INTERNATIONAL DATA CORPORATION

Understanding the Total Cost and Value of Integrating Technology in Schools

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An IDC White Paper Sponsored by

Apple Computer, Inc.

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Executive Summary

Selecting a computer in the education sector involves the use of different factors and metrics than those used in business. Educators must weigh ownership costs against a computer's value in teaching and developing curriculum. Most importantly, an educational computer must foster the integration of technology into the teaching and learning process in schools.

This white paper is based on an IDC study of the costs and values of K-12 educational computing in America. The study includes IDC's educational computing market analysis as well as the findings of focus groups and over 400 interviews with educators throughout the United States.

Key Findings

Our study uncovered some interesting findings. A few of the key items are summarized below.

- TCO (Total Cost of Ownership) is dramatically different in the education and business sectors.
  - Per computer, school TCO is half of business TCO.
  - Per student, schools exhibit extremely low levels of technical support or roughly 1 support person for every 500 students. In the business environment, this ratio is 1 to 50.
    - In business, the ratio of computers to users is 1 to 1. In schools this ratio is 1 computer to 7 users (students and teachers). Excluding teachers and their dedicated computers, the ratio rises to 8.4 students for every PC.
- Schools with mixed computer environments have the lowest satisfaction levels. Schools that standardize on a single platform have the highest satisfaction levels.
- The Macintosh's ease of use increases technical support staff's efficiency and indirectly lowers TCO.
- Educational Value is a measure of a computing platform's effectiveness in integrating technology into the curriculum to support students' acquisition and application of skills and information.
  - Measures of effectiveness in education are different from those used for business.
  - Schools whose computing platform is predominantly Macintosh utilize the greatest number of applications and report the most positive results among students and teachers.
- Schools can make better computer purchasing decisions if they reconcile TCO with educational value and acknowledge that, ultimately, educational value factors will outweigh pure cost-based considerations.

Introduction

As President Clinton articulated in his 1996 Technology Literacy Challenge, our national education and technology objectives must include improvements in "Four Pillars": Hardware; Connectivity; Digital content; and Professional development.

"These Four Pillars provide a foundation for creating an innovative learning environment where students and teachers can reach beyond the confines of a single school building for information, interaction and enrichment," quoting from the CEO Forum's October 9th report on education, School Technology and Readiness Report, from Pillars to Progress (http://www.ceoforum.org/). The CEO Forum is a non-profit partnership among 21 U.S. business and education leaders.

In this White Paper, we analyze the differences in hardware costs and value. We look at results to compare a computer's ability to connect to the Internet. We examine the most effective tools for creating digital content. Most importantly, we scrutinize how different educational computers enable professional development and acquisition of student skills.

Survey Methodology

IDC initially tested the survey methodology with four focus groups at the district and school levels. These focus groups were held across the US. The feedback from these events was used to refine the survey instrument.

To gather more statistically valid data, IDC conducted a phone survey of 406 educators, teachers, principals, superintendents, and technical support personnel at the school and district level. The survey was administered in September 1997. This report only represents a small percentage of the data we gathered, but it summarizes the most important elements.

Explanation of Terms

This report uses certain terms to categorize the survey results. "**Macintosh**" refers to schools using Apple's Macintosh computers. The survey excluded other products such as the Apple II. "**Other PC**" means non-Macintosh computers based on Microsoft Windows and Intel microprocessor technologies. The research excluded DOS, CPM, Unix, and other PC technologies from this group. "**Mostly**" describes schools using at least 80% of either platform (see Figure 13). "**Only**" is limited to schools that contained 100% Macintosh or Other PC.

As for percentages that appear in the charts, IDC often used a rating system so the respondents could enumerate their answers on a 1-10 scale (1 = Worst and 10 = Best). To eliminate irrelevant data and focus on positive responses, the percentages in this white paper are commonly based on responses with numeric ratings of 8-10. In other words, the percentage of respondents that rated an item as "**Very Good to Excellent**" or "**Easy to Very Easy.**"

More specifically, this IDC White Paper analyzes the cost and value of educational computing in primary and secondary schools (K-12). It is the result of surveying over 400 educators at the school and district level.

