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Lessons Learned from IMPACTing Technology Integration Practices: Four IMPACT Model Case Studies

ABSTRACT. This article describes the efforts of four North Carolina schools that implemented the state's IMPACT model into their respective schools. The primary emphasis of this IMPACT model focuses on the efforts of a technology facilitator in facilitating effective technology integration practices with public school teachers. Outcomes of this evaluation center on the importance of collaboration between the technology facilitator and teachers, continual and regular staff development workshops, and the essential role of a technology facilitator. The results of these case study analyses can influence future implementation of North Carolina's IMPACT model and may affect other districts considering a technology facilitator for their schools. doi:10.1300/J025v24n01_03 [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <<http://www.HaworthPress.com>> © 2007 by The Haworth Press, Inc. All rights reserved.]

KEYWORDS. School library media specialists, technology integration, IMPACT model school, collaboration, flexible access, professional development, technology skills, technology-enhanced learning

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Public school teachers have ample opportunity to successfully integrate an assortment of technologies into their respective classrooms. Since 1999, 99% of all public school teachers reported having computers available in their schools, and 84% of those teachers had computer access in their classrooms (U.S. Department of Education, 2000). As of 2002, 92% of the public schools now have Internet access in the classroom, computer labs, and media centers (U.S. Department of Education, 2003). Teachers now have the tools to adopt and integrate technology into their curricula and facilitate successful, student learning outcomes. The missing link in this process is the teachers' lack of confidence and lack of preparedness in using computers and more advanced technologies in the classroom (Russell, Finger, & Russell, 2000; U.S. Department of Education, 2000). To combat this deficiency, continual professional development of teachers with regard to successfully using technology in the classroom is a necessary and critical factor (Cooley & Johnston, 2001; Darling-Hammond & McLaughlin, 1999). A National Center for Education Statistics report concurred with our assessment. It noted:

Research suggests that unless professional development programs are carefully designed and implemented to provide continuity between what teachers learn and what goes on in their classrooms and schools, these activities are not likely to produce any long-lasting effects on either teacher competence or student outcomes. (U.S. Department of Education, 1999, p. v)

Although there are successful pedagogical tools to support teacher professional development, such as Bonk, Ehman, Hixon, and Yamagata-Lynch's (2002) TICKIT online program, the human element is an essential ingredient in facilitating teachers' successful technology practices. That is, a technology facilitator continuously interacts and mentors teachers as they learn about and adopt new technologies into their classroom. Several research studies documented the effects of a technology facilitator within both a public school setting and a higher education setting (e.g., Chuang, Thompson, & Schmidt, 2003; Swan, Holmes, Vargas, Jennings, Meier, & Rubinfeld, 2002). Essentially, a technology facilitator provides technology support and guidance to an assigned group of teachers. This individual directs and facilitates teachers in using and integrating technology in their respective classrooms. In Boston Public Schools' coaching model, "the teacher(s), school leader, and coach engage, as colleagues, in a process of inquiry about how students learn and what are effective instructional practices that support

student learning” (Boston Public Schools, 2001). It is apparent that collaboration among the key stakeholders is a critical component in a teacher-technology facilitator relationship.

OVERVIEW OF NORTH CAROLINA’S IMPACT MODEL

North Carolina’s Department of Public Instruction also realized the importance and benefits of linking a technology facilitator, as well as a media coordinator, with public school teachers. In 2000, this department published *IMPACT: Guidelines for School Library and Instructional Technology Programs* (North Carolina Department of Public Instruction, 2000a). Aligned with *Information Power: Building Partnerships* (American Association of School Librarians, 1998), the IMPACT model recognized the importance of including a school media coordinator and an instructional technology facilitator in each school to lead in the integration of media and technology in teaching and learning. North Carolina’s IMPACT model provides guidance in instruction, access, and administration of these key members of the school instructional team. North Carolina Department of Public Schools observed:

Media and technology programs are the centerpiece of education. Teachers are no longer surrounded by students but, rather, teachers and students work together to answer the questions they encounter on their educational journey. The necessity for information literacy to be a part of a child’s education demands that library media coordinators and instructional technology facilitators serve as teacher and student travel guides on this eye-opening journey of learning. (North Carolina Department of Public Instruction, 2000a)

To be effective guides, North Carolina’s Department of Public Instruction (DPI) recommended, “The school library media coordinator and the instructional technology facilitator work closely with teachers, administrators, students, and support personnel” (North Carolina Department of Public Instruction, 2000b).

