Implementing Arts for Academic Achievement: The Impact of Mental Models, Professional Community and Interdisciplinary Teaming

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Executive Summary

The following paper explores the impact of several factors on the implementation of the Annenberg-funded Arts for Academic Achievement program in the Minneapolis Public Schools using survey data collected from elementary teachers in spring 2001. This program sought to increase the integration of theatre, music, visual arts, and other art forms into core curriculum as a means of increasing overall academic achievement. Specifically, we examine the contributions of two important sociological concepts related to teaching practice: mental models and professional community, along with the specific teaching strategy of interdisciplinary teaming as employed in the program.

Mental models refer to a set of cognitive maps that summarize ideas, concepts, processes or phenomena. The present analysis focuses on mental models of good teaching that were further broken down into three, separate but related dimensions: contemporary teacher-centered, real-world connections, and student-centered. Professional community refers to a set of shared beliefs and norms which influences teacher interaction and understanding of their role in the school. The measures used in this analysis distinguished between related dimensions of professional behavior and professional belief system. Interdisciplinary teaming was measured here by the degree to which teachers voluntarily worked with an artist to plan and implement curriculum.

Three separate statistical models (hierarchical linear regression) examined the impact of mental models, professional community, and interdisciplinary teaming respectively on how often and broadly a teacher reported integrating arts into his or her teaching. Each model took into account the impact of teacher gender, whether the teacher was working with a special population of students, and the grade level taught. Interdisciplinary teaming proved to have the strongest impact on teachers' self-reported levels arts integration followed by the teachers' mental models and sense of professional community. The latter two factors had small but significant effects.

Structural equation modeling was used to understand the impact of mental models, professional community, and interdisciplinary teaming taken together and their relationship to one another. The results showed that the impact of mental models and professional community on arts integration operated only indirectly through influencing levels of interdisciplinary teaming. Interdisciplinary teaming, in turn, had a strong and direct impact on teachers' reports of arts integration. A causal path from sense of professional community to mental models proved to be a better fit to the data than vice versa suggesting teachers in these schools were strongly influenced by their colleagues regarding what they believed about good teaching practice.

Introduction

This study, which is part of the evaluation of the Annenberg-funded Arts for Academic Achievement program in the Minneapolis Public Schools, investigates change in teachers' classroom practice. Using data from a 2001 survey of all teachers in participating schools, we examine how teachers' existing conceptions of pedagogy and their experience of a supportive professional environment in their school influence their adoption of arts-infused practices. In a more general sense, this analysis represents our effort to understand the way in which an externally funded initiative combines with individual professional beliefs and the social organization of the school to produce change.

Introduction to the AAA Project

Minneapolis Public Schools (MPS), in partnership with the Perpich Center for Arts Education, received a $3.2 million dollar Challenge Grant from the Annenberg Foundation[1]. Minneapolis Public Schools' proposal focused on the arts as a means for overall academic improvement. To accomplish this goal, schools would increase integration of the arts into the core curriculum and would develop strong partnerships with artists and arts organizations. The district's vision was that ultimately every child in the Minneapolis Public Schools would experience and learn from the richness, diversity, and life changing truths that are found in theatre, music, visual arts, and other art forms.

To carry out this initiative, Arts for Academic Achievement (AAA) used a three-part implementation and research structure: 1) school-based projects, 2) district-initiated professional development and technical assistance, and 3) continuous research, assessment and correction.

This paper focuses on the elementary school teachers who were employed in schools that were participating in the AAA project, and supplements other analyses of elementary school implementation (Freeman & Louis, 2002) as well as case studies of implementation in high schools (Louis & Freeman, 2001). Our emphasis is on the core objective of the AAA proposal: improving the content and methods of instruction by incorporating the arts in as many classrooms as possible.

[1] This grant was part of the Annenberg Foundation's $500 million commitment to improving urban and rural public schools.

Related Literature

We frame our study in the context of research on organizational culture (Hatch, 1993), more particularly the culture of schools (Firestone & Louis, 2000). Two prominent themes, both of which stem from efforts to explain how schools improve, are related to the growing overlap between cognitive psychology and sociological studies of culture. These three concepts, which are the focus of this research, are *mental models* (also referred to as cognitive maps or schemata), *professional community*, and *teacher interdisciplinary teaming*.

Mental Models

The term mental models has emerged as a shorthand for capturing a central tenet of recent cognitive research, namely that people always interpret their environment through a set of "cognitive maps" that summarize ideas, concepts, processes or phenomena" in a coherent way. That people have mental models that serve as internal representations of the world is not new (Carley & Palmquist, 1992), but the incorporation of concept into cultural studies is more recent. The convergence of cognitive psychology and cultural sociology is based on the assumption that culture presents a "toolkit" (Swidler, 1986) of mediated images and validated actions that individuals and groups draw on, often with little explicit thought, to guide their daily behavior (DiMaggio, 1997). Mental models are important because decision makers, whether CEOs or working mothers, need them in order to simplify the chaotic environments and multiple logical options that they face (Porac & Thomas, 1990; Thomas, Clark, & Gioia, 1993). Reliance on mental models may be particularly prevalent in the case of busy professional like teachers, whose work requires them to make hundreds of rapid decisions each day as they search for the best way of encouraging their students to absorb and interpret the material that they are presenting.

