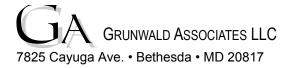# Intel-based Mac Computers in Education:
Research and Findings

April 2007

Executive Summary

In order to investigate the adoption, use, and benefits of the new Intel-based Mac computers in the K–12 educational setting, GRUNWALD ASSOCIATES, *LLC,* in partnership with ROCKMAN *ET AL*, conducted research to document the experience of school districts that have added Intel-based Apple technology to their computing environments.

Having interviewed technology decision makers, influencers, and support staff in five K–12 districts from diverse perspectives in terms of size, location, technology environments, and student body served, GRUNWALD and ROCKMAN conclude that Intel-based Mac computers offer the following benefits to school districts.

1.   Administrative efficiencies
The Intel-based Mac appears to offer increased efficiency for district and school administration and includes features that support administration by providing the "best of both worlds" i.e., the ability to work in both the Mac and Microsoft Windows environments. Administrators report that they gain efficiency and the power to accomplish more with the Intel-based Mac computers. Efficiencies include:

- Cost savings and greater efficiency
- Multiplatform functionality
- Fast, reliable, and stable technology
- Ability to leverage most current software assets

2.   Ease of implementation and compatibility
Technical support of Intel-based Mac computers is simpler, saves time and can lead to lower total cost of ownership. Features include:

- Quick setup and integration
- Reduced technical support due to the stability of the Mac OS X operating system
- Support for strategic deployment
- More efficient and more valuable training for teachers
- Increased professional skills for technology staff

3.   Value-added benefits in teaching and learning
For teachers, the new Intel-based Mac computers can offer easy access to both instructional and necessary administrative software. In addition, for students and teachers, the range of software for teaching and learning increases. The innovative Apple features and solutions available on the Intel-based Mac (particularly the iLife suite) can engage and inspire students to learn in new ways. Benefits include:

- Development of critical 21st-century skills for students and teachers
- Powerful yet easy-to-use digital authoring tools for increasing student engagement
- Opportunity to take advantage of hardware and software innovations

Introduction

Over the past year, Apple has been increasing its share of the U.S. school computer marketplace—dramatically, in the case of notebook computers. According to IDC's WW PC Tracker report, in calendar year 2006, more Mac notebooks were sold in the United States than in any other year and Apple gained 3.2 share points in the education market. One of the major reasons for this growth is the benefit that comes from Apple's adoption of Intel technology in the Mac. This fundamental change in architecture provides options for school administrators and teachers that have not been available before. This report illustrates the differences schools have seen when they introduce the Intel-based Mac into their existing technology environments.

To more clearly understand the changes that CIOs, MIS directors and technology coordinators, and superintendents and principals have seen with the new Intel-based Mac, GRUNWALD ASSOCIATES, *LLC*, in partnership with ROCKMAN *ET AL*, undertook a study to document the experiences of various school districts that have added this technology to their computing environments. In districts large and small, urban and rural, we sought out those sites that were increasing the presence of the Mac in administration and instruction, those who were adding Intel-based Mac computers to their current installed base of Macintosh systems, and those who were seeking to introduce the Mac to mostly Windows-based PC environments.

We asked the following questions to explore the rationale for acquiring Intel-based Mac computers, and the nature of any impact that may have been observed after installing the Mac platform in administrative and instructional settings.

- Why did districts choose to purchase Intel-based Mac computers?
- How easy has it been to set up, deploy, integrate, and support Intel-based Mac computers?
- How do Intel-based Mac computers support the successful integration of technology for administrative and instructional purposes?
- How are Intel-based Mac computers being used for administrative purposes, and what are the benefits?
- How are Intel-based Mac computers being used for teaching and learning, and what are the benefits?

The purpose of this white paper is to report on the findings of this research to assist education administrators and technology leaders in making informed decisions about which technologies to use in support of administration, teaching, and learning. We address each of these questions in the findings section.

We'd like to thank all of the school districts that participated in this research effort:

Hopedale Public Schools District, Massachusetts

All Windows-based PC district replaced one third of systems with 150 Intel-based Mac computers.

District Demographics:
- 1,261 students in 2 schools, 1 elementary, 1 junior-senior high school
- Working class community in small town
- 94% Caucasian, 2% Asian, 2% Hispanic, 1% African American
- 4% eligible for Free/Reduced Lunch
- 150 Intel-based Mac computers out of 440 computers districtwide

Methodology

Researchers conducted in-depth interviews with individuals responsible for overseeing or implementing the use of technology in five school districts. The districts were selected in collaboration with Apple, and included:

- Hopedale Public Schools District, Hopedale, Massachusetts
- Prince George's County Public Schools, Upper Marlboro, Maryland
- Socorro Consolidated School District, Socorro, New Mexico
- Indianapolis Public Schools, Indianapolis, Indiana
- Los Altos School District, Los Altos, California

These districts represent diverse perspectives in terms of size, location, and the extent to which they use Mac versus Windows-based technologies. We spoke with a total of 19 educators including district superintendents, CIOs, and directors of curriculum and assessment. At the school level, we interviewed K–12 principals, and integration and media specialists. Our interviews followed a protocol designed to elicit information about the overall goals for technology use within each district, particularly with respect to the administration, teaching, and learning aspects.

