Table of Contents

From the Editor ................................................................................................................. iv

Principals as Assessment Leaders in Rural Schools ......................................................... 1
Patrick Renihan; Brian Noonan

Teachers’ Perceptions of Rural STEM Teaching: Implications for Rural Teacher Retention
Kasey P. S. Goodpaster; Omolola A. Adedokun; Gabriela C. Weaver

Exploring Rural Contexts with Digital Storytelling ....................................................... 23
Donna G. Wake

The Effect of Constructivist Mathematics on Achievement in Rural Schools ............... 38
Michael Grady; Sandra Watkins; Greg Montalvo

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Principals as Assessment Leaders in Rural Schools

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This article reports a study of rural school principals’ assessment leadership roles and the impact of rural context on their work. The study involved three focus groups of principals serving small rural schools of varied size and grade configuration in three systems. Principals viewed assessment as a matter of teacher accountability and as a focus for the school professional team. They saw themselves as teachers first, stressing their importance as sources of teacher support, serving a ‘buffer role,’ ameliorating external constraints to effective assessment and learning. Bureaucratic environments and trappings of large-scale assessment were seen to be incompatible with the familial nature of rural professional contexts. Other constraints were the logistical challenges of small student populations, higher instances of multi-graded classrooms, and the absence of grade-alike professional interaction. Conversely, smallness enabled professional interaction and transformational leadership. Finally, the quality of system-level support emerged as a critical catalyst for assessment leadership at the school level.

Key Words: principals; teacher accountability; assessment of learning; assessment leadership

One aspect of the assessment reform movement that has not been well researched is its connection to the role of the school principal. It is well known that assessment reform (McMillan, 2001; Stiggins, 2002) has been defined and promoted in a number of ways and with its own lexicon reflecting pedagogical stances and strategic preferences related to such orientations as assessment literacy (Cizek, 1995; Fullan, 2001), assessment for learning (Stiggins, 2001), assessment of learning, assessment as learning (Earl & Katz, 2006) and large-scale testing. These have become central elements of the principal’s mandate (Harris, 2002). One of the concepts that has been used, but not frequently examined, in educational research is that of assessment leadership that we have defined as the role and expectations of formal school leaders in relation to the task of enhancing assessment literacy among school professionals and paraprofessionals (Noonan & Renihan, 2006). It is also recognized that the role of instructional leader is very much influenced by the context in which the school leader operates. That context may include, for example, the size of the school, the nature of the community, grade levels (early, middle, high school), and the types of students involved (e.g., students with special needs, members of diverse cultural and language groups).

The purpose of this article is to report and discuss the findings of an exploratory study designed to shed light on how principals in rural schools perceive and engage their assessment leadership responsibilities. Particular attention was devoted in this study to the impact of rural contexts upon the instructional leadership and assessment leadership provided by principals. In short the study addressed the following questions:

1) How do principals of rural schools understand what it means to be an assessment leader in rural contexts?

2) To what extent and in what ways does rural school context affect the principal’s instructional/assessment leadership role?

Why are these questions relevant to rural educational research? In light of recent reforms, the expectations placed upon in-school leaders for enhanced attention to (and accountability for) leadership for learning has been felt by principals throughout the world (Phillips et al. 2003). The impacts of these developments on principals have included an increased demand for new sets of leadership knowledge, leadership appreciations and leadership skills (Noonan & Renihan, 2006). These include skills of leading professional development, knowledge regarding the use of achievement data in classroom planning, school planning and decision-making, and appreciations for the importance of nurturing professional collaboration on matters relating to instruction and student achievement. Meeting these demands presents a challenge for principals everywhere, and the challenge is compounded when the particularities of school context are added to the mix. In the context of rural schools, the issue arises as to the supports available
to principals, not only in acquiring knowledge, appreciations and skills required of assessment leadership, but using them effectively given the powerful constraints placed upon them by their context.

**Meeting School Effectiveness and Instructional Leadership Expectations**

A central assumption underlying this article is that principals make a difference. Over the course of the past ten years, an increasing amount of research evidence has pointed to the central role played by the school principal in student achievement, school effectiveness and school improvement. Many studies across different countries have found evidence of the crucial role that principals can play in improving teaching and learning (Renihan, 2008; Donaldson, 2001; Elmore, 2001; Henchey, 2001; Leithwood, 2000; McLaughlin & Talbot, 2001; Newmann, King & Young, 2000; and others.). Gonzales et al. (2002) identified over 60 pertinent studies including theoretical and field research of the principal’s impact on student achievement. Fullan (2003) cited improvements in 93 schools in the Toronto District School Board’s Early Literacy Project and in the UK’s national literacy and numeracy initiative as illustrations of the importance of principal leadership in successful translation and implementation of mandated curricular strategies. Further, following a large scale international study of school effectiveness research, Reynolds & Teddlie (2000, pp. 141-144) made the observation that leadership is ‘centrally synonymous with school effectiveness.’

Specific expectations of principals as assessment leaders have received increasing attention in the research. Investigations conducted by Stiggins (2001), O’Donnell and White (2005), and Noonan and Renihan (2008) provided useful guidelines for principals involved in assessment leadership. Stiggins (2001), for example, proposed how principals can work toward assessment success. He made the point that, for success in school-based assessment, principals must have: i) clear and appropriate achievement targets and ii) an assessment literate school staff or faculty. Those two conditions establish a basis for the five standards that Stiggins (2001) used as a framework for principals’ assessment literacy, namely: i) appropriate achievement expectations for students, ii) assessment that serves instructional purposes, iii) accurately serving the intended purpose, iv) a broad scope of student performances to permit confident conclusions, and, v) elimination of bias that can affect the accuracy of results. Stiggins (2001) added the point that, in order to be effective in assessment leadership, principals need: i) to become assessment literate and, ii) to remove barriers to teachers’ assessment literacy.

Other researchers expressed views that provide useful elaboration on the themes outlined by Stiggins. For example, O’Donnell and White (2005) provided a developmental perspective on assessment leadership for principals. In conducting a study of public perceptions of the role of the principal, these researchers drew some conclusions as to factors that can affect the development of principals as assessment leaders. Their work suggests that important skills for development in this regard are i) skills of working with teachers to promote school learning, ii) skills of encouraging collaboration among teachers, particularly in lower socio-economic status schools, and iii) skills of comprehensively assessing their own instructional leadership behaviours. The results of the O’Donnell and White study, though not unique, highlight the importance of principals focusing on their own behaviour as a way to influence teacher development and student achievement.

**Assessment Leadership in Rural Contexts**

A significant body of research has focused on the work of principals in rural schools from a variety of perspectives. For example, the role of principals in rural settings has been addressed by Browne-Ferrigano and Allen (2006) who proposed collaborative efforts for school principals involved in high needs rural schools, as have Livingston, Reed, and Good (2001). Others, such as Loveland (2002), have taken a much broader perspective, investigating the challenges and rewards of rural school leadership. Similarly DeRuych (2005) pointed out the importance of strong instructional leadership in contemporary rural schools. In other studies, the role of the principal was found to be such that it creates its own types of stress or anxiety; for example, Buettn (1992) studied the types of coping mechanisms used by principals in rural contexts, and provided a number of observations on the implications for principals who may experience stress in their workplace. Some of the suggestions included but were not limited to: in-service opportunities, frequent and purposeful dialogue, and recognizing the complexity of distress.

Although there is a clear realization of the need for principals to possess leadership skills, it is also recognized that principals require some form of professional development to enhance those skills. For example, Salazar (2007) of the University of Nevada, Las Vegas discussed the results of their study of professional development for rural high
school principals to enhance leadership skills that can guide school reform and “reach higher standards of student achievement” (p.1). Thus it would seem that, in the context of assessment reform, there is a strong interest in principals’ knowledge and skills in relation to assessment leadership. That said, although there is considerable evidence to recognize the importance of strong instructional leadership in rural schools, research-based acknowledgement of the environmental influences upon assessment leadership in these settings remains relatively sparse.

Methods

The study reported in this article was designed to collect data from practicing rural school principals with respect to what it means to be an assessment leader in rural contexts and in what ways rural school context affects their instructional/assessment leadership roles. Data were collected from three focus groups comprised of rural school principals most of them serving in small rural schools in villages in Western Canada. Participants represented twelve rural schools in three school divisions in a Western Canadian province. The schools ranged in size from very small (less than 50 students) to moderately sized schools (up to 400-500 students). They also varied in their grade configurations, and included high schools, K-12 schools and schools with a variety of grade patterns at the elementary/middle levels.

The primary method chosen for data collection in this study was the focus group method. Vaughn and others (1996) noted that focus groups offer distinct advantages over individual interviews, including their variety and visibility, their compatibility with the qualitative research paradigm, the richness they can add to information on the theme under investigation, the opportunities they provide for dynamic, interactive discussion, and the added possibility they provide for individuals to form and discuss opinions during the process. Vaughn et al. (1996) added that this approach is particularly useful in exploratory research. Given these points, combined with the time efficiencies and economies they provided us in rural contexts where the subjects were geographically dispersed, we considered focus groups to be suitable for our purposes.

The key questions posed to focus group participants (and shared with them prior to the sessions) were as follows:

- How important to you, as principal, are teachers’ grading and assessment practices?
- To what extent do teachers’ assessment and grading strategies reflect your expectations of teachers’ instructional practices?
- To what extent should principals be accountable for the assessment practices of teachers?
- How should the results of teachers’ assessment practices be used by principals or other administrators?
- To what extent has the environment of large-scale testing and accountability influenced your role as an instructional leader?
- To what extent have developments in assessment for learning influenced your role as instructional leader?
- What is the effect of a rural context (school size, isolation, distance from central office, available supports etc.) on your role as assessment leaders?
- What are the assessment leadership opportunities presented by the rural context of your schools?
- What are the constraints to assessment leadership presented by the rural context of your schools?

Three focus group sessions were held with groups of principals, and results of the focus group sessions were collated and reviewed to determine major themes and ideas relating to their school/organizational contexts, their teacher contexts and the intricacies of the instructional leadership and assessment-related issues in their schools. Once the interviews were completed they were reviewed and summarized on the basis of recurrent themes or ideas that would provide evidence as to: a) Rural principals’ understandings of what it means to be an instructional/assessment leader and, b) their perceptions as to the impact of rural context upon the instructional/assessment leadership role.

Once the focus group interviews were completed, the results of the interviews were collated and reviewed by the researchers to determine what major themes or ideas guided the discussions with respect to assessment-related issues in their schools. The results were reviewed and summarized according to recurrent themes relating to the meanings these principals gave to their assessment leadership roles, and the impacts they believed their rural contexts had on them.

Findings

Prior to the description and discussion of the findings of this study, a clarification of the nature of the accountability context of these schools and their jurisdictions is necessary. The locus of control and responsibility for education is different for the United States and Canada. In Canada, education has (since Confederation in 1867) remained a provincial rather than a Federal responsibility and in the absence of a federal Ministry or a Federal Bureau of Education (as
exists in the United States), educational matters across the country have been directed by the individual provincial departments-or ministries-of education. Thus the accountability context for education varies from province to province, with varying degrees of emphasis on assessment for, and assessment of, learning. In the United States, because of the No Child Left Behind initiative, assessment, analysis and alternative uses of related data has become one of the major roles of the principal. In the province where this study was based (Saskatchewan) there has been, over the past ten years, an increasing emphasis on large-scale assessment and data-driven school decision-making, though a 'softer' orientation to accountability with a strong emphasis on AFL (assessment for learning) continues to predominate.

The summary of discussions with the groups of principals in these Western Canadian rural schools is presented below from two perspectives: a) Rural principals’ understandings of what it means to be an instructional/assessment leader and, b) their perceptions as to the impact of rural context upon the instructional/assessment leadership role.

Rural principals’ understandings of what it means to be an instructional/assessment leader

Principals saw their assessment leadership role in various ways. Most agreed that the provision of a clear vision and direction for instruction and assessment throughout the school, and promoting discussion of formative, summative and diagnostic elements of assessment among staff were defining elements of their assessment leadership role. As one participant noted, “there needs to be an assessment culture or philosophy in the school, and teacher strategies should align with that.” These principals emphasized the importance of knowing what is happening in classrooms, and having the ‘big picture’ concerning assessment practices in their building. The general consensus seemed to be that the teacher has to bear significant responsibility for assessment practices. There was reluctance among some principals to micromanage the work of teachers, The majority of these principals noted that, given the contexts of their schools, they play the multiple roles of teacher, manager and supervisor. In regard to their role priorities, some observed that they see themselves as teachers first, and that their orientation to assessment is that it is at its best when managed professionally and collegially rather than bureaucratically.

Another dimension of the principal’s role in these contexts was that of support. Principals saw their two most common support functions as expediting relevant professional development based upon teacher-identified instructional and assessment needs, and, simply 'being available' for school professionals. Specifically, several principals emphasized the importance of helping teachers cope with the tasks of balancing multiple grades, coping with the demands of special needs students, responding to cultural differences, and differentiating instruction, often in the absence of the additional paraprofessional and material resources that are available to many of their colleagues in larger schools and urban schools. One principal explained, “I don’t want my teachers burnt out and on stress leave. I will do all I can to help them be successful.” These principals were quite clear, however, in their belief that teachers should be held accountable for their attention to student assessment practices and their impact upon teaching and learning strategies. In this respect, when it came to issues of assessment, they described themselves as maintaining a fairly delicate balance between ensuring accountability and quality control, on one hand, and nurturing professional empowerment among teachers, on the other.

Principals as Assessment Leaders: Impacts of Rural Contexts

There are obvious contextual differences between rural and urban school jurisdictions (i.e. distance to school, school/classroom size, transportation, accessibility, etc.). However, the extent to which those factors influence the principal’s role as an assessment leader remains less obvious. The principals involved in the focus groups did acknowledge that a rural school has some unique features (such as grade patterns, parent-involvement/values, community roles and expectations) and that in the rural context principals spend considerable time and energy on administrative (school organization) issues and less time on such specific leadership functions as assessment leadership.

In the case of the smaller rural schools, the phenomenon of their getting ‘lost in the statistics’ of large-scale assessment was identified, and for this reason some principals of smaller schools questioned the value of their involvement in large-scale assessment. For the most part these rural school principals assumed that classroom teachers have the ability and responsibility to implement and utilize current grading and assessment practices. However some of the principals did note that a school’s grade configuration will influence some assessment initiatives. For example, the assessment reform movement acknowledges that large-scale assessment is undertaken for specific grade levels (i.e. 5, 8, and 11). This would mean that the large-scale assessment process in a k-6 school would be limited to one grade
level. Further, assessment implementation could involve three grade levels which is an administratively challenging process in a rural school with small student populations and several multi-graded classrooms. Some of our respondents questioned the cultural relevance of some tests. One principal, for example, remarked: “When the Math instrument has Shrek on it, it causes me to ask about the cultural relevance of the test for students from Sudan, the Ukraine etc.” Also, in rural schools with populations of Aboriginal students, the compatibility of assessment with Aboriginal learning styles and ways of knowing is an important consideration.

From the discussions with our participants, it was evident that several distinctive facets of the rural context of their schools were seen to have powerful influences upon the ability of individual principals to provide assessment leadership. Our participants were quite clear in pointing out that, while some of the above phenomena represent facets that can facilitate their assessment leadership functions, others serve to seriously constrain them.

**Those Facets that Facilitate Assessment Leadership**

- Small school populations present an opportunity for enhanced knowledge of students, leading to greater individualized attention to student learning and assessment needs; as one participant observed, “One thing I look at is that we are small in size, and we know each other well. People feel comfortable coming to see me as instructional leader.”
- More intimate, familial professional cohorts present greater opportunity for the creation of collaborative professional cultures within the school, focused on teaching strategies, assessment literacy and school-wide data-driven decision-making;

**Those Facets that Constrain Assessment Leadership**

- Community politics;
- Distance from central office and associated isolation of in-school leaders and classroom professionals from sources of support when dealing with challenging instructional and assessment issues;
- Volume of expectations, paperwork etc
- Lack of collegial support for in-school administrators;
- Lack of mentorship for new in-school administrators;
- Difficulties experienced by principals in balancing the multiple roles and expectations of teaching, administration, and instructional leadership/supervision.

Finally, the role of system administration emerged as a significant force that can influence school-level assessment leadership and assessment literacy (and, consequently, the quality of student learning) for better or worse. Participants in our discussions varied in their assessments of the quality of the support devoted by their respective central office administration to school-level efforts at improving learning; but it became clear during our deliberations that the role of central office leadership is a critical one. In short: where senior administrator guidance and expectations for assessment were seen as clear, where central leadership was perceived to model a commitment to the value of assessment for learning, where tangible support was provided in the form of visible leadership presence, and where there was central commitment to professional development and resource allocation, the quality of assessment literacy was seen to be more focused, better planned and more enthusiastically pursued.

**Discussion**

Two tensions appear to present concerns for principals who serve in a contemporary rural school context. These relate to the general demands of accountability on one hand, and the changing leadership role demands presented by assessment reform and classroom assessment practices, on the other.