Mental models are, in part, a consequence of the range of cultural (socially constructed and recognized) elements that any group develops, and partly a result of how any given individual organizes the cultural information for their own use (DiMaggio, 1997, 268). In education, this means that each teacher carries their own set of images about what constitutes good pedagogy, but that this image is drawn from a limited bank of options that are generated by common expectations, collective experience, and shared professional practice, as well as "their biases, expectations, and explanations about how people this and how they learn (Spillane, Reiser, & Reimer, 2002, 395). The common bank of images from which mental models are drawn is influenced by the "microculture" of a school or a local community, but also by the broadly shared professional or "macroculture" (Abrahamson & Fombrun, 1994). In particular, in education, teachers are faced with alternative schemata for good teaching, ranging from practices that are often collected under the rubric of "direct instruction" (which, in this paper, we choose to call contemporary teacher-centered pedagogy) to those that are based on constructivist or progressive education principles (which, in this paper, we choose to call student-directed learning). Newmann and his colleagues also point to the importance of pedagogic mental models that emphasize connections between the classroom and the real world (Newmann, 1996).

Mental models serve as guides to making both big and little decisions, but they are also constraints because they are the first screen through which new information must pass. DiMaggio (1997) notes that people pay more attention to information that is relevant to their current schemata, and are less likely to have correctly remembered information that is inconsistent. The more widely shared the individual mental models are, the more likely it is that challenging information will be readily accepted—or rejected and reinterpreted (Giddens, 1984; Meyer & Rowan, 1977). Thus, when individuals use their mental models as a way of making sense of new information or ideas from their environment, they can lead to creativity and innovation, or inhibit it (Ford, 1996).

Making an effort to use arts-infused lessons requires significant change in pedagogy, and represents a real challenge for those who are most comfortable with conceptions of knowledge that emphasize teaching a single discipline at a time, or thinking about learning as equivalent to acquiring stronger basic skills and facts (Wahlstrom, 2003). Thus, research suggests that a teachers' mental models may hold the key to determining whether they make significant changes in their practice, or pour the new wine of the arts into existing teaching strategies (Toole, 2001).

Professional Community

A key sociological contribution to the study of school culture and change has emerged in the concept of professional community. Although it has been around for some time, (Westheimer, 1999) argues that theories of teacher communities are "under conceptualized." (Furman, 1999) calls them "confusing," a "mismatch" with postmodern life, and providing "little guidance for practice." Adding to the confusion, researchers use a variety of terms to describe how to organize schools for teacher community and learning: *collegiality* (Barth, 2001; Little, 1990), *collaboration* (Nias, Southworth, & Yeomans, 1999; Zellermeyer, 1997), *professional community* (Louis, Kruse, & Associates, 1995; McLaughlin & Talbert, 1993), *discourse communities* (Putnam & Borko, 2000), *professional learning community* (Hall & Hord, 2001) and *schools that learn* (Leithwood, 2002).

By using the term *professional learning community* we signify our interest not only in discrete acts of teacher sharing, but in the establishment of a school-wide culture that makes collaboration expected, inclusive, genuine, ongoing, and focused on critically examining practice to improve student outcomes. The term integrates three robust concepts: a school culture that emphasizes professionalism is "client oriented and knowledge based" (Darling-Hammond, 1990); one that emphasizes learning places a high value on teachers' inquiry and reflection (Toole, 2001) and one that is communitarian emphasizes personal connection (Louis et al., 1995). The hypothesis is that what teachers do together outside of the classroom can be as important as what they do inside in affecting school restructuring, teachers' professional development, and student learning .

Kruse, Louis, & Bryk (1995) designate five interconnected variables that describe what they call genuine professional communities in such a broad manner that they can be applied to diverse settings. The variables are: shared norms and values, a focus on student learning, deprivatized practice, reflective dialogue, and collaboration. Researchers can and do vary on the exact list and number of key variables, and those variables can only act as general descriptors. Little (2000) points out that there is no simple checklist or template that will ever adequately guide the construction of professional learning communities. But the central idea of the model is the existence of a social architecture to school

organizations that helps shape both teachers' attitudes toward new pedagogies (Toole, 2001), and recent research using professional learning community as a variable has shown powerful associations with teacher practice (Bryk, Camburn, & Louis, 1999; Louis, Marks, & Kruse, 1999; Pounder, 1999; Scribner, Cockrell, Cockrell, & Valentine, 1999; Toole, 2001).