Prince George's County Public Schools, Maryland

Predominantly Windows-based PC district purchased 1000 Intel-based Mac computers to support a Windows-based administrative environment within Mac-based instructional settings.

District Demographics:
- 136,095 students in 205 schools, PK-12. 120 Elementary Schools, 31 Middle Schools, 28 High Schools, 3 Charter Schools, 23 Special Schools and Centers
- Urban fringe of a large city (outside of Washington DC)
- 77.4% African American, 10.3% Caucasian, 8.6% Hispanic, 3% Asian/Pacific Islander, <1% Native American
- 42.3% eligible for Free/Reduced Lunch, 6.9% ELL
- 1,000 Intel-based Mac computers out of 35,000 computers districtwide

Findings

This section discusses our findings, grouped under each of the research questions that were asked.

Why did districts choose to purchase Intel-based Mac computers?

Cost savings and greater efficiency

When asked why they chose to purchase and deploy the Intel Mac, Prince George's County and Hopedale Public Schools noted the cost savings and efficiencies gained. The multiplatform functionality of the Intel-based Mac computers saves precious work hours, both for those who use the computers and for the technical support staff who provide repair and technology training services. At Prince George's County Public Schools in Maryland, teachers can easily switch between platforms on one Mac computer to handle both administration and instruction.

Prince George's County high school technology coordinator, David Hechinger commented that the Unix foundation on which the Mac OS X operating system is based makes the Mac computer more stable and reduces administrative overhead.

"The underlying code makes a system solid. The Unix platform is very stable. It allows for that much less administrative overhead…[M]any of us are looking for alternatives because the [Windows-based] PCs are just piling code on top. The Mac commercials are so 'on the money.'"

At Hopedale Public Schools in Massachusetts, Director of Curriculum, Assessment, and Technology, Tom Plati explained that they've experienced cost savings because they have not had to do any repairs. Plati said,

" In terms of maintaining the Mac [computers], it's much less time consuming…There's a cost savings in terms of repairs."

Additionally, Hopedale noted that they save money since many of the computer accessories that they require such as cameras and microphones are already built into the Mac. The money that would be spent on these devices is now available for other technology purchases. Network manager Lisa Appell explained,

"I think that the biggest benefits are that we've been able to use a lot of [add-ins]… the camera, the microphone—all that is integrated [so they can] do podcasting in Special Education and foreign languages. Teachers can speak paragraphs and have the kids interpret them. On Windows [PCs], you have to buy all the extra add-ins. So, [built-in] peripherals [are] a benefit."

The stability of the Intel-based Mac also results in less maintenance and support from technology staff. At Indianapolis Public Schools, Academic Technology Officer Jeff McMahon said that because Mac OS X is Unix-based, it is more easily accessible to technicians who may need to program changes. This saves staff work hours that could otherwise be spent on more strategic and mission-critical tasks.

In addition to saving maintenance and repair time, Indianapolis support staff said that professional development for teachers also takes less time because "people catch on

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Los Altos School District, California

Mostly Mac-based district deployed 350 Intel-based Mac computers seamlessly into their existing technology environment.

District Demographics:
- 4,036 students in 9 schools, K-8. 7 Elementary Schools, 2 Intermediate Schools
- Suburban (San Francisco Bay Area)
- 65% Caucasian, 28% Asian, 4% Hispanic, 2% Other, 1% African American
- 2% eligible for Free/Reduced Lunch, 6% ELL
- 350 Intel-based Mac computers out of 1500 computers districtwide

quicker" with computers running Mac OS X. Technology managers note that the platform maintains the confidence of former Windows-based PC users while they adapt to the more intuitive Mac OS X systems. This saves money and reduces the total cost of ownership. McMahon explained,

"While both platforms require some training and support, for [the Mac], it is more seamless. People catch on quicker, so when it comes to investing in professional development, that helps reduce the total cost of ownership."

Multiplatform Functionality

Districts often cited the multiplatform functionality of the Intel-based Mac as one of their primary motivations to purchase Mac computers. In order to support both administrative functions—in many districts largely Windows-based—as well as instructional efforts that require flexibility independent of operating system to meet students' needs, the Mac offers the best solution.

Indianapolis Public Schools made the decision to purchase Intel-based Mac computers for all teachers and administrators at two new schools because they felt the multiplatform functionality helped them address the varied needs of their constituents. Teachers—used to working on PCs—continue to use Windows-based software on their Mac computers to perform administrative tasks, but they now have the added ability to access the Mac platform for instructional activities. Chief Information Officer Dorothy Crenshaw explained,

"The decision to purchase [Intel-based] Mac [computers] was the logical next step, and the Intel chip was central to the decision. We have always been challenged by the fact that business applications run on Windows. We liked the … 'one-size-fits-all' situations—that teachers could still do their administrative work (attendance, discipline tracking, etc.) in Windows, and use the Mac for instruction."