**Demands of Accountability**

Accountability, in the context of our discussions, presented three tensions related to expectations of school principals in rural settings. First, it is well-recognized that principals in large urban systems are expected to work for and with senior officials in their school jurisdiction. In a rural context where schools may be geographically dispersed and have different grade distributions and enrollments, the principal may need to establish different or unique working relationships with senior officials. Second, teachers’ professional development in a rural context can be more difficult for smaller geographically diverse schools but it is still expected that the principal provide guidance for the professional development opportunities for his or her staff. Third, in a rural setting, a high premium is frequently placed upon the ability of principals to work with parents and the community. Though this may not be difficult in some small close-knit communities, if the principal is not a member of the school community it can present significant challenges. This can be particularly true
when, for example, principals are addressing assessment issues such as large-scale assessment where they are expected to ensure that teachers are accountable for a testing program that has been externally prepared and will be externally reported.

**Negotiating New Role Demands.**

Although accountability is a significant element of principals’ instructional and assessment leadership, the assessment reform movement has focused on the principals’ role related to aspects of classroom assessment that have traditionally been within the teacher’s realm of responsibility. It is recognized, increasingly, that the role of the principal is to support teachers in learning, and developing cultures of assessment literacy using concepts such as assessment for learning and assessment as learning as vehicles to enhance classroom and school planning and decision-making. As well, it has become necessary for rural principals to be informed about a wide range of current grading practices which can be difficult to implement in rural schools with differences in enrollment, grade distributions etc. Training and professional development for teachers is more easily delivered in urban settings than in rural settings where the resources and opportunities may be less accessible for teachers. As the results of the focus groups illustrated, assessment leadership includes a wide range of classroom-related assessment concerns for rural school principals, and these undoubtedly require substantial leadership time and commitment. It follows that success in this facet of the principal’s role is dependent upon the nature of the supports available for leaders who work in these settings.

In short, then, although assessment is seen as an important issue for rural principals, it should also be noted that rural principals are faced with a number of related issues that characterize leadership in a rural context. In light of this discussion, it is important to ensure that rural principals are provided with the opportunity, the resources and the supports to provide not only assessment leadership as outlined here but also a strong focus on their larger role as instructional leaders.

**Some Implications for Action**

Although this study highlighted numerous constraints to the effectiveness of assessment leadership in rural contexts, it should be noted that several of our findings represent themes that have been identified as constraints to principals’ effectiveness in a variety of studies and across contexts. In a recent survey of the international research on the role of the principal, for example, Philips, Raham & Renihan (2003) identified a range of significant barriers to principal efficacy which must be overcome in order to create a culture that supports quality school leadership. Among these were the findings that:

- institutions do not devote sufficient attention to promoting/selecting principal candidates for knowledge and skill related to instructional leadership (Elmore, 2000);
- most of principals’ time is spent attending to parent issues, community-related tasks, discipline, and facilities management, allowing for very little time to be devoted to instructional leadership, teaching and learning. Lack of time and excessive managerial demands are the two greatest obstacles for modern principals;
- although there are noteworthy exceptions, principals are seldom properly supported in their leadership role by school districts which have previously expected them to do little more than follow orders, oversee staff, keeping the buses running, and contain problems. In these conditions the school leader often feels isolated, overwhelmed, and powerless to accomplish the job;
- in many instances, the rapid pace of reforms presents principals with incoherent and conflicting goals and inadequate lead time to prepare their school communities for their implementation;
- school system policies and union contracts place limits on the autonomy, flexibility and capacity of the principal to act as a change agent.

These barriers to efficacy resonated throughout the discussions we had with our rural school principals, but our participants can take some solace from the realization that their frustrations are to some extent shared by principals everywhere, even though there is little question that such concerns are exacerbated by the very real concerns of their rural contexts. There seems little question that serious attention to the amelioration of major constraints such as those identified by our participants, would go a long way to enhancing the assessment culture and the quality of learning in these school environments. From our discussions, the central and most promising quality is that of support in its various dimensions.

The rural context presents serious challenges to school professionals as they go about the organization of the learning environment, but from what we have heard and seen, we are convinced that the contextual constraints are far from insurmountable. The policy and action implications of our findings suggest that concerted attention to the articulation of the rural principal’s support system would serve these professionals very well in ensuring coherent and consistent leadership for learning.
Those elements of the support system that would seem to hold most promise in this regard include support for relevant preparation, leadership development, and planned mentorship.

It has been pointed out that school leadership programs generally lag far behind best training practice in other sectors and that no nation has developed the comprehensive and coherent leadership development program necessary to do the job (Tucker & Codding, 2002).

Even where school leaders require a qualification as an entry point, therefore, the practice of providing financial support and time for individuals to access programs, short courses and training modules relevant to the contexts of their work has considerable merit. Further, the vice principalship as a training ground, and source of support, for the principals’ role would seem to be an even greater asset in rural contexts than in others.

Local provision for professional development appropriate to the stages of the principal’s career is a responsibility school districts have not taken seriously enough (Tucker & Codding, 2002); effective practices would include the engagement of sharing arrangements with other boards to coordinate aspects of their leadership development activities; the examination of ways by which financial support can be provided for enhanced professional development of school level leaders; and the utilization of the expertise of experienced principals in the delivery of professional development to beginning principals.

Finally, there is a large and growing body of research evidence pointing to the considerable professional payoffs associated with initiating practices of mentorship among school-level administrators within their systems. The provision of the opportunity and time for beginning principals to interact with their more experienced colleagues has considerable potential as a vehicle for developing assessment leadership capacity, particularly among those who are, or will be, working in rural schools.

References


leadership behaviors and student achievement. NASSP Bulletin, 89, 56-70.

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Teachers’ Perceptions of Rural STEM Teaching: Implications for Rural Teacher Retention

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Rural school districts often struggle with attracting and retaining high-quality teachers, especially in science subject areas. However, little is known about STEM in-service teachers’ lived experiences of rural teaching as they relate to retention. In this phenomenographical study, six rural in-service science teachers were interviewed regarding their perceptions of the benefits and challenges of teaching in rural schools in general, and teaching science subjects in particular. Community interactions, professional development, and rural school structures emerged as three key factors related to rural teacher retention. Participants viewed each of these factors as having both positive and negative aspects. Findings from this study confirm existing literature regarding rural teaching, in general, but provide additional insight into the complexities of rural science teaching, in particular. Implications for rural teacher preparation, recruitment, and retention are discussed.

Keywords: rural teacher retention; rural teacher attrition; science teaching; teacher attitudes; rural education.

This study addresses gaps in the recruitment and retention literature by examining the lived experiences of rural STEM teachers, including their perceptions of the benefits and challenges of rural teaching, with the overarching goal of understanding the factors related to their persistence in rural teaching in general, and rural STEM teaching in particular. As the prior research suggests, there is a great need for studies focused on the lived experiences of in-service rural teachers and, specifically, how their experiences might influence their decisions to persist in rural teaching. Also, because the consequences of rural teacher attrition are dire for rural STEM learning in particular, it is necessary to investigate the experiences of rural STEM teachers and examine whether or not their experiences and challenges are peculiar or similar to those reported by rural teachers in other studies. Thus, the current study investigated the following research questions:

What are the lived experiences of rural STEM teachers?
What do rural STEM teachers perceive as the benefits and challenges of rural STEM teaching?
How do rural STEM teachers’ experiences relate to rural teacher retention?
How do rural STEM teachers’ experiences compare to previously published reports of rural teaching, generally?

Rural Teacher Attrition and Retention

Teacher turnover, estimated to be 9% annually (National Center for Education Statistics [NCES], 2009), presents a major challenge for rural schools. Although some teachers originating from rural communities remain teaching in the same school for their entire careers, other teachers leave rural schools soon after beginning employment (Monk, 2007). Problems with rural teacher shortages are compounded in secondary areas of specialization including mathematics, science, and technology (Monk, 2007). Compared to schools in central cities, suburban areas, and large towns, schools in rural areas and small towns have greater difficulty filling vacancies, particularly in physical and computer science areas (NCES, 2006). Hence, rural school districts particularly struggle to attract and retain quality science and math teachers.

The negative consequences of rural teacher attrition cannot be overemphasized. Rural teacher attrition often results in schools staffed predominantly with relatively new and inexperienced teachers (Murphy & Angelski, 1997). Compared to teachers working in cities, suburban areas, and towns, rural teachers are more likely to be younger in age and less likely to have earned graduate degrees (NCES, 2009). Additionally, rural teacher attrition can have deleterious effects on the quality of
education in rural schools. Schools in rural areas and small towns are more likely to deal with vacancies by cancelling planned course offerings and assigning an administrator or counselor to teach those classes (NCES, 2006). This solution to rural teacher shortages presents dire consequences for rural science, technology, engineering, and mathematics (STEM) instruction in particular. Due to teacher shortages, teachers specializing in other fields are sometimes required to teach STEM courses even if they are underprepared and uncomfortable with teaching these subjects (Friedrichsen, Chval, & Trescher, 2007). Ultimately, student science achievement suffers when there is a STEM teacher shortage and when the available teachers are under-qualified for the subjects they teach (National Commission on Teaching and America's Future, 2002).

These challenges, coupled with the requirement of the No Child Left Behind Act (2001) that each classroom have a teacher qualified in the subject matter being taught, has led to increased interest among rural school administrators in identifying and understanding the factors related to the attraction and retention of rural teachers, especially those qualified to teach multiple science subjects. However, despite the continued interest in best practices and effective strategies for recruiting and retaining rural teachers, there are notable gaps in the literature and research in this area. There is a paucity of research on the manner in which the experiences and perceptions of rural in-service teachers relate to their persistence in rural teaching. Most research in the area of teacher retention is focused on why teachers leave rural schools and has been conducted mainly with pre-service teachers, first year teachers, and administrators. For example, of all manuscripts published in this journal, Rural Educator, between the years 2000 and 2010, sixteen addressed issues related to rural teacher attraction and retention. Of these sixteen manuscripts, eleven focused (primarily or partially) on issues related to the training, preparation, experiences, and expectations of rural pre-service teachers and/or professional development programs to improve the retention of new or first year rural teachers (e.g., Barley, 2009; Harris, Holdman, & Clark, 2005; Lowery & Pace, 2001; Munsch & Boylan, 2008). Only four manuscripts examined the experiences and/or retention of in-service teachers (e.g., Huysman, 2008; Malloy & Allen, 2007; Ralph, 2002). Davis (2002), referring to the paucity of research a decade ago, called for in-service teacher-focused studies that engender “in-depth knowledge about factors related to within classroom, whole-school, community, and personal/family spheres of influence and their impact on teacher retention” (p. 50). Davis’ call for in-depth study of rural teacher attrition, though made a decade ago, is still relevant today. Such in-depth knowledge may best be gained from qualitative studies of the lived experiences of rural teachers and their perceptions of the factors that have positive and negative influences on the retention of rural teachers.

Benefits and Challenges of Rural Teaching

The perceived benefits and challenges of rural teaching may help to shed light on the attrition and retention of rural STEM teachers. Extant research suggests that factors such as the preparation time required, relationship with the principal, and lifestyle of the rural community influence teacher attrition and retention (Murphy & Angelski, 1997). Further, it has been suggested that new teachers must be prepared for the challenges of rural teaching by both earning the necessary credentials and learning about the nature of working in rural communities (Barley, 2009). Indeed, a large part of the rural “way of life” is managing the social aspects of rural teaching, both within and outside of the school. To that end, Jazabkowski (2003) noted that a distinct characteristic of rural teaching is the intersection between life and work. Because rural communities tend to afford little privacy to teachers, teachers must find ways of “fitting into” these communities in order to be successful (Jazabkowski, 2003).

Social capital theory (Coleman, 1988) provides a useful framework for understanding the effects of rural social interactions on the retention of rural teachers. Social capital theory posits, among other things, that the strong social networks in rural communities work to facilitate as well as constrain behavior through multiple community members rewarding or sanctioning the behavior of other members. When community members meet each other’s expectations, trustworthiness is created; by contrast, when some community members resist norms or obligations, poor reputations arise (Coleman, 1988). While Coleman’s assertion would be true in any social setting, what is notable about rural communities is that the impact (positive or negative) is more acute than in a diffused, large school, urban setting.

The multiplex relations concept of social capital theory also helps explain the benefits and challenges of rural teaching. Multiplex relations refer to situations in which persons are linked in more than one context (Coleman, 1988). Resources like information or obligations from one relationship can be appropriated for use in other relationships (Coleman, 1988). In the rural teaching context, multiplex relations may manifest as teachers having
multiple relationships with their students (e.g., as a teacher, sports coach, friend’s parent) and their students’ parents.

In sum, social capital theory helps to explain how the strong ties in rural communities can pose both benefits and challenges. Teachers who are unfamiliar with rural community norms may be unprepared for contending with these dynamics, contributing to teacher attrition. Conversely, teachers who are comfortable in rural environments may understand how to best capitalize on the benefits of rural teaching, contributing to teacher retention.

Despite the consequences of attrition for rural STEM teaching, little is known about the experiences of rural STEM teachers and how their experiences might differ from the experiences of rural teachers in general. Most research conducted to date has examined rural teacher retention, broadly, with little attention to rural science teacher retention, specifically. Despite the national interest in enhanced STEM learning and teaching, especially in socioeconomically disadvantaged schools—including most rural schools—little is known about how the experiences of rural STEM teaching relate to rural STEM teacher attrition and retention. Most of the few studies (e.g., Aldous, 2008; Lake, 2008) addressing the retention of rural science teachers documented the experiences of rural teachers in other countries (e.g., Australia). We posit that the retention of rural STEM teachers in the United States may involve unique complexities related to community and school factors that have an impact on support for science teaching resources and pedagogical innovations. Hence, learning more about the benefits and challenges of rural STEM teaching is vital to developing strategies for increased retention of rural STEM teachers, and ultimately, students’ science achievement and interest in science careers.

**Study Design and Analysis**

This study employed phenomenography to describe, analyze, and understand data regarding the lived experiences of rural STEM teachers. Phenomenography is a qualitative research framework which focuses on understanding perceptions of reality rather than understanding reality itself (Marton, 1981). The goal of phenomenography is to identify, describe, or make statements and assertions about participants’ ideas and experiences (Marton, 1981). Although similar to phenomenology in its focus on lived experiences, phenomenography differs in its emphasis on collective rather than individual meanings of experiences (Barnard, McCosker, & Gerber, 1999). Collective experiences are described using categories which are not specified a priori nor derived from preconceived ideas (Marton, 1981). When analyzing experiences of a certain group of participants, researchers using phenomenography specify categories that emerge from the data and may also calculate how many participants share these experiences (Marton, 1981). Phenomenography was deemed appropriate for this study because of our interest in examining the shared or collective experiences of our study participants as rural STEM teachers.

**Participants**

Participants were six in-service high school STEM teachers working in rural areas in Indiana. These participants were recruited from a group of seven in-service teachers involved in a summer professional development program designed to assist rural STEM teachers in delivering the global research topic of sustainable biofuel energy into their high school classrooms. All but one in-service teacher in the professional development program agreed to participate in a focus group interview session for this study, which took place prior to their participation in the two-week intensive workshop held in the summer of 2011.

Regarding participants’ demographic characteristics, they were four female and two male Caucasian high school science and mathematics teachers. The teachers had taught a variety of STEM subjects including biology, earth science, chemistry, mathematics, physics, etc., in the school year preceding data collection for this study. The number of years they spent teaching in their current schools ranged from two to eleven. Two participants had experiences also teaching in urban schools, and four did not. All of the teachers had lived in their current communities for at least five years, most commonly more than 15 years. Regarding their communities of origin, all participants grew up on farms, in small cities or towns, or in the country. Four participants reported that they preferred to live in the country, one preferred to live in a small city or town, and one had no preference. Table 1 further describes the participants’ demographic, professional, and residential characteristics.
Table 1
Participants’ Characteristics

<table>
<thead>
<tr>
<th>Descriptions of Participants (N = 6)</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subjects Taught in Past Year</strong></td>
<td></td>
</tr>
<tr>
<td>Biology</td>
<td>4</td>
</tr>
<tr>
<td>Earth science</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry</td>
<td>1</td>
</tr>
<tr>
<td>Mathematics</td>
<td>1</td>
</tr>
<tr>
<td>Physics</td>
<td>2</td>
</tr>
<tr>
<td>Other subjects</td>
<td>3</td>
</tr>
<tr>
<td><strong>Years Spent Teaching in Current School</strong></td>
<td></td>
</tr>
<tr>
<td>2 years</td>
<td>1</td>
</tr>
<tr>
<td>5 years</td>
<td>1</td>
</tr>
<tr>
<td>8 years</td>
<td>1</td>
</tr>
<tr>
<td>11 years</td>
<td>1</td>
</tr>
<tr>
<td><strong>Years Spent Living in Current Community</strong></td>
<td></td>
</tr>
<tr>
<td>5-9 years</td>
<td>1</td>
</tr>
<tr>
<td>10-15 years</td>
<td>2</td>
</tr>
<tr>
<td>More than 15 years</td>
<td>3</td>
</tr>
<tr>
<td><strong>Communities of Origin</strong></td>
<td></td>
</tr>
<tr>
<td>On a farm</td>
<td>1</td>
</tr>
<tr>
<td>In the country (not a farm)</td>
<td>1</td>
</tr>
<tr>
<td>In a small city/town</td>
<td>4</td>
</tr>
<tr>
<td><strong>Preferences for Communities of Employment</strong></td>
<td></td>
</tr>
<tr>
<td>In the country (not a farm)</td>
<td>1</td>
</tr>
<tr>
<td>In a small city/town</td>
<td>3</td>
</tr>
<tr>
<td>No preference</td>
<td>2</td>
</tr>
</tbody>
</table>

*Note.* * = Information regarding this item was unavailable for two participants

**Procedures**

The focus group session solicited information about participants’ experiences of teaching in rural schools. The interview protocol included questions regarding teachers’ experiences and perceptions of the benefits and challenges of teaching in rural contexts in general and teaching STEM subjects in particular. The interview protocol also probed teachers’ perceptions of the factors related to rural
teacher attrition and retention. The session lasted 75 minutes, was audio-taped, and was transcribed verbatim for analysis.