Interdisciplinary Teams

A final variable that we examine in this paper deals with a key effort on the part of the AAA program to change the culture of collaboration between artists and teachers by promoting classroom-based *interdisciplinary teaming*. Introducing teams is a strategy that has often been used in schools to foster teacher leadership for innovation and improvement, and is currently being promoted under the general label of Small Learning Communities (SLCs). The results of such structural changes have been mixed. Formal teams may have limited effects on student achievement (Hackmann, Petzko, Valentine, Clark, & Nori, 2002; Supovitz, 2002), and may even undermine collaboration on a school-wide basis (Kruse & Louis, 1997), although in other cases they create profound change in practice (Louis & Freeman, 2001). Some researchers and practitioners are focusing more on semi-formal teamwork and collaboration in efforts to raise achievement (Kanthak, 1995; Polite, 1994), and it is this voluntary, informal pairing of an artist and a teacher to work in a classroom is the focus of our inquiry. (For a more extensive discussion of how teaming worked in the AAA program, see Freeman & Louis, 2002.)

Teamwork, innovation, and changes in practice can be fostered by sustained, high quality professional development (Disimone, Porter, & Garet, 2002). While greater emphasis is currently placed on whole-school professional development, often to create professional community (DiSimone, 2002), there is also a consensus that professional development must consistently reinforce the basic focus on teaching and learning. (Newmann, Smith, Allensworth, & Bryk, 2002; Spillane & Louis, 2002). This is where team work fits in, because it is in smaller groups, working around new curriculum and pedagogy, that the greatest professional growth through reflective practice is likely to occur (Freeman & Louis, 2002; Kruse & Louis, 1997).

An Integrated Model of School Improvement

Mental models, professional community, and interdisciplinary teaming are, theoretically, distinct dimensions of school culture. On the one hand, teachers hold individual and collective images of pedagogic practice that steer both individual decisions in classrooms and collective decisions about how best to work with students in the school and joint curriculum work. These mental models may support or inhibit change. On the other hand, individual teachers work in settings that may be characterized by more-or-less supportive environments, which encourage collective action and nurture professional improvement. Finally, teachers may take steps to counter the disciplinary culture of autonomy and individualism by accepting professional partners within their classroom, or they may choose to work on changing their pedagogy to incorporate the arts on their own. If we think of improvement practices and more effective school organization as the goal, all three can be expected to contribute.

A comprehensive model of change must, of course, take into account other important and empirically verified approaches, which emphasize extra-school environmental conditions, such

as policies, available resources, parental expectations, etc., as well as the characteristics of the students who populate the school. In addition, psychological predispositions of teachers will affect their behavior above and beyond the cultural features that we have noted. In this paper, however, we will focus exclusively on mental models, professional community, and interdisciplinary teaming to answer three questions:

1. To what extent do teachers' mental models predict their use of arts-infused pedagogies in their classrooms?

2. To what extent do teachers' experiences of professional community in their school predict their use of arts-infused pedagogies in their classrooms?

3. To what extent do teachers' direct experiences of interdisciplinary teaming predict their use of arts-infused pedagogies in their classrooms?

4. To what extent does the combined effect of all cultural variables, considered simultaneously, affect the use of arts-infused pedagogies in classrooms?

Research Methods

This paper is based on survey data collected in the spring of 2001 from all teachers working in Minneapolis schools funded by the AAA project.

Sample and Data Collection Procedures

Research staff administered the survey during a staff meeting at each site during April and May of 2001. The survey was designed to capture teachers' perspectives of arts integration and their school community; interests in the arts; beliefs about teaching; the extent of their use of integration and partnering; and demographic information. All teachers were asked to complete the survey even if they had not been directly involved in any project activities during the year. Teachers were informed that their responses were confidential and the survey results would not be used to determine future funding. A conservative estimate of the response rate at each site varied from 23% to 94%, or 62% overall[2].

For the purpose of this paper, we were interested in responses from educators who taught in grades 1-6[3]. From the original dataset of N = 1369, we selected schools that were either K-5 or K-8 configurations (N = 30). From these sites, we chose teachers who were not arts specialists and who taught in grades 1-6. The final number of subjects was 725[4]. Descriptive information for demographic variables, as well as the dependent and outcome measures used in this study, may be found in Table 1.

Measurement and Scaling

Mental Models: Mental models measures were based on an instrument previously developed by Toole (2001). The 15 mental models items were completed on a 4-point Likert-type scale ("1" = Strongly Disagree, "4" = Strongly Agree). These items were submitted to a Principal Components Factor Analysis with Varimax Rotation. The analysis revealed three components with Eigen values greater than 1. Factor 1 appears to represent variance related to Contemporary Teacher-Centered schemas, while Factor 2 represents variance representing Real-World Connections, and Factor 3 Student-Directed Learning. Together these three factors account for 50% of the variance. Alpha reliability coefficients for each of the three factors were .81, .74, and .60, respectively. Scales were created by adding together individuals' responses to items loading on each factor. Descriptive information about the scales may be found in Table 1, while

[2] A discussion of the issues and method of calculating the response rates from the AAA surveys may be found in Anderson & Ingram (2002).

