the web. How will a district address these issues? Burrus (1993) stated that "technology changes everything" (p. 18). Whether the district employs a sophisticated planning process or merely transplants hardware in a library/media center, the existing school culture is threatened. How will districts focus the benefits of educational technology and restrain those that may be detrimental to learning? Districts need to forecast these changes and be attentive to them, if they observe what Burrus claims, we have no choice.

In the political arena, this study noted that educational technology policy formulation is a political process. The leadership of technology planning must recognize that individuals or schools will attempt to influence the plan to benefit the particular agenda. The leadership must be ready to act to keep the process focused on reaching a school district vision and be ready to soothe bruised egos, reward behavior parallel to reaching district goals, and prod lagging planning activities.

Dormant (1992) identifies problems in causing change in an organization. Culture and leadership are two major issues that cause or stop change. She quotes Shein's definition of culture as "a pattern of basic assumptions -- invented, discovered, or developed by a given group as it learns to cope with its problems of external adaptation and internal integration" (p. 173). Simply stated, culture is the behaviors and beliefs that exist in an organization. Any change is an assault on those beliefs. Some will "buy-in" to the change quickly while others will be "middle adopters" or "laggards" (Dormant, 1992, p.181).

As part of the cultural change, show that the technology plan is important to the district. Organize a parade; set off metaphorical fireworks or real ones, if affordable; have a rally; or merely have the band play. Show everybody in the school community the importance of the technology plan. Sell the sizzle, as Burrus (1993) stated, and be prepared to deliver the thick, juicy steak of student learning and goal achievement.

Communication is important in this cultural change. The committee should institute a means of communication with the constituent community. Committee members who serve as technology hubs is one avenue of communications. They should request time in faculty meeting to explain planning updates to teachers. Staff and community newsletters, brochures, and press releases are other means of communications. Planning committees should exploit these means of informing the greater school community of progress in planning.

Another human element is staff development or "human infrastructure." What good is a fully-funded technology initiative with all the physical hardware and wire infrastructure in place, if the staff and students have not been trained in how to use for its desired purpose? Burrus states (1993), "Upgrade technology and upgrade people. The two must go together. . . . If [people] don't have the necessary skills then even the most sophisticated technology is only a blunt instrument" (p. 107).

Burrus (1993) relates a looming problem that accompanies the lack of employee training.

Talk about death spirals. Add new technology at great expense but without upgrading the people who will use it. When the technology doesn't work right, dispose of the people. The problem persists, eliminate more people. No solution in sight, scrap the new technology. (pp. 107-108)

While education depends heavily on people to deliver its services, the business problem Burrus explains has a parallel in education; that is, when employees and students are not trained and consequently do not use the equipment, blamed is assigned, and funding is diverted to other projects.

One component of staff development is related to the organization's reward system. Burrus (1993) listed many short, seemingly trite, sayings about causing change, but one is important for this circumstance. "We get the behavior we reward" (p. 179). Burrus maintains that the quickest way to get a change in culture is to change the reward system. Reward those employees who first adopt what the new culture of technology offers. As other employees see that the new way is rewarded, they will begin to work toward those goals, too, or they may leave the organization, if the goals are contrary to their personal beliefs.

Gilbert (1978) described the importance of reward systems many years ago. He divided them into two areas: "money and other things" (p. 309). Other things are "recognition for good work, patting them on the back, and presenting medals," among many possibilities. Gilbert advocated using money to reward.

In educational organizations the reward system is typically in the form of recognition. It could be in the form of a certificate presented in a large group meeting; a verbal commendation in front of a large group; or a letter of commendation. The achieved goals should become part of individual employee evaluations, although this is a personnel issue and rarely seen by anyone besides the teacher and the evaluator.

The final element in the web is research and development (R&D). The researcher considers the R&D element of technology planning vital in part of the planning process. With the high costs of hardware, software and time, (e.g., U.S. Congress, 1988), planning should have a speed regulator -- the R&D section. R&D should be directed by the district's technology specialist and funded as part of the technology budget.

The R&D component has at least two branches. One of them deals directly with attainment of goals, and the second tests new products. If the planning process centers on literacy issues, why change from current practices, if the learning gains from educational technology are minimal and there is no other measurable advantage? For example, does the software program "Mathblaster" contribute to student growth in math facts better than traditional means of drill and practice activities -- such as flash cards and chalkboard contests? If R&D finds that 90% of third graders know 90% of their required math facts after using "Mathblaster" three times a week for 20 minutes each session and the students are achieving at the 75% level through traditional means, this finding needs to be explained to teachers through many sources, especially staff development activities and internal communications. Advantages of using this software need to be identified and expressed to the teachers. Furthermore, the reward and employee evaluation systems needs to encourage "Mathblaster's" use. Additionally R&D could assist curriculum adoption committees as they test, develop, and evaluate prototypes; and assist in curriculum development activities.

In the second branch, new hardware and software are tested. As new hardware is introduced to the market, the R&D section should acquire it and develop tests to see if it improves achievement in stated goals, such as with the previous "Mathblaster" example, and to find new equipment's operating envelope. This important step identifies the unit's actual operation, not what the sales person or specifications predict. Buy one, put it in a common area for students and staff to use, and let them help determine its actual operating characteristics. This could save embarrassment to the district when committing money to buying many pieces or a system for the district, only later to find out it does not operate like it did in the demonstrations or as the specifications promised.

Educational technology planning, as any other planning process, is not a simple, linear function. The Technology Planning Web is a research-based template, founded on the insights developed during this study. By using the web, planners can focus on goals and support those goals with full consideration of staff development, hardware, finances, R&D, physical infrastructure, political and cultural infrastructure, and evaluation.

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