To implement their IMPACT model, the North Carolina Department of Public Instruction awarded Enhancing Education Through Technology (EETT) planning federal grants to 11 schools in 2003 (North Carolina Department of Public Instruction, 2003). The purpose of these grants was to provide funding and technical assistance to fully implement the IMPACT model of integrating media and instructional technology in

the schools. Each of these 11 schools received awards of \$450,000 for the next three school years (i.e., 2003-2004, 2004-2005, and 2005-2006), with the major portion going toward staff development.

PURPOSE OF STUDY

During the past year, we evaluated the progress of 4 of the 11 North Carolina IMPACT model schools. The intent of this paper is to present case studies of these four schools. We describe the progress of each of these schools and analyze the similarities and differences between each of the school's IMPACT model activities. Results of our study not only will influence further implementation of North Carolina's IMPACT schools, but also can affect other school districts that consider adopting a technology facilitator model in promoting effective technology integration.

METHODS

To evaluate each school's implementation of their respective IMPACT model, we performed the following data collection methods at some or all of the schools. Teachers completed surveys during the beginning and at the end of the school year during spring 2004. Teachers also completed monthly logs and reflected upon their technology use. Technology facilitators, media coordinators, administrators, and teachers at the respective schools participated in individual interviews. Students and teachers also participated in focus group interviews. Extensive observations were made in individual classrooms, respective media centers and computer labs, as well as during staff development and collaborative planning meetings. For our evaluations, we also examined existing data. These data included media center and computer lab logs, student projects and sketches of teachers' classrooms (before and after the IMPACT project).

IMPACT MODEL CASE STUDIES

Each of the four schools (i.e., Southwest Elementary, Southeast Elementary, Northwest Middle, Northeast Middle) and their corresponding IMPACT model activities are described. In Table 1,

TABLE 1. Demographic Information on the Four IMPACT Schools

Category	Southwest Elementary	Southeast Elementary	Northwest Middle	Northeast Middle
Number of students	358	452	667	695
Racial composition of students	Caucasian 62% African American 36% Multiracial ~2% Asian < .1% Hispanic < .1%	African American 66% Caucasian 32.3% Hispanic 1.1% Asian .6%	African American 70% Caucasian 15% Hispanic 7% Multiracial 6% Asian 1% Native American 1%	African American 51.1% Caucasian 48.3% Hispanic .6%
Number of teachers and staff	28	41	38	54
Percentage of teachers who completed advanced degrees	36	23	18	18
Percentage of teachers, who have taught three years or less	7	23	28	43
Percentage of teachers, who have taught between four and nine years	29	20	44	11
Percentage of teachers, who have taught more than ten years	64	57	28	46
County's population, 2000	11,678	25,593	308,620	55,007
Percentage of high school graduates (2000)	72	58	85	71
Average SAT score (2003)	924	896	946	928

pertinent demographic information about each school is presented. Table 2, presents technologies that were implemented at each of the four schools as a result of the IMPACT grant. We organized these technologies into four main categories: hardware (e.g., SmartBoard), software (e.g., FrontPage), Internet resources (e.g., WebQuests), and video.

TABLE 2. Use of Technologies in Classroom and Curricular Activities as a Result of the IMPACT Project

Technology	Southwest Elementary	Southeast Elementary	Northwest Middle	Northeast Middle
Hardware	<ul style="list-style-type: none"> • SmartBoard • Document reader • Scanner • Digital camera • CD burner • LCD projector • Wireless laptops • CPS 	<ul style="list-style-type: none"> • Digital microscope • Digital camera • LCD projector • Laptops • Overhead 	<ul style="list-style-type: none"> • SmartBoard • Laptop • CPS • Digital camera • Scanner • CD burner • Versapods • LCD projector • Infocus • Overhead 	<ul style="list-style-type: none"> • PDA • Digital whiteboard • LCD projector • Digital camera • Video camera • Scanner • Laptop • Alphasmart • Telephone homework message service
Software	<ul style="list-style-type: none"> • PowerPoint • Microsoft Word • Kids Pix • Kids Works Plus • Kidspiration • Graph Club • Accelerated Reader • Desktop publishing 	<ul style="list-style-type: none"> • Inspiration • Kids Pix • Microsoft Word • Excel • PowerPoint • Paint • Accelerated Reader 	<ul style="list-style-type: none"> • Excel • PowerPoint • Lightspan • Sony Playstation • FrontPage • Windows Media Player • Paint program • Databases • FastForward • Accelerated Reader • Desktop publishing • Cool Timer 	<ul style="list-style-type: none"> • Microsoft Office • PowerPoint • Orchard • Inspiration • Online databases • Cornerstone
Internet	<ul style="list-style-type: none"> • Web sites 	<ul style="list-style-type: none"> • NCWiseOwl • Selected Web sites • United Streaming Video 	<ul style="list-style-type: none"> • Web sites • Epals • NC Wise 	<ul style="list-style-type: none"> • Selected Web sites • NCWiseOwl
Video	<ul style="list-style-type: none"> • Television studio • VCRs 	<ul style="list-style-type: none"> • Television • VCRs 	<ul style="list-style-type: none"> • VCRs 	<ul style="list-style-type: none"> • Video cameras • VCRs • Media retrieval system