For Indianapolis Public Schools, the availability of the Intel chip in new Mac computers made all the difference in its purchasing decision. The multiplatform functionality helped reduce the burden of requiring teachers to use two different machines—one for administration and one for instruction.

The decision to purchase Intel-based Mac computers was similar for Prince George's County, Maryland, a predominantly Windows-based district where the Mac has been used at the elementary school level for many years. Elementary school teachers, support staff, and administrators faced the difficulty of negotiating a largely Windows-based administrative environment as well as a Mac-based instructional setting. This year, teachers, integration specialists, and administrators at 20 elementary school sites were given Mac computers with both Mac OS X and Windows installed. According to elementary technology coordinator Curry Hoskey this is particularly important for elementary-level Special Education teachers who must use Windows applications for tracking student data. Hoskey explained that the Intel-based Mac computers have had a very positive impact on these teachers.

"The biggest positive change is [among] Special Ed teachers who have specific web-based admin programs [that] they can only get on Windows. Because of how data-heavy it is, they need to do it through the network…[T]he [Intel-based Mac computers] are invaluable to them…they have to document everything. If the teacher has 15 free

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Indianapolis Public Schools, Indiana

The district purchased 300 Intel-based Mac computers to provide multiplatform functionality to address the varied needs of its constituents.

District Demographics:
- 36,957 students in 80 schools, K-12. 50 Elementary Schools (K-6), 9 Middle Schools (7-8), 5 High School (9-12) Campuses (incorporating 24 Small Schools); 12 schools with other grade groupings, and 4 Alternative Schools.
- Urban
- 58% African American, 25% Caucasian, 12% Hispanic, 5% Multiracial, 1% Asian/Native American
- 82% eligible for Free/Reduced Lunch, 9% ELL
- 300 Intel-based Mac computers out of 20,000 computers districtwide

minutes, they can enter data instead of trying to wait for centrally located computers. That's a positive impact."

Hopedale Public Schools—a small school district that was originally a Mac environment—switched to a Windows environment and has now replaced one-third of its systems with Intel-based Mac computers. The introduction of these new computers has given staff with the option to pick the platform that is most comfortable for them or to switch between the two if necessary for their work. Hopedale's previous switch from an all-Mac to an all-Windows district created a mix among staff and teachers as to which platform they preferred. High school technology specialist Meredith Ekwall commented,

"I have absolutely loved going back to a Mac. I struggled with Windows machines for years. It was night and day. Mac is so much more intuitive [and] integrated more simply and efficiently. I just love the Mac and that you can use [both platforms]."

Socorro Consolidated School District is a small rural district in New Mexico where most computers are old, donated PCs. Intel-based Mac computers are being introduced in order to standardize the district on one system while using all current applications and allowing users to start out on the operating system with which they are most comfortable. Superintendent Dr. Cheryl Wilson said the Intel-based Mac was a good fit for her district.

The multiplatform capability of the Intel-based Mac has allowed these districts to use one system for two platforms, thereby supporting the most effective use of technology for both administrative and teaching purposes.

Fast and reliable technology

The Socorro Consolidated School District decided to purchase Intel-based Mac mini computers in order "to get [teachers] functioning equipment." Director of Technology Jeff Miller commented that maintenance of the Intel Macs "will be a lot faster." Superintendent Dr. Cheryl Wilson explained that this decision was made because Miller "made the case to the technology committee [on] the issues of security and ease of maintenance, while having the benefit of [the] Intel-based [technology]."

In Indianapolis, Academic Technology Officer, Jeff McMahon said that in addition to offering the multiplatform capability and cost savings associated with less technical support, the Intel-based Mac computers also appear to be faster than previous generations, a factor that helps make things run more smoothly in the classroom.

To better prepare students and teachers with digital literacy skills

Some school districts noted that the Intel-based Mac computers are helping them meet their goals of preparing students for the workforce and developing teachers' knowledge and use of technology. The multiplatform capability of the Intel-based Mac gives both students and teachers the opportunity to become literate in two "languages," namely Windows and Mac OS X.

Socorro Consolidated School District, New Mexico

The district introduced 150 Intel-based Mac computers to standardize on one system and replace old Windows-based computers.

District Demographics:
- 2,031 students in 9 schools, PK-12. 6 Elementary Schools, 2 Middle Schools, 1 High School, 1 Charter (Elementary).
- Small town
- 65% Hispanic, 29% Caucasian, 3% Native American, 2% Asian, 1% African American
- 55% eligible for Free/Reduced Lunch, 24% ELL
- 150 Intel-based Mac computers out of 900 computers districtwide

At Hopedale Public Schools, Tom Plati, the Director of Curriculum, Assessment and Technology, said this aligns perfectly with their district technology plan and standards for students and teachers. K–8 Integration Specialist Coleen Collette said,

"[Students] learn both operating systems so it's helping to prepare them for the real world… In all honesty, Tom [Plati] was right. We need to get kids on both platforms."

The Intel-based Mac supports students in the operating system with which they are most familiar and also allows them to broaden their knowledge of computers.

