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# School Finance and Technology: A Case Study Using Grid and Group Theory to Explore the Connections

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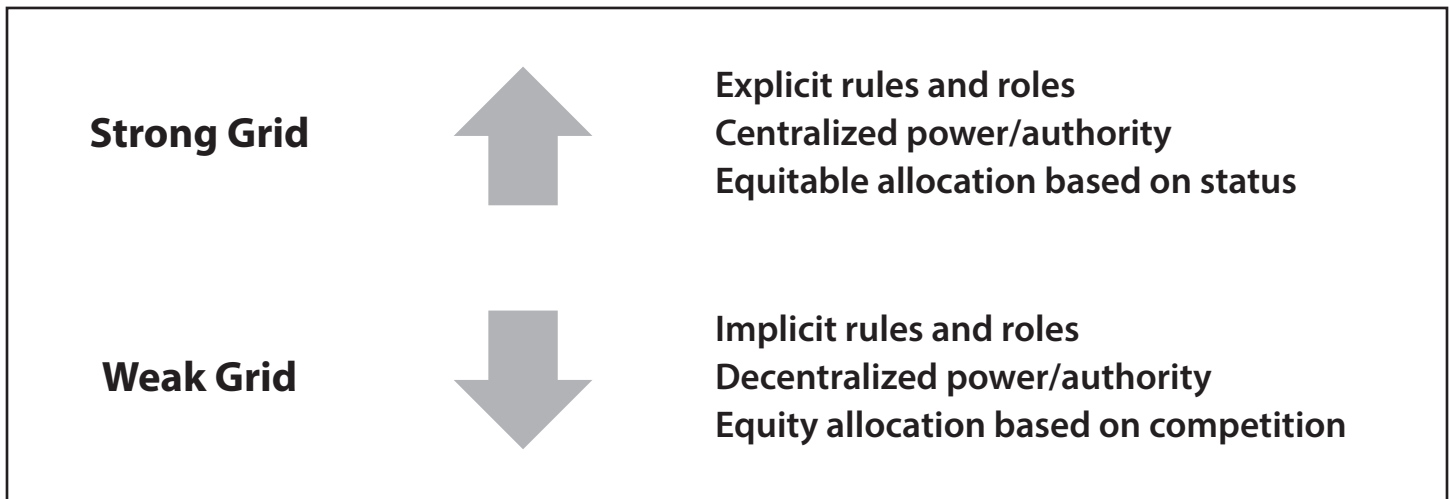
## **Introduction and Background**

Using grid and group theory (Douglas 1982, 2011), the study described in this article examined the intersections of technology and school finance in four schools located in districts differing in size, wealth, and commitment to technology integration. In grid and group theory, grid refers to the degree to which policies and role prescriptions either hinder or promote individual autonomy.<sup>1</sup> For instance, in some schools, prescribed bureaucratic rules restrain personal freedoms and govern activities, and, in other schools, nominal regulations promote autonomy in most educational processes. Also, in any setting, ideas and practices of fairness and equity are often related to roles and relative status in the organization (Harris 2014).