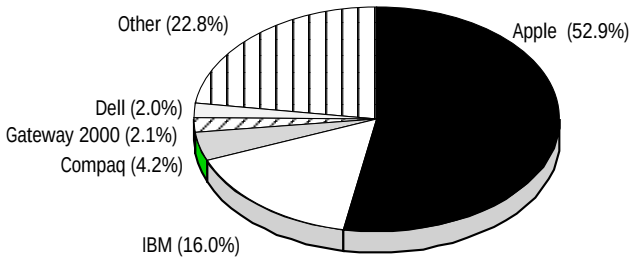
This research includes the study of Macintosh and Intel-based computers running Windows. It excludes other platforms such as Apple II, DOS and Unix.

Market Overview

When purchasing computers, the first step is to look at the supplier and its relative position in the market place. In terms of installed base, Apple holds the largest share of the educational market. Apple products comprise 53% of the installed educational computers in the K-12 market, as shown in Figure 1. Other PCs hold substantially smaller shares. Even the next largest player, IBM, has less than 1/3 Apple's presence in the K-12 educational market.

Spending on instructional technology by K-12 schools continues to rise. Districts estimated on average that

Figure 1.
Educational Computers Installed in K-12 Schools (1997)



Source: IDC 10/6/97

$274,000 was spent on technology per school district during the 1996-1997 school year. This figure is expected to grow by 47% to $407,000 in the upcoming year. The expanding technology budget is driven by several factors: additional funds from government and private sources; schools that are ready to upgrade outdated technologies; the heightened awareness among people in the education arena that technologies have a positive impact on a child's education; and the push from the Clinton administration to have all schools wired to the Internet by 2000.

Where is the money being spent? The majority goes to hardware purchases and networking, accounting for 55% and 16% of the total budget, respectively. In general, spending on other areas such as software (9%), training (6%) service/support (6%), supplies (5%), and on-line services (1%) is expected to rise overall.

Differences between the Educational & Business Environments

"Though the parameters of corporate and education community efforts to integrate technology are different, in neither case is technology for technology's sake the key," according to the CEO Forum report.

IDC agrees. Our research shows that educational and business computing differ substantially in the following areas.

- Levels of support - When an educational PC fails, it simply gets taken out of service for several days. A business computer is usually repaired within a matter of hours. Therefore, downtime for educational computers is two to three times higher.
- Services - Maintenance, software support, and available technical support skills are less sophisticated in educational environments.

- Applications - Computer users within educational institutions, especially students at elementary schools, typically use twice as many applications as business.
- Value - Computers used in education focus on teaching and learning. Businesses focus on profitability and reducing costs.

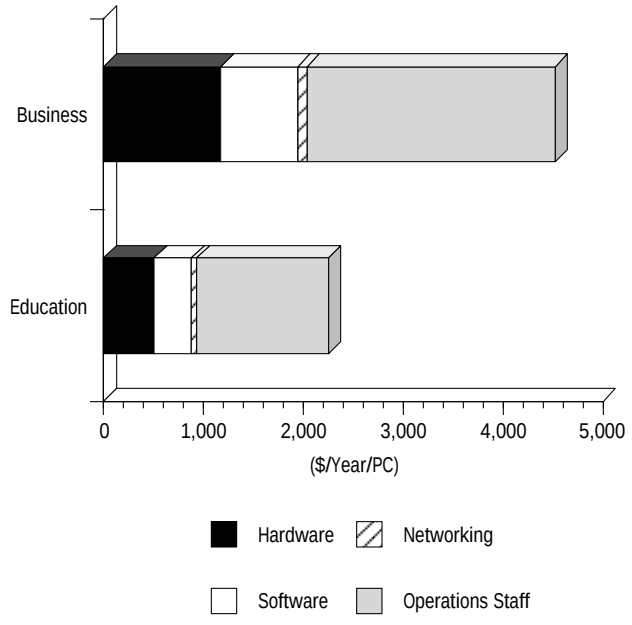
Compared to the business environment, the total cost of ownership of a computer in an educational setting is reduced by a number of factors, which we explore in the next section.