Data Analysis

To accomplish the goals of phenomenographical methodology, the interview was analyzed using conventional content analysis to generate categories of perceptions reported by the teachers. Content analysis involves subjectively interpreting text by classifying, coding, and identifying themes (Hsieh & Shannon, 2005). An inductive approach to data analysis was employed, such that no preconceived theories were imposed on the data; rather, the authors attended to the themes that emerged from the data. Consistent with conventional content analysis recommendations, words, sentences, paragraphs, and comments in the focus group session transcript were the units of analysis (Stemler, 2001). However, where appropriate, the number of participants who agreed with the category described is also presented.

The researchers used the method of open-coding to identify statements/comments related to rural teacher attrition and retention. This process yielded 116 total statements or phrases reflecting a variety of beliefs held by the six participants. Using the process of constant comparison, the 116 statements were categorized by grouping together similar statements and phrases into themes. Categories were examined in relation to each other, resulting in a hierarchical structure. To add trustworthiness to the data, a researcher not directly involved in data analysis reviewed the transcripts and analysis. The researchers reached a consensus about the codes and themes, and collaborated to reduce the data into the final categories.

Results

Analysis of the data revealed three broad themes or factors related to the attrition and retention of rural teachers: (a) strong interpersonal relationships and community ties in rural communities, (b) school factors, and (c) professional factors. Interestingly, teachers described each category as a set of double-edged factors consisting of both beneficial and challenging aspects. Teachers viewed the positive aspects as benefits of rural teaching and thus, factors that influence teachers’ attraction and retention in rural schools. Conversely, teachers viewed the challenging aspects as factors contributing to the attrition of rural teachers. These three themes and the associated categories are presented in Table 2.

Strong Interpersonal Relationships and Community Ties

This theme describes the benefits and challenges of the close relationships and strong community ties that exist in rural communities. Thirty-one of the teachers’ comments (27%) were related to community ties, of which twenty referenced the positive aspects and sixteen referenced the negative aspects. With regards to the positive aspects, teachers reported that rural communities are characterized by strong social connections and interactions, e.g.,

I am able to form partnerships within the community...because of the people that I know...I bring agriculture into my lessons almost on a daily basis....and so the partnerships that we form maybe deal with just someone coming in and speaking, or it may be because a conservation officer has passed me on the street, and I say, hey, why don’t you come in and speak to my kids?

The comments in this category indicate that community members and rural STEM teachers can work together to improve student learning and interest in science. With specific regards to teacher-parent connections in rural communities, a teacher mentioned that teachers often play multiple roles in rural communities and thus develop different types of relationships with the parents of their students:

We can make contact with the parents more easily, and it’s more personal contact, because we’ve either been there long enough and we’ve had them in school, and they know us as a teacher, or they think of us as a teacher, or maybe our children have been in sports with...their children, or we’ve seen them in the community so we’ve had contact in a different type of way, other than just their child’s teacher.
Table 2  
*Categories of Perceptions of Rural STEM Teachers Regarding Factors that Impact Attrition and Retention*

<table>
<thead>
<tr>
<th>Categories</th>
<th>Positive aspects</th>
<th>Negative aspects</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong interpersonal relationships and community ties</td>
<td>Teacher-parent connections and mutual trust</td>
<td>Developing connections as an “outsider”</td>
<td>15</td>
</tr>
<tr>
<td>Positive aspects</td>
<td>Sense of reward</td>
<td>Maintaining boundaries</td>
<td>5</td>
</tr>
<tr>
<td>Negative aspects</td>
<td></td>
<td>Challenging public relations</td>
<td></td>
</tr>
<tr>
<td>School factors</td>
<td>Contact between teachers and administrators</td>
<td>Resistance to change</td>
<td>4</td>
</tr>
<tr>
<td>Positive aspects</td>
<td>Personal interactions with students</td>
<td>Rural student performance</td>
<td>13</td>
</tr>
<tr>
<td>Negative aspects</td>
<td></td>
<td>Problems with administrators</td>
<td></td>
</tr>
<tr>
<td>Professional factors</td>
<td>Intellectual stimulation</td>
<td>Salaries and benefits</td>
<td></td>
</tr>
<tr>
<td>Positive aspects</td>
<td>Connecting science and rural life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative aspects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insufficient mentoring</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Preparing for multiple classes</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lack of access to university resources</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* F = frequency of comments. Total number of comments = 116.

Furthermore, five comments indicate that teachers perceived that the shared sense of belonging that characterizes rural communities makes rural teaching rewarding and enhances teachers’ interest, persistence, and commitment to rural teaching. Examples of their comments were:

*Feeling like you’re making a difference...we could go off and work in industry or work in, you know, research...but would we make the difference that we’re making in the smaller classroom with these students in this community?*

*Feeling like you’re contributing to a community.*

*Even if you’re an outsider, you can still get the community behind you over time, and then it makes it more rewarding, and you can bring those community aspects in there and you have those connections and that closer bond with the people there...that you would have to, if you went somewhere else, rebuild or try and build up.*

Although teachers highlighted the advantages of the strong connections in rural communities, they also mentioned the associated challenges that could discourage their persistence in rural teaching. Specifically, three categories of the negative effects of strong community ties emerged from the data.
First, eight comments mentioned difficulties with being considered an “outsider” and the challenges of developing connections within tight-knit rural communities when teachers are new or live outside of the communities in which they work. Describing what it is like for her to live outside of her current school district of employment, a teacher stated:

*The community there is very tight knit. [If] you live outside of it, trying to get into that community is awfully hard...because the rural communities are so tight-knit. And if you don’t have kids that go there, or you didn’t grow up there, you don’t have that connection.*

Second, teachers mentioned boundary concerns. Although they reported that living and working in the same community seems to help to build relationships and trust, teachers also mentioned that it often leads to fluid boundaries between work and personal life. Four comments referred to the challenge of having to always be “on call.” For example, a teacher said:

*It’s a small community, they know you, they know your phone number, [and] they know where you live. So, you know, you just usually get used to it, eventually, or they will just walk into your classroom, no matter [if] your door is open. You’re basically on call 24 hours a day, seven days a week.*

Teachers also noted another negative result of fluid boundaries: limited privacy due to community member awareness of their whereabouts and life circumstances. For example, one teacher said, “Your attendance, or whether you’re there, what’s going on in your personal life, whether it has anything to do with the classroom, is always out there.”

Third, six comments identified challenging public relations and their effects on teachers’ reputations as another negative consequence of the strong interpersonal relationships that exist in rural communities. For example, a teacher stated:

*If a student suddenly doesn’t do well in your class, or if you have a bad experience with them, then it’s not just an isolated event...then you’re probably going to have that student again in the future, you’re going to have siblings, and people in the community are going to talk, and then if somebody else has a bad experience, you’re suddenly a really bad person, and so reputations can be formed and destroyed quickly...So you do have to be very careful in how you deal with parents and with the students.*

With regards to rural STEM teaching in particular, participants did not make any comments that suggest that the identified negative and positive sides of the social connectedness in rural communities have any peculiar implications for rural science teaching, including the retention of rural STEM teachers. Although some teachers indicated that community members and rural STEM teachers can work together to improve science learning (as earlier stated), the data suggest that the social factors encompassed by this theme impact teachers regardless of their expertise or the subjects they teach.

### School Factors

Overall, 46 comments (40%) referenced school related factors that may influence the retention of rural teachers. Twenty-three of the 46 comments referenced the positive school environment in rural districts and the benefits of rural school structures including availability of teaching resources, safety, contact between teachers and administrators, and flexibility within the school. In most cases, participants discussed the impacts of these factors not only on rural teaching in general, but rural STEM teaching in particular.

Specifically, three categories of benefits of rural school structures and environment emerged from the data: (a) close relationships and contact among teachers and between teachers and administrators, (b) strong personal interactions with students, and (c) safe rural school environments. Four comments referred to the close relationships and contact among teachers and between teachers and administrators of rural schools as an important catalyst for rural teacher retention. Participants indicated that these close relationships allow for a more flexible science curriculum and school environment. For example, participants reported that they (as rural STEM teachers) have some leeway in taking students outside of the classroom, bringing in guest speakers, and incorporating other less conventional science teaching activities that help students see the relevance of science and promote student interest in science and science careers. For example, one teacher said:

*The administration, because there’s fewer teachers, because they know each of us maybe a little bit better [than they would in urban schools], there’s a little more license yet they trust [us]...If I say, well I want to walk over to the forest today, and we’re going to need a little extra time, they know what’s going on in my classroom, and so they know my students, they know me...So the smaller schools offer more flexibility, and more trust, I think.*

Teachers identified this leeway as an offshoot of the structure and staffing model of rural schools including small class sizes and multiple-subject teaching assignments. Teachers indicated that this environment promotes positive teacher-student interactions, the second sub-category of benefits that
emerged from the data. Thirteen comments referenced the strong personal interactions with students that result from small class sizes and the opportunity to teach the same students over the course of multiple years. Participants reported that these structures enhance their ability to get to know students better, understand each student’s needs, and personalize each student’s learning. For example, a teacher said:

*There were students that I first had as 8th graders and I had almost every year until they were seniors. And so you can really grow with them and...get to know them and help them develop better than, you know, just having them for one year or something like that.*

For these teachers, prolonged student-teacher interactions and the opportunities to witness and be a part of students’ cognitive and social development enhance their persistence in rural STEM teaching.

The third category was comprised of comments related to the benefits associated with safe rural school environments. Three comments indicated that participants feel comfortable and safe in their schools, partly due to the fact that rural students are generally well-behaved and partly due to strong connections among teachers, students, parents, and administrators. An example of the comments was:

*I think the student body...they’re more aware of each other, and they pick up on when some students maybe are not acting as they normally would...the teachers, we know each other, the students know each other, and then...you add those two layers together, and I just think it makes for a much more aware environment.*

Turning to the challenges associated with rural school factors perceived by the participants, twenty-three comments discussed the negative sides of rural school teaching and staffing structures, environment, and administration; these comments yielded four categories: (a) rigid school structures and resistance to change, (b) poor student performance, (c) problems with school administrators, and (d) dissatisfaction with teacher salaries and benefits.

With regards to rigid school structures, all six participants agreed with the sentiment that it is often difficult to bring new or innovative science teaching approaches into rural schools. Although teachers reported having leeway necessary for curricular flexibility, they also noted that rural school structures often produce resistance to change. For example, a teacher discussed the difficulties she faced when she tried to incorporate an investigatory type of learning in her classroom. She said:

*[Investigative learning] was different than what the kids were used to, and it was a difficult thing for some parents to accept because...all of a sudden, grades went from As to not As, Cs, and of course it was all my fault because their child always got an A until they got me. So, you know, that can be challenging sometimes, and to try to explain that...we’re trying to teach more than just algorithms here, we’re trying to teach a way of thinking, and that was not always well-received.*

Second, eight comments referred to how the poor school performance of rural students may be a source of discouragement for teachers. Specifically, participants noted that in rural schools, where there are fewer high-performing students, it is often a challenge to get students motivated and interested in school and in STEM subjects. A teacher compared the performance of rural and urban students as follows:

*If you can get into a larger school district, an affluent school district, where the students are going to be more consistently high performing, there’s an attraction there for some teachers. Because...with the rural students, trying to get them to perform at the level they need to be performing at can be a real challenge; sometimes[school] holds no interest for [the students].*

Teachers also noted the challenges associated with modifying their STEM teaching to account for the underperforming students. Three comments referred to the challenges rural STEM teachers face in their attempts to differentiate their instruction to accommodate multiple ability levels in one classroom. One teacher said:

*The number of top students that you have is going to be different if you’re in a larger school...I could have two AP classes that are full of top-notch students, you know; 40 kids, 50 kids. But at a rural school, if I still have those two classes, I’m going to have the whole range, from students that are barely capable, to maybe one or two of those top students. It’s just quantity, you just don’t have the numbers, and so if you want to offer those high-level classes, your trade-off is you have to understand you’re going to have kids in there who maybe aren’t going to perform as high...and you might have to bring your teaching down a level, still trying to challenge those one or two kids.*

Although these teachers enjoyed the intellectual stimulation of teaching multiple science subjects at various levels, they also reported that they often have to devote a significant amount of time to class preparation in order to find ways to present their materials in a manner appropriate for students of varying ability levels.
The third category of challenging school factors identified by the teachers was problems with school administrators. Five comments referred to the politics and accountability issues that prevail in rural school districts. Regarding politics, one teacher mentioned the “politics and personal power plays” that occur in her school. Referring to how she interacts with her school’s principal, she stated, “I do my best to stay on her good side, but I know of teachers that…because of one reason or another…don’t end up on her good side, and they end up, you know, retiring, or they get the worst assignments.” In the same vein, the participants also discussed the downsides of administrator oversight. While some comments indicated that in rural schools, there is more accountability due to closer relationships with administrators, other comments indicated that because of the level of trust, there is little oversight. For example, one teacher offered the following description of oversight in her small rural school:

Our principal, he’ll will go through the motions, he’ll show up when it’s time for an evaluation, but I think he goes more on word of mouth for his evaluations, because it is small, he can just go on what’s coming in from the community, what he hears, and he may pop in if he’s heard questionable stuff just to check it out…but that’s about it…as long as nobody’s getting hurt, nothing’s really causing [worry] out there to have them check on you, they’re not going to come in either... [This] is because of that trust part, I think.

The fourth category comprised participants’ perceptions of rural teachers’ salaries and benefits. Participants indicated that they feel they are underpaid. Ten comments referenced participants’ belief that poor compensation of rural STEM teachers contributes to attrition. For example, one teacher articulated her frustration that despite having numerous responsibilities as one of the very few STEM teachers in her school, she felt that her work was not valued. She said:

It’s like we can give and give and give of ourselves to such a great extent, but yet, it’s not valued. We never give enough, and it’s not paid for...If it was being valued, at least in some respects, you can manage to do with less pay if you get an intrinsic value out of it, which I do, but, you know, there comes a point you feel like you’re just being taken advantage of.

These teachers reported that rural teachers always need to find intrinsic reward in teaching, or they would not be able to work so hard with so little pay. A participant illuminated this point when she stated, “If you don’t find that personal reward, then teaching’s not the place for you. You know, you have to be intrinsically motivated…it’s a mission field.”

Professional Factors

Overall, thirty-nine comments (34%) referenced professional factors of which twenty-eight referred to the professional benefits of rural teaching and fifteen focused on the associated challenges. Teachers’ discussion of professional factors focused more on rural STEM teaching in particular than rural teaching in general.

Twenty-eight comments referenced the professional benefits of teaching STEM subjects in rural schools, yielding four categories of professional benefits: (a) opportunities to teach intellectually stimulating science subjects, (b) opportunities to connect science topics to rural life, (c) opportunities for professional development, and (d) sense of satisfaction and job security. The first sub-category encompassed nine comments referencing opportunities to teach intellectually stimulating science subjects. Although some teacher comments referenced the heavier workload involved in teaching multiple science subjects, relatively more comments referenced its positive aspects. Participants seemed to prefer teaching varied subjects, as opposed to teaching the same subject all day. For example, a teacher compared her previous urban teaching experience to their current rural teaching experience:

The school where I taught for 12 years was a larger school, and even though I was trained and certified to teach AP courses, in 12 years, I only had a few opportunities to teach that. Now, at the small school where I’m at, I get to teach two different AP courses and...I wouldn’t have had those opportunities to teach those other classes at a larger school where you might have a larger teaching staff and somebody latches onto those classes and never lets go of them.

Participants also mentioned enjoying the intellectual stimulation associated with teaching multiple subjects for different student ability levels.

The second category consists of six comments regarding participants’ perceptions that the geographic environment of rural communities provides science teachers with various opportunities to connect STEM subjects to rural life. Participants reported that rural communities offer excellent opportunities for linking science to rural life (in particular, farming and agriculture) and opportunities for experiential or hands-on science learning. For example, a participant mentioned the opportunities to use concepts related to wind energy and the wind turbines located on farms in rural communities to explain mathematical concepts to rural students.
Ten miles down the road, we are surrounded by farm fields or the windmill farms, or the wind turbines. I mean, my kids see that all the time, and trying to make connections for them besides just all the algorithms that they do, just show that there is meaning and purpose in our immediate area.