High school technology specialist Ekwall commented that students benefit from the ability to use both platforms. Since purchasing the Intel-based Mac computers, she has noticed that they allow for further exploration and the potential for greater technology literacy. These skills can lead to other opportunities. Ekwall notes,

"One [high school] student is looking for an internship with our tech team because he knows about [the Mac]."

Prince George's County technology staff also noted the importance of students and teachers learning both operating systems. Elementary technology coordinator Hoskey explained that the decision to purchase the Intel-based Mac was based on their priority to develop students' and teachers' 21st-century skills.

"The principal feels very strongly that everybody—students and teachers—should learn on both platforms, Windows and Mac. That was the reasoning… The principal feels strongly that we need to be able to work and be productive on both platforms… [N]ow we've got the added benefit of being proficient on both platforms."

High school technology coordinator David Hechinger commented that as students move on to college, they "will face [Windows-based] PCs, [the Mac], anything. They need both."

To take advantage of technology innovations

In addition to multiplatform functionality, cost savings, fast and reliable technology, and preparing students and teachers, districts also like to explore Apple's technology innovations. Districts said they viewed the purchase of the Intel-based Mac computers as a way to take advantage of Apple's new technologies including the innovative and powerful software that comes bundled with every Mac.

In Prince George's County, CIO Wesley Watts said that he would be "foolish" not to investigate and take advantage of innovations offered by Apple. When Watts saw that the Intel-based Mac computers could run all of the Windows software they had, as well as Mac OS X applications, he could see the potential benefit. Watts explained,

"As a CIO, I don't want all my eggs in one basket. If I do, I don't get to see the advances that other companies [make]. I saw [that] the Apple [Intel-based Mac] could run all our Windows software and the Mac OS–and Apple has a strong tie to education."

High school technology coordinator Hechinger also said that the ability to have both platforms on one system allowed the district the flexibility to investigate new software for both Mac and Windows-based PCs. Hechinger commented,

"The decision to purchase [Intel-based Mac computers] was the logical next step, and the Intel chip was central to the decision."

Dorothy Crenshaw,
Chief Information Officer,
Indianapolis Public Schools

"One does not [have to] abandon one operating system for another. What the [Intel-based] Mac allows us to do… we could start playing with [the new technology that Apple] produces while running dedicated Windows apps virtually."

With the option to use software on both platforms, schools can assess and adopt new applications that meet their administrative and instructional needs.

At Hopedale Public Schools, the innovative software included with Macintosh computers has engaged teachers and increased their interest in and use of technology. High school technology specialist Ekwall said that the iLife suite of integrated applications–including iPhoto, iMovie, iTunes, GarageBand, iWeb, and iDVD–gave her a reason to use the computer for herself, and then she started showing teachers things that would interest them:

"One teacher did scrapbooking, so I showed her iPhoto. Another was going on vacation; I convinced her to buy a Mac so she could use music and photos on her vacation."

In Los Altos, students are creating videos and podcasts with the iLife suite to demonstrate their understanding of the subject matter. One principal noted,

"The kids just love [using multimedia]. It engages them…It appeals to the fun part [of learning]."

In Prince George's County, teachers are taking advantage of the integrated Mac applications to try new, innovative curriculum adaptations. Elementary school technology coordinator Curry Hoskey said,

"GarageBand. Our music teacher loves that. [He] is using the feature where you can record into GarageBand and iTunes to create podcasts on the Mac."

Likewise, several administrators in Indianapolis have begun using their new Intel-based Mac computers to explore podcasting—something they had never attempted to do on a Windows-based PC.

How easy has it been to set-up, deploy, integrate and support Intel-based Mac computers?

Quick setup and integration

Once a district made the purchase of the Intel-based Mac computers and had them in hand, they experienced a fast and convenient setup process that required few changes in their networked environments.

At Hopedale Public Schools, the technical staff was able to do mass re-imaging using NetRestore, an application that can reduce setup time. (See http://www.bombich.com/mactips/dualboot.html). Network Manager Lisa Appell said,

"We set up the computers using dual boot [with the beta version of Boot Camp, which allows users to run Mac OS X and Windows on the same Intel-based Mac] and created images using NetRestore for both [Mac OS X] and Windows. [O]nce we got

"While both platforms require some training and support, for [the Mac] it is more seamless. People catch on quicker, so when it comes to investing in professional development, that helps reduce the total cost of ownership."

Jeff McMahon,
Academic Technology Officer,
Indianapolis Public Schools

the system through NetRestore down, we were able to image them really fast… Boot Camp itself is extremely easy to use, step by step, easy to follow.”

Appell said that setting up the system was smooth, even though she had previously been a Windows-based PC user, because the Mac computers “are a lot easier to use” and are “more forgiving.” Her experience setting up the computers for networking was very positive:

“A lot of the stuff is built in and easier to move through the screens in the networking [process]. I’m a Windows person. And I bought a Mac. It’s a MacBook Pro, because it’s dual-booted and I can use Windows stuff at home. You can just really go and if DHCP is set up, it’s easy to connect the MacBook anywhere you go–it’s just seamless.”