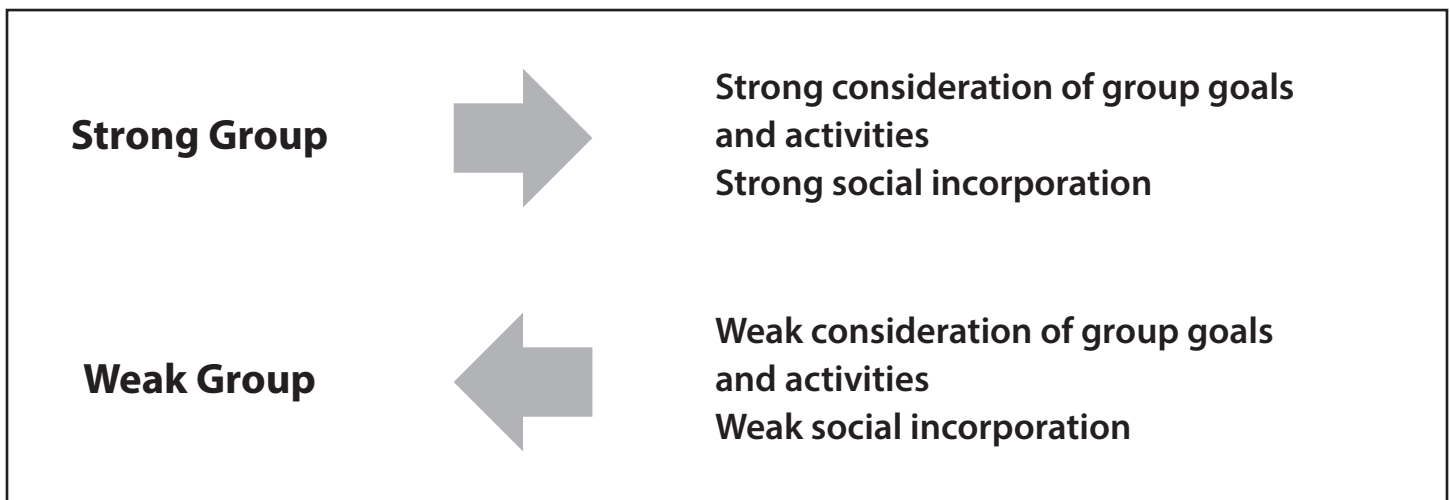
Grid is plotted on a continuum from weak to strong. At the weak end of the scale, few role distinctions exist, resources are competitive, and individuals are valued for their skills, behaviors, and abilities. In weak-grid contexts, the work environment is void of the insulating silos often formed by bureaucratic job responsibilities or policy-laden departments. At the strong end of the grid continuum, explicit institutional regulations order personal interactions and labor patterns. In strong-grid schools, for example, teacher autonomy is limited because many of the major decisions are made by upper administration. Strong-grid environments also contain numerous role distinctions at the teaching and staff levels, with proportionately fewer, yet more prestigious, distinctions further up the organizational ladder.

In institutions where role and rule dominate, justice and fairness vary explicitly across the hierarchical layers and are often dependent upon equity-based allocations that correspond with role and status (Darling-Hammond 2010). Upper levels may view the organization as nondiscriminatory, as they may either be insulated from unfair practices occurring in subordinate rungs or simply indifferent to unfair practices. Lower-level members' perceptions of fairness depend upon their respective pay, and they often envy those above them with greater pay for what appears to them to be less work.

**Figure 1 | Salient Features of Grid in Grid and Group Theory**



**Figure 2 | Salient Features of Group in Grid and Group Theory**



Inequity can also be manifested in weak-grid contexts because they often foster a survival-of-the-fittest mentality. Some of the salient features of grid can be seen in Figure 1.

Group refers to the degree of commitment a person has to the larger social unit. Like grid, group can be plotted on a scale from weak to strong. Weak-group environments place little emphasis on group-focused activities and relationships. Members of social and working subgroups tend to focus on short-term activities rather than long-term organizational objectives, and group allegiance is minimal. An example of weak group can be seen in schools that do not have entrenched traditions or that have a social system in constant flux due to recurring teacher or administrator turnover. In these settings, individual interests override what few organizational goals exist.

In strong-group social settings, members rely upon the larger unit for social support. Collective survival is more important than individual survival, and insider-outsider norms regulate group membership. For instance, some public

schools are located in elite, influential neighborhoods, which in essence create de facto membership criteria because poorer families typically cannot or will not transport their children to those schools. Figure 2 depicts some pertinent features on the group continuum.

The dynamics of grid and group are simultaneously at work in any social setting, and consequently, over time, certain themes and dominant patterns of thought and behavior tend to define a particular setting. These dominant patterns are referred to as “social games” because they define the character of social life people carry out or “play” in a particular setting (Lingenfelter 1996) and are very similar to Deal and Kennedy’s “rules of the game, the way things are done around here” (2000, 4). Figure 3 categorizes the four ways of life reflected in grid and group theory.

**Methodology**

Naturalistic inquiry was utilized in this study because of its exploratory potential in understanding contextual meanings. In naturalistic inquiry, case study is the preferred reporting mode because it can capture both individual perceptions of participants as well as variations from one context to another (Erlandson et al. 1993). Data were collected and analyzed from three sources: an online questionnaire, observations, and documents. Appendix A contains a copy of the online questionnaire.

