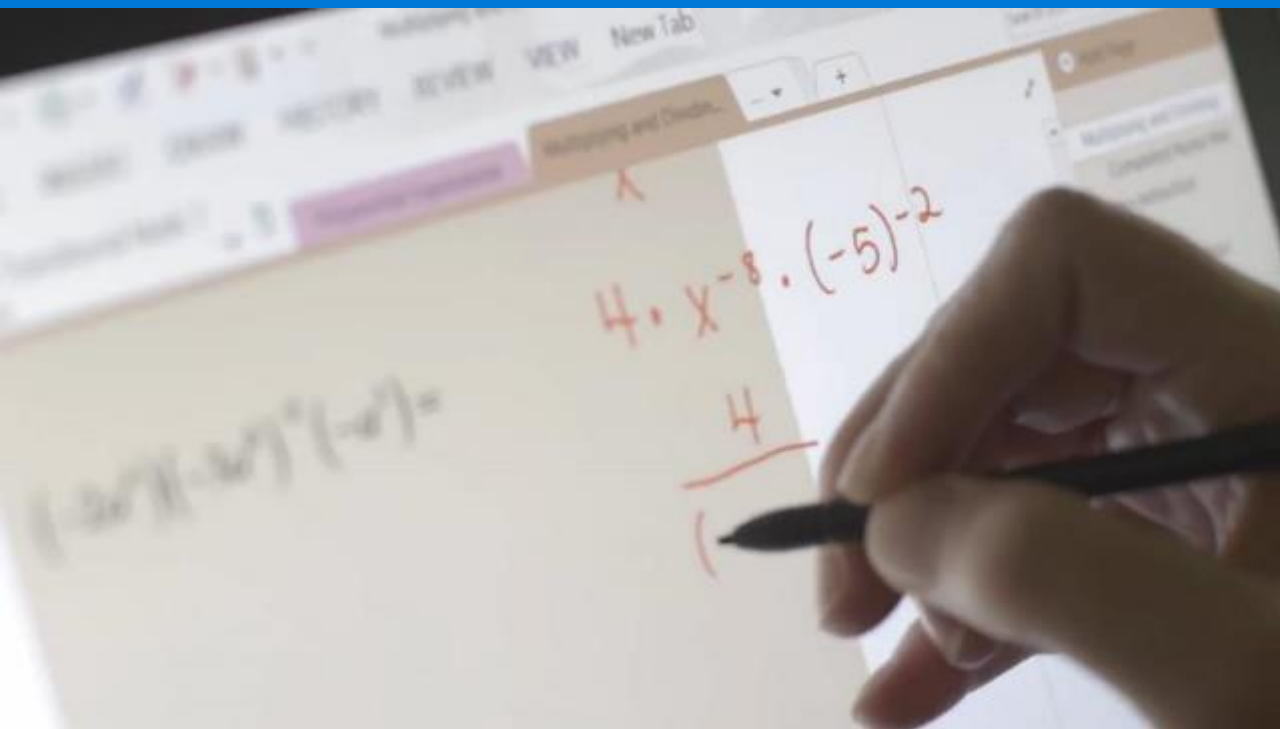


# BYOD / 1:1 eLearning

Microsoft Hong Kong



IT'S NOT JUST TECHNOLOGY



# Device and Deployment Considerations







**EDUCATION**  
IS ALWAYS CHANGING



Note taking with digital pen, intuitive and natural remote learning, fluent mind mapping and complex visual thinking

handwriting recognition for mathematics, music, chemistry, Asian and Arabic characters.

Software for CAD, Web and graphic design.

Typing longer assignments, multitasking, complex research and knowledge building.

Music composition, playing in, composing, and so on.

Video and audio capture and editing.

Small amounts of typing.

Voice, video and audio recording, conferencing and collaboration.

Internet research.

# Interfaces vs Learning Process



## EXPLORE

Keyboards, mouse and touch may be suited to researching, collecting information or exploring content.



## THINK

Digital pen is best suited for thinking processes like conceptualizing, prototyping, sketching, brainstorming, memorizing and knowledge construction.



## EXPRESS

Multiple inputs may be suited to expression, or organizing and consolidating ideas.



## COLLABORATE AND RECORD

Multiple inputs may be suited to collaborating, presenting and recording ideas.