TCO – Educational versus Commercial Computing Environments

Overall, IDC believes that different computing environments require different skills and attributes. Therefore, education and business don't require the same computing technology.

One major example of this differentiation is TCO. Based on the educational survey data and our previous analysis of commercial businesses, IDC calculated a comparative TCO. As indicated in Figure 2, educational TCO equaled $2,251/year/computer. For a comparably sized business, the costs are twice as high, at $4,517/year/computer.

Figure 2.
Education and Business Total Cost of Ownership



Source: IDC 10/6/97

TCO Methodology

IDC has analyzed TCO (Total Cost of Ownership) since 1992. Using a consistent model that takes its inputs from survey-based data, IDC targets its research at specific user types, workloads, and geographies.

Elements of the IDC TCO model include:

- **Hardware** (Purchase Price, Warranty, Annual Maintenance, Depreciation or Life Cycle, and Upgrades),
- **Software** (License Price, Support, and Upgrades),
- **Networking** (Hardware, Software, Warranties, Maintenance, Depreciation, and Upgrades),
- **Internal Staffing** (Salaries Overhead for Management, Operations, Help Desk/User Support and Applications Development),
- **Other Costs** (Consultants/Contractors, Installation, Training and Downtime.

All these capital and operational costs (including staff salaries) are totaled and divided by the average life cycle (years until replacement) and divided again by the number of PCs. This yields an average annual cost per computer.

For Figure 2's comparison, IDC compared an average school with a median of roughly 75 computers (total of both student and teacher systems) to a small business with the same PC count. The small business TCO was based on previous survey work.

The 101% TCO difference between educational and business environments results from four major distinctions. First, schools buy less expensive PCs at larger discounts than business. Second, software is less expensive because educational applications are priced lower, and charitable donations are common.

Third, schools use roughly half the number of people to support an equivalent number of PCs. Because salaries of support staff typically constitute 50% of overall TCO costs, differences in headcount yield large cost differences.

Finally, schools retain their computers for an average of five years versus three years for business. This longer life cycle and the associated depreciation schedule represent significant savings.

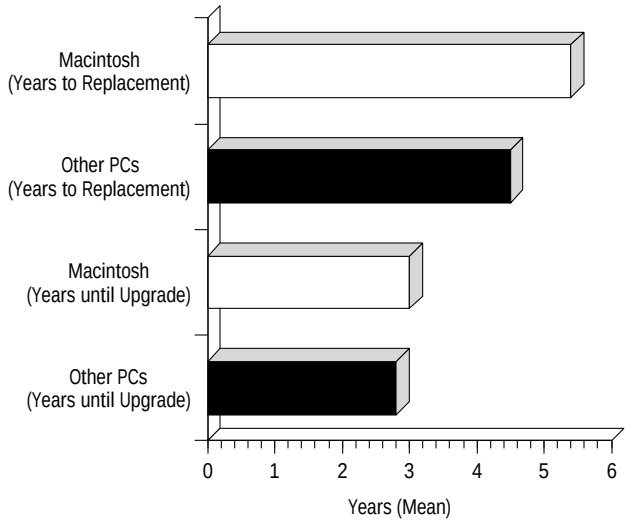
Comparing TCO Factors

"Once the school or district is convinced of the value of educational technology, initial investments are made to bring technology into the school. Unfortunately, unforeseen costs such as computer maintenance, software and computer upgrades and staff training are often encountered," according to the CEO Forum report.

Expanding on these factors, our study found some notable TCO differences between Macintoshes and other PC platforms. First, the Macintosh depreciation or life cycle is longer than for other PC platforms. Survey results indicated that Macintoshes are used by schools for an average of 5.4 years versus other PC platforms that are typically replaced after only 4.5 years, as shown in Figure 3.