[3] While some kindergarten teachers and pre-school teachers participated, the program was not targeted at pre-reading and math skills, while almost all of the 7th and 8th grade teachers taught a specific discipline rather than having responsibility for a multi-disciplinary classroom.

[4] For the purpose of the larger project, the factor analyses described in the next section were conducted on the full data set of N=1369. Preliminary analysis suggests that the differences in factor loadings between elementary and secondary teachers is limited.

additional information regarding the individual items and their loadings on each factor is located in Appendix A.

Professional Community: Professional community measures were based on an instrument previously used by Louis, Marks, and Kruse (1999). The 12 professional community items were completed on a 4-point Likert-type scale ("1"= "Not at all true", "2" = Not very true", "3" = "Somewhat true", and "4" = "Very true"). Although Louis, Marks, and Kruse used a single scale of professional community, these items were submitted to a Principal Components Factor Analysis with Varimax Rotation, which yielded two components with Eigen values greater than 1. Factor 1 represents variance related to professional behaviors, while Factor 2 represents variance associated with professional belief systems. The alpha reliability coefficient for Factor 1 and Factor 2 was .85. As with the mental models scales, the professional community scales were computed by adding together responses to items that loaded on Factor 1 and Factor 2, respectively (see Table 1). A table of the professional community items and factor loadings may be found in Appendix B.

Interdisciplinary Teaming: In one section of the survey, teachers were asked whether they worked with an arts partner to integrate the arts, and were then asked about the number of times they engaged in a number of activities with the arts partner. Because a major focus of AAA was to give teachers and artists the opportunity to develop new ways of working together we included survey items that would allow us to distinguish between teachers who may have had an artist in their classroom as part of a typical artist residency program and teachers who collaborated with artists on interdisciplinary teams to develop and deliver arts integrated instruction. Many of the activities that were listed were typical of artist residency programs and involved no interdisciplinary teaming as we have defined it. For example, an artist may have taught the class an arts activity with no participation by the regular teacher, or they may have taught an in-service lesson for several teachers in the school.

The following activities, which were embedded in the longer list of ways in which the arts partner may have worked with the teacher, were intended to measure interdisciplinary teaming: co-developed an arts-integrated curriculum, co-developed an arts-integrated assessment, and co-taught students in the teacher's classroom. Response options for these items were: *1 = Never, 2 = 1-2 times, 3 = 3-4 times, and 4 = 5 or more times*. These items were aggregated to create an "extent of partnering" or interdisciplinary teaming scale. A score of "0" on this scale indicates that the individual did not have an arts partner, while a score of "3" means that although the individual had an arts partner, he/she did not participate in any of these activities. Table 1 contains descriptive information for the interdisciplinary teaming scale.

Arts Integration: The extent, or level, of each teacher's use of arts integration in the classroom was obtained from four survey items in which teachers rated their use of arts integration on a 4-point scale (*not at all, very little, some, a lot*) in English/reading, math, history/social studies, and science. As with the interdisciplinary teaming variable, these items were aggregated to create an arts integration scale (see Table 1).

Individual level control variables: Individual characteristics and specific work settings and roles are always reasonable predictors whose effects could outweigh the individual, cultural and program variables that we examine. We include three teacher characteristics as controls:

1. *Gender:* Measured as a dichotomous variable ,we include gender because it is an established correlate of teachers' job satisfaction and experience of professional community.

2. *Special-focus teaching.* The roles of special education teacher and ELL teacher have a distinctly different role in the elementary schools in this study: they do not see the same group of children for the whole day, and have specific and much more prescribed learning objectives for the students that they do work with. Special education and ELL teachers were coded as a 1, all other teachers with specific grade assignments were coded as 0.

3. *Grade level.* We include attention to the grade level taught because, in this district, the nature of other policies and innovative programs affected the two groups differently. While the primary teachers (1-3) were all focused on a major district effort to increase the reading skills of all students, upper elementary teachers (4-6) were also deeply involved in district-sponsored mathematics and science innovations. In our view (based on qualitative data collected in the schools), there was considerably more pressure on upper elementary teachers to work on disciplinary knowledge of all types, in addition to beginning to prepare students for important standardized and state tests. Teachers who taught at the primary level were coded as "1", while those teaching at upper elementary or both primary and upper elementary, were coded as "0".

The simple correlations of the variables used in the analysis are presented in Table 2.

Data Analysis and Results

Question 1 asked: *To what extent do teachers' mental models predict their use of arts-infused pedagogies in their classrooms*? To answer this question, we conducted separate two-stage regression of the measure of reported arts integration on the three mental models variables. In the first step, the control variables were entered, while in the second, third, and fourth, a single mental model variable was added. Finally, the three mental models variables were entered simultaneously. These regressions are summarized in Table 3.