# Pen Input Interface

## The Pen Is Mightier Than the Keyboard: Advantages of Longhand Over Laptop Note Taking



**Pam A. Mueller<sup>1</sup> and Daniel M. Oppenheimer<sup>2</sup>**

<sup>1</sup>Princeton University and <sup>2</sup>University of California, Los Angeles

### Abstract

Taking notes on laptops rather than in longhand is increasingly common. Many researchers have suggested that laptop note taking is less effective than longhand note taking for learning. Prior studies have primarily focused on students' capacity for multitasking and distraction when using laptops. The present research suggests that even when laptops are used solely to take notes, they may still be impairing learning because their use results in shallower processing. In three studies, we found that students who took notes on laptops performed worse on conceptual questions than students who took notes longhand. We show that whereas taking more notes can be beneficial, laptop note takers' tendency to transcribe lectures verbatim rather than processing information and reframing it in their own words is detrimental to learning.



# Pen Input Interface



## About the author

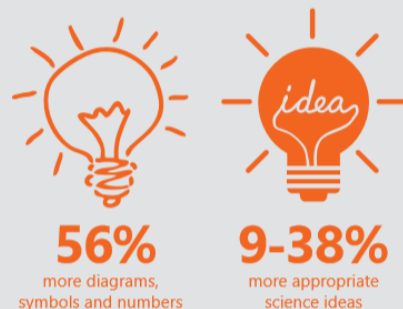
Professor Sharon Oviatt is internationally known for her research in human-centered, educational, mobile, multimodal, and communications interfaces. She is President and Director of Incaa Designs (<http://www.incaadesigns.org/>). She also is the author of *The Design of Future Educational Interfaces* (Routledge, 2013), and *The Paradigm Shift to Multimodality in Contemporary Computer Interfaces* (Morgan Claypool, to appear in 2015).

## How do keyboards and digital pens stimulate or undermine students' ability to think?

Over the last decade, our studies and those of others have repeatedly shown that when students solved science and math problems, performance improved significantly when they used a pen interface rather than a keyboard. Using the pen, they produced 56% more nonlinguistic content (diagrams, symbols, numbers), which led to 9-38% improvement in performance [11; 12; 13]. Research showed that knowing a student's level of nonlinguistic communication predicted their ability to produce appropriate science ideas (Figure 1, top).

However, when the same students shifted to using a keyboard, they typed 41% more linguistic content, or words. In this case, analyses showed that expressing more words actually reduced students' ability to produce science ideas (Figure 1, bottom) [11; 12; 13]. This poor performance occurred in spite of the fact that high school students in these studies were millennials, who grew up using computers with keyboard input.

Using a digital pen,  
students produce...



## Why do pen interfaces have cognitive advantages?

Pen interfaces are more expressively powerful than keyboard interfaces. They more accurately accommodate how we think. They can convey all types of representation, including words, symbols, numbers, and diagrams. When students are solving a problem, they can shift flexibly among them. For example, diagramming a genetics problem, then writing formulas with numbers and symbols to solve it, and summarizing their answer in words. In subjects like math, about 80% of what students write is nonlinguistic content, rather than words.

Pen interfaces are better suited for expressing spatial content than keyboards (e.g., diagrams, symbols), which is considered the foundation of thought [6]. In studies including our own, where students diagrammed before solving a problem, their science scores were 25-36% higher than when they did not [13]. In other research, students who used a pen interface constructed and viewed more diagrams, which improved their inference accuracy [13].

Pen interfaces enhance performance by minimizing cognitive load more than a keyboard interface. Work practice using a pen is already largely automated in our brains, so a pen interface can easily leverage these existing patterns. Interfaces that minimize cognitive load enhance average performance, and they also reduce the performance gap between low- and high-performing students [9].

Active writing with pen interfaces directly shapes brain functions. In research, children who drew letters, rather than viewing and naming them, performed better at recognizing them visually later. fMRI scans revealed that the motor act of writing increased neural activation in the brain area for visual letter discrimination [5], which facilitates word comprehension during reading (Figure 2) [1,4].