Second, Macintoshes are used longer before upgrading is necessary. As seen in Figure 3, schools using mostly Macintosh computers go 3.0 years before upgrading. Schools using mostly other PC platforms upgrade their computers every 2.8 years.

Figure 3.
Mean Number of Years Schools Use Computers Before Replacing and Upgrading



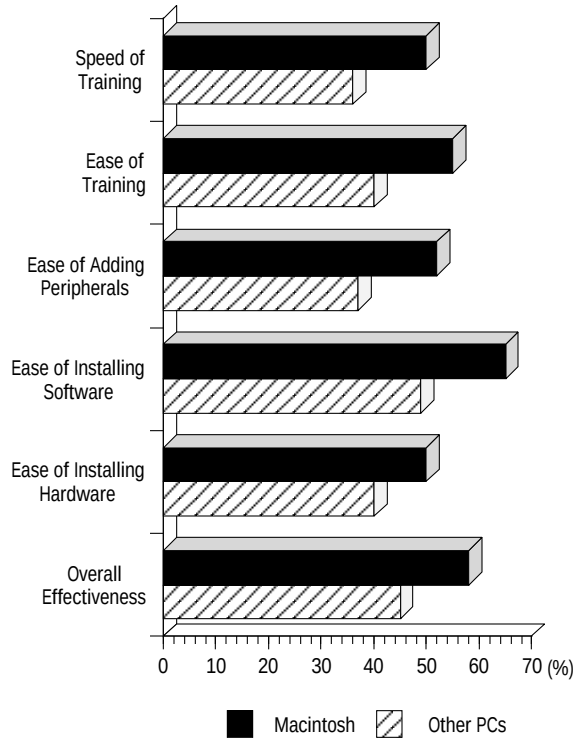
Source: IDC 10/6/97

Effectiveness of Technical Support – Ease of Support

Technical support is a critical factor in keeping students at the forefront of the technological learning curve. The CEO Forum reports notes, "Although technology is being leveraged in the classroom, lack of on-site technical support in High Tech schools may discourage teachers from using technology to its fullest potential. Even highly experienced, technology-using teachers can become preoccupied with trouble-shooting hardware and software problems which siphon time away from students."

Therefore, our study examined the effectiveness of technical support. The Macintosh received high marks in several areas. As shown in Figure 4, Macintosh was rated higher than other PC platforms in ease of installation (hardware and software). The ease and speed of training was also measurably better than other PCs. Summing up the results, schools gave the Macintosh a higher rating for overall effectiveness than other PCs.

Figure 4.
Ease of Support Tasks for Technical Staff (Percentage responding with Very Good to Excellent ratings)



Source: IDC 10/6/97

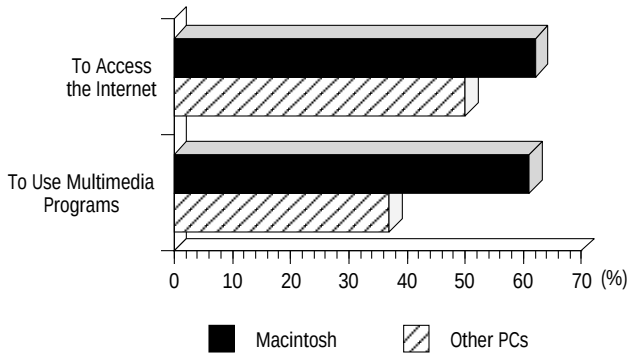
Effectiveness of Technical Support – Ease of Upgrades

As for upgrades for specific applications, Macintosh was rated easier to upgrade to critical multimedia and Internet applications, as shown in Figure 5.

Specifically, for ease of upgrading to multimedia, 61% of Macintosh schools rated it as very good to best (8-10) compared with 37% for schools using other PCs.