Another teacher discussed taking her students to dairy farms and corn fields to illustrate science, math, and technology concepts.

I have a lot of students who are from farming families... So we were able to you know, bring that into the classroom, talk about ...what happens at your farm... where you grow corn primarily and so...with the science and math and technology, I think we can make it more real for the kids, because we can actually take it out into the field and say, look, here it is.

Thus, for these teachers, the opportunities to employ inquiry-based and hands-on activities to make science relevant to students are important professional factors that contribute to their persistence in rural STEM teaching.

The third category of professional gains cited by participants was the ample opportunities for professional development, to which ten comments referred. Contrary to the general perception that rural teachers have limited access to professional development opportunities and resources, participants discussed the ease with which they could access these resources. Participants opined that access to professional development opportunities is easier for rural teachers than for urban teachers. For example, one teacher compared her experience going from a rural to an urban school as follows:

[Working in a rural school] I wanted to go to everything and do as much as I could to make myself a better teacher, and it was always welcomed, and I could go to everything, because nobody [else] wanted to go to everything. They’re like, if you want to go to that, fine, we’ll send you. But then when I went to my bigger school, with a much larger staff...the financial resources aren’t the same, and so you are a bit more limited as to what you’re able to attend, and a lot of the cost burden is placed...on ourselves.

Participants also mentioned that there are special professional development opportunities tailored to rural teachers, including the opportunities to secure grants to help implement new programs in their classrooms. Teachers’ comments included

I’ve recently found a ton of advantages for professional development, [Particular Program] being one...This summer I’m in two others because of being from a rural school and teaching in these areas...There’s a lot of stuff out there that you can use and bring back to your classroom.

The fourth category of professional gains mentioned by the teachers included the rewarding aspects of teaching and a sense of job security. Four comments referred to the professional and personal gratification that comes from their contributions to the educational achievement of rural students and the wellbeing of rural communities including the feelings that they are making a difference in the community, witnessing students have “aha moments” and having a strong impact on students’ success. For example, one teacher said, “The aha moments...the, ‘I got it.’ That’s my favorite part.” With regards to job security, four of the six participants agreed that job security was a positive professional benefit that contributes to the retention of rural STEM teachers. Not only did the teachers find their work in rural schools to be professionally gratifying and enriching, they also derived comfort in knowing that their positions were stable. When asked why STEM teachers stay in rural schools, one teacher said, “Job security. In [big cities], there’s a hat with, you know, 1,000 names in it, and if you’re gone, you’re gone. But you know, I’m the only physics teacher at this school.”

The professional benefits notwithstanding, teachers also talked about the professional challenges that could inhibit their persistence in rural teaching. Largely, teachers’ discussions of professional challenges focused specifically on perceived hindrances to their professional growth, especially with regards to rural STEM teaching. Overall, fifteen comments referenced factors related to barriers to professional growth, yielding three sub-categories: (a) insufficient vertical and horizontal mentoring, (b) challenges associated with having to learn new material for multiple courses, and (c) lack of connection to university resources.

With regards to insufficient vertical and horizontal mentoring, six comments referenced the lack of guidance provided to new rural STEM teachers and the limited opportunities to collaborate with other STEM teachers in rural schools. Teachers noted that despite the vast array of professional development opportunities available to rural STEM teachers, they are often faced with barriers related to insufficient vertical and horizontal professional mentoring, including insufficient opportunities for peer-peer interactions and collaborations. For example, a teacher spoke of the difficulties of teaching on an emergency license with little prior preparation or guidance.

My first year, they actually called me, the principal at that school knew I was finishing up,
so...I hadn’t student taught, I hadn’t taken a methods class, I just got an emergency license, and so, and it was a week before classes started. So, you know, it was baptism by fire, it really was. I needed to talk to people...and I just really needed a sounding board, and I didn’t get that.

Participants reported that even teachers who are not new to teaching often need “sounding boards” as well. For example, another teacher stated, “It’s hard to bounce off ideas, like say you’re thinking of doing something in the class, and you want somebody else to see how they think that would go…you don’t have that if you’re the only one in your area.

The second category was comprised of three comments indicating the challenges associated with having to learn new material for multiple courses or having to teach courses on a rotating basis. While teachers recognized that having diverse science teaching responsibilities can be intellectually stimulating for them, they also complained that it can become time-consuming. For example, a teacher talked about teaching something new every year. She described the experience by saying, “About the time you get your groove going, it’s time to quit.” Another teacher added that having multiple teaching responsibilities can be difficult, especially for teachers with many family responsibilities, as well. She stated, “Especially young teachers with young families, in a rural school, I would see where it would be very difficult to try and manage all the different preps, and raising a young family.”

The third category of barriers to professional growth that emerged from the data was lack of connection to university resources. The teachers reported that the geographic isolation of many rural communities often results in limited access to curricular and research support and resources from universities, and lack of connection to university researchers. Specifically, six comments referred to the relative disadvantage of participants’ school districts in terms of access to special programs, equipment, and other resources offered by universities. For example, one teacher noted, “Some of the teachers from the larger schools have had special advantages over the teachers who come from smaller schools, and it’s like, why can’t we have those advantages because we have less resources or less access to resources than some of these other teachers.”

Discussion

The current study uses qualitative data from a focus group session conducted to solicit information regarding six rural STEM teachers’ perceptions of the factors related to their persistence in rural teaching.

We believe that the findings can serve as groundwork for a holistic view of the experiences and persistence of rural in-service teachers in general and rural STEM teachers in particular.

Overall, the participants discussed the positive and negative aspects of three key factors influencing their persistence in rural teaching: community interactions, professional development, and rural school structures. Clearly, it would be an oversimplification to conclude that features of rural teaching fit neatly into categories of benefits and challenges. Rather, it is apparent that in several instances, there are two sides to each of the identified factors. The data showed that the same factor often poses both benefits and challenges to rural teachers.

Perhaps most notably, the study revealed how the close interpersonal relationships and social connections found in rural communities and rural schools can enhance or inhibit persistence in rural teaching. Consistent with social capital theory (Coleman, 1988), our findings suggest that strong social networks in rural communities engendered a sense of trust but also threatened teachers’ reputations when their actions were inconsistent with community norms. Participants indicated that parents felt safe leaving their children with them, and allowed them to use some unconventional teaching strategies like taking students onto farms to see the relevance of science in their lives. On the other hand, several participants described the ripple effect of having a bad experience with one student impact their reputation in the larger community; in this situation, teachers indicated that they would likely have the student and/or their siblings and friends in future classes, and possibly contend with the community assuming that one bad experience makes them poor teachers.

Our results are also consistent with the concept of multiplex relations. Our findings indicate that rural STEM teachers play multiple roles in their communities such as neighbors, fellow parents, church members, etc. These multiplex relations enhance communication and interactions with students, parents, other teachers, administrators, and community members, thus enabling teachers to form partnerships and develop a sense of trust. On the other hand, our participants also indicated that because community members knew them outside of school, they were “basically on call 24 hours a day, seven days a week,” leaving little separation between personal and professional life. Thus, communication and obligations are two sides of the multiplex relations coin.

With regards to rural teaching in general, these findings are not significantly different from what has been documented in previous research studying rural
introducing them to influential people who can serve as resources. One participant mentioned that offering housing benefits, such as down-payment or rental assistance, could help immerse new teachers in the community. Moreover, all of our participants felt comfortable with working in rural schools due, in large part, to growing up in small towns or rural communities. Therefore, those whose life experiences have shaped realistic expectations for working in rural communities may be better prepared and have increased chances of retaining their teaching appointments. Yet even STEM teachers who have never lived in rural areas can be successful with enough intrinsic motivation and proper guidance on how to assimilate into the community.

Beyond the social factors described above, other challenging and beneficial aspects of rural STEM teaching point to factors related to attrition and retention. Numerous responsibilities such as teaching multiple courses to multiple ability levels, combined with insufficient mentoring, lack of administrative oversight, and insufficient pay, can understandably take a toll on rural STEM teachers. Offering rural STEM teachers more preparation time may help them to manage their multiple responsibilities. Regarding the challenge of insufficient mentoring, rural schools may need to offer networking opportunities with other rural districts in the county, thus allowing for collaboration that would otherwise be impossible with so few STEM teachers per rural school. Furthermore, our results indicate that low salaries create not only financial stress to rural STEM teachers, but also give them the sense that they are not valued. Indeed, compared to their peers in towns, suburban areas, and cities, rural teachers earn less pay, even after accounting for differences in cost of living (NCES, 2007). Monk (2007) suggested that raising teacher salaries or offering benefits such as interest-free loans could help to solve the problem, but could be too costly for rural schools with no guarantee of effectiveness. Working to ameliorate the underlying concerns of rural STEM teaching, highlighting the benefits, and helping teachers to feel valued in other ways may be more plausible.

Indeed, our results suggest that there are many factors that could help to sustain rural STEM teachers in their teaching positions, including the job security inherent in working in rural schools with few STEM teachers, comfort and safety within rural school environments, and the personal gratification they derive from contributing to their communities and helping students to see the connections between science and rural life. Therefore, teacher educators are encouraged to explicitly train pre-service and in-service teachers in how to capitalize on the benefits and manage the challenges of teaching in rural communities. Ultimately, preparing creative,
innovative STEM teachers to implement relevant, experiential curricula in rural classrooms can have a tremendous impact on the educational attainment and STEM aspirations of our nation’s rural youth.

Conclusions

This study used a phenomenographical framework to explore six rural high school STEM teachers’ experiences of teaching STEM subjects in rural schools. Three major categories emerged: strong interpersonal relationships and community ties, school factors, and professional factors. Teachers discussed both positive and negative aspects in each of these categories. In many cases, the same factor emerged as both a benefit and a challenge, suggesting that some aspects of rural STEM teaching could be perceived as “double-edged swords.” The positive aspects of rural STEM teaching help to explain rural STEM teacher retention, whereas the negative aspects help to explain teacher attrition. Therefore, multiple recommendations were made for rural school districts to help STEM teachers to capitalize on the benefits and manage the challenges of rural STEM teaching.

A limitation of this study is the small sample size consisting of six rural in-service teachers from Indiana. Indiana teachers may differ from teachers employed in other rural settings. Our participants were also unique in that they were all participating in a professional development program aimed at infusing advanced science topics into their high school STEM curricula. Therefore, compared to rural STEM teachers not participating in the program, our participants may have had greater access to professional development programs and special interests in using non-traditional approaches to rural science instruction, thus influencing their perceptions of rural STEM teaching. Hence, our results cannot be generalized beyond the scope and context of the study.

Future research may examine rural STEM teachers’ experiences using a larger, more diverse sample size. Additionally, researchers may use qualitative methodology to compare perceptions of current rural STEM teachers and former rural STEM teachers who decided to leave rural areas or the teaching profession as a whole. Such research efforts may contribute a different perspective of rural STEM teacher attrition and retention than was explored in our study.

References


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Exploring Rural Contexts with Digital Storytelling

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This article describes rural middle school students’ exploration of their identity and their rural contexts through the vehicle of digital storytelling. Participants included 40 7th and 40 9th grade students at two rural schools in the Southeast United States. Students worked in shared writing groups to create digital stories expressing their views on teen life in a small, rural town. The resultant stories were analyzed using comparative grounded theory yielding some themes which may be posited as unique to a rural population while other themes were typical of the developmental age regardless of geographical context. Study findings indicate that the rural nature of the participants’ communities had a significant impact on their identity formation and understanding of community. This study supports students’ use of technology to promote exploration of identity within geographic and sociological settings.

Keywords: digital writing; new literacies; place-based education; rural education

Rural schools occupy a unique sociological and historical niche in American education and represent the centers of their communities. These schools offer a place for social interaction and community renewal reproduction; they create a shared local identity and sense of place (Nitta, Holley, & Wrobel, 2010; Schaft, Alter, & Bridger, 2006). Rural schools can unify the community and provide a sense of identity; they may work to build pride and a sense of place creating a more connected, thriving community. In this way rural schools are uniquely positioned to promote student identification with their community. However, rural schools may also alienate students from their surroundings by reinforcing negative stereotypes associated with rural communities and promoting the idea that leaving the community is the best path forward for those with the ability to do so (Corbett, 2009).

Unfortunately, education in these rural communities is often premised on a philosophy of loss. Kelly (2009) states:

Rural places, now more than at any other point in history, are places of great loss—of people, natural resources, and, often, as a result, any vision of long-term viability. In such places, loss as a persistent condition of life is vividly felt. (p. 2).

Indeed, Corbett (2009) argues that formal education is “designed for those who leave” (p. 1), and this may cause significant tensions for students and families in these communities (Hardrée, Sullivan, & Crowson, 2009).

This study examines the use of digital storytelling with rural middle school students to promote their identity development and examination of community contexts (Corbett, 2009; Gruenewald, 2003).

Participants engaged in a shared authoring project where they created digital stories in small groups. These stories were then analyzed for themes, particularly those themes unique to rural contexts.

Thus, the significance of this study is in considering the students’ unique perspectives as they worked to define who they were within their rural contexts and what those rural contexts meant to them. This paper examines issues associated with rural contexts and student identity development and describes the application of digital storytelling to support rural middle school students’ exploration of identity and community.

Education in Rural Contexts

The term rural is being used in this study in alignment with the definition provided by the National Center for Educational Statistics (2007) publication Status of Education in Rural America. This document classifies communities as city, suburb, town, or rural with each context having several subcategories. The rural classification is defined by proximity to an urban-sized area and contains three sub-categories (fringe, distant, or remote) based on census data. The schools taking part in this study were classified as distant rural and remote rural. Distant rural communities are located more than 5 miles but less than 25 miles from an urbanized area. Remote rural communities are more than 25 miles from an urbanized area.

Despite the significant presence of rural schools in the national demographics, little research exists exploring education in rural contexts. While more than a third of all public schools and one-fifth of all students are considered rural (National Center for
effects of consolidation may include increased the form of decreased funding and resources. Specific profound impact on remaining students and families in unity (Graves, 2010). Consolidation can have and identification resulting in a loss of community schools may cause communities to lose sense of place small, rural communities. The consolidation of rural school consolidation is a very real threat in many populations as the “other” (Corbett, 2009; Kelly, 2009). In this way, education works to functions independently of the place where it is implemented. In this way, the work of education must consider and reflect the local contexts of the school. This approach to education is experiential and aligns curriculum and assessment to location (Corbett, 2009). Educators are challenged to reflect and to connect their instructional work to the places and spaces where they practice or “inhabit” while using strategies aligned with constructivist and democratic practices (Gruenewald, 2003).

Finally, while the local aspects of place should be used as a basis for education, an approach that focuses solely on local contexts in a manner that overinflates the local community (e.g. “our town is the best”) can be just as damaging as an approach that promotes disassociation from place. A naïve perspective on community can result in a passionate attachment to place which may lead to unexamined myths about ‘a way of life’ and an unquestioned acceptance of social hierarchies. This view of community is no more liberating than disassociation or an attitude of resignation toward leaving (Kelly, 2009, p.3).

In other words, the rural community must not be idealized and inflated in the minds of the learners.
Rather, it must be analyzed critically and considered realistically.

**Student Identity Development**

Adolescents are occupied by attempts to define identity (Erikson, 1979; Kroger, 2003, 2006; Meeus, Iedema, Nelson, & Volleber, 1999). In this case, the identity formation process is defined by the rural contexts of the students involved. As these students actively engage in the search for their identity, they seek independence and an identity separate from their family, and perhaps community, context. Students may “try on” different identities, take part in different activities, and assume different behaviors. In addition, the peer group becomes the most important reference point, and adolescents may connect with different friends and peer groups as they attempt to define “who they are” in relation to others around them. Part of this process includes formulating a philosophy of life. Often these philosophies are based on ideals rather than a sense of concrete reality. Thus rural students may seek to experiment with or “try on” identities different than those of their lived experiences.

Those students who receive support and encouragement in the identity formation process will successfully establish a strong sense of self. They will become independent and will develop a feeling of control over their actions and options. Those who are not able to successfully navigate this stage of development will remain insecure and confused about themselves and the future (Erikson, 1979).

Regardless of environment, students’ attempts to define identity are impacted by their school and community environments. Students moving through this stage in rural contexts may feel pride and a close sense of identification with these settings (Kelly, 2009). On the other hand, they may feel disassociated or unconnected from their rural surroundings (Corbett, 2009) and may attempt to redefine themselves using some real or perceived indicator of a more suburban or urban environment. For example, a student may attempt to take on an identity like goth or emo – identities that have their origin in urban cities. Conversely, those students who enthusiastically assume the rural identity may be forming an unexamined, zealous attachment that may limit opportunity and perspective (Kelly, 2009).