Southwest Elementary School

Southwest Elementary's principal, technology facilitator, and media coordinator guided teachers in developing effective curricula that promoted effective use of technology. Southwest teachers developed several multidisciplinary, thematic projects throughout this school year. One representative unit is the Winter Olympics thematic project. This

project involved several content areas, including reading, science, social studies, math, physical education, music, and other areas. Each class represented a country and completed various instructional activities that directly corresponded to specific science curricula objectives. Although the actual events were physical fitness activities, the lessons leading up to the Olympics were technology related. Students researched their specific county on the Internet, and also used Kidspiration and PowerPoint for this event. Other thematic projects during the school year focused on a weather unit, plants, life during the Colonial era and international celebrations of Christmas and other similar projects.

The use of a SmartBoard was quite prevalent among Southwest Elementary teachers. The principal reported that the school's "best tool is the SmartBoard." Teachers used the SmartBoard in multiple ways. They put a book on a SmartBoard, so all of the students could see the page. The teachers used Kidspiration as a writing tool to do whole group instruction in an innovative way (one can still do individualized, small group work with this software). With the option of connecting to effective Web sites with the school's Internet connection, teachers used the SmartBoard as a way to present instructional content to the class. One teacher remarked that her "teaching delivery has changed because of the Smart Board." She used it "for everything," including learning the alphabet, songs with various clipart, or Kidspiration graphics. In addition to working on curricular projects, students' eye-hand coordination and fine motor skills were also enhanced. Southwest Elementary teachers also used several software packages, such as Kidspiration, Kid Works Deluxe, and PowerPoint (see Table 2).

These additional projects and tools obviously benefited Southwest Elementary students and teachers. The technology facilitator noticed a group of kindergarten students who were "full of excitement. They were engaged, and it was really a discovery time for them." One teacher realized that she now could use the technology to meet the needs of the diverse learner. She observed, "With PowerPoint this year, I have learned to add sound to the slides. My children record themselves and play them back with the class." Another teacher noticed that her students "stay on task. My problem is getting them to give up the computer when their time is up. Nine times out of 10 they'll choose the computer to complete their work."

Another significant initiative for promoting effective instruction was the regular staff development and collaborative team meetings. These meetings provided instruction to assist teachers in identifying and developing appropriate, technology-enriched curricular projects and

enabled teachers to share ideas and become more comfortable in using new technologies purchased through IMPACT grant. At Southwest Elementary, in-service teacher staff development took place in four distinct ways: scheduled staff development, collaborative team planning, technology newsletters, and “technology therapy.” Scheduled staff development occurred twice per month. Teachers met in grade-level teams for an hour. Teachers also met in grade-level teams during collaborative team planning meetings that took place every six weeks. The technology facilitator and the media coordinator usually provided instruction during these collaborative meetings. Another source of technology instruction was the monthly technology newsletters. In these newsletters, the technology facilitator wrote articles dealing with technology, provided a resource list, and identified a technology teacher of the month. This honor was for teachers who have been flexible, willing to collaborate, or who have experienced some change in their attitude toward using technology. Besides group staff development, the school developed a service that they have called “technology therapy.” The technology facilitator reported that “teachers can come to me for one-on-one help. They tell me the problems and I’ll help them work them out.”