An initial sample was drawn from 22 school districts located in the south central part of the United States. The online questionnaire was administered to narrow the focus of the study to four districts,<sup>2</sup> each falling into a quadrant of the grid and group theory framework. These observations took place in large group settings with multiple schools represented as well as in single site settings with one school. Those observed were either school business officials or school instructional technology personnel. Documents included school district budget reports and technology related materials from their web sites. (See Appendix B for a list of documents used.)

Chief informants from the four school districts were finance officers, teachers, central office and site administrators.<sup>3</sup> Also, in school business management workshops, the researchers observed discussions and interactions of groups of finance officers from these four districts which were of different types and sizes. Data were analyzed using methods of data triangulation.<sup>4</sup> Essential classification criteria, grid and group dimensions, and the criteria for four prototypes were examined (Douglas 1982, 2011). We also identified the types of technology used in each situation and levels of training and use of administrators, teachers, and students. We sought to see how technology was used either as a mode

of presentation or as an integral part of daily practice. We explored the motivation that drives (or hinders) the use of technology on particular campuses. Lastly, we identified the funding used to obtain and maintain technology in each setting.

**Grid and Group Analysis and Implications**

The four schools in this study, and their respective social games are detailed in this section. Each district was characterized by varying strengths of individual autonomy and group identity, and each reflects similarities and differences in annual budget, leadership, and technology integration. Figure 4 depicts the four schools, their social games, and respective funding details.

*Small Rural School: Individualist  
(Weak-Grid, Weak-Group) Environment*

In the small rural school, the district spent an average of \$10,728 per student. From an annual budget of \$3,476,000, 1.8 % was spent on technology. Students spent up to 25% of their day using technology, and administrators and teachers spent about 30%. The general attitude towards technology and resource allocation was negative while the attitude towards school climate was positive. One teacher commented, "It is up to individual teachers to find ways to fit technology into their classrooms and curriculum." Due to lack of imposed formal rules and traditions, individualist environments promote competition for resources, unconstrained relationships and individual experiences. In this school, the predominant social game, "individualism," encouraged members to make the most of individual opportunities, seek risks that resulted in personal gain, and be competitive and proactive in securing resources. There was little consideration for anything related