The process of adolescents’ identity formation that involves self, social, and environmental identities strongly connected to place is aligned with the tenets of place-based education (Gruenewald, 2003). Yet this process may also work to position individuals differently within the rural context and potentially lead to tensions and resistances. Corbett (2009) found that social class and gender did influence students’ specific socio-spatial identities within their rural community in terms of access to resources and likelihood of remaining in or leaving the community. Those with the ability to leave may feel compelled to do so, while those who stay are somehow viewed as deficient or incapable of “making it” in the world outside their rural community (Corbett, 2009). Students may align themselves with and against each other based on these views, which further impacts their identity formation process.

**Technology in Rural Contexts**

While minimal educational research focuses on rural contexts (Hardré, Sullivan, & Crowson, 2009), even less of this research focuses on the use of technology in rural school contexts (Miller, 2010; Schaft, Alter, & Bridger, 2006). Furthermore, few studies focus on using technology to promote student exploration of identity within their geographic and sociological settings (Corbett & Vibert, 2010).

Rural communities also are associated with uneven educational development and opportunity, particularly in the face of globalizing influences brought about by technology advancement (Gruenewald, 2003). In school contexts, technology is seen as a source of necessary 21st century literacy skills regardless of income, language, or geography. Rural schools can use technology to provide students with options, experiences, and resources equivalent to their urban and suburban counterparts (Hawkes, Halverson, & Brockmueller, 2002; Miller, 2010; Schaft, Alter, & Bridger, 2006). Technology can be used to promote students’ critical analysis of a topic and to support students’ expression of their own perspectives and voice.

Encouraging students to explore identity with a conscious and critical awareness of their rural contexts may aid their development of identity and voice (Corbett & Vibert, 2010; Wood & Smith, 2010). Technology can be used to support students’ analysis of identity and community to allow for greater perspective in comparing rural contexts to other environments; this may work to reduce bias and stereotype and/or idealization of one context over another (Kelly, 2009). Technology can also be used by students to express their perspective and as an outlet for student voice. For these reasons, and given the research of Corbett (2009) and Gruenewald (2003) on place-based education, technology was seen as central to this study and a source of relevance to the field.
Digital Storytelling

Digital storytelling is one form of digital writing and was chosen as the vehicle for the students’ exploration of identity and context in this study. Whereas digital writing encompases all forms of writing supported by technology (e.g., tweeting, blogs, social networking, word processing), digital storytelling is a specific digital writing application. The final product of this type of writing is a digital story – in essence, a small movie containing still images, voiceover narration, and music if desired (Center for Digital Storytelling, 2010). Digital storytelling, then, is the act of writing and producing the digital story.

In digital storytelling, the writer weaves narrative, images and audio together using common, technology-based platforms (Center for Digital Storytelling, 2010). Educators view digital storytelling as a powerful means for promoting literacy with adolescents (Ohler, 2008) as these learners are surrounded by visual and media influences that work to predispose and motivate them to digital writing (DeVoss, Eidman-Aadahl, & Hicks, 2010; Kajder, 2010).

Digital storytelling has been recommended as a vehicle for teaching skills in multiple content areas and in multiple literacies (O’Brien, & Scharber, 2008). As such, digital storytelling is one means of promoting a place-based or place-conscious curriculum which allows students to explore identity and community through technology supported literacy. Gruenewald’s (2003) place-based education approach aligns with the New Literacy Studies which positions literacy as a socially situated practice (Cope & Kalantzis, 2000; Gee, 2000; New London Group, 1996). In this perspective literacy is defined as something broader than traditional print-based media and instead looks at the variety of expressive and communicative means available and allows students to explore that which defines them socially, culturally, and emotionally.

Research Questions

The research questions for the study are:
(a) What factors influence rural adolescents’ perceptions of identity as revealed in their digital stories?
(b) What factors influence rural adolescents’ perceptions of their communities as revealed in their digital stories?
(c) How does rural adolescents’ use of technology support their examination of identity and context?

Method

This study used a qualitative research paradigm in seeking to understand the meaning-making efforts of the participants. A qualitative approach is well-suited to examining a topic where little research has previously been conducted or where the researcher does not know the important variables to examine (Creswell, 2002). The views of rural adolescents of their identities and contexts have received modest attention in the research base, and this makes qualitative inquiry an apt fit for this research study.

In this phenomenological approach, information is gathered first-hand through personal interaction with the participants. Underlying assumptions in this approach are that knowledge is socially constructed through interaction within a community and that individuals seek to make sense of their world through experiences and interpretation.

Data gathered through these interactions is interpreted through induction and is, in part, shaped by the researcher’s own experiences and background (Bogdan & Biklen, 2003; Creswell, 2002). The researcher’s role in this type of research is to have sustained, intensive engagement with the participants. In this study, engagement occurred as the researcher supported the students in crafting and refining their stories. Due to the fact that the researcher is implicitly involved in the research process, the act of interpreting the resultant data may include biases, values, and interests from the researcher’s own “personal, cultural, and historical experiences” (Creswell, 2002, p. 9). When possible, these personal perspectives are indicated in the results and discussion sections of this study.

Specifically, this study employed a grounded theory methodology wherein theory is generated or “grounded” in the views of the participants (Bogdan & Biklen, 2003; Glaser & Strauss, 1967; Strauss & Corbin, 1990; Strauss & Corbin, 1994). In this approach, theory is derived from the views of the participants in the study through multiple stages of data analyses involving coding, refinement, and interrelationship of categories within the data which are constantly compared to the emerging categories of reveal patterns and themes leading to hypothesis formation. The goal of this type of research is to focus on the participants’ views which are collected in the form of open-ended, emergent data (Creswell, 2002); the emergent data collected in this study were the narratives created by the adolescents in forming their digital stories. The multiple meanings provided by the individual participants’ experiences, defined by historical and cultural norms, lead to a theory or pattern.
Participants

Participants in the study included eighty 7th and 9th grade students at two rural schools. Forty of the participants were 9th grade students attending a mid-sized rural junior high in one Southern community. This group participated in the project in late spring 2009. Forty of the participants were 7th grade students attending a small rural middle school in a second Southern community. This group participated in the project in fall 2010.

Participants at the first school included 21 females and 19 males ranging in age from 14 to 16 years. Eleven of the students were of Hispanic or Latino ethnicity with two identified as English second language learners; 29 participants were Caucasian or White/non-Hispanic. Twenty-one of the participants were eligible to receive free or reduced price lunch. Seventy-three percent of the participants at this location had achieved proficient or advanced on their yearly, state-mandated benchmark exams in literacy. None of the participants were identified as having a disability that would interfere with their ability to take part in this project.

Participants at the second school included 22 females and 18 males ranging in age from 11 to 13 years. Three of the students were of African-American descent; the remaining 37 participants were Caucasian or White/non-Hispanic. Within this participant pool, there were no identified English language learners. Twenty-three of the participants were eligible to receive free or reduced lunch. Sixty-two percent of the participants at this location had achieved proficient or advanced on their yearly, state-mandated benchmark exams in literacy.

The age of student was particularly relevant for inclusion in this study due to their need to explore issues of identity in relation to their stage of development. These students’ exploration of identity was seen as intertwined with their local contexts thus providing a window into these learners’ unique experiences and perspectives in their rural communities.

Participants were selected as they were enrolled in their required English coursework at their respective schools. Both teachers involved in the study felt that their students needed an authentic, expository writing experience and felt that the end-product of the digital story would motivate students to write. Authentic writing is defined as writing with a real audience and purpose in mind – not writing for a contrived reason (i.e. for testing purposes) or for a limited audience (i.e. the teacher, test reviewers). An authentic audience is comprised of people genuinely interested in the writing topic who will be likely to listen, respond, and attach value to the writing.

Based on discussions with the teachers, it was clear that neither student population had previous authentic writing experiences in these classrooms. The literacy curriculum at both schools was largely driven by the state-mandated frameworks and testing requirements focusing primarily on grammar instruction, vocabulary, comprehension strategies, and responding to writing prompts. Understandably, both teachers had focused their writing instruction on benchmark exam preparation where students wrote to contrived prompts for an audience of the teacher and unknown test reviewers. This is aligned with the findings of Corbett (2009) and Gruenewald (2003) who warn against the limiting influence of standardized curriculum and accountability in education.

The two schools were located in communities approximately 75 miles from each other. The first community was identified as a remote rural school (more than 25 miles from an urban area); the second community was identified as a distant, rural school (more than 5 and less than 25 miles from an urban area) (National Center for Education Statistics, 2007). The socioeconomic profiles of both districts indicated that over half of the student population was eligible for free or reduced lunch status.

These schools had limited technology available to the students. A technology survey completed by the classroom teachers showed that each classroom included only one master classroom computer with internet access and a classroom smart board. The teacher at the first school site used the smart board to project the daily bell ringer, to diagram sentences, and to project workbook pages. The teacher at the second school did not use the smart board regularly in the classroom. Neither school offered a technology curriculum; however, participants at the second location were required to take a keyboarding course. Neither teacher involved in this study had previously used technology to support their students’ literacy efforts due to a reported lack of resources and professional support.

Research Design

Participants at both locations were led through an identical process overseen by the researcher. The adolescents in the study were guided to create a digital story exploring their lives as teens in the rural south. The teachers’ and researcher’s role in the process was to guide and provide support.

On the first day of the project, students were placed into heterogeneous groups of 4-5 students, predetermined by the classroom teachers. The group structure was chosen by the researcher and teachers for two reasons. First, the use of groups supported the
idea that knowledge is socially constructed. The researcher and teachers felt that the group structure would promote diversity of viewpoint and opinion. The process of negotiating the story within the group would also require students to fully explore and analyze the content they chose to include and the structure of their stories. Second, since access to technology was limited, it was felt that groups would be a more efficient way to approach technology integration.

The groups were monitored closely by the researcher and teachers for group processing. It was important to all involved in the project that the students handle as much of the process as independently as possible. Groups wrote contracts on the first day of the project delineating each member’s roles and responsibilities. The group members also peer-evaluated each other at the conclusion of the project, and the peer-evaluation rubric was shared on the first day as well. Conflicts among the group were expected to be mediated by the group members with the researcher and teachers called into assist when needed.

To begin the process, the participants were then given the prompt: “If you could tell the world about what life as a teenager in (name of town) is like, what would you tell them?” Participants were provided with chart paper and markers and supported in the brainstorming process. The groups also were told that the final day (day 6) of the project included a public showing of their work, thus establishing the identity of an authentic audience. The students were also shown several examples of digital stories so that they would understand the goal of the end product.

On the second and third days of the project, student groups were invited to refine their initial brainstormed ideas and to start a rough draft of their story script. Again, they were given large chart paper for brainstorm maps and their initial drafts. This part of the process was the most labor-intensive as the student groups had to negotiate and navigate the group process in order to write the drafts. The initial drafts were hand-written due to the lack of available technology.

On the fourth and fifth days, the students added images, voice, and music into their digital story. Groups staged and photographed their own visuals with the use of digital cameras and their phones. Alternatively, they found images on the internet which they emailed to the researcher for approval and inclusion. Students also began to rehearse their scripts and to search for appropriate music for inclusion.

Note that the teachers and researcher introduced the concept of visuals and audio late in the process as they felt that introducing these components too early in the process might distract students’ from the writing process. Introducing visuals and audio later in the process also compelled students to revisit their stories for further development and revision.

Beginning on the sixth day, with the assistance of the researcher, the students began to build their stories in Microsoft Photostory 3. Some students worked in small groups with the researcher while other groups continued to revise and edit their writing. Both sites used only one laptop containing a copy of Microsoft Photostory 3. The researcher sat with the student groups showing them the software and aiding them in their design and production of the stories.

Finally, students at both locations held viewing parties showcasing their work to their peers, administration, teachers, and parents. This event was always a planned aspect of the curriculum and used as a way to communicate to participants the idea of an authentic audience. Eighteen stories were produced across the two school sites – nine at each location.

Data Analysis

Qualitative research focuses on describing rather than explaining an event or situation. Researchers using qualitative approaches make interpretations and form a conceptual schema based on their observations of the data (Bogdan & Biklen, 2003). Grounded theory, sometimes called comparative grounded theory, is a qualitative method that emphasizes the generation of theory from data in the process of conducting research. This approach requires the researcher to analyze data through four stages: coding, creating of concepts (groups of similar codes), creating of categories (groups of similar concepts), and developing theory generation or explanation (Glaser & Strauss, 1967; Strauss & Corbin, 1990; Strauss & Corbin, 1994).

The patterns noted in the data lead to the identification of general concepts about the observed phenomenon. These concepts contribute to identification of broader theoretical positions that can be replicated and/or tested through comparison with other groups. According to Glaser and Strauss (1967), theory generation does not require a large number of cases; rather, the researcher’s task is to develop a theory from the data that are collected on the relevant behavior. Thus, the small population size in this study is conducive to this methodology.

The validity of qualitative research is important to verify and should be considered to substantiate the accuracy of the findings, particularly as the act of interpreting the resultant data may be shaped by the researcher’s background and how the researcher is positioned in the research. In this case, the study findings were corroborated through the use of rich, thick description in an attempt to convey the focus of
the study and the essence of the participants’ perspectives around the central topic. Included in this description is mention of any bias the researcher brought to the study. This strategy provides a framework for others interested in transferability and comparison. In addition, a peer reviewer experienced in narrative inquiry was used to verify the research design and findings (Creswell, 2002). Using these strategies supports the credibility and dependability of the data findings.

Data Sources

The student-produced digital stories were the sole data source for this study. The students’ stories were analyzed using grounded comparative analysis describing reoccurring codes, concepts, and categories. Initial themes were established during the first and second combings of the transcripts. All statements that did not fit the initially-defined themes were examined in a third combing of the scripts; they were either incorporated into an existing category or a new category was created for their placements. The scripts were examined two more times by the researcher to eliminate errors in the coding and to combine or collapse existing concepts and categories into broader or more clearly defined categories.

An objective rater, a literacy education specialist, checked the scripts and codes to establish inter-rater reliability. The researcher and objective rater used joint-probability of agreement to examine the data with the benchmark of 100% agreement.

Procedures

The initial thematic coding of the student stories involved 329 separate idea units (120 from the first community and 209 from the second community) which were assigned numeric codes. The stories were coded for discrete idea units: a clause including any verb and the elements that cluster with it (Gee, 2005). Each idea unit received a numerical, coded assignment. Coded idea units were grouped into concepts and, subsequently, into categories. For example, the first code to emerge from an idea unit was related the importance of sports in student role identification - “I play football;' this idea unit received a numeric code of “1”. Any subsequent idea unit that mentioned football in relation to role identity also received a code of “1”. Other idea units that mentioned sports received separate codes and were identified as related concepts.

The 329 separately coded idea units were collapsed into fifteen dominant concept families. For example, all sports-related idea units were grouped into a concept family labeled “sports and identity.” Finally, the concept families were grouped to reflect larger categories. In this instance, “sports and identity” was placed under the “facts about teenagers” category.

Four categories emerged from the coding of the data: facts about teenagers (8 concept families, 21 codes); facts about friends and peers (2 concept families, 2 codes); facts about the school (2 concept families, 6 codes); facts about community (2 concept families, 4 codes). These categories were aligned with the project prompts provided to the students as a catalyst for student brainstorming and may reflect a bias of the researcher in designing the study and interpreting the results.

A simple percentage was calculated to represent the number of comments made within each category and to the number of overall comments. The data were also disaggregated in order to assess any differences between sites keeping in mind that even rural communities cannot be regarded as uniform (Corbett & Vibert, 2010). There were no significant differences between the population groups in the coding. Thus, further discussion of community differences will be limited.

Codes seen as rural were noted by the researcher in the data coding process based on the bias of the researcher. The researcher felt secure in identifying “rural” themes based on extensive teaching experiences in both rural and urban settings. While the researcher does not wish to be reductionist in labeling certain markers as “rural”, these markers may yield greater insight into the identity formation of rural adolescents.

Findings

This section contains data about the categories, concepts, and codes, with specific examples detailed in tables 1-5. The subsequent discussion section will analyze themes and categories unique to these adolescents’ identity exploration within their rural environments. As shown in Table 1, four categories emerged from the coding: (a) facts about teenagers/role identification -62%, (b) facts about friends/peers - 12%, (c) facts about school - 20%, and (d) facts about community - 12%. 

29
Table 1
Thematic Categories, Concepts, and Codes

<table>
<thead>
<tr>
<th>Categories</th>
<th>Concepts</th>
<th>Codes</th>
<th>Total Comments</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facts about Teenagers</td>
<td>8</td>
<td>21</td>
<td>203</td>
<td>62%</td>
</tr>
<tr>
<td>Facts about Friends</td>
<td>2</td>
<td>2</td>
<td>39</td>
<td>12%</td>
</tr>
<tr>
<td>Facts about School</td>
<td>2</td>
<td>6</td>
<td>67</td>
<td>20%</td>
</tr>
<tr>
<td>Facts about the Community</td>
<td>2</td>
<td>5</td>
<td>40</td>
<td>12%</td>
</tr>
</tbody>
</table>

Facts about Teenagers and Role Identification

The category that received the most comments in the digital stories reflected the adolescents’ attempts to describe their identity as teenagers. Sixty-two percent of all comments fell in this category with 8 concept families and 21 distinct codes. Prevalent concepts in this category included: recreational activities, role identification, use of technology, friends and family, food, and pets/livestock (see Table 2). These comments overwhelmingly represented the participants’ attempts to identify, define, and explain their identity for themselves, for their peers, and for a larger external audience. This effort to define ‘self’ is aligned with the developmental needs of this age of student (Kerpelman, Pittman, & Lamke, 1997; Kroger, 2003, 2006; Meeus, Iedema, Helson, & Volleberg, 1999).