The results indicate that teachers' personal and professional characteristics contribute significantly to the prediction of using arts integration in the classroom. In particular, "regular" classroom teachers who work in the primary grades and primary grade teachers were the most likely to use arts infused models. Teacher gender had no effect on reported arts integration.

These relationships, as measured by the standardized regression coefficients (ß), are not dramatically altered in Model 2 by introducing the MM- Teacher Centered variable. However, the latter added substantially to the variance explained by the model, (R^2 =.136 for model 1 and $R^{2=}$.19 for model 2). In addition, MM-Teacher Centered was also a significant predictor of arts infusion (ß=.243, significant at the .000 level).

The comparable regression model for the second mental model variable, MM-Connections, produced similar but weaker results. In other words, the MM-Real World Connections variable increased the percentage of variance explained slightly in step 2 (from R^2 = .136 for Model 1 to R^2 = .165), but achieved a significant beta coefficient in the regression model (ß = .172, p< .001).

The fourth regression model used the MM-Student Directed variable, with results that were more similar to Model 2 (MM-Teacher-Centered). The R^2 increased from .136 in step 1 to .184 in step 2, and the standardized coefficient for the variable was ß=.22 –- the largest after the coefficient associated with being a primary (1-3) teacher.

The full model 5, which includes all three MM variables, is slightly more effective at explaining the dependent variable, increasing the amount of variance explained to 21%. Both the teacher-centered MM variable and the student-directed MM variable are significant in the model.

To summarize, all three Mental Model variables contribute significantly to predicting teachers' use of arts infused pedagogy in their classrooms, but the teacher-centered and student-centered mental models are most powerful.

The second question, *To what extent does teachers' experience of professional community predict their use of arts-infused pedagogies in their classrooms*?, was addressed using a similar regression model. The results of the regressions are presented in Table 4.

We turn directly to model 2, since the first model, which introduces the covariates, has been described in conjunction with Question 1. This model shows that PC-Behavior increases the Multiple R^2 from .136 to .156. While the increase is not great, the variable exhibits a standardized regression coefficient of ß=.139, which is significant at the .001 level. The effect of PC-Beliefs is similar, as shown in Model 3. The introduction of the professional community variables does not impact the large negative effect of being a special populations teachers or the large positive effect of working in the primary grades. In the fourth full model, both the professional behavior and professional beliefs scales were significant predictors of arts integration. The R^2 increase is similar to that observed for the two scales separately – from .136 to .16, and both of the PC variables are significant at the .05 level. As in the other regressions, the introduction of the PC variables does not change the significant effects associated with grade level or being a special populations teacher.

To summarize, the professional community variables significantly affect the degree to which teachers actively infuse the arts into their regular classroom practice, although they do not outweigh the importance of the teachers' role within the structure of elementary school settings.

The third question asks: *To what extent do teachers' direct experiences of interdisciplinary teaming predict their use of arts-infused pedagogies in their classrooms?* A two-step regression model with the extent of partnering variable entered as the second step, is shown in Table 5. The partnering variable has a more profound effect on the use of arts infused pedagogy than either the mental models or professional community variables. The amount of variance explained increased from .136 in Step 1 to .323 in Step 2, with a corresponding increase in the F statistic from 37.69 to 85.89 ($p<.001$). The standardized regression coefficient for the teaming variable is ß=.45 ($p<.001$). Further, the addition of the teaming variable substantially reduces the beta coefficients associated with being a special populations teacher (from ß= -.23 to ß= -.13) and working with lower elementary students (from ß= .25 to ß= .19). This contrasts markedly with the limited effects of the MM and PC variables on the covariates.

To summarize, it appears that teachers who are involved in interdisciplinary teaming with an arts partner are more likely to use arts infused models in their teaching. Although teaming was voluntary in all schools, teachers who engaged in classroom based teaming learned new pedagogies.

Our final question, *To what extent does the combined effect of all cultural variables, considered simultaneously, affect the use of arts-infused pedagogies in classrooms?*, was addressed with a structural equation model. The model used all the indicators involved in the regression models with the exception of gender since it did not have a relationship with any of the other indicators including the arts integration scale. The model explored the possibility of direct effects of mental models and professional community on arts integration and indirect effects on arts integration through interdisciplinary teaming. Grade level was modeled as having a direct impact on arts integration while special-focus teaching was thought to have an indirect impact through interdisciplinary teaming. Special-focus teaming, grade level, interdisciplinary teaming, and arts integration are all measured by single indicators. The model imposes the assumption that single indicators are measured without error. Mental model is a construct measured by the three mental model scales (teacher-centered, real world, student directed). Professional

community is a construct measured by the two professional community scales (professional beliefs, professional behavior). Given the differing types of variables involved, the input data is an asymptotic covariance matrix based on polychoric, polyserial, and Pearson R correlations between the indicators. The model was estimated with LISREL 8.52 (Joreskog & Sorbom, 2002).