Figure 3 | **The Four Ways of Life**

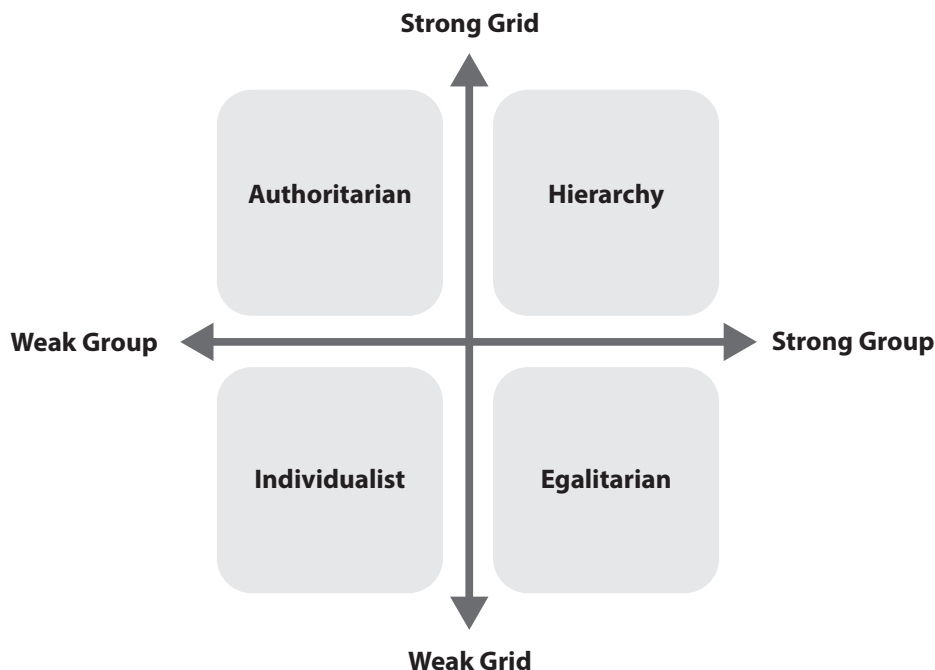
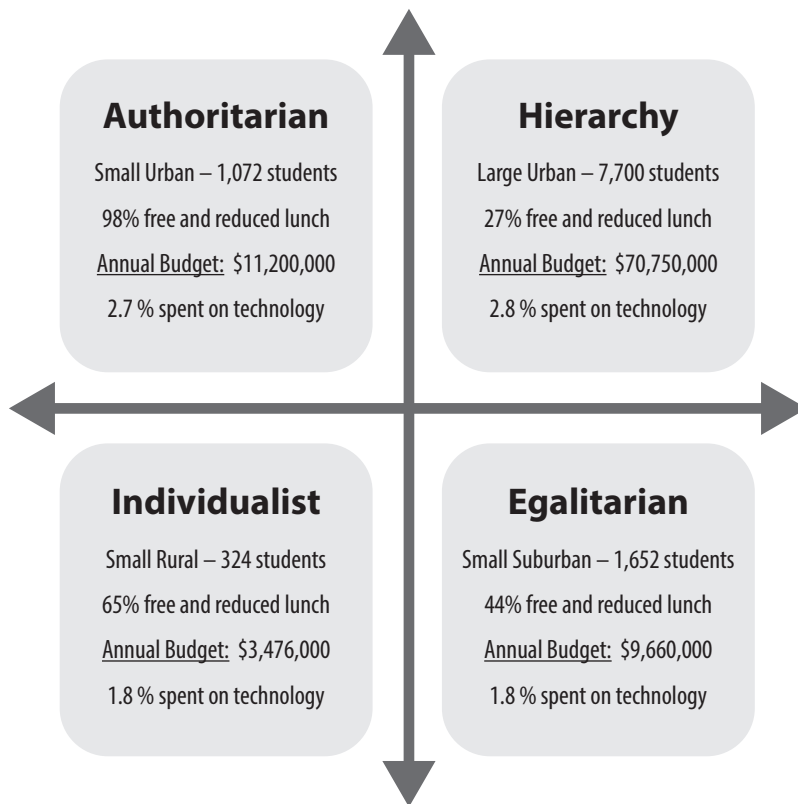


Figure 4 | Characteristics of Schools Per Grid and Group Theory



to group achievement or group activities. Goals were typically short-term, and traditional norms were few. Teachers focused on their individual classrooms and had little concern for other teachers' classrooms. Individual success as a teacher was reflected differently in each classroom. Teachers competed for technology and other resources and believed that anything they accomplished in their classrooms was due to their own means and determination. To them, schoolwide professional development was nonexistent and irrelevant.

*Small Urban School: Authoritarian  
(Strong-Grid, Weak-Group) Environment*

The district in which this school was located spent an average of \$10,447 per student out of its \$11.2 million annual budget. Technology represented 2.7% of the annual budget. Students spent up to 25% of their time each day on technology, and teachers spent about 35%. The general attitude toward technology and resource allocation was negative, as exemplified by one administrator's comment: "We are dependent on the leadership of our technology director, who is less than dependable." Authoritarian contexts offer minimal individual autonomy due to explicit classifying criteria, which emphasize such factors as division of labor and specialization, ethnicity, or gender. Authoritarianism often promotes compliance to rules and procedures, lack of control of group goals and rewards, and autocratic rule by administrators. In this school's technology program, one person was in charge, and all educators had clearly defined roles. The leader monitored and directed all activities and

decisions. The leader did not have positive interactions with coworkers, nor was it an important consideration. In this bureaucratic environment, teachers who used technology worked more for the good of their individual classrooms and student accomplishments. Their short-term goals included the hope for equitable technology access. Collaborative technology use to promote learning for everyone was almost nonexistent. Computers were used to promote learning for students as individuals or as a reward for completing other assignments. Rewards were based on operating well in relationship to the authority figure.