Collaborative planning is not a new concept at Southwest Elementary. Several years ago, the superintendent in Southwest Elementary’s school district challenged each of the schools to increase collaboration among grade levels. As described by the Southwest Elementary principal, “Teachers are no longer confined to the classroom; we have one big classroom. The classroom doors have opened up, with everyone sharing ideas, techniques, and Web sites.” In fact, from the very beginning of the IMPACT project at Southwest, the school emphasized three key words: flexibility, change, and collaboration. The technology facilitator believed that these activities “were the main ingredients to make the IMPACT grant work. Without any of these, we were going to have some type of flaw. Now we are working toward an understanding of the importance of being team players.”

Southeast Elementary School

In the first year of their IMPACT initiative, Southeast Elementary decided to concentrate on developing two sets of skills for their teachers. One of the primary goals was learning about the possibilities of student-driven and project-based learning. The IMPACT team also concentrated

on providing activities to improve developing collaborative relationships among Southeast's teachers. The intent of this collaboration was to develop project-based technology activities for Southeast students.

This collaborative and project-based learning emphasis definitively influenced and affected teachers' teaching practices and subsequently, student learning outcomes. For example, Southeast third-grade students documented their spring fieldtrip to a farm with their digital cameras. Then, using their digital images and PowerPoint, Southeast students presented their farm trip to other classes, parents, and the Southeast Elementary community. Southeast fourth-graders visited the Outer Banks North Carolina area and integrated language arts, math, science, and technology. Research-based projects involved the collection of data and the creation of newsletters, brochures, and learning cubes (i.e., 8" to 10" cubes with an appropriate digital photo or hand-drawn graphic related to the theme on each surface). The highlight for the fifth-grade team was the collaborative unit with the National Guard. "Starbase" involved members of the National Guard working with the teachers and students for a week of experiments. Students used digital cameras to record the events of the week and gather data for PowerPoint presentations about their "Starbase" experiences.

Southeast students noted differences in the projects that they completed during the previous year. These projects including writing pen-pal letters with digital images, creating brochures and newsletters, and creating three-dimensional objects, such as the learning cubes described previously. A fourth-grade student mentioned that her classroom is "no longer in rows." Other student projects included working with digital microscopes, SmartBoards, Web cams, and online encyclopedias. Southeast students also used specific software packages, such as, KidPix, Publisher, Microsoft Works, and PowerPoint. Changes to the curriculum were evident in several subjects, including social studies, language arts, math, science, and art. The intent of these projects was to provide opportunities for students to express their creativity while learning. In addition to the emphasis of new student and technology-driven projects, the respect for ownership displayed in the citations used for graphics and information was included in individual student projects.

Because of the emphasis on collaboration and student-driven learning, Southeast Elementary teachers attended monthly staff development sessions. These sessions were called the R.E.C.I.P.E.S (Recognizing Everyone Contributes in Providing Educational Successes) club. The faculty and staff were divided into technology teams, called Tech Teams. Session presenters included central office personnel, media

coordinator, and technology facilitator. By spreading the schedule of training throughout the school year, the introduction of new tools and materials was paced to allow for maximum retention and time for practice before moving on to another topic. In addition to the R.E.C.I.P.E.S club meetings, Southeast teachers also attended other staff development initiatives. For example, prior to the 2003-2004 school year, a Technology Day was held for teachers and staff members. The purpose of this Technology Day was to enable teachers and staff members to become comfortable with the available technology (i.e., digital microscope, data projector, and the school's network) at Southeast. Southeast teachers also participated in INTEL-trainer model sessions. The purpose of this training program was to help teachers integrate technology into instruction. These teachers became the trainers for other members of the faculty.

Collaboration definitively has become an integral part of teaching and learning at Southeast Elementary. At the grade-level planning sessions, the Southeast technology facilitator and media coordinator introduced new resources and offered assistance for the upcoming curriculum unit. These sessions were scheduled for half a school day and were held every six weeks. The focus of these sessions was on the development of integrated lessons using digital cameras, field studies, and real-life scenarios in curriculum areas.

Northwest Middle School

Individual Northwest Middle school teachers completed curricular projects utilizing technology. The technology facilitator referred to these projects as "hands-on projects" that used more than one technology. For instance, a group of students created a project involving African masks that included supplementary information found on Web sites and PowerPoint presentations. Several Northwest Middle teachers required students to complete PowerPoint presentations for school projects. One teacher planned an exploration of Malcolm X and Martin Luther King, Jr., and how they differ in their viewpoints. Students reported on these differing viewpoints using PowerPoint presentations. Another common instructional project for Northwest Middle teachers and students has been WebQuests. The media coordinator consulted with individual teachers and developed specific WebQuests for a particular project. She and the technology facilitator also prepared specific Web sites for particular content areas. Subjects for these WebQuests and Web resources

included science, health education, social studies, communication skills, and other relevant content areas.