Recreational activities that defined what teens do made up 26% of the overall comments in this category. These activities focused on what teens did for fun and included sleeping, watching TV, listening to music, going to the movies, shopping, and participating in outdoor activities (hunting, fishing, 4-wheel driving). These activities also were heavily couched in relations and communications with their peer groups as many of these activities involved interacting with their friends – e.g., going to the movies with friends. The researcher’s observational notes indicated that the activities participants mentioned correlated with gender divisions; males noted outdoor activities as important and females noted movies and shopping as their preferred recreation.

After recreation, the next prevalent theme emerging from the data in this category was role identification (22% of all comments in this category). These comments included participants’ references to themselves in relation to an identity definition. In this theme, labels abounded (e.g., – jock, redneck, goth, cheerleader, smart kid, in the band, play softball). Note that some labels are rural while others reflect a more urban vibe; this will be explicated in the discussion.

Technology was the next dominant category with 21% of all comments reflecting these adolescents’ use of various technologies. The comments discussing technology largely focused on use of technology for social networking. These teens saw themselves as technology users with technology being a large part of what teens do and who they are. They noted the importance to their lives of texting, using the internet for research, using facebook, and gaming. Texting friends was the leading code within this category carrying 48% of the technology related comments overall. The next categories to emerge from the data were the teens’ recognition of friends (10%) and family (4%) in their work to define identity. The mention of friends in this regard was coded differently than the participants’ comments describing friends and peers (discussed in the next category). Comments in this concept family focused on adolescents’ needs to connect with friends and family as part of what teens do (e.g., hang out, talk on the phone, text, spend time with friends) and who they are. It was not surprising that mention of friends was more prevalent than mention of family. This is in fitting with the research on teens and identification with peer groups regardless of the environment (Kroger, 2003, 2006; Meeus, Iedema, Helson, & Volleberg, 1999).

Food was the next dominant concept with 7% of comments in this category. Here participants noted eating and eating with friends as something teens do. Finally, mention of pets/livestock was a strong concept in the coding (5%) with the participants mentioning animals in relation to their identity (e.g., I ride horses, llamas are my favorite animal) and making note of animal-related chores as part of what teens do (e.g., we check chickens for eggs).
Table 2
Thematic Categories, Concepts, and Codes Reflecting Facts about Teenagers

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Code</th>
<th>Example Coded Statements</th>
<th># of Occurrences</th>
<th>% in Category</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recreation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Families</td>
<td>Sleep</td>
<td>We like to sleep</td>
<td>3</td>
<td>26%</td>
</tr>
<tr>
<td></td>
<td>TV</td>
<td>Mostly we watch TV</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Music</td>
<td>Most of us rock out to music</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Movies</td>
<td>We like going to the movies</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shopping</td>
<td>You can shop at Wal-Mart</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Outdoors</td>
<td>On weekends, we hunt deer, dove, and turkey if the seasons are open</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>We also do a lot of your four-wheeling</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>We do dirt bike racing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>We like to read</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>We do chores</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Role</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identification</td>
<td>Sports</td>
<td>I am a jock</td>
<td>27</td>
<td>22%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The sporty kids rule</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preppy cheerleaders are the best</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td>There are some kinds in the band</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Some kids are into art</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Smart”</td>
<td>There are smart kids</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>You can participate in G.T.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>There are cool kids</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>There are rednecks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>There are wimpy kids</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I am a goth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Texting</td>
<td></td>
<td>We like to text</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cell phones are genius</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>My phone is on vibrate so I can text</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td>Internet</td>
<td>My favorite internet site is Facebook</td>
<td>12</td>
<td>21%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>We also get on Twitter</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Facebook</td>
<td>There is this thing called Facebook</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>You can post everything you do</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gaming</td>
<td>We play computer games with our friends</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>We like to surf the internet</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>Friends</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Friends</td>
<td>We like to hang out with our friends</td>
<td>20</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>We talk on phones to our friends</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teens text their friends</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family</strong></td>
<td>Family</td>
<td>We spend time with family</td>
<td>8</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Food</strong></td>
<td>Food</td>
<td>Most of us stuff our faces with food</td>
<td>14</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After school, we go to Sonic</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pets/Livestock</strong></td>
<td>Pets/ Livestock</td>
<td>Before school, we check chickens for eggs</td>
<td>10</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I ride horses</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Llamas are my favorite animal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I have 11 dogs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Other</td>
<td></td>
<td>12</td>
<td>6%</td>
</tr>
</tbody>
</table>

**Facts about Friends/Peers**

The theme of *hanging with friends* should be cross referenced as closely related to the previous category of facts about teenagers and their role identification, particularly in relation to the *recreation* and *technology* themes given above. Interestingly, this category yielded the lowest number of coded comments when not cross-referencing friend relationships in terms of defining identity. In their more general comments, the participants merely noted that they had friends who they considered *strong and good* as opposed to peers who caused *a lot of drama* (see Table 3). Mention of peer pressure...
was also included in this category as co-mingled with the peers who caused drama. This finding is aligned to research indicating that the peer group is a source of conflict for teens and is central to identify formation regardless of geographical location (Reed & Rossi, 2000).

Table 3

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Code Families</th>
<th>Examples of Coded Statements</th>
<th>Total: Rate of Occurrence</th>
<th>% within Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friends</td>
<td>Friends</td>
<td>When it comes to friends, some of us are kind, caring, and nice Some friends are funny, shy, outgoing, and smart</td>
<td>26</td>
<td>42%</td>
</tr>
<tr>
<td>Peers (not friends)</td>
<td>Peers (not friends)</td>
<td>There are people who cause drama A lot of us are rude, disrespectful Some people stab their friends in the backs In school, there is a lot of peer pressure When you become a teen, there is a lot of drama, heartache, no money, and gossip</td>
<td>13</td>
<td>68%</td>
</tr>
</tbody>
</table>

Facts about School

Participants also shared their thoughts on school. Comments in this category fell into two broad concepts: positive comments and negative comments with six codes emerging related to sports, teachers, school spirit and culture, curriculum, rules and regulations, and food (see Table 4).

Table 4

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Code Families</th>
<th>Example Coded Statements</th>
<th>Total: Rate of Occurrence</th>
<th>% within category</th>
</tr>
</thead>
<tbody>
<tr>
<td>School Positive</td>
<td>Sports</td>
<td>Our school is obsessed with sports. We LOVE to get down and dirty. Sport events are a BIG high with everybody</td>
<td>28</td>
<td>66%</td>
</tr>
<tr>
<td></td>
<td>Teachers</td>
<td>All your teachers know you by name (that can be a good or bad thing!) We have the most awesome teachers</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>School Spirit and Culture</td>
<td>Some benefits of going to a small school is that you have small classes You still have a variety of kids in your class We like small schools That way we know everybody</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>School Negative</td>
<td>Curriculum</td>
<td>School is hard School is boring School is not as easy as it looks School has too many rules School starts too early Not enough time between classes</td>
<td>11</td>
<td>34%</td>
</tr>
<tr>
<td></td>
<td>Rules and Regulations</td>
<td>The food is bad</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
Positive comments included admiration of local sports teams, and great ‘school pride,’ praising teachers, and a noted appreciation of small schools. In appreciating their schools, the participants noted the small class sizes, knowing all their peers, and having a diverse peer group. These students felt that they knew a lot of ‘different sorts of kids’ and felt their peers represented a diverse population, even at the second school where the demographic was overwhelming Caucasian. Their definition of diversity hinged primarily on considerations of the perceived talents and interests of their peers (sporty kids, jocks, kids who like art, smart kids).

Negative comments included remarks about the academic demands of school, school strictness in rules and regulation, and comments about cafeteria food quality. The students’ protests of school strictness included a large number of comments about school positions on technology usage indicating the participants’ desire to keep their phones.

Facts about Community

Finally, student comments on their communities fell into two thematic categories with five codes: positive comments and negative comments (see Table 5). Positive comments included participants’ references to specific restaurants they endorsed with Sonic being a front contender in popularity. Participants also positively referenced ‘things to do’ in their town including specific stores to visit (Wal-Mart) and local festivals or events.

Interestingly, participants made unambiguous references praising the benefits of their small town as opposed to an urban setting. In this vein, they included the benefit of everyone in the community being connected and knowing each other. Ironically, negative comments included statements about lack of privacy as well as remarks indicating there was not much to do in the community and that the community was boring and too safe.

Table 5

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Code Families</th>
<th>Example Coded Statements</th>
<th># of Occurrences</th>
<th>% within category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community Positive</td>
<td>Restaurants</td>
<td>Things we like about our community (list of restaurants)</td>
<td>12</td>
<td>88%</td>
</tr>
<tr>
<td>(Total)</td>
<td>Amusement</td>
<td>We have a community park</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>At our park we have some yearly events like Christmas in the Park and the Easter Egg Hunt</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>The fairgrounds has the fair every year</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>You might live in the city, and you might live in the country, but if you have never lived in (name of town), you don’t know what you are missing</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Your lifestyle … will probably change if you come from the city. If you’re a city slicker and you’re watching this, you would be shocked with how different [our town] is</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>In [our town] we don’t party all night. There aren’t many “parties” in [our town]. Teenagers in [our town] don’t sneak out of the windows at midnight and get in trouble or anything like that. Most of the time, we are in bed sound asleep. We’re always laid back, and we want to have fun.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>We love (name of town)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>We love living in a small town</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>My community is like one big family</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Some benefits of living in a small town is that everybody knows everybody</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community Negative</td>
<td>Community</td>
<td>Everyone knows your business</td>
<td>5</td>
<td>12%</td>
</tr>
<tr>
<td>Negative</td>
<td>Negative</td>
<td>This town is too small</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is nothing to do here</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is too much security</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion

This study examined rural middle school students’ narrative inquiry processes as they explored their identity and their local, rural contexts via digital storytelling. The digital stories produced by the participants yielded themes shared across both rural participant communities. While some themes may be posited as unique to a rural population, other themes were quite typical of the adolescent developmental stage regardless of geographical context.

Rural Factors Influencing Perception of Identity

The predominant theme emerging from the data was the adolescents’ focus in their writings on defining their identity. They defined themselves by their recreational activities (movies, shopping, outdoor activities, for example), their role identification (e.g., jock, smart, in the band), their use of technology (texting, Facebook), their friend and family ties, their food preferences, and the presence in their lives of pets and livestock.

Some of these concepts represent typical concerns of this age-group regardless of geographical location (Erikson, 1979; Kroger, 2003, 2006). These concepts include the importance of friends and some of the school specific roles they adopted for themselves as influential in adolescent identity formation. The roles the students adopted included both academic roles (desire to make good grades or simply make it through to the next grade) and non-academic roles (i.e., sports, arts). This finding is aligned with Reed and Rossi’s (2000) study which identified that the adolescent search for identity is prevalent regardless of context (urban, suburban, or rural).

The adolescent search for self is not distinctive, but it is reliant on place. In this study, identity was influenced by the students’ rural contexts.

One code emergent in the data considered unique to rural settings was the mention of outdoor recreational activities. Corbett (2009) identifies skills unique to rural contexts to include the ability to “build your own shelter, hunt, fish, grow food, cut wood, prepare cooking fires, and live outside grids, systems, and expert controlled mass delivery system” (p. 11). Similarly, Conroy (1997) found that a noteworthy number of rural youths had job aspirations aligned with trade or work related to outdoors activities.

Many of the students, the male students in particular, made specific references to outdoor recreational activities like hunting, fishing, and 4-wheeling. While suburban and urban students may also have experiences with similar outdoor activities, it was thought that the prevalence of this theme in this study was an indication of the students’ identification with their rural setting.

Additionally, some of the labels the teens used in describing their role identification might be considered uniquely rural, such as “redneck” (someone who works or spends significant time outdoors) or “proper” (someone who participates in rodeo settings). These students appeared to be identifying with the rural nature of their community and were proud to be considered “farm kids.” Some of these students openly and proudly identified themselves as “rednecks.” Again, this is an identification concept and aligned with the research of Corbett (2009) and Conroy (1997).

Finally, the mention of pets and livestock (chickens, cows, horses, llamas, goats, rabbits, etc.) held some uniquely rural codes. While all teens might be expected to reference pets (dogs, cats, for example), these participants’ mention of goats, llamas, chickens, and pigs seemed uniquely rural. Interestingly, mention of livestock was more prevalent in the second participant community, and these students may be seen as attempting to “claim” their rural identity despite their closer location to an urban setting bringing to mind Kelly’s (2009) study which references the agency of nostalgia in connecting people to an unexamined myth about ‘a way of life.’ Again, Conroy’s (1997) research is relevant here as is Corbett’s (2009) reference to life skills that rural individuals feel are important, to include animals used as a food source.

Rural Factors Influencing Perception of Community

The influence of the rural contexts on these participants also emerged in the fourth category, facts about community, and, to some extent, in the third results category, facts about school). Comments indicated an awareness of these adolescents of their unique geographical context. Many of the adolescents made comments specifically contrasting their understanding of their community to their vision of the ‘big city.’ Participants’ comments assumed certain stereotypes about big cities as opposed to their rural contexts. They clearly felt that life in a rural setting was superior to life in a city. They also assumed that teens who lived in cities were trouble makers who sneaked around, partied all the time, and joined gangs.

Participants made comments like, “You might live in the city, and you might live in the country, but if you have never lived in (name of town), you don’t know what you are missing!” and “In [our town] we don’t party all night.” “There aren’t many parties in [our town]” and “Teenagers in [our town] don’t sneak out of the windows at midnight and get in trouble or anything like that. Most of the time, we are in bed sound asleep.”
These findings are aligned with research shared by Lewis and Ketter (2008). In their work with rural teachers, the authors found that these teachers “associated urban youth culture with violence, gangs and sex. By contrast, [the teachers] believed that the lives of their rural students were not overly touched by these realities” (p. 287). These teachers viewed their rural students as innocent while perceiving urban students and culture as ethnic and potentially threatening. In doing so, they cast urban students into the role of “other” and used this sense of other to define identity and set boundaries. While the Lewis and Keith study focused on teachers’ perceptions, it is not much of a leap to presume that their students may also share these views.

Overall, the participants in this study seemed to feel that there was an advantage to living in a rural context, and they were proud to differentiate their community as a better place to live. This fits with Kelly’s (2009) research into rural contexts as a center of identity, possibility, and interconnection. If students in this study had any desire to leave their communities or to regard other contexts (urban, suburban) as more attractive, they did not share these thoughts in the stories beyond simple comments about their home towns being “too safe” and “everyone knowing your business.” Unfortunately, the comments produced by these teens may also represent Kelly’s warning about passionate, unexamined attachment leading to a “fierce clinging to places and identities and their deeply embedded and often unexamined myths about a ‘way of life’”(p.3). The participants’ comments do reflect some deeply engrained and uncritical views about life in rural towns as opposed to life in cities.

Use of Technology to Explore Identity and Context

The use of digital storytelling in this study was intended as a vehicle to allow the participants to express their views on who they were and where they lived. Certainly traditional writing formats, that is, without technology integration, may have allowed these adolescents to share their perspectives. However, the use of digital storytelling provided some unique advantages to the participants and the study.

First and foremost, digital storytelling allowed these learners to write for an authentic audience and recognize their product as something worth sharing with others interested in their message in a social context (Cope & Kalantzis, 2000; Gee, 2000; Gruenewald, 2003; New London Group, 1996; O’Brien & Scharber, 2008). This provided the participants with an expanded sense of writing and of audience. In contrast, a traditional writing assignment (pen and paper) may have been construed as just another school assignment with the teacher as reader/evaluator.

Second, digital storytelling provided participants with a multimodal venue for exploring and communicating issues of identity and community important to them as they shared their insights with an authentic audience. In crafting their stories, the adolescents used both images and narrative thus increasing the power of the messages the adolescents chose to share. The inclusion of images may also have motivated these students to engage in the writing process as they saw themselves producing something more akin to a movie or documentary, which is more appealing than a position paper. Again, these learners are predisposed to receiving and working with visual and media influences (DeVoss, Eidman-Aadahl, & Hicks, 2010; Kajder, 2010).

Finally, the appeal of technology alone may have been enough to motivate these students to share their stories. The participants’ use of technology was a dominant concept in their discussion about teens. The influence of technology on rural adolescents’ identity formation and their use of technology to connect to friends was an important finding. These participants were clearly accessing and using technology and they saw technology as essential for communicating connecting to each other.

While participant comments in this category indicate that students are already connected digitally and are already engaged in digital literacies, school support for adolescents’ use of these tools to critically examine their own identity and the impact of their rural community appears to be limited. Schools may not be capitalizing on adolescents’ existing digital writing practices to aid these learners in exploring issues of identity or community. The technology survey completed by the classroom teachers showed that each classroom associated with this study had limited technology resources and that the teachers involved in the study were not able to easily integrate technology into their instruction. Unfortunately, this finding is aligned with the research (Hawkes, Halverson, & Brockmueller, 2002).