*Large Suburban School: Hierarchical  
(Strong-Grid, Strong-Group) Environment*

The district in which this school is located spent an average of \$9,188 per student from a \$70,750,000 annual budget, with technology procurement and distribution representing 2.8%. Students spent approximately 35% of their day with technology, and teachers spent about 65%. The general attitude towards technology and school climate was positive, as exemplified in one teacher's comment, "Our tech use is intentional; it's the way we do business. The driving force of our success is training, and it takes all of these people at the schools working together to make this happen."

In hierarchical contexts, group goals take priority over individual goals. Labor, behavior, and interpersonal relationships are influenced by group norms and social incorporation. The social game valued in this environment, "hierarchy," promotes loyalty to the ordered system and

organizational goals. While everyone shares opportunities and risks, levels of reward and resource allocation are dependent upon role status in the organization. People in this school believed that if their school looked good, if technology was impressive, if test scores were on the rise, then everyone won. Group status was a reflection of individual contribution to the group. In hierarchical settings, members have strong social incorporation and collaboration, and, in this setting, educators had a common purpose and relied on each other for support.

Students modeled their instructors' technology behaviors and practices. Teachers, in turn, modeled the behaviors of administrators and technology leaders. Students and instructors were observed working together to use technology to accomplish projects or complete tests. This group was technology-literate and communicated well across the layers of the hierarchy. The desire was to get the job done properly so that the entire group would succeed.

*Small Suburban School: Egalitarian  
(Weak-Grid, Strong-Group) Environment*

The district in which this school was located had an annual budget of \$9,000,000 and spent \$5,847 per student. Only 1.8 % of the district budget was spent on technology. Students spent about 35% of their each day using technology. Administrators spent about 65% and teachers, 35%. The general attitude towards technology and the school climate was positive and collaborative. One teacher noted, "Online programs and using technology help students to collaborate."

Egalitarian contexts have many of the strong-group features of organizational hierarchy, including emphasis on group goals and social incorporation. However, the weak-grid aspect allows for fewer yet more equitable role distinctions. This school placed a high value on unity, equal distribution of resources, conformity to collective norms, and rejection of mindsets associated with strong-grid authoritarianism and hierarchy. They were suspicious of those outside the community who may want to help. From a technological perspective, most egalitarian environments have someone who is very inspired and likely to take the initiative in leading regarding tech implementation. In this school, the leader had been in the system for a long time and was passionate about the school mission, group ownership, and equal distribution of resources.

*Grid and Group Implications*

In strong-group schools, collective tendencies promoted either systemwide computer labs, clusters of student computers in each classroom, or convenient rolling carts of laptops for student checkout. Weak-group tendencies promoted individual rather than organizational technology use and distribution. Weak-group schools had the highest per-pupil funding and a greater percentage of federal funding and state appropriations. Strong-group schools had less state and federal money and lower per-pupil funding. However, strong-group school environments were conducive to greater efficiency with regard to resource use for technology integration and group success. Weak-group schools had minimal technology integration.

Strong-group schools also had leaders, including principals, superintendents, and technology directors who had a long-term vision for technology integration and understood how to best implement that vision in their respective contexts. Compared to weak-group environments, technology was used by more students during more times of the day. In essence, the collective affiliation often associated with strong-group environments had an integrative effect on the teaching and learning process. Success for weak-group schools took place on an individual basis, rather than a group basis. Some teachers were disengaged with regard to technology integration, not fully realizing a vision for school-wide integration, while those who did embrace technology use did so out of individual interest. In weak-group schools, there was less camaraderie among classroom teachers.

Regarding grid, both districts with strong-grid schools dedicated more of their annual budget to technology. This is significant because weak-grid schools also had a significantly smaller budget to draw from than their strong-grid counterparts. While neither grid nor group corresponds directly to wealth, each offers insight into the distribution of resources, especially in relation to the roles and rules associated with equity and attitudes toward leadership who often make those distribution decisions. For example, both strong-grid schools acknowledged the role and power of site administrator as technology leader and facilitator. However, attitudes toward these leadership figures were different in each school. In the authoritarian environment where more inequitable distribution practices prevailed, educators were critical of and often indifferent to leadership. In the hierarchical setting, technology resources were equitably allocated and educators respected the leadership and desired to perform well. The weak-grid schools reflected fewer role distinctions. Classroom teachers chose whether or not to initiate technology and implement it into curriculum. Classrooms were mostly independent of each other in terms of classroom management and technology use.