Individual Northwest Middle teachers also made use of the SmartBoards. Each grade-level team had one SmartBoard. Some teachers benefited from using these instructional tools. One teacher reported that she was reluctant to try using the SmartBoard at first, but she finally attempted to learn how to use it. She noted, "Finally, I said, 'You know what, I'll just do it.'" She realized that "it almost [was] stupid that earlier in the year I didn't connect the Smart Board to do that [a presentation]." Another common instructional and classroom management tool at Northwest was eInstruction's Classroom Performance System (CPS). This tool delivered real-time, interactive responses via a wireless pad technology. Some Northwest classrooms and the media center utilized this CPS technology. Usually, a teacher created a CPS quiz that contained several questions. Students' instant responses gave the teacher an understanding on students' knowledge of the particular content area. The technology facilitator observed that using the CPS system is "a game. It's like you're tricking them into learning. They're using their math skills at the same time they're playing a game."

Several Northwest Middle teachers noted changes in how their students used technology throughout the school year. One teacher remarked that the IMPACT project "has enhanced their [students] performance somewhat; a larger number of students are doing better." In the beginning of the school year, students were a little reluctant to use the new technologies, but now, "they're more eager to get up and try." The students are definitely interacting more during the lessons. A teacher commented, "I see more attention being paid to what's going on up here [with the SmartBoard] as opposed to when the overhead was being used primarily for instruction." The use of these new technologies is prompting students to learn more about these technologies. A teacher noted that "if I use Web sites related to lessons, especially games, they're writing down the Web site address so they can do it at home." Students are not exclusively relying on the teacher to learn about these technologies, but "they're learning from the other kids in the class." "They help each other out or a lot [of students] figure out on their own—trial and error."

Northwest Middle offered several workshops to their teachers and staff members prior to the 2003-2004 school year, during fall and spring. These workshops covered a variety of topics, including thematic units, thinking maps, a motivational speaker, learning styles assessment, and other similar topics. During the spring, a majority of these workshops focused on improving state test scores. A Spring Lake

teacher said that at the beginning of the year, they learned how to use the SmartBoard. However, no “opportunities have been offered for in-house staff development.” One teacher thought that there should have been more staff development with the equipment purchased through the IMPACT grant. A teacher remarked, “There was an initial staff development on how we may do some things [technology projects and equipment]. There needs to be more follow-up on how things should be done.”

Despite this lack of formalized technology staff development workshops, the technology facilitator and the media coordinator spent considerable time offering informal staff development and working with individual teachers on specific curricular projects. Teachers typically contact the technology facilitator via e-mail. He often will check his e-mail to see if he has had a request from a teacher. He also will walk through the school and “five or six people [teachers] are asking me something. So, I ask them to e-mail their concerns.” He also will “walk around to see what the teachers are doing, to see if I can help out and collaborate with the teachers.” Northwest Middle teachers are complimentary of this informal approach. One teacher said that “staff development has been on-going. We always grab whomever. There’s someone on campus who knows about everything. We’re self-contained staff development, really and truly.” The technology facilitator and the media coordinator agreed that they will need to improve staff development. The main culprit for this limited staff development is time and lack of collaboration. The technology facilitator noted, “We need more time, time to do staff development on the basic operations (e.g., e-mail attachments) with the stuff we have.” The technology facilitator commented, “With thirty-eight teachers doing different things it is very difficult to service and help them all.”

Northeast Middle School

The overall goal of Northeast’s IMPACT project was to integrate technology throughout the school by concentrating on student mastery of six literacies: (a) visual, (b) digital, (c) language, (d) information, (e) scientific, and (f) mathematical. Distinct committees were formed based on one of the six literacies. These committees developed technology integration plans that cross over grade levels and subject areas. Each committee established goals for the year, based on the Northeast Middle School Improvement Plan. These committees made recommendations for new technologies and software to the principal and the

IMPACT team. Project ideas were discussed and planned that are appropriate to the committee focus. The primary emphasis through the literacy committees was on the development of collaborative units at each grade-level that fully integrated thematic, subject-oriented, project-based learning activities into the instructional program. At the end of the school year, each literacy team completed a self-evaluation of their efforts during the first year. Several groups reported that there was not enough time between training on new technology or software before it had to be incorporated into teaching. Fifty percent of the literacy committees reported that more time was needed for planning the collaboration. It was difficult with the complex school schedule to meet with both the media coordinator and the technology facilitator, as well as with other teachers. Enrichment teachers (i.e., art, music, and special needs) were often unable to schedule time to meet with the planning teams.