Allowing students to explore identity in their rural contexts may be critical to their development of identity and voice and may either promote student identification with their community or disassociate students from their community. Kelly (2009) cautions that rural places are premised on a loss paradigm; yet, participants in this study used literacy to claim community and to refute this loss paradigm in contrast to the research findings (Corbett, 2009; Corbett & Vibert, 2010; Hardré, Sullivan, & Crowson 2009), while at the same time showing evidence of an uncritical attachment to place (Kelly, 2009). So while the digital storytelling application used in this study may have allowed students opportunity to explore their
own narratives, they did not critically examine their contexts.

**Limitations**

This study is limited by its inclusion of only two schools in a fairly restricted geographical area. In addition, while the intent of using of digital stories should have conveyed the message that the students were writing for an authentic audience, more could have been done to send students the message that they were writing for an authentic audience and rather than for a grade. Also, students could have been supported in producing individual stories as opposed to group-produced stories.

Additional data could have been collected around this study design to include field notes documenting the participants’ work in process, artifacts of the students’ work in process (brainstorm maps, drafts). Finally, an analysis of the images chosen by the students could have been analyzed for their message and impact.

**Conclusions**

This study examined adolescent students’ exploration of identity and community. The use of digital storytelling with adolescents provided a particularly rich opportunity for these students to explore the areas of inquiry unique to their age group as determined through grounded theory analysis of the participants’ digital story products.

Study findings indicate that the rural nature of the participants’ communities had a significant impact on their identity formation in particular with respect to specific recreational activities and identity roles. Participants also were keenly aware of their rural contexts. While participants made some comments decrying the limitations of rural schools and towns, the main focus was on the positive aspects of school and community, which they viewed as places of support and connectedness.

Findings from this study also indicate that rural students are already engaged in digital literacy practices. However, school support for adolescents’ use of these tools may not be capitalizing on students’ outside-school digital writing practices. Technology should be considered implicit in adolescent identity development and should be used to promote student exploration of identity and context. These tools provide students with means to assess and acquire skills necessary to compete in current global and technological climates. As such, this study supports students’ use of digital writing to explore identity, to examine their rural contexts, and to further their literacy development through technology-supported practices.

**References**


York, NY: W.W. Norton.


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**About the author:**

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The Effect of Constructivist Mathematics on Achievement in Rural Schools

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International assessment data indicate American students are not competing with their counterparts in other countries. The mathematics curriculum and pedagogy are not preparing students to compete in a global economy. This study compared student achievement using sixth grade mathematics results from the Illinois Standards Achievement Test. Specifically, the study compared the results of students in three different rural school districts, all of whom were receiving instruction in three different mathematics curricula. In one district, students received seven years of the K-6 Everyday Mathematics curriculum which was compared with students who received seven years of instruction using a traditional mathematics curriculum in the second district and in the third district scores were compared with students who were taught using a traditional mathematics curriculum supplemented with Mountain Math. The results of this study indicate the constructivist K-6 elementary mathematics curriculum did not lead to higher levels in math achievement when compared with the traditional methods of instruction.

**Key words:** mathematics curriculum; student achievement; constructivist curriculum; traditional methods of instruction

In recent years national and international assessments have spurred America’s educational and political leadership into action. Mediocre results from the 2003 and 2007 *Trends in International Mathematics and Science Study* (TIMSS) as well as results from the 2003, 2006, and 2009 *Program for International Student Assessment* (PISA) have brought intense criticism on the United States public education system to change, specifically mathematics instruction, so that students can compete with their peers from other countries. The 2011 report published by the National Center for Education Statistics Institute of Education Sciences on the National Assessment of Educational Progress (NAEP) for fourth and eighth graders showed the average scores for fourth graders in 2011 did not show significant change from 2009. The scores of the eighth graders did show an upward trend with a 1 point increase from 2009 and a 3 point increase from 2007. Despite this trend, 32 states and jurisdictions showed no significant change at either the fourth or eighth grade. In 2008, the National Mathematics Advisory Panel declared the delivery system in mathematics education in the United States as broken and must be fixed. The panel recommended instruction be varied and not solely student-centered or teacher-directed (U.S. Department of Education, 2008).

Despite this call, theorists have not been able to agree on a particular approach to the teaching of mathematics. Ellis and Berry (2005) point out the lack of consensus that exists in the U.S. about how to improve mathematics education. Since the 1980’s, two schools of thought have been used to address the performance short-comings: the procedural-formalist curriculum and a constructivist curriculum; more recently referred to as the cognitive-cultural curriculum by Ellis and Berry (2005). The procedural-formalist curriculum is synonymous with a more traditional approach to mathematics instruction, which emphasizes a set of logically organized facts, skills, and procedures that are perfected over time. Within this traditional approach to teaching, students practice these skills and procedures repeatedly until a minimum level of competence is attained. Assessment of learning is structured around the belief there is only one way to solve a mathematics problem. Some researchers view
the traditional, procedural-formalist curriculum approach to learning as a passive process of learning facts, skills, and procedures (Stigler & Heibert, 1997; Ellis & Berry, 2005). Fifteen years ago Stigler and Heibert (1997) asserted the typical eighth-grade mathematics lesson in the United States was organized around this passive form of instruction.

The constructivist approach to mathematics instruction views learning as an active process. Cobb (1988) suggested that constructivism challenges the assumption that meanings reside in words, actions, and objects independently of an interpreter. Teachers and students are viewed as active meaning-makers who continually give contextually based meanings to each other’s words and actions as they interact. Von Glaserfeld (1989) provided the following definition of constructivism:

Constructivism is a theory of knowledge with roots in philosophy, psychology, and cybernetics. It asserts two main principles whose application has far-reaching consequences for the study of cognitive development and learning as well as for the practice of teaching, psychotherapy, and interpersonal management in general. The two principles are: (a) knowledge is not passively received but actively built up by the cognizing subject; and (b) the function of cognition is adaptive and serves the organization of the experiential world, not the discovery of ontological reality. (p. 162)

One program, *Everyday Mathematics*, developed by the University of Chicago School Mathematics Project and based on constructivist principles, is being used by 2.8 million students in 175,000 classrooms (What Works Clearinghouse, 2007). Several studies have examined the effects of *Everyday Mathematics* on student achievement. Carroll (2001) conducted a longitudinal study of children using the *Everyday Mathematics* curriculum. The study compared Japanese, Chinese, traditionally taught U.S. students, and U.S. students taught *Everyday Mathematics*. The *Everyday Mathematics* first grade students performed higher than both the Chinese and the traditionally taught U.S. first graders, but below the Japanese students. This improvement in scores relative to the Chinese group indicated a positive effect of the curriculum (Carroll, 2001).

Briars and Resnick (2000) examined the way *Everyday Mathematics* narrowed the achievement gap between African American and Caucasian students on the New Standards Mathematics Reference Exam (NSMRE). In their study, the Pittsburgh Public School System adopted the *Everyday Mathematics* curriculum in grades K – 5. To assess the effect of this curriculum, the study examined NSMRE data from 1995 to 1998. The results of the study showed a significant improvement in student skills, concepts, and problem solving. The percent of students in the lowest scoring category in problem solving declined from 23 percent in 1996 to 7 percent in 1998. The study found that some teachers did a better job of implementing the curriculum than other teachers. In the classrooms where the implementation of *Everyday Mathematics* was strong, virtually no students scored in the lowest levels of the NSMRE in the areas of concepts, skills, and problem solving. African American students in classrooms with a strong implementation of *Everyday Mathematics* outperformed Caucasian students in classrooms with a weak implementation of *Everyday Mathematics*.

Similar results were found by the ARC Center Tri-State Student Achievement Study (2001). The study examined the effects of three purported constructivist math curricula, *Everyday Mathematics*, Math Trailblazers, and Investigations in Number, Data, and Space. The study examined the standardized test performance (ISAT, MCAS, ITBS, and WASL) of students in Illinois, Massachusetts, and Washington State. The results showed students using *Everyday Mathematics*, Math Trailblazers, or Investigations in Number, Data, and Space out performed traditionally taught students. The results were consistent across all grade levels and all mathematical strands, regardless of social economic status and ethnicity. The study concluded these curricula improved student performance in all areas of elementary mathematics, including basic skills and higher-level processes (ARC Center, 2001).

Riordan and Noyce (2001) extended the finding of the ARC study by examining the impact *Everyday Mathematics* had on fourth grade elementary students’ mathematics achievement. Riordan and Noyce hypothesized students in schools with *Everyday Mathematics* would score significantly higher on the Massachusetts statewide math test. Schools in this study were matched on the previous year’s Massachusetts Educational Assessment Program (MEAP) test prior to the implementation of *Everyday Mathematics* and by the percentage of students eligible for the free and reduced lunch program. The results of the quasi-experimental
design of matched comparison groups showed the students using *Everyday Mathematics* outscored their counterparts from 2.5 to 5.7 points on an 80 point scale. Furthermore, the study showed *Everyday Mathematics* was effective for all students, regardless of race or socioeconomic status.

Waite (2000) conducted research comparing the effects of *Everyday Mathematics* versus a more traditional approach on student achievement of third, fourth, and fifth graders in a large, urban, North Texas school district. The two groups studied were similar in socioeconomic status, ethnicity, gender, and grade makeup. Prior mathematical achievement was assessed using the Iowa Test of Basic Skills to determine if there was a statistical difference between the control (2,704 students) and experimental (732 students) groups. No difference was found. The research found there was a significant difference in student achievement on the Texas Assessment of Academic Skills math scores for the students taught using *Everyday Mathematics* over the more traditional approach. Students using *Everyday Mathematics* scored on average 3.9 points higher than the traditionally taught students.

Not all researchers believe that *Everyday Mathematics* should be the curriculum of choice. Wang (2001) claims the curriculum omits skills and topics that are detrimental to students, leaving them unprepared for higher level mathematics topics taught in middle school, high school, and college. In response to Wang (2001), Ysseldyke, Spicuzza, Kosciolak, and Boys (2003) conducted a study comparing 157 fourth and fifth graders using *Everyday Mathematics* along with Accelerated Math against a control group of 61 students receiving only *Everyday Mathematics*. Accelerated Math is a computer program that allows a teacher to manage multiple instructional tasks like matching instruction to an individual student’s skill level, providing appropriate practice, monitoring student progress, and giving corrective feedback. The rationale behind using Accelerated Math in conjunction with *Everyday Mathematics* was to address the lack of practice on basic math facts that critics claim. The Northwest Achievement Levels Test, which measures students’ basic skills in mathematics, and the STAR Test, which also measures basic skills in mathematics, were used to determine the effect of the treatment on the control group. The results of the study indicated students receiving *Everyday Mathematics* and Accelerated Math together demonstrated more growth than the students receiving only *Everyday Mathematics*.

Despite the mixed results outlined above, proponents of constructivist approaches such as *Everyday Mathematics* consider it to be a superior mathematics curriculum. School districts all over the United States have adopted it as their primary method of mathematics instruction, especially in the K-6 curriculum. Unfortunately, few studies have examined the impact of the constructivist approaches instruction in rural settings, nor have they compared constructivist approaches with methods rural schools currently use to address student performance needs at the elementary school level. This is not surprising given recent findings by ACCLAIM (Appalachian Collaborative Center for Learning, Assessment, and Instruction Mathematics) which showed that until 2001 “no specifically relevant empirical literature could be said to exist that addressed rural mathematics education” (Howley, Howley, & Huber, 2005, p. 2). To help rural schools improve instructional practice, comparative studies examining rural school mathematics approaches are particularly important at this time given the tendency for rural communities to value more traditional methods over alternative, reform based methods (Howley, 2003; Howley, Larson, Adriaiano, Rhodes, & Howley, 2007).

The purpose of the current study was to compare *Everyday Mathematics* with traditional programs of mathematics instruction. The study was guided by the following research question, what effect does *Everyday Mathematics* instruction have on the performance of students in rural schools? More specifically, the study compared the performance of rural school students taught with a K-6 Everyday Mathematics curriculum to the performance of students taught using a more traditional math curriculum.

**Method**

The present study was designed to compare the effects of *Everyday Mathematics* curriculum with a more traditional mathematics curriculum. To make the comparison, the performances of students in three northern Illinois rural schools were examined. The three schools were selected based on the length of time students had been exposed to the school’s curriculum; each school had been using the same method of instruction in grades K through 6. The two schools using a
more traditional approach were select because their textbook series encourage teachers to follow a traditional lesson sequence consistent with the procedural formalist paradigm. During the lessons teachers show students how to solve a particular problem, students then practice similar problems either alone or in groups while the teacher monitors their progress. Additional problems are then assigned as independent practice. One of the schools also supported student learning by using a supplemental review program called Mountain Math. The supplemental review program emphasizes repetition and was used to support daily lessons.

**Participants**

The study compared the Illinois Standards Achievement Test (ISAT) math scores for two cohort groups from the three schools: 2006 and 2007. The 2006 cohort group consisted of the following: a) 116 sixth grade students from School A who received the *Everyday Mathematics* curriculum from kindergarten through sixth grade, b) 73 sixth grade students from School B who were taught mathematics traditionally, and c) 213 sixth grade students from School C who were taught mathematics traditionally and supplemented with Mountain Math. The 2007 cohort groups consisted of: a) 94 students from School A, b) 91 students from School B, and c) 176 students from School C.

School A is located in a rural, north-central Illinois town with a population of approximately 9,800 citizens. It uses the K-6 *Everyday Mathematics* curriculum and houses grades six through eight with an enrollment of 576 students. Sixty-six percent of the students are Caucasian, 28 percent Hispanic, four percent multi-racial, and two percent African American. School A’s mobility rate is 22.6 percent and 29.7 percent were low income. The students receive 58 minutes of math instruction each day and are not ability grouped.

School B is located in a rural, north-central Illinois town of approximately 7,300 citizens. School B uses the Silver/Burdett textbook series. It is considered to be a traditional approach to mathematics instruction because it encourages teachers to use a direct instruction approach. The first page of every section includes a discussion of the topic to be learned. This is followed by a step-by-step process of instruction which includes lecturing, modeling the process by solving example problems, guided practice, independent practice and homework. School B houses grades four through eight and has an enrollment of 752 students. Sixty-seven percent are Caucasian, 30 percent Hispanic, 1 percent multi-racial, 1 percent African American, and about 1 percent Asian. Forty-six percent of the students are low income, and the mobility rate is 18.9 percent. The elementary and middle school students in this district received between 45 and 50 minutes of daily mathematics instruction. Overall, the students are not grouped by achievement or ability; however, fifth grade students identified as gifted in math are allowed to be accelerated into the sixth grade mathematics curriculum.

School C is located in rural, north-central Illinois in a town with a population of 15,300 citizens. It uses the Houghton/Mifflin Math textbook series along with Mountain Math, a supplemental program, at the K-2 level to reinforce daily math lessons. The Houghton/Mifflin series is also considered to be a traditional approach to mathematics instruction because it uses a direct instruction approach to learn new math concepts and solving problems. Each teaching lesson introduces an objective and provide teachers with a step-by-step process for introducing and developing a concept followed by guided and independent practice monitored by the teacher, and a lesson quiz to assess student understanding.

School C houses grades six through eight with an enrollment of 711 students. Seventy percent of the students are Caucasian, 20 percent Hispanic, 7 percent multi-racial, 2 percent African American, and 1 percent Asian. Thirty-seven percent of the students are low income, and the mobility rate is 11 percent. At the kindergarten through second grade levels, students receive 50 minutes of math instruction each day along with an additional 15 to 20 minutes of Mountain Math. Mountain Math was used to support daily lessons. Students are not grouped by achievement or ability during kindergarten through second grade. Beginning in third grade level, student showing advanced achievement are advanced one grade level. Fifth grade students are grouped by achievement in mathematics.

The dependent variables in the study, based on Illinois Standards Achievement Test (ISAT) data, include test scores of number sense, measurement, algebra, geometry, and probability, as well as a general mathematics scale score. The mathematics assessment contains 65 multiple choice questions, two short-constructed-response questions, one extended-
response question, and seven field-test questions. The results are reported in terms of percent of items answered correct.

**Results**

To determine the effect of the *Everyday Mathematics* curriculum on the performance of students in rural schools, the 2006 and 2007 sixth grade ISAT math scores were analyzed. The results reported here reflect data for students who attended schools A, B, and C from Kindergarten through 6th grade. The findings show comparisons of general mathematics scale scores along with a comparison by ethnicity, gender, special education status. The report also includes a comparison by the ISAT math subtests.

**Overall Math Scale Scores**

Table 1 shows the means and standard deviations for 2006 and 2007 sixth grade ISAT mathematics scale scores. The 2006 data indicate the mean scale score for the K-6 *Everyday Mathematics* curriculum was the lowest of the three schools and the Traditional+ curriculum’s mean scale score was the highest. A one-way ANOVA using the 2006 data indicated there was no significant difference in sixth grade ISAT mathematics scales scores among the three schools, $F(2, 399) = 2.14, p > .05$. The 2007 data also indicate the mean scale score for the K-6 *Everyday Mathematics* curriculum was the lowest of the three schools.