**Conclusions**

In this study of four schools, neither school size nor budget size were indicators of successful integration and equitable distribution of technology. However, grid and group features that promoted either isolation or integration were important indicators for these schools. For example, the weak-group leaders did not provide vision and direction, and individual teachers chose whether or not to integrate technology or not. The strong-group schools were more intentional in their technology mission. Their leaders developed program goals, systems to be used, the types of computers purchased, and use by students. The conclusion that we draw from this case study is that technology integration and equitable distribution depended upon the intentionality of those who budgeted the funds and provided necessary training.





## Endnotes

<sup>1</sup> In prior research and publications, the authors explained the basic tenets of grid and group theory and demonstrated how technology adaptation, fairness, justice, and other values specific to social contexts can vary in different school settings. (See Case 2010; Harris 2005.) The explanation in this section is adapted from those publications.

<sup>2</sup> Of the 22 individuals who participated in the initial observation, eleven volunteered to complete the questionnaire. The questionnaire was administered to volunteers from an initial observation that took place between November 28, 2012 through February 2013.

<sup>3</sup> Chief informants were the types of responders (position in the school district) on the questionnaire. Respondents volunteered to participate while attending an annual workshop for school business officials. Of the participants present, 22 participated in the discussion that was guided by an informal survey. Of these, eleven completed the questionnaire.

<sup>4</sup> Triangulation is a process of gathering data from a variety of sources in order to corroborate findings for richer understanding of the phenomenon. We followed the Erlandson et al. (1993) process of inductive data analysis, which includes unitizing data and emergent category designation. Unitizing data can be understood as breaking the data down into the smallest pieces of information that can stand alone without changing the meaning of the data. Units of data were classified into emergent categories based on similarities and differences.

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Appendix A | **Grid and Group Assessment Tool****Cultural Assessment**

Below are 30 items that will help the researchers characterize the culture of your school. Each item reflects a continuum from 1 to 8. For each item, choose the statement that you think best represents your school site. Then, on the continuum, mark the button that represents the degree to which that statement applies to your school site. You will also find 6 short answer questions at the end of the survey.

<b>School</b> Please provide your school organization name here:									
<b>Position/Title</b> Please indicate your position or title within the school: <input type="checkbox"/> Teacher <input type="checkbox"/> Support Staff <input type="checkbox"/> Administrator <input type="checkbox"/> Other:									
<b>Grid Considerations</b>									
1 – Authority structures are:									
	1	2	3	4	5	6	7	8	
Decentralized/ non-hierarchical									Centralized/ hierarchical
2 – Job responsibilities:									
	1	2	3	4	5	6	7	8	
Ill-defined									Well defined
3 – Individual teachers have:									
	1	2	3	4	5	6	7	8	
Full autonomy in textbook/ software/web tools selection									No autonomy in textbook/ software/web tools selection
4 – Individual teachers have:									
	1	2	3	4	5	6	7	8	
Full autonomy in generating their educational goals									No autonomy in generating their educational goals
5 – Individual teachers have:									
	1	2	3	4	5	6	7	8	
Full autonomy in choosing instructional methods/strategies									No autonomy in choosing instructional methods/strategies
6 – Students are:									
	1	2	3	4	5	6	7	8	
Encouraged to participate/take ownership of their education									Discouraged from participating/ taking ownership of their education
7 – Teachers obtain instructional resources through:									
	1	2	3	4	5	6	7	8	
Individual negotiation									Administrative allocation