For ease of upgrading to access the Internet, 62% of Macintosh schools rated it as very good to best (8-10) versus 50% of schools using other PCs.

Figure 5.
Ease of Internet and Multimedia Upgrades for Technical Staff (Percentage responding with Easy to Very Easy ratings)

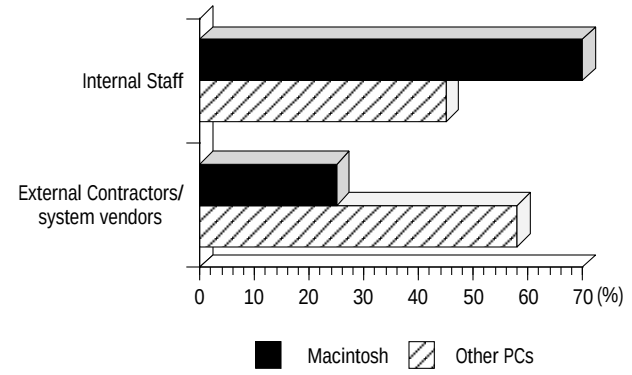


Source: IDC 10/6/97

Effectiveness of Technical Support – Installation Issues

Installation is another TCO factor that can affect a school's staffing costs. We estimate that installation is 30% to 50% less expensive when using internal support people. As shown in Figure 6, 70% of the Macintosh schools used internal staff compared to 45% for schools with other PC platforms.

Figure 6.
Who Initially Installs Computers?



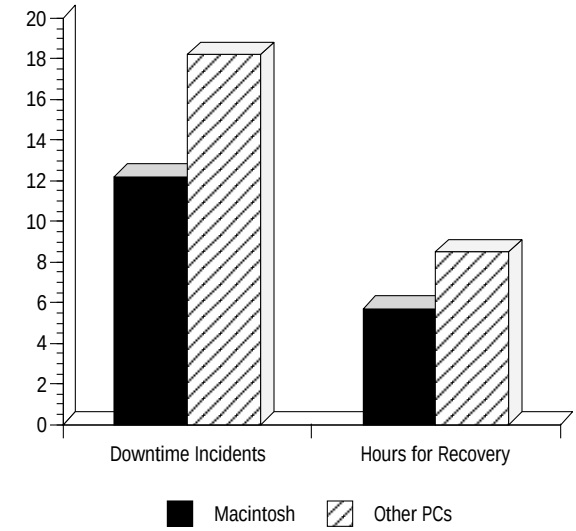
Source: IDC 10/6/97

Effectiveness of Technical Support – Downtime Issues

Finally, unexpected downtime (or the unavailability of computer because of a hardware, software, or networking failure) is an important TCO consideration. When a school computer fails unexpectedly, teaching programs are interrupted and costs are incurred in terms of support staff time. Our survey showed that schools using Macintoshes experienced an average of 12.2 downtime incidents over the past year. In comparison, other PC platforms exhibited 50% more failures (18.2).

Because so many schools' computers are connected to servers (for applications access, file sharing and print functions), downtime in this area is also costly. Our survey indicated that recovery is critical. The less time to recover a server and make it available to the students, the lower the support costs and the better the educational experience. We found that, on average, 5.7 hours were spent on recovering a Macintosh server versus 8.5 hours on PC platforms.