High school technology specialist Ekwall said that they saved time by not having to find, install, and update drivers on the computers, saying,

“In [the Mac], all drivers are included for cameras, video cameras, flash drives, etc. [They’re] already there.”

Elementary school technology coordinator Hoskey from Prince George’s County also commented that one of the benefits of the Intel-based Mac computers was that they can easily run software that the district currently licenses without the technical staff having to install any drivers.

Ekwall went on to say that in networking, they saved time by not having to set up individual computers for wireless access. Instead, the computers conveniently find access points around the school building. Ekwall explained,

“Another benefit is that we didn’t have to go through individual computers to set up [wireless] access. We have seven access points for wireless ports. You go around the building–the Mac just finds them. That’s been a huge help with the mobile carts.”

In Socorro Consolidated School District, administrators and technology staff echoed the experiences of Hopedale’s Network Manager. Superintendent Wilson commented that the technical staff was able to “get them out pretty fast, on schedule.” Director of Technology Jeff Miller thought that the set up and deployment were smooth:

“We’re able to clone and deploy in very rapid circumstances, do a Ghost on [Windows] and a Carbon Copy Clone on [Mac] OS X. We use NetBoot/NetRestore. With [the beta version of] Boot Camp, we can hook up seven computers and in a couple hours clone those. Within less than an hour, they’re ready to go to the teachers. The whole workgroup manager piece—basically I can go in, set up preferences—set up toolbars for certain classes…We’ve done three different images since the beginning of the calendar year.”

Elementary school technology coordinator Hoskey from Prince George’s County commented that one of the benefits of the Intel-based Mac computers was that they can easily run software that the district currently licenses without the technical staff having to install any drivers.

In Socorro, like Hopedale, set-up was expedited by the fact that the addition of the Intel-based Mac computers did not require any changes in Socorro’s network. This

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>
> Curry Hoskey,
> Technology Coordinator,
> Prince George’s County

was in direct alignment with key issues for the district, which prioritize compatibility between systems when choosing to purchase and deploy new technology.

Historically, the Los Altos School District has been mostly Mac-based. In fall 2006, the district deployed 350 Intel-based Mac computers for use by administrators, teachers, and students. They have not had any problems with integration or reverse compatibility with any of their new computers. Administrators, teachers, and students are all familiar with the Mac OS X applications and interface. Los Altos finds the seamless integration a time-saver and an asset.

Reduced technical support due to stability of Mac OS X

Part of the decision to buy Mac computers came as a result of Apple's reputation for creating a stable operating system. School districts that acquired these computers found that this was true of the Intel-based Mac computers, which has resulted in a reduced need for technical support and consequently, has led to cost savings.

Many of the school districts commented on the stability they've experienced with the Intel-based Mac computers. In the Socorro Consolidated School District, Superintendent Wilson commented,

> "Another benefit is that we didn't have to go through individual computers to set up [wireless] access. We have seven access points for wireless ports. You go around the building–the Mac just finds them."
>
> Meredith Ekwall,
> Technology Specialist,
> Hopedale Public Schools

"You can't beat [Mac] OS X for stability. Windows is still not stable. The hardware itself isn't crashing as much. Windows crashes, that's just Windows. Occasionally, something on the Mac will crash, but you won't have to reboot."

Hopedale Public Schools has experienced greater stability when running Windows applications on the Intel-based Mac than when running the same applications on Windows-based PCs. K–8 Integration Specialist Coleen Collette said,

"[W]e have a reading program where the computer records the students reading. The teachers then can evaluate and see how much the students' reading fluency has improved. We've had no trouble on the Mac [computers on which] we've installed it, but [on] the [Windows-based] PCs, so much trouble… In that sense, when we were installing the software, the Mac [computers] seemed [more user-friendly] than the PCs. We don't have any trouble with them. The issues, 8 out of 10 times, come from the PCs."

How do the Intel-based Mac computers support the successful integration of technology for administrative and instructional purposes?

Facilitation of strategic deployment

The quick setup of the Intel-based Mac computers allowed districts to train technical staff and deploy systems in a strategic fashion. At some sites, technical staff seeded the Mac computers with certain teachers or schools that could serve as exemplary models for further deployment within the district. This approach was felt to be a more effective way of getting new technology into the classroom and adopted more quickly.

Pilots have been set up in different ways in different school districts. At Hopedale Public Schools, they designated "pioneer" teachers to start using the Intel-based Mac

computers in the first year, so that those more experienced teachers could model instruction and support further rollout. K–8 Integration Specialist Collette explained,

"Last spring before we had the computers, Tom [Plati] had Apple representatives come in and show us some things. Then once we had the new equipment we tried stuff with Tom. Last year, the fifth grade teachers were the only ones with Apple notebooks. We did one-on-one training with them. This year we purchased 60 more, they were a little bit better at troubleshooting. [There was a] learning curve with new teachers, but [they] had stronger support because we had the second-year teachers."