Appendix A continued | **Grid and Group Assessment Tool**

8 – Instruction is:									
	1	2	3	4	5	6	7	8	
Personalized for each student									Not personalized for each student
9 – Individual teachers are motivated by:									
	1	2	3	4	5	6	7	8	
Intrinsic/self-defined interests									Extrinsic/institutional rewards
10 – Hiring decisions are made:									
	1	2	3	4	5	6	7	8	
With teacher input									Without teacher input
11 – Class schedules are determined through:									
	1	2	3	4	5	6	7	8	
With teacher input									Without teacher input
12 – Rules and procedures are:									
	1	2	3	4	5	6	7	8	
Few									Numerous
<b>Group Considerations</b>									
13 – Chain of command is:									
	1	2	3	4	5	6	7	8	
Individual teachers working alone									All educators working collaboratively
14 – Educators' socialization and work are:									
	1	2	3	4	5	6	7	8	
Separate/dichotomous activities									Incorporated/united activities
15 – Extrinsic rewards primarily benefit:									
	1	2	3	4	5	6	7	8	
The individual									Everyone at the school site
16 – Teaching and learning are planned/organized around:									
	1	2	3	4	5	6	7	8	
Individual teacher goals/interests									Group goals/interests
17 – Teaching performance is evaluated according to:									
	1	2	3	4	5	6	7	8	
Individual teacher goals, priorities, and criteria									Group goals, priorities, and criteria
18 – Teachers work:									
	1	2	3	4	5	6	7	8	
In isolation toward goals and objectives									Collaboratively toward goals and objectives

Appendix A continued | **Grid and Group Assessment Tool**

19 – Curricular goals are generated:									
	1	2	3	4	5	6	7	8	
Individually									Collaboratively
20 – Communication flows primarily through:									
	1	2	3	4	5	6	7	8	
Individual, informal networks									Corporate, formal networks
21 – Instructional resources are controlled/owned:									
	1	2	3	4	5	6	7	8	
Individually									Collaboratively
22 – People hold:									
	1	2	3	4	5	6	7	8	
No allegiance/loyalty to the school									Much allegiance/loyalty to the school
23 – Responsibilities of teachers and administrators are:									
	1	2	3	4	5	6	7	8	
Ambiguous/fragmented with no accountability									Clear/communal with much accountability
24 – Most decisions are made:									
	1	2	3	4	5	6	7	8	
Privately by factions or independent verdict									Corporately by consensus or group approval
<b>Additional Questions</b>									
Check all that apply for each question below.									
25 – How is technology funded in your school?									
<input type="checkbox"/> Local grants <input type="checkbox"/> Foundation grants <input type="checkbox"/> Federal programs <input type="checkbox"/> Bond money <input type="checkbox"/> General fund <input type="checkbox"/> Activity fund <input type="checkbox"/> Other:									
26 – What types of technology are used in your school?									
<input type="checkbox"/> iPods <input type="checkbox"/> iPads <input type="checkbox"/> netbooks <input type="checkbox"/> Macbooks <input type="checkbox"/> desktop Macs <input type="checkbox"/> desktop PCs <input type="checkbox"/> SmartBoards (or similar product) <input type="checkbox"/> laptops <input type="checkbox"/> Other:									

## Appendix A continued | Grid and Group Assessment Tool

<p>27– Who uses technology in your school and how much?</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Students - less than 25% of the day</li> <li><input type="checkbox"/> Students - 26% - 50% of the day</li> <li><input type="checkbox"/> Students - 51% - 75% of the day</li> <li><input type="checkbox"/> Students - more than 75% of the day</li> <li><input type="checkbox"/> Teachers - less than 25% of the day</li> <li><input type="checkbox"/> Teachers - 26% - 50% of the day</li> <li><input type="checkbox"/> Teachers - 51% - 75% of the day</li> <li><input type="checkbox"/> Teachers - more than 75% of the day</li> <li><input type="checkbox"/> Administrators and support staff - less than 25% of the day</li> <li><input type="checkbox"/> Administrators and support staff - 26% - 50% of the day</li> <li><input type="checkbox"/> Administrators and support staff - 51% - 75% of the day</li> <li><input type="checkbox"/> Administrators and support staff - more than 75% of the day</li> <li><input type="checkbox"/> Other</li> </ul>
<p><b>Brief Answer Questions</b> In your own words, please answer the questions below.</p>
<p>28 – How is technology used in your school?</p>
<p>29 – What impact has technology had on your school?</p>
<p>30 – What is the driving force that causes the success or lack of success regarding technology use in your school?</p>

## Appendix B | Documents

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