Figure 7.
Downtime and Recovery Issues



Source: IDC 10/6/97

Educational Value

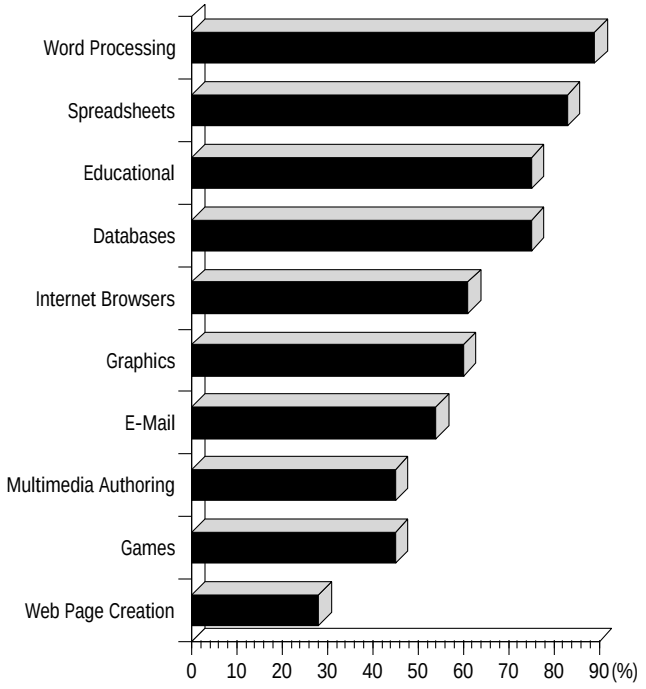
According to the CEO Forum report, "To thrive in today's world and tomorrow's work place, America's students must learn how to learn, learn how to think and have a solid understanding of how technology works and what it can do. American schools must, therefore, provide students with the opportunity to combine the best of traditional learning with the unprecedented opportunities technology offers."

IDC believes that a school's computer selection strategy should analyze a technology's ability to improve educational value. A computer's educational value is determined by teachers' and students' ability to disseminate and acquire skills and knowledge along with applications usage, and implementation of new technology (e.g., multimedia).

Educational Value – Applications Usage by Type

Software usage is important as an indicator of the predominant skills being acquired by students. It is also indicative of curriculum requirements for teachers and administrators. Figure 8 shows software applications usage for all computing platforms used in schools.

Figure 8.
Software Applications Used in Schools



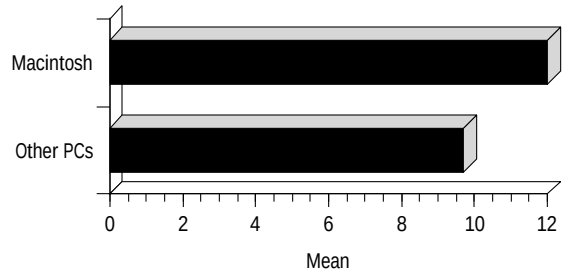
Source: IDC 10/6/97

We believe that new technologies are critical to ensure children maintain currency with the latest developments. While we don't expect game playing to develop into a major skills requirement, we do believe that the more lightly used software categories represent future skills requirements (e.g., Web page creation, multimedia authoring, and graphics). For example, multimedia authoring is on the rise and Macintosh is the preferred platform. 56% of schools using Macintoshes report that they are involved in multimedia authoring.

Educational Value – Number of Applications in Use

Software usage is a major element in educational value for a very simple reason – the more applications a student uses, the more skills she/he learns. Students in Macintosh-based schools used 12 titles compared with 9.7 applications in schools with other PC platforms as shown in Figure 9.

Figure 9.
Mean Number of Applications Used by Students

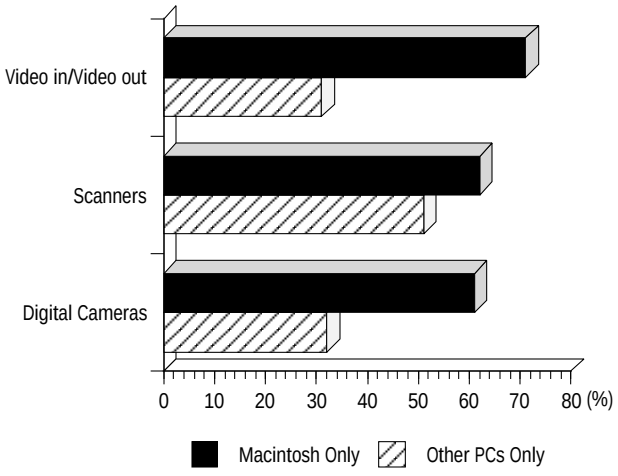


Source: IDC 10/6/97

Educational Value – Content Creation and Multimedia Usage

An educational computer should always seek to prepare a student for future career opportunities. New technology is critical to ensure that children maintain currency with the latest developments. Multimedia is the technology that transforms the way we think about computing and the precursor for Internet content-creation. Schools using only the Macintosh computing platform facilitate the learning experience with greater access to advanced multimedia peripherals for content development (see Figure 10).