<u>More efficient and more valuable training</u>

At Hopedale Public Schools, some of the technical staff have become Apple certified technicians as a strategy for reducing the time and cost of maintenance. This training was described as "an easy process." Network Manager Appell said,

"I went on their [Apple's] website and looked at what was necessary to pass the courses. Bought a CD for Apple Tech Training [and] took the test... [It was] pretty clear on their web page. With that training we can do onsite repair; there's a cost savings for us. There's a time savings for us, too: you don't have to send them out."

Integration specialists also commented on the fact that there was "a lot more hand-holding with the Windows machines" and that they are "not all that intuitive," which makes training more difficult.

At Indianapolis Public Schools, technical staff found that in the same amount of time they take to train teachers on Windows-based PCs, they are able to go into greater depth with the Mac. Academic Technology Officer Jeff McMahon said,

"It's easier to train on [the] Mac, but because there is so much there—so many tools—you spend more time doing it. On the [Windows-based] PC, you spend more time because it's difficult; the learning curve is long for new users. In the end you've spent the same amount of time [on training], but there's more benefit on the Mac. A person leaves a Mac workshop with a lot more knowledge; they have much more they can do."

In Indianapolis, computers were deployed strategically and technical staff slowly built teacher capacity. At one school where all teachers received Intel-based Mac computers to replace their PCs, the librarian/technical support person said,

"We have to slowly bring teachers around to using the Mac. Getting them over the initial fear has been the biggest challenge, but once they see the creative things [the] Mac can do, they want to try … and once they see how easy it is, they get excited!"

The Los Altos School District started using more digital resources for classroom instruction a year and a half ago. Currently, a consultant from Apple Professional Development comes to the district and conducts a total of ten sessions on using instructional technology in the classroom. They take regular curriculum content and show teachers how to make it more engaging using the iLife tools. This professional development has encouraged greater use of the computers for instruction.

While many teachers readily started using their Apple notebooks for instruction, the district found that the teachers' ability and comfort level with technology varied

"In the end you've spent the same amount of time [on training], but there's more benefit on the Mac. A person leaves a Mac workshop with a lot more knowledge; they have much more they can do."

Jeff McMahon,
Academic Technology Officer,
Indianapolis Public Schools

greatly. In order for their teachers to get the most out of the professional development, the district developed an in-house training program to teach basic to intermediate computer skills prior to participation in the Apple workshops. Eighteen teachers were provided notebooks and professional development on how to use them. In turn, the pilot group of 18 teachers will help train subsequent groups the following school year. This additional training prepares teachers for more advanced sessions with Apple and ensures that they start the Apple Professional Development courses with a similar set of computer skills.

"There's definitely a noticeable speed difference. The new [Intel-based] Mac is much quicker on startup and when I'm flipping through the programs. It also runs a lot cooler."

Jeff Baier,
Principal, Almond School,
Los Altos School District

How are Intel-based Mac computers being used for administrative purposes, and what are the benefits?

Multiplatform use: greater efficiencies for administrators and teachers

Representatives from all districts interviewed said that they have seen teachers and administrators using the Intel-based Mac computers for administrative purposes in ways that increase efficiency and further support their students.

In the Socorro Consolidated School District, the ability to run both operating systems provides more flexibility and greater capability on one machine. Most district- and school-level administration tasks are Windows-based, and some teachers and district-level administrators are now running Windows on the Intel-based Mac computers to complete administrative tasks. Applications used in Windows on the Mac include a student information system, Visions and Vision Links (human resources software), Microsoft Access and FoxPro.

At Hopedale Public Schools, the administrative environment is mostly Windows-based. Special Education teachers use Internet-based administrative software and the high school secretary uses Windows on the Intel-based Mac to run Modular Management System (MMS). The school has made the investment in these programs and they are delighted to be able to keep using them, while gaining other benefits from the Macs.

The seamless compatibility of the Intel-based Mac with a predominantly Windows administrative environment means that the Hopedale Public Schools can integrate the Mac into existing networking for file storage. The district successfully deployed and networked the Intel-based Mac computers using a Windows server, so that both their PCs and their Mac systems could be connected to the same network.

In Prince George's County, elementary school administrators and teachers are able to use Windows administrative software on their Intel-based Mac computers. Elementary school technology coordinator Hoskey explains how she uses hers to run both Windows and Mac OS X.

"I [switch back and forth]… I do it because [for] some of the software and activities… I need to use both systems… I flip because [for] some of the network chores, I have been taught where things can be found."

Administrators and technical staff at the district level have also found the Intel-based Mac provides flexibility, reliability, and simplicity to support all school tasks. CIO Watts said that he uses both Mac OS X and Windows, depending on the task.

The use of Intel-based Mac computers by administrators at Indianapolis Public Schools addresses their goal of integrating Windows-based (administrative) tasks with Mac-based (teaching and learning) tasks. With both platforms installed, they are able to continue performing PC tasks comfortably while exploring at their own pace the added functionality that the Mac world offers. In this district, teachers are historically PC users. Now those teachers with Intel-based Mac computers boot up to manage their classroom technology environment (such as projection and multimedia devices, document cameras, and so on) with Windows software, but have the opportunity to switch to Mac OS X where they can see what their students see.