All Northeast classrooms and labs had interactive software for reading, mathematics, graphic organization, writing, multimedia presentations, and research. The school network had several online resources distributed from CD-ROMs. Northeast teachers and students used several software packages (e.g., Paint, PowerPoint, Inspiration, Orchard, etc.). Northeast teachers and staff members also had access to technologies, such as digital cameras, ACTIVBoards (interactive white boards with individual response devices), new television monitors and similar technologies. One fifth-grade student commented, "You can do more 'stuff' because it 'triggers' thinking." Several Northeast students completed their science, language arts, writing, math, and social studies projects using a variety of technologies (e.g., digital cameras) and a variety of software programs (e.g., PowerPoint, spreadsheets). An eighth-grade Northeast student commented that the use of visuals "helps us to understand concepts better." At Northeast's Technology Showcase, students and teachers displayed their project that included an assortment of formats, as well as shared students' various PowerPoint presentations with parents, teachers, and members of the community. As part of next year's Northeast Middle School Improvement Plan, teachers will plan, develop, and assign at least one problem-based learning project per semester based upon the state curricular objectives.

Northeast teachers attended several staff development workshops throughout the school year. They attended training on the Big 6 model that emphasized the process for research and reporting, covering task definition, information-seeking strategies, location and access, use of information, synthesis, and evaluation. Northeast faculty also participated in INTEL workshops, Explornet workshops, and a vendor training

session for the digital whiteboards that included the capability for voting or polling students. Small group training was held as needed for using data projectors, visual presenters, cameras, and Alphasmart units. In addition, software sessions for faculty included assistance in learning and teaching of Microsoft Word and Excel, Inspiration, Orchard, Cornerstone, and online resources. Northeast teachers and staff members also participated in a training session on how to analyze disaggregated test data and develop strategies to meet the needs of lower achieving subgroups as described by the No Child Left Behind Act of 2001.

Prior to the IMPACT grant, faculty at Northeast Middle had varied experience in teaming and collaborating. With an extremely complicated scheduling pattern nine different schedules for the five grades (i.e., 4th, 5th, 6th, 7th, and 8th) at Northeast, the challenge was to create time for collaborative planning. Fortunately, the goal of two project-based learning activities for each grade-level was achieved during the first year of the grant such as the use of cameras to study angles found around the school? The scheduling of the middle school, especially one that spans five grades, is a challenge to working in the IMPACT Model. Northeast Middle school's fourth and fifth grade teachers work collaboratively on instructional units as part of EnTech training and the School Improvement Plan, but the classes are completely self-contained for academic subjects. The revised schedule provided team-planning time once every three or four weeks for fourth and fifth grade teachers. Sixth-grade classes started teaming during the 2002-2003 school year and were ready for collaboration for the project-based learning activity during the 2003-2004 year. Math teachers teamed up with math teachers, social studies teachers with social studies teachers. Seventh and eighth grades started teaming during the 2003-2004 school year, since, in the past, they had been scheduled using a junior high school model. Students changed classes for academic subjects, but the teachers worked in grade-level groups rather than participating as genuine middle school teams.

ASSERTIONS

Based upon these four IMPACT case studies, we made the following three assertions. Not only do these assertions indicate IMPACT Model "lessons learned" from the first year, they also may offer advice for other schools that are considering the implementation of a technology facilitator model at their own school.