Figure 10.
Multimedia Peripherals Used for Content Creation

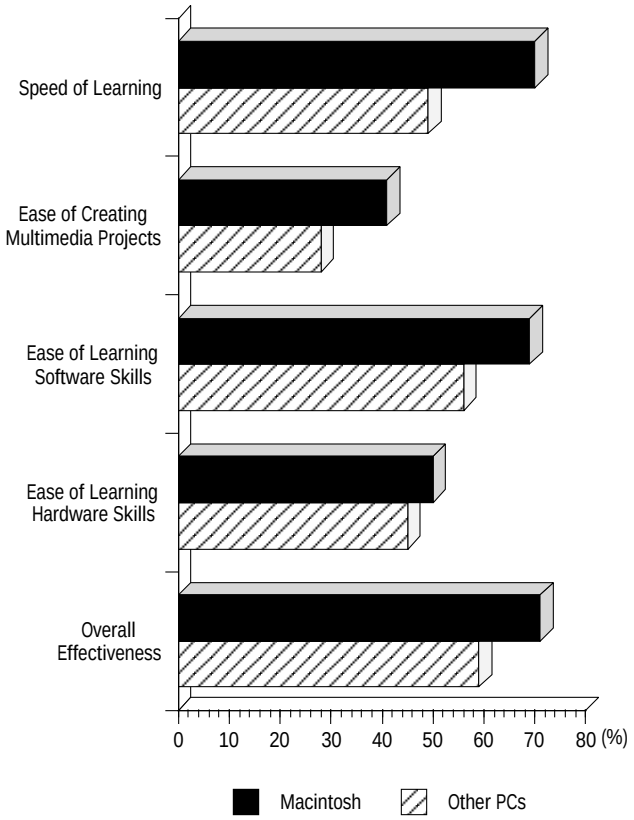


Source: IDC 10/6/97/97

Educational Value – Student Effectiveness

Educational effectiveness needs to be considered from the students' perspective, as well. As Figure 11 shows, student value is measured in several ways. Overall effectiveness is a simple way of summing up the total benefits.

Figure 11.
Comparing Educational Value-Students (Percentage responding with Very Good to Excellent ratings)



Source: IDC 10/6/97

71% of schools using mainly Macintosh computers felt their computing platform was highly effective. Only 62% of schools using mostly other PCs rated their platform as highly effective.

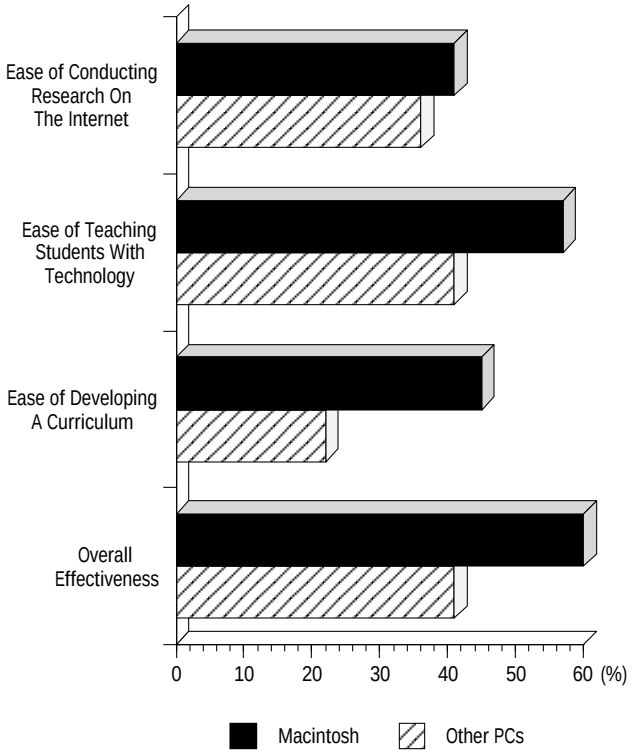
Similarly, the Macintosh received higher marks for ease of learning hardware and software, creating multimedia, and speed of learning.