The model achieves a good fit to the data based on several fit measures. It has a chi-square ratio to degrees of freedom equal to 4.1, which is considered acceptable (Wheaton et al., 1977). It has a root mean square error of approximation (RMSEA) equal to .064, which is considered acceptable (Brown & Cudeck, 1993). The Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI) are both high at .99 and .95 respectively. The model shows the central role interdisciplinary teaming plays in determining the level of arts integration. The impact of professional community is indirect on arts integration as is that of mental model. Professional community affects mental model which in turn is a significant predictor of interdisciplinary teaming. Professional community also impacts interdisciplinary teaming directly. Neither professional community nor mental model had direct effects on arts integration however. Whether a teacher works with a special population has a positive impact on interdisciplinary teaming in contrast to its negative relationship to arts integration seen in the regression models. Grade level does not have a significant impact on arts integration however in this model.

Discussion and Conclusion

We summarize briefly, noting that our analysis suggests that the integrated model proposed at the beginning of the paper is supported by the data. *Mental models*, which are individually held "schema" or maps that teachers draw on to guide their professional practice, *professional community*, which measures the supportive learning environment for adults, and *interdisciplinary teaming*, which provides significant cognitive stimuli for change all contribute to elementary teachers' reported efforts to introduce arts-infused pedagogical approaches in their classrooms.

The implications of these findings go beyond the identification of three variables that have an effect on a particular pedagogical innovation. We believe that they represent the three supporting legs of efforts to create learning organizations in schools, and that they direct our attention to the importance of cognitive approaches to school reform.

Learning organizations depend on the willingness of individual member to be open to challenges and experimentation. As many authors have noted, without actors who are both willing and able to actively make sense of new ideas and demands, change *cannot* occur in contexts where discretion and judgment are needed to carry out the work at hand. This is particularly true where the change requires a significant shift from past practices—which is almost always the case when teachers are asked to alter *how* they teach as well as *what* they teach (Spillane & Louis, 2002). Our analysis supports Toole's (2001) research, which suggests that mental models can predict whether teachers will change.

In this case, we also add to the theoretical debates about what kinds of mental models are most conducive to reflective pedagogical practice. While our measures of "teacher centered" and "student directed" pedagogy are imperfectly related to the "direct instruction"-"constructivist pedagogy" debate, our findings suggest that it may be more important for teachers to have a clearly held mental model that incorporates contemporary knowledge about teaching and learning than to have a consistent theoretical position. It is indecisive teacher – those who do not score high on either or both of these mental models—who seemed to be the least likely to be able to take advantage of the opportunities for change presented by the Arts for Academic Achievement program.

Learning organizations are also dependent on a culture that supports talking about and exploring new ideas and their impacts in schools. While this may, in part, be considered as an aggregation of the situated cognition or mental models of all members of the organization, most people who study schools as learning organizations view the culture as greater than the sum of its parts (Firestone & Louis, 2000). We have looked here at one way of framing school culture – professional community -- that has been explicitly linked to way in which schools learn (Bryk et al., 1999; Leithwood, 2002). Our analysis suggests that professional community has a role to play in changing classroom practice, but its effects are less than those suggested by some previous studies. One possible explanation for this, put forward by Toole (2001), is that mental models determine whether a teacher is ready to change, while professional community is more powerful in determining whether pedagogical changes persist over time on a school-wide basis.

The third leg of the stool is teachers' opportunity to learn. In this case we have used the collaboration between an artist and a teacher in the classroom as the source of powerful learning experiences. Through teaming and collaboration, teachers both participate in and observe very different ways of teaching, and are able to extrapolate from these experiences to other instructional activities. Unlike most forms of professional development, teaming with a partner who approaches instruction and learning in a very different way provides both immediate and longer-term challenges. It also provides an opportunity to experiment with a low cost of failure or loss of face, since there is no supervisory or peer coaching role implied in the partnership. Clearly there are powerful learning opportunities other than teaming that can occur in schools, but in this case it seems that the opportunity to work closely with another person who approached both content and instruction very different provided a particularly important boost to learning. We suggest, thus, that creating significant change in classrooms must involve sustained engagement with ideas and practices that challenge their taken-for-granted assumptions about themselves, their students, and how best to stimulate learning.