Collaboration—A Key Ingredient in Becoming an Effective IMPACT School

Both Southwest Elementary and Southeast Elementary emphasized collaboration at the very beginning of the implementation of their IMPACT project. At these two schools, it was vital that teachers collaborate with the technology facilitator and media coordinator and also with one another. In this collaborative environment, teachers become more active in the planning process. One Southwest teacher commented, “We are having to rely on each other. I may be more of an expert on something than someone else.” One of the primary benefits of promoting collaboration among teachers is eliminating teachers’ isolation. A Southwest teacher commented, it is “not that we are on the same level [of technology expertise], but we are all learning at the same time.” An experienced teacher from Southwest noticed a difference between sharing of resources and ideas among her colleagues. She commented, “I have got 20 years of teaching, so I have worked with the isolation piece and collaboration piece. No one wants to stand alone. Isolation has got to go.” When asked about the “isolation piece,” she recalled: “When I first started [teaching], there was isolation, in that teachers kept to themselves. Teachers did their own thing. Even in grade-level meetings, we didn’t share like we do now.” Another Southwest teacher concurred by stating, “Collaboration has been a real key for the IMPACT grant. Before they were teaching in isolation; now, they know that they are not responsible for that unit. They have the media coordinator and technology facilitator; they are not the sole person responsible.”

In contrast, Northwest Middle and Northeast Middle struggled with collaboration throughout the year. Though individual Northwest and Northeast teachers produced quality technology projects for their students with the support of the technology facilitator and the media coordinator, these teachers did not collaborate with each other. Northwest and Northeast technology facilitator and media coordinator need to support teachers’ individual projects, but also promote collaboration within and across grade levels, particularly with teachers within the same discipline. This collaboration can prompt additional ideas on how to use technology equipment and software to meet the needs of the entire middle school curriculum. Since Northwest Middle and Northeast Middle struggled with collaboration, we speculate that the existing middle school structure at these two schools may be an impediment to successful collaboration. Middle school teachers in a particular grade-level

typically are experts in a particular content area (e.g., math, science). Middle school teachers may need additional incentives and/or an altered school structure to fully collaborate with one another.

Continual and Curriculum-Related Staff Development Workshops Are Essential

Again, both Southwest Elementary and Southeast Elementary held regularly scheduled staff development workshops that focused on learning about and aligning technology-rich projects with state curriculum standards. Each of these workshops concentrated on an upcoming curriculum unit. Southwest and Southeast teachers developed new lessons by combining this content area with a new technology or technologies. While Northwest Middle and Northeast Middle offered several staff development workshops, these workshops were not recurring (e.g., every other week), and many of these workshops did not exclusively focus on technology integration. To facilitate teachers' comprehension and adoption of integrating new technologies, we strongly advise schools to follow Southwest and Southeast's direction. At the end of the school year, Southwest and Southeast teachers learned to integrate new technologies in a team-based approach. In contrast, Northwest and Northeast teachers noted that they learned about new technologies in a piecemeal approach; that is, these teachers realized that they learned about a new technology, such as a SmartBoard in the beginning of the school year, but did not have any follow-up sessions throughout the school year. As a result, some Northwest and Northeast teachers felt "lost" and did not fully implement a SmartBoard in their classrooms. Having frequent staff development workshops that focus on integrating new technologies with the current curriculum will alleviate this confusion.

A Successful Technology Facilitator at an IMPACT School Must Possess a Wide Variety of Skills and Competencies

As documented in existing literature, a technology facilitator must possess an extensive array of abilities. The scope of skills for these individuals includes (a) teaching specific technology skills, (b) providing technical expertise, (c) identifying quality, (d) providing existing technology resources, and (e) collaborating with teachers on technology integration projects (Sugar, 2005). In addition to these skills, a technology facilitator and a media coordinator (to a lesser extent) need to be flexible during a

typical school day. Northwest Middle teachers realized their technology facilitator possessed a variety of skills and more importantly, was flexible. He was able to adjust to teachers' technology needs. One teacher commented, "The technology facilitator came into my classroom, probably three times per week. 'Anything you need, as far as lesson?' he'd ask, 'Here are some resources. Or do you need me to come in?'" He also continually identified relevant resources that could aid teachers. A teacher explained, "He is always finding stuff for us, everything we need." A Southwest teacher also realized that her technology facilitator and media coordinator "are very open. If there is something that I'm working on, I can go to either one." Another Southwest teacher concurred. She said, "Having the flexible scheduling, being able to call on them when we need it has really helped." Though being flexible or providing just-in-time information is essential, the ability to facilitate collaboration and help faculty develop their own instruction is equally important. A Southwest teacher summarized this essential capability:

I think now that we have the media coordinator and technology facilitator, they can steer us in the right direction of what tools to use. With all three, the teachers, media coordinator, and technology facilitator, everybody has their own area of expertise.

A successful technology facilitator, as well as a successful media coordinator must facilitate this team process.

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