<table>
<thead>
<tr>
<th>School</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Everyday Mathematics</td>
<td>116</td>
<td>246.48</td>
<td>23.40</td>
</tr>
<tr>
<td>Traditional Mathematics</td>
<td>73</td>
<td>248.21</td>
<td>28.97</td>
</tr>
<tr>
<td>Traditional+ Mountain Math</td>
<td>213</td>
<td>252.03</td>
<td>22.99</td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Everyday Mathematics</td>
<td>94</td>
<td>246.72</td>
<td>25.81</td>
</tr>
<tr>
<td>Traditional Mathematics</td>
<td>91</td>
<td>253.13</td>
<td>25.50</td>
</tr>
<tr>
<td>Traditional+ Mountain Math</td>
<td>176</td>
<td>252.47</td>
<td>22.97</td>
</tr>
</tbody>
</table>

The Traditional curriculum had the highest mean scores. The one-way ANOVA results indicated there was no significant difference in sixth grade ISAT mathematics scales scores among the three schools, $F(2, 358) = 2.11, p > .05, \eta^2 = .01$.

**Ethnicity**

A two-way ANOVA was used to analyze differences among the scale scores of the three schools using two years of data, 2006 and 2007 Sixth Grade ISAT mathematics. Because some ethnic groups had a small sample size (e.g., Asian, multi-racial), ethnicity was collapsed into two groups: Caucasian and Non-Caucasian. Table 2 shows the means and standard deviation for the Caucasian and non-Caucasian groups. The 2006 data indicated that the mean scale score for Caucasian students was lowest for the K-6 *Everyday Mathematics* curriculum and highest for Traditional+ curriculum. For non-Caucasian students, the Traditional+ curriculum had the highest mean scale score and the Traditional curriculum had the lowest mean scale score. Two-way ANOVA results indicated no school by ethnicity effect in the 2006 sixth grade ISAT mathematics scale scores, $F(2, 396) = .50, p > .05$.

The 2007 data indicate that for Caucasian and for non-Caucasian students in the three schools the mean scale score was the lowest for the K-6 *Everyday Mathematics* curriculum and highest for the Traditional curriculum. The two-way ANOVA results indicate no school by ethnicity effect in the 2007 sixth grade ISAT mathematics scale scores, $F(2, 355) = .69, p > .05$.
Table 2
2006 and 2007 Mean ISAT Mathematics Scale Scores for Three School by Ethnicity

<table>
<thead>
<tr>
<th>School</th>
<th>Ethnicity</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Everyday Mathematics</td>
<td>Caucasian</td>
<td>73</td>
<td>250.81</td>
<td>23.65</td>
<td>60</td>
<td>249.03</td>
<td>26.24</td>
</tr>
<tr>
<td></td>
<td>Non-Caucasian</td>
<td>43</td>
<td>239.14</td>
<td>21.27</td>
<td>34</td>
<td>242.65</td>
<td>24.88</td>
</tr>
<tr>
<td>Traditional Mathematics</td>
<td>Caucasian</td>
<td>51</td>
<td>253.47</td>
<td>30.07</td>
<td>64</td>
<td>257.55</td>
<td>25.81</td>
</tr>
<tr>
<td></td>
<td>Non-Caucasian</td>
<td>22</td>
<td>236.00</td>
<td>22.40</td>
<td>27</td>
<td>242.67</td>
<td>21.78</td>
</tr>
<tr>
<td>Traditional + Mountain Math</td>
<td>Caucasian</td>
<td>138</td>
<td>255.16</td>
<td>19.89</td>
<td>111</td>
<td>255.66</td>
<td>23.67</td>
</tr>
<tr>
<td></td>
<td>Non-Caucasian</td>
<td>75</td>
<td>245.17</td>
<td>20.78</td>
<td>65</td>
<td>247.03</td>
<td>20.78</td>
</tr>
</tbody>
</table>

Gender

The 2006 and 2007 means and standard deviations for the ISAT scale scores for each school by gender are reported in Table 3. The 2006 data show the mean scale score for the K-6 Everyday Mathematics curriculum was the lowest of the three schools for both male and female students. The Traditional+ mathematics curriculum had the highest mean scale score for females and the Traditional curriculum had the highest mean scale scores for males. The two-way ANOVA results indicate no school by gender effect, F(2, 396) = .04, p > .05. The 2007 data show the mean scale score for the K-6 Everyday Mathematics curriculum was the lowest of the three schools for both male and female students. The Traditional+ curriculum had the highest mean scale score for females and the Traditional curriculum had the highest mean scale scores for males. The two-way ANOVA results indicate no school by gender effect, F(2, 355) = .36, p > .05.

Table 3
2006 and 2007 Mean ISAT Mathematics Scale Scores for Three Schools by Gender

<table>
<thead>
<tr>
<th>School</th>
<th>Ethnicity</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Everyday Mathematics</td>
<td>Female</td>
<td>62</td>
<td>245.8</td>
<td>20.47</td>
<td>46</td>
<td>244.5</td>
<td>21.62</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>54</td>
<td>247.2</td>
<td>26.55</td>
<td>48</td>
<td>248.85</td>
<td>29.34</td>
</tr>
<tr>
<td>Traditional Mathematics</td>
<td>Female</td>
<td>38</td>
<td>247.4</td>
<td>27.66</td>
<td>37</td>
<td>249.73</td>
<td>24.08</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>35</td>
<td>249.0</td>
<td>30.72</td>
<td>54</td>
<td>255.46</td>
<td>26.39</td>
</tr>
<tr>
<td>Traditional + Mountain Math</td>
<td>Female</td>
<td>115</td>
<td>251.9</td>
<td>23.23</td>
<td>95</td>
<td>252.14</td>
<td>22.70</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>98</td>
<td>252.1</td>
<td>22.82</td>
<td>81</td>
<td>252.86</td>
<td>23.42</td>
</tr>
</tbody>
</table>

Special Education Status

Means and standard deviations for the ISAT scale scores are reported for each school by special education status in Table 4. The 2006 data show the mean scale scores were lowest for the K-6 Everyday Mathematics curriculum among the three schools for non-IEP students. The mean score were highest for the Traditional+ curriculum. The Traditional+ curriculum had the highest mean scale scores for IEP students and the Traditional mathematics curriculum had the lowest mean scale scores. Two-way ANOVA results indicated no school by special education status effect among the three schools, F(2, 396) = 1.12, p > .05.
Table 4
2006 and 2007 Mean ISAT Mathematics Scale Scores for Three Schools by Special Education Status

<table>
<thead>
<tr>
<th>School</th>
<th>Special Ed. Status</th>
<th>2006 N</th>
<th>Mean</th>
<th>SD</th>
<th>2007 N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Everyday Mathematics</td>
<td>IEP</td>
<td>14</td>
<td>225.64</td>
<td>25.18</td>
<td>12</td>
<td>228.92</td>
<td>27.10</td>
</tr>
<tr>
<td></td>
<td>No-IEP</td>
<td>102</td>
<td>249.34</td>
<td>21.76</td>
<td>82</td>
<td>249.33</td>
<td>24.72</td>
</tr>
<tr>
<td>Traditional Mathematics</td>
<td>IEP</td>
<td>9</td>
<td>218.00</td>
<td>15.47</td>
<td>15</td>
<td>229.93</td>
<td>19.38</td>
</tr>
<tr>
<td></td>
<td>No-IEP</td>
<td>64</td>
<td>252.45</td>
<td>27.93</td>
<td>76</td>
<td>257.71</td>
<td>24.11</td>
</tr>
<tr>
<td>Traditional + Mountain Math</td>
<td>IEP</td>
<td>33</td>
<td>234.58</td>
<td>17.38</td>
<td>23</td>
<td>229.52</td>
<td>13.51</td>
</tr>
<tr>
<td></td>
<td>No-IEP</td>
<td>180</td>
<td>255.23</td>
<td>22.49</td>
<td>153</td>
<td>255.92</td>
<td>22.12</td>
</tr>
</tbody>
</table>

The 2007 data show the mean scale score for the K-6 Everyday Mathematics curriculum was the lowest of the three schools for both IEP and non-IEP students, and the Traditional mathematics curriculum had the highest mean scale scores, $F(2, 355) = .53, p > .05$.

ISAT Mathematics Subtests

Means and standard deviations for each of the five subtests for each school are presented in Table 5 (2006 results) and Table 6 (2007 results). The data in Table 5 indicate the school using the K-6 Everyday Mathematics curriculum had the lowest mean scale score for number sense ($M = 58.65$) with the Traditional curriculum having the highest ($M = 62.66$). The school using the K-6 Everyday Mathematics curriculum also had the lowest mean scale score for measurement with the Traditional+ curriculum having the highest score. The school using the Traditional mathematics curriculum had the highest mean scale score in number sense, but the lowest mean scale scores in algebra, geometry, and probability. The school using the Traditional+ mathematics curriculum had the highest mean scale scores in measurement, algebra, geometry, and probability. Results from a one-way MANOVA indicate scores from all the different subtests did not differ significantly among schools, Wilk’s Lambda $F = 1.84, p > .05$.

Table 5
Means and Standard Deviations for the 2006 Sixth Grade ISAT Mathematics Scale Scores for each Subtest by School

<table>
<thead>
<tr>
<th></th>
<th>Everyday Mathematics (N=116)</th>
<th>Traditional Mathematics (N=73)</th>
<th>Traditional + Mountain Math (N=213)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Number Sense</td>
<td>58.65</td>
<td>21.08</td>
<td>62.66</td>
</tr>
<tr>
<td>Measurement</td>
<td>70.78</td>
<td>22.77</td>
<td>71.51</td>
</tr>
<tr>
<td>Algebra</td>
<td>61.58</td>
<td>22.30</td>
<td>60.71</td>
</tr>
<tr>
<td>Geometry</td>
<td>69.00</td>
<td>17.46</td>
<td>66.53</td>
</tr>
<tr>
<td>Probability</td>
<td>53.72</td>
<td>24.39</td>
<td>52.04</td>
</tr>
</tbody>
</table>

The 2007 data in Table 6 indicate the school using the K-6 Everyday Mathematics curriculum had the lowest mean scale score for number sense, measurement, algebra, geometry, and probability. The school using the Traditional mathematics curriculum had the highest mean scale scores in measurement, geometry, and probability. The school using the Traditional+ mathematics curriculum had the highest mean scale scores in number sense and algebra. MANOVA results for the 2007 data indicate there was a difference among the scores on the five subtests, Wilk’s Lambda $F = 4.51, p < .05$. Follow-up ANOVA tests were conducted to find out which test was responsible for the difference on the MANOVA. Results indicate the difference was found in the algebra subtest $F_{algebra} = 6.03, p < .01$. Post hoc tests were performed on the algebra subtest to determine which scores were significantly different.
Bonferroni procedure was used for the post hoc test because it is a more conservative test (Fielding, 2006). Results indicate the school using the K-6 Everyday Mathematics curriculum had a significantly lower subtest score in algebra ($M = 61.23$) than the school using the Traditional+ curriculum ($M = 70.25$).

### Table 6
**Means and Standard Deviations for the 2007 Sixth Grade ISAT Mathematics Scale Scores for each Subtest by School**

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Everyday Mathematics (N=94)</th>
<th>Traditional Mathematics (N=91)</th>
<th>Traditional+ (N=176)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Number Sense</td>
<td>63.98</td>
<td>18.71</td>
<td>64.78</td>
</tr>
<tr>
<td>Measurement</td>
<td>65.27</td>
<td>23.31</td>
<td>71.53</td>
</tr>
<tr>
<td>Algebra</td>
<td>61.23</td>
<td>21.31</td>
<td>65.29</td>
</tr>
<tr>
<td>Geometry</td>
<td>67.90</td>
<td>19.61</td>
<td>75.68</td>
</tr>
<tr>
<td>Probability</td>
<td>57.02</td>
<td>21.64</td>
<td>63.52</td>
</tr>
</tbody>
</table>

**Discussion and Implications**

There is little doubt the world we live in is becoming more complex and competitive. Mathematics skills are a vital necessity for rural students to compete in the global economy. Finding the best mathematics curriculum to educate rural school students in the United States has been difficult and much debated, and until recently very little research focused on mathematics education in the rural context. During the past several decades, two approaches to math instruction have been documented: a traditional procedural-formalist approach and a constructivist approach. The overarching question of the current study was to what effect does seven years of Everyday Mathematics instruction have on the performance of students in rural schools? The study specifically compared the performance of rural school students taught with a K-6 Everyday Mathematics curriculum to the performance of students taught using more traditional math curricula. Examination of the data suggests there is no significant difference in the performance levels of students taught with the Everyday Mathematics curriculum as compared to students taught with a more traditional approach. The pattern was consistent for all areas examined in the study (i.e., ethnicity, gender, SES, and special education status). There was no significant difference in achievement for rural students on the state math assessments, with one exception: the algebra subtest results. In which case, students taught using Everyday Mathematics performed lower than their peers who were taught with a traditional approach supplemented with Mountain Math. These findings are inconsistent with previous studies of Everyday Mathematics (ARC, 2001; Briars and Resnick, 2000; Riordan and Noyce, 2001; and Waite, 2000).

Much of the past research indicated students who were exposed to the Everyday Mathematics curriculum outperformed students taught using a traditional mathematics curriculum. Wood and Sellers (1997) found fourth grade elementary students receiving two years of problem-centered mathematics instruction outperformed traditionally taught fourth graders on standardized tests. Waite (2000) studied two groups of third, fourth, and fifth grade students from a large, urban Texas school district; one which taught using Everyday Mathematics and the other traditionally taught. The Everyday Mathematics students outperformed the traditionally taught students on the TAAS.

The ARC Center Tri-State Student Achievement Study (2001) and Riordan and Noyce (2001) found students taught using Everyday Mathematics outperformed traditionally taught students regardless of socioeconomic status or ethnicity. The ARC Center Study’s sample included students across all elementary grade levels, from three different states, Illinois, Massachusetts, and Washington, and used the ISAT, MCAS, ITBS, and WASL to measure student achievement, while Riordan and Noyce utilized the Massachusetts State-wide test. Also, both studies examined only one year of data, which could also explain the differences in their findings.

While the current study found no significant differences with the comparison group of students, the study was limited by several factors that could be investigated in future research. The first area of research needs to address the implementation effect and possible biases by
teachers. No measures were taken to verify that the Everyday Mathematics curriculum was implemented appropriately and consistently at each grade level. Other factors which should be considered are: quality of professional development offered to teachers before the initial year of implementation, during implementation and annual follow-up professional development. In addition, there is a crucial “buy in” factor by teachers which is paramount to the successful implementation of the Everyday Mathematics curriculum. If the program was dictated by the central office administration, “buy in” could be a concern in terms of the fidelity of implementation.

Another aspect of the study that needs future research are the areas of subject level and grade level acceleration, and grouping of students by mathematical achievement. One of the rural schools that utilized the traditional approach to teaching mathematics allowed subject level acceleration for students who demonstrated advanced mathematical achievement in the fifth grade. The rural school offering a traditional mathematics curriculum supplemented with Mountain Math in kindergarten through second grade also advanced students one grade level (subject level acceleration), beginning in the third grade, if they demonstrated advanced mathematical achievement. This rural school also grouped student by mathematical achievement in the fifth grade. Based on the findings, it appears traditional instruction in conjunction with other strategies (supplemental practice, subject level acceleration, and achievement grouping) are viable alternatives to adopting the Everyday Mathematics curriculum.

The current study adds to our understanding regarding the use of the Everyday Mathematics curriculum in rural settings. Our findings indicate a more traditional approach used with other methods may be as good as the Everyday Math curriculum in rural schools. Finally, the study adds to the body of rural research on K-6 Everyday Mathematics curriculum by examining the effects of the program after seven years of instruction. To date no other study has attempted to examine the cumulative effect of the program.

References


Springfield, IL: Illinois State Board of Education.


About the authors:

Mike Grady is a high school principal in Dixon, IL, and a former Illinois high school mathematics teacher. He has a profound interest in district and school improvement and is especially interested in the delivery of a viable curriculum in PreK-12 mathematics.

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The 104th NREA Convention will be held in Cincinnati, Ohio, October 12-14, 2012. The location of the meeting is the “Netherlands Hilton Hotel”. Special conference rates are available three days before through three days after the conference. The theme of this year’s event is: “Rural Education, the Heart of American Renewal” General session speakers include Jim Mahoney, Executive Director of Battelle, who will share experiences assisting rural schools in southeast Ohio, Gene Whilhoit, Executive Director of the Chief State School Officials, who will focus on the Common Core, and Trina Trim, the founder of Vschoolz, who will share a vision of schools of the future. Over 50 research and professional development sessions are available, including two sessions featuring panels of teachers for Ohio sharing their school improvement experiences.

Here are just a few of the advantages of attending the conference:

- Enjoy the best of the Convention and Research Symposium – running simultaneously this year.
- Network with other rural educators from across the country.
- Meet with vendors who can help rural schools and communities.