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Table 1. Descriptive information for demographic/control, dependent, and independent variables

	N	%		
Gender				
Male	135	18.6		
Female	590	81.4		
Special Focus Teaching (ELL or Special Education)	96	13.2		
Grade Level				
Primary (1-3)	302	41.7		
Upper Elementary (4-6) or Both	423	58.3		
	Mean	SD	Median	Range
Mental Models Scales				
Contemporary Teacher Centered	20.20	2.28	20	6-24
Real World Connections	15.55	1.89	15	5-20
Student-Directed Learning	11.51	1.58	11	4-16
Professional Community Scales				
Professional Behavior	20.70	3.68	21	7-28
Professional Belief System	16.29	2.75	16	5-20
Interdisciplinary Teaming	2.76	3.52	0	0-12
Arts Integration	5.21	3.97	6	0-12

Table 2. Correlation Matrix

	Gender	Special Populations Teacher	Elementary Level	Partnering	MM: Teacher Centered	MM: Real World Connections	MM: Student Directed	PC: Behavior	PC: Beliefs
Gender		.08*	.11**	.00	.12**	.09**	.07†	.11**	.12**
Special Pop. Teacher			.17***	-.24***	-.004	.05	-.04	.05	-.01
Elementary Level				.16***	-.02	-.06†	-.05	-.05	.002
Partnering					.136***	.10**	.13***	.11**	.13***
MM: Teacher Centered						.60***	.55***	.19***	.215***
MM: Real World Connections							.47***	.18***	.19***
MM: Student Directed								.18***	.17***
PC: Behavior									.61***
PC: Beliefs									

†p<.01, *p≤ .05, **p<.01, ***p< .001

Table 3. Multiple Regression of Level of Arts Integration on Mental Models

	Model 1	Model 2	Model 3	Model 4	Model 5
	ß	ß	ß	?	ß
Covariates					
Gender	.051	.019	.034	.033	.018
Special Populations Teacher	-.225***	-.220***	-.231***	-.213***	-.215***
Elementary level (lower/upper)	.249***	.258***	.262***	.264***	.265***
R2	.136				
Adjusted R2	.132				
F	37.76***				
MM- Teacher Centered					
		.243***			.168***
R2		.19			
Adjusted R2		.19			
F		43.30***			
MM-Real World Connections			.172***		.013
R2			.165		
Adjusted R2			.160		
F			35.52***		
MM-Student Directed				.220***	.123**
R2				.184	
Adjusted R2				.179	
F				40.50***	
Full Model					
R2					.21
Adjusted R2					.20
F					30.86***

† p<.10
**p<.01
***p<.001

Table 4. Multiple Regression of Level of Arts Integration on Professional Community

	Model 1	Model 2	Model 3	Model 4
	ß	ß	ß	ß
Covariates				
Gender	.051	.036	.034	.031
Special Populations Teacher	-.225***	-.230***	-.224***	-.227***
Elementary level (lower/upper)	.249***	.256***	.251***	.255***
R^2	.136			
Adjusted R^2	.132			
F	37.76***			
Professional Behavior		.139***		.085*
R^2		.156		
Adjusted R^2		.150		
F		32.96***		
Professional Belief System			.140***	.088*
R^2			.155	
Adjusted R^2			.150	
F			33.04***	
Full Model				
R^2				.160
Adjusted R^2				.154
F				27.32***