Figure 2. Writing activity changes neural basis of letter recognition and reading comprehension



# Choosing the Right Device for Your Schools

## Ten Considerations

**1**

Choice

**2**

Total Cost of  
Ownership

**3**

Compatibility &  
Interoperability

**4**

Security and  
Privacy

**5**

Manageability

**6**

Productivity &  
Employability

**7**

Partner  
Ecosystem

**8**

Durability and  
Quality

**9**

Training and  
Support

**10**

Accessibility &  
Language

# BYOD Models

1. School defined single platform, brand & model
2. School defined multiple platform/brand/model
3. Student choice of laptop or tablet (with requirements guidance)
4. Bring your own whatever connects to the internet

# Considerations for BYOD Models

	1. School defined single platform	2. School defined multiple platform	3. Student choice with guidance	4. Whatever connects to the internet
<b>Cost</b>	School or parent		Parent	
<b>Acquisition model</b>	Group purchase possible for negotiation with vendor		Individual purchase at retail stores	
<b>Management</b>	School		Parent / Student	
<b>Capabilities</b>	Full		Some	Limited
<b>Support</b>	School		Parent/Student with limited support in school	Parent/Student
<b>Application availability</b>	All		Some	Few
<b>Join to school domain network</b>	Yes		Usually No	
<b>School has full control of device</b>	Yes		No	
<b>Manage software deployment e.g. antivirus, applications</b>	Yes		No	



# Windows Tablets



## Designed for 21st Century Learners

- Powerful learning tools for consuming, creating and producing knowledge
- Intuitive interface and interactive learning experiences
- Accessible features for learners of all abilities



## The Power of a PC + The Mobility of a Tablet

- "Anytime, anywhere learning"—on any device
- Touch, stylus, mouse and keyboard enable flexible learning experiences
- Lightweight portable devices with USB
- Full power of the web with Flash enabled content



## Easy to Deploy and Manage

- Supports all models, including shared, one-to-one, BYOD and blended
- Compatible with the widest range of devices, apps and resources
- Consistent, controlled and secure learning environment

# Top 10 ways Windows wins in the classroom

Windows 10 provides students and teachers with a platform for collaborating, exploring, and getting things done. It enables engaging learning experiences to elevate student outcomes and transform education.

## Designed for all learning styles

**73%** of teachers say that technology allows them to tailor their teaching to different learning styles.



- ✓ Windows provides the right device for the right need. Voice, pen, touch and gesture input allow students to interact more naturally with their PCs.

## Best in class assistive learning technology

**~10%** of the population is thought to be affected by specific learning disabilities, having a profound effect on educational outcomes.



- ✓ Windows devices are compatible with the widest array of assistive technology. Teachers can create inclusive classrooms with assistive technologies.

## Thinking in ink

**25%-36%** higher scores were obtained by students who diagramed their thinking with a pen versus those who only used a keyboard when solving science problems.



- ✓ Windows offers a premier inking experience across devices and applications that engage students and enhance their learning.

## Safest Windows ever

**79%** of parents are concerned with privacy and security of their children's data.



- ✓ Windows 10 is the safest Windows ever with new and improved tools for data protection, student identity and log-in, and malware protection.

## Collaborative learning on all devices

**79%** of teachers surveyed agreed that digital tools encourage greater collaboration among students.



- ✓ Windows devices, apps, and software enable students and educators to work on the same documents at the same time within the same classroom, or from different parts of the world.

## Windows is for doing

**65%** of teachers reported that technology allows them to demonstrate something they cannot show in any other way.



- ✓ Windows multi-doing abilities help students and teachers get things done faster, and save time - get things done in a snap with Snap Assist, virtual desktops, and Task View.

## The platform you never outgrow

Students can grow from learning their ABC's on Endless Alphabet to developing their dissertations with Office 365 all on one platform.

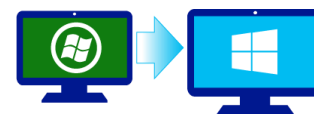


- ✓ Windows can reach all grade levels with a choice of styles and form factors.

## Deploy and manage your way

"The IT department is impressed with the ease of deployment of Windows 10. It was a seamless transition for everyone."

Christopher Rhoda,  
Vice President for Information Services and  
CIO, Thomas College, Waterville, Maine



- ✓ Windows 10 provides educational institutions with simplified ways to deploy and manage your way including in-place upgrades and deployment packages.

## Compatibility king

Connect to printers, cameras, digital microscopes, as well as with traditional and new educational resources, from websites running on Flash to interactive digital textbooks.



- ✓ Windows is compatible with the widest range of connected devices in the classroom.

## Get more for free than ever before

Microsoft is committed to enabling schools and students to have affordable, advanced technology.



- ✓ Microsoft offers many free products and services for students and teachers, as well as Academic Volume licensing and special offers for schools.

# Anytime Anywhere Learning for ALL

*With uncompromising Data Privacy and Cyber-Security*