In the Los Altos School District, a predominantly Mac computing environment, the technology staff maintains a small number of Windows-based PCs in order to be compatible with county and statewide applications. The technology director also keeps a PC in her office for the purpose of state reporting requirements. Although her Intel-based Mac is not currently being used to support Windows-based administrative tasks, she expects it will eliminate the need for an extra system in the future and allow her to perform all her necessary work on one computer.

> "I used to be a [Windows-based] PC guy but I've changed my whole opinion about [the Mac], especially now that it can run a Windows environment. The benefits make a huge difference. I can't ignore the Mac anymore. I have to look at it as a viable option."
>
> - Wayne Hawkins, Technology Systems Officer, Indianapolis Public Schools

With the exception of these applications, technology across the district runs exclusively on the Mac. Teachers and administrators use Mac OS X Mail and Microsoft Office on the Mac for their day-to-day administrative tasks and Atomic Learning for web-based training. The student information system has moved to a web-based application and is easily accessible by teachers and administrators from any computer with an Internet connection.

As an administrator, Jeff Baier, the principal at the Almond School in Los Altos, often works in multiple applications simultaneously. He mentioned that his new Intel-based Mac notebook runs noticeably faster and at a much cooler temperature than his previous notebook, which can potentially save money because of energy efficiency. Baier said,

"There's definitely a noticeable speed difference. The new [Intel-based] Mac is much quicker on startup and when I'm flipping through the programs. It also runs a lot cooler."

Increase in professional skills for technology staff

There are also benefits to technical support staff being trained on and exposed to both Mac OS X and Windows on Intel-based Mac computers. By being able to effectively support both platforms, they can be more flexible in supporting whatever would best meet teachers' instructional needs and students' learning goals. Technology staff members knowledgeable in both platforms also provide additional value to school districts with the ability to make more informed decisions about how and why to deploy particular technologies.

Some districts reported an easy conversion of "PC-centric" tech support staff—who were comfortable on the Windows operating system—to the Mac, since the Mac OS X platform was not difficult to learn. This is especially helpful in districts where technical staff is split between supporting Macs versus Windows-based PCs, as is the case in Prince George's County.

"Typically we have different meetings for different grade levels because we don't talk the same language. I suspect [those who use the Intel-based Mac computers] are

more capable of making the cross-platform switchover than we are on the [Windows-based] PC machines."

> "The last time I used [the Mac] as [an] instructional platform was 1994. What the [Intel-based Mac computers] do is give those of us who have been around for a while something new. I'm actually thinking of moving to the Mac after 30 years!"
>
> David Hechinger,
> Technology Coordinator,
> Prince George's County

Historically, most technical support staff at Indianapolis Public Schools has worked on a Windows platform, but this trend is changing. Now the Intel-based Mac is the standard computer provided to them. Technology Systems Officer Wayne Hawkins observed that once the technical support staff (including himself) gains experience with the Mac, they prefer it to the Windows-based PC. Hawkins notes,

"I have to say, I used to be a [Windows-based] PC guy but I've changed my whole opinion about [the Mac], especially now that it can run a Windows environment. The benefits make a huge difference. I can't ignore the Mac anymore. I have to look at it as a viable option. Basically, I'm a convert!"

In Prince George's County, high school technology coordinator Hechinger said that he pushed the Intel-based Mac as much as he could to test it and, based on its ability to function under these conditions, he may have been convinced to buy one for his own personal use:

"When I got the [Intel-based Mac], I could use Parallels [a desktop virtual machine technology for running both Mac OS X and Windows simultaneously] and get everything on Windows and play with the Mac. I like to push and it was amazing… The last time I used [the Mac] as [an] instructional platform was 1994. What the [Intel-based Mac computers] do is give those of us who have been around for a while something new. I'm actually thinking of moving to the Mac after 30 years!"

How are Intel-based Mac computers being used to support teaching and learning, and what are the benefits?

Powerful digital authoring tools increase student engagement

The digital authoring tools in the iLife suite help teachers and students to manage audio files, videos and photos, and to create multimedia projects easily. At Hopedale Public Schools, teachers have found the iLife suite very convenient to use.

"Basically [the benefits are] iLife, the PDF maker, the iWeb templates. It all came with the Mac."

Administrators at Hopedale Public Schools reported that both technology staff and teachers use Mac applications for multimedia projects. Director of Curriculum, Assessment and Technology, Tom Plati commented that the Intel-based Mac offers teaching and learning support with its digital authoring features. He said that teachers are trying to engage students in innovative ways because of these features.

"Multimedia is the advantage I see. iPhoto is catching on. A year ago we were an all-Windows environment. You don't do that [digital authoring projects with Windows]… GarageBand with podcasting will go faster in high school. We [use] UnitedStreaming a lot, downloading videos and using those in a lot of different subjects. We're starting to use iPods in Special Education [and] blogs in Civics."

In Prince George's County, teachers at the elementary level are taking advantage of the integrated Mac applications to try new, innovative curriculum adaptations.

Elementary technology coordinator Hoskey said that the music teacher at Cora Rice Elementary has been using GarageBand and iTunes to create podcasts, something that had never been done with their Windows-based PCs.