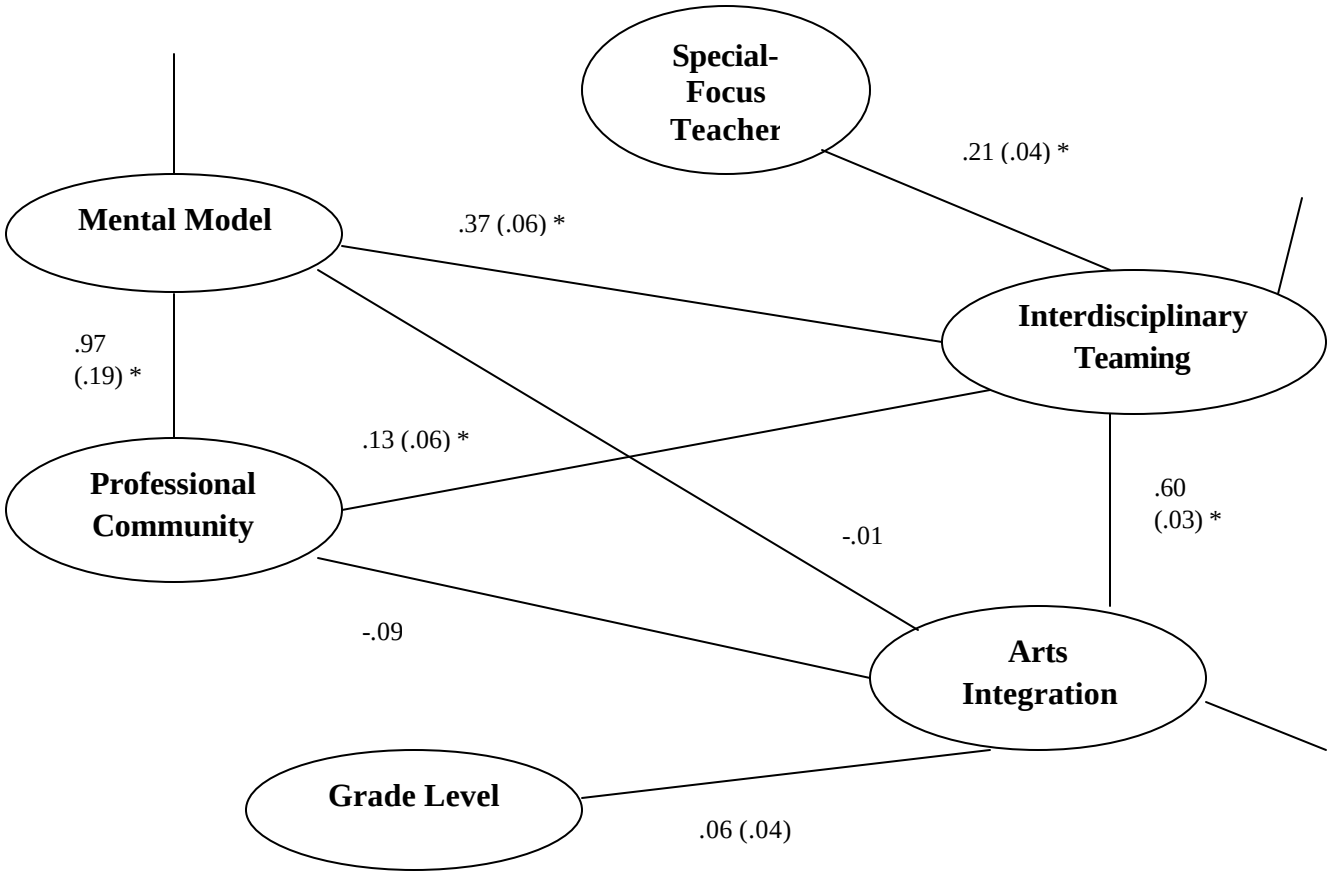
† p<.10
*p<.05
***p<.001

Table 5. Multiple Regression of Level of Integration on Interdisciplinary Teaming

	Model 1 ß	Model 2 ß
Covariates		
Gender	.051	.049
Special Populations Teacher	-.225***	-.125***
Elementary level (lower/upper)	.249***	.193***
R^2	.136	
Adjusted R^2	.132	
F	37.76***	
Partnering		.450***
R^2		.323
Adjusted R^2		.319
F		85.89***

***p<.0

Figure 1. Structural Path Coefficients Predicting Arts Integration



* Indicates statistically significant coefficient ($p < .05$).
Coefficients are standardized coefficients with standard errors in parenthesis. N=725. Chi square with 12 degrees of freedom = 49.20. Root mean square error of approximation (RMSEA) = .064. Adjusted Goodness of Fit Index (AGFI) = .95

Appendix A

Mental Models Items and Factor Loadings.

	Factor 1: Contemporary Teacher Centered	Factor 2: Real World Connections	Factor 3: Student Directed Learning
Teachers should prompt students to explain and justify their ideas to others.	.53		
Teachers should design lessons that provide students with choices.	.59		
I regularly incorporate student interests into lessons.			.55
I often allow students to shift the direction and content of my lessons.			.58
Students learn best when they are actively involved in exploring things, inventing and trying out their own ways of doing things.	.68		
In order to learn complex material, students need information presented to them in several different ways.	.76		
Students should help establish criteria on which their work will be assessed.			.45
Hearing other classmates' ideas is essential for student learning.	.59		
Most students in my class are capable of taking charge of their own learning.			.77

Mental Models Items and Factor Loadings Continued

	Factor 1: Contemporary Teacher Centered	Factor 2: Real World Connections	Factor 3: Student Directed Learning
If students can't apply what they learn to the real world, they don't really understand it.		.67	
It is important that students study real life problems that they are likely to encounter outside of the classroom.		.67	
If students have an audience besides the classroom teacher, they will often work harder and produce better academic results.		.64	
Students should be given opportunities to take on adult roles (e.g., as artists or scientists) to produce original work and knowledge.		.59	
Students need to address subjects in depth to explore connections and produce complex understandings.		.58	
By trying different teaching methods, I can significantly affect my students' achievement levels.		.66	

Appendix B

Professional Community Items and Factor Loadings

	Factor 1: Professional Behavior	Factor 2: Professional Belief System
We frequently talk about past activities or projects and what made them work well or not so well.	.66	
We continuously look for the most recent programs and research that can improve student learning.	.69	
We spend a lot of time planning how to improve curriculum and instruction.	.77	
We frequently discuss how the school can best be organized to improve learning.	.74	
We often observe each other teach.	.54	
Most teachers here take responsibility for improving the school.		.68
We frequently collaborate in developing curriculum, materials, or activities that will improve the school.	.68	
We frequently talk about how to assess student learning.	.66	
Teachers share high standards for each other; there is peer pressure to teach well.		.67
Most teachers in this school feel responsible that all students learn.		.82
In this school most teachers help maintain discipline in the entire school.		.76