Educational Value – Teacher Effectiveness

Because teachers are the most critical educational resource, their opinions are extremely important.

Macintoshes scored highly for effectiveness from the point of view of teachers. As Figure 12 shows, 60% of schools relying on the platform rated it highly effective overall. Only 41% of schools using other PCs rated their platform as highly effective. The Macintosh was rated as superior in ease of developing curriculum, teaching, and conducting research on the Internet.

Figure 12.
Comparing Educational Value-Teachers (Percentage responding with Very Good to Excellent ratings)

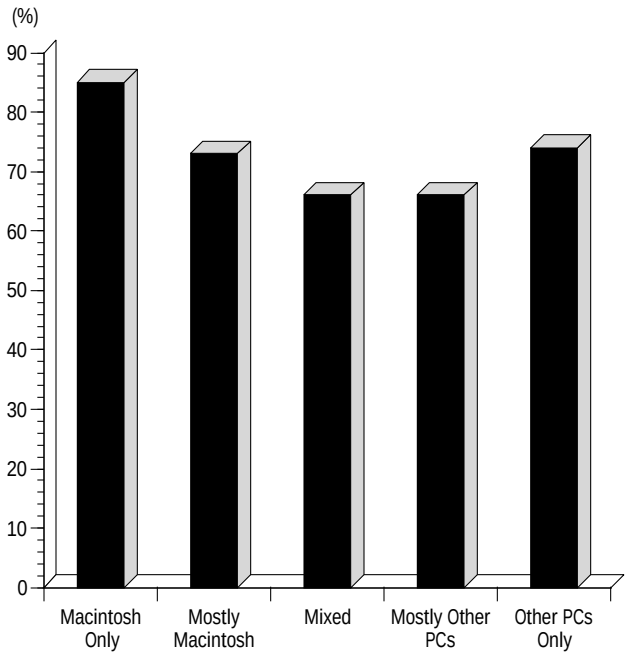


Source: IDC 10/6/97

Educational Effectiveness – Overall Satisfaction

Customer satisfaction is the single most important measurement for any product. In this regard, IDC found that 85% of schools using only Macintosh computers rated overall satisfaction as "Very Good" to Excellent" compared to 74% of schools using only other PCs (Figure 13).

Figure 13.
Overall Level of Satisfaction (Percentage responding with Very Good to Excellent ratings)



Source: IDC 10/6/97

It is also interesting to note that schools with a variety of computer technologies reported lower satisfaction ratings. Mixed schools (i.e., no single platform constituted more than 79% of total computers) had the lowest satisfaction levels (66%). Overall, this data shows that pure Macintosh schools have the highest satisfaction levels.

Conclusion

Based on this study's results, IDC believes that schools must balance technology's cost and value. The ability of students to learn new skills rapidly and easily must be encouraged with technology that also provides them with the broadest set of applications. For teachers, ease of use is critical in shifting their attention back to personal interaction with students and in integrating technology into the curriculum for teaching and learning.

The ease of use of the Macintosh platform allows for the most positive learning experience for students and teachers and indirectly lowers overall costs by increasing technical support staff's efficiency.

Addressing the larger issues, the CEO Forum report states that, "In the hands of well-trained, enthusiastic educators with access to quality digital content, technology can help meet key education objectives by preparing today's students to be knowledgeable citizens and productive workers in the world tomorrow."

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More information about Apple Computer can be found on the Internet at http://education.apple.com. Or call 1-800-800-APPL (2775).

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