Hoskey also said that she noticed teachers integrating presentations and other multimedia tools into their teaching. One teacher showed his students how to take a picture using Photo Booth and got the students so excited that everyone took their picture and the photos were used on a display with their work. Hoskey commented on using multimedia to enhance teaching.

"[It was something] we didn't do last year. So in my mind things have changed dramatically with these folks doing new things; [it] helps others discover new ways of using [technology]."

Many of the Cora Rice Elementary School teachers have used the DVD features of the Intel-based Mac computers for instructional and educational DVDs. Hoskey said that they use the Internet to access movies from UnitedStreaming through Safari and QuickTime in order to support instruction with multimedia resources.

In the Los Altos School District, students in fifth and sixth grade science classes recently completed a project where they had to conduct extensive research on volcanoes and create a Keynote presentation to share their research findings. Keynote is one of two powerful applications (along with Pages) included in Apple's iWork productivity suite. Teachers assisted their students by providing a list of resources and websites to get them started. Along with honing their presentation skills, students also heightened their information literacy—students had to defend the validity of their information sources as part of the presentation.

Los Altos teachers use the Intel-based Mac computers to supplement "less engaging" textbook units by including streaming video content and other types of digital media in their lessons.

"What we're finding, when this is used well, is that it [the iLife digital authoring tools] enhances learning. We're seeing a huge percentage of students participating. Those few children who have been hard to reach are now engaged."

Indianapolis Public Schools is focused on creating a physical classroom environment where teachers have the digital tools to work with students around core standards. They emphasize being respectful and mindful of students' needs. In 2001, the district decided to develop a predominantly Mac computing environment for students. With a technology infrastructure in place, the goal is to encourage integration—using the right tools to engage students in a meaningful process. The iLife suite of applications and podcasting provide an array of tools to use as needed for school-related or personal projects.

For example, high school seniors use iWeb to develop their online portfolios. In addition, Indianapolis Public Schools developed a Web-based portal (IPS Online) to an online environment where teachers create lesson plans and students log on to get assignments. In Indianapolis, the iLife suite of software tools—so integral to the student computing environment—provides a high level of educational value.

With the unique features and software built into Intel-based Mac computers, teachers now have innovative, engaging ways of meeting the needs of all students.

"I'm a Windows person. And I bought a Mac. It's a MacBook Pro, because it's dual-booted and I can use Windows stuff at home. You can just really go and if DHCP is set up, it's easy to connect the MacBook anywhere you go, it's just seamless."

Lisa Appell,
Network Manager,
Hopedale Public Schools

Leveraging current software assets

Some teachers at Hopedale Public Schools have taken advantage of the Intel-based Mac computers because of new applications available to them through the iLife suite. Other teachers use applications on Mac OS X because they feel they are more user-friendly in that environment (e.g., Adobe PhotoElements, graphic analysis software for science). Still others use the Mac because a particular piece of software only works on Mac OS X (i.e., TI Interactive). However, many teachers have been able to continue using Windows-based applications that aren't yet available for Mac OS X on the Intel-based Mac. This has been especially important in several departments in Hopedale's junior-senior high school, including business, communications, math, science, and reading.

The ability to continue running previously purchased Windows applications on the Intel-based Mac saves precious district resources. The business teacher has a full lab of Intel-based Mac computers and typically only uses Windows on the Mac because her entire curriculum was based around Windows applications. She uses the Windows version of the Adobe Macromedia MX suite—Fireworks, Dreamweaver, and Flash. For the same reasons, the Communications teacher uses the Adobe Macromedia MX suite exclusively on Windows. Microsoft Publisher and Frontpage are used on the Intel-based Mac running Windows because they only have Windows versions. The video communications lab is mostly a Windows environment, but some Intel-based Mac computers were integrated into the lab because of their ability to support the Windows-based curriculum. And the math department is mostly running Windows, but they have successfully integrated three new Intel-based Mac computers for teachers, who can use TI Interactive on Mac OS X and Geometer's Sketchpad on Windows.

Other departments in the Hopedale junior-senior high school run Windows on the Intel-based Mac computers for selective applications, including probeware in the science department and vocabulary software in reading.

In the Socorro Consolidated School District, the Intel-based Mac computers are used to run not only Mac OS X and Windows, but also the Linux operating system for applications that include Open Office, the Scholastic Reading and Math series, Primary Learning pieces, Compass Learning applications, and Plato. In the high school's business classes, students also use Open Office applications such as Impress, a Linux-based presentation software.

Regardless of which operating system their applications are designed for, teachers can use Intel-based Mac computers to utilize the applications that meet their students' needs and engage them in quality learning experiences. And school districts have a cost-effective solution that maximizes the investment that they have made on prior technology purchases.

About the researchers

Grunwald Associates (www.grunwald.com) is an independent research and consulting firm that has conducted highly respected surveys on educator and family technology use since 1995. The firm also conducts qualitative research and provides analysis to corporate and education clients. Grunwald research partners and key clients have included the National School Boards Association, PBS, the Consortium for School Networking, the George Lucas Educational Foundation, the Educational Testing Service, and many others.

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