Should Laptops Be Allowed in the Classroom? Two Viewpoints

Viewpoint 1: Laptops in Classrooms Facilitate Curricular Advancement and Promote Student Learning

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Viewpoint 2: Deconstructing and Rethinking the Use of Laptops in the Classroom

HsingChi von Bergmann, Ph.D.

Abstract: This Point/Counterpoint article discusses the pros and cons of deploying one aspect of instructional technology in dental education: the use of laptops in the classroom. Two opposing viewpoints, written by different authors, evaluate the arguments. Viewpoint 1 argues that laptops in classrooms can be a catalyst for rapid curricular advancement and prepare dental graduates for the digital age of dentistry. As dental education is not limited to textual information, but includes skill development in spatial relationships and hands-on training, technology can play a transformative role in students’ learning. Carefully implemented instructional technology can enhance student motivation when it transforms students from being the objects of teaching to the subjects of learning. Ubiquitous access to educational material allows for just-in-time learning and can overcome organizational barriers when, for instance, introducing interprofessional education. Viewpoint 2 argues that, in spite of widespread agreement that instructional technology leads to curricular innovation, the notion of the use of laptops in classrooms needs to be deconstructed and rethought when effective learning outcomes are sought. Analyzing the purpose, pedagogy, and learning product while applying lessons learned from K-12 implementation leads to a more complex picture of laptop integration in dental classrooms and forms the basis for questioning the value of such usage. For laptop use to contribute to student learning, rather than simply providing opportunity for students to take notes and access the Internet during class, this viewpoint emphasizes that dental educators need to think carefully about the purpose of this technology and to develop appropriate pedagogical strategies to achieve their objectives. The two viewpoints agree that significant faculty development efforts should precede any introduction of technology into the educational process and that technology alone cannot change education. While the first viewpoint emphasizes the pivotal role of technology in bringing dental education into the contemporary digital world, the second viewpoint focuses on challenges surrounding laptop usage in the classroom including the alignment of instructional methods with learning objectives.

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Viewpoint 1: Laptops in Classrooms Facilitate Curricular Advancement and Promote Student Learning

This viewpoint will take the role of arguing exclusively in favor of integrating laptops into the classroom to facilitate rapid curricular change in dental education. It will expand the definition of “laptops in the classroom” to include various instructional technology enhancements, such as the use of tablets or smartphones, as well as educational settings outside the traditional classroom, such as seminar rooms for small-group teaching or large lecture halls. Thus, when using the terms “laptops” and “classroom,” this discussion intends to refer to that expanded definition of technology and location.

There seems to be widespread acceptance that the implementation of instructional technology leads to curricular innovation, and 86 percent of North American dental schools reported having expanded their use of instructional technology in the early 2000s. Dental educators base their acceptance of the educational benefits of technology integration on advantages such as enhanced student enthusiasm and motivation, as well as the ubiquitous access to educational material. While early attempts at technology use in dental education were marred by a lack of guidance, nowadays dental educators can tap into a wealth of guidelines and methods for developing, evaluating, and effectively using educational software before planning to incorporate such technologies into their own teaching.

As dental education is by its very nature not limited to textual information, but expands far into the realm of spatial relationships and hands-on training, it seems natural that advances in technology can play a transformative role in students’ learning. Today’s students have access to many instructional technologies, such as an interactive 3D tooth atlas that allows them to peel away anatomical structures to view the internal anatomy—a major improvement over the black and white drawings of a late twentieth-century anatomy book. However, dissenting voices have argued that the flexibility provided by technology is associated with a greater risk of interruption, disruption, and reduced concentration and have reported that a majority of dental students surveyed said technology was not essential for their successful performance. Clearly, dental educators need to balance faculty development efforts to achieve digital literacy among faculty members—one of the key challenges in higher education—against the benefits of graduating competent entry-level practitioners who are prepared for the digital age of dentistry. Preparing graduates for a professional life characterized by instant access to information and the need for lifelong learning constitutes a major challenge for U.S. dental educators given that the proficiency of young Americans (ages sixteen to twenty-four) in problem-solving in technology-rich environments ranks last among twenty Organization for Economic Cooperation and Development (OECD) countries according to a 2013 global report (p. 110). As Atul Gawande has argued, “What ultimately makes the difference is how well people use technology. We have devoted disastrously little attention to fostering those abilities.”

Opportunities for Laptops in the Classroom

Laptops in the classroom offer various opportunities to facilitate rapid curricular advancement. A survey of several of those opportunities, with evidence supporting each, demonstrates the potential for their use. (See Table 1 for a summary of the main points made in Viewpoints 1 and 2.)

Flip the classroom. Technology can play a major role in ensuring that students become subjects of learning instead of objects of teaching. While “flipping the classroom” has risen to a fad, the importance of guaranteed access to a laptop or mobile device is a conditio sine qua non if faculty members want to introduce blended learning techniques. If some learning material is transferred to video lectures, faculty members can use the freed-up class time for creative options to engage students by making wireless devices part of instruction (e.g., having students answer questions, manipulate images, manage patient care in treatment plan simulations, and even observe consequences of social interactions). While active learning was favored by progressive educators long before the advent of laptops, the implementation of instructional technology provides many opportunities for educators to effectively and efficiently transition all students in a large lecture hall from passive listeners to active processors of information on a daily basis. Most non-technology-based...
Laptops in the classroom can lead to . . .

- curricular innovation, such as student-centered, hands-on, and exploratory learning
- enhanced student enthusiasm and motivation, transforming students into active learners
- ubiquitous access to educational material, easy sharing of educational resources, and collaborative learning in interprofessional groups
- better preparation of students for the digital age of dentistry and just-in-time learning when new clinical situations occur
- significant enhancements in students’ knowledge
- streamlined assessment, including e-portfolios

... teaching before meaningful patient experiences can occur. Thus, students sometimes need to “re-learn” procedures shortly before they perform them for the first time on their patients. Faculty-developed learning aids such as short video tutorials, PDF guides, and short instructions can be used by students where and when needed if they have a laptop.

Streamlined assessment. Frequent assessments have been shown to increase student performance; however, they greatly increase the time required from overworked faculty members. In the past, computerized examinations have been limited to low-stakes tests as the enforcement of academic integrity was hard to achieve. Nowadays, significant reductions in proctoring efforts while maintaining the highest standards of integrity can be achieved by using new technologies, such as provided by Examsoft and Respondus LockDown Browser (https://www.respondus.com/products/lockdown-browser/). While a closed-book examination can be simulated on personal laptops using this technology, the question must be asked if educators should prepare students to be skilled closed-book test takers or to become lifelong learners skilled at using all the resources in their environment. Norman describes mobile devices as “cognitive artifacts” that augment human cognition; we owe our students the opportunity to unlock these devices for lifelong learning.

Interprofessional education and evidence-based dentistry. Laptops can enhance “student-centered, hands-on, and exploratory learning” as well as “meaningful student-to-student and student-to-instructor interactions.” Expanding teamwork to students from other health sciences is not only

<table>
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<td>Laptops in the classroom can lead to . . .</td>
<td>merely elementary usage of technology if curricular objectives are not clearly articulated as to what role laptops play to aid learning</td>
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<td>• curricular innovation, such as student-centered, hands-on, and exploratory learning</td>
<td>• additional faculty workload with little learning gain</td>
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<td>• enhanced student enthusiasm and motivation, transforming students into active learners</td>
<td>• overwhelming amount of material from which students must select for review</td>
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<td>• ubiquitous access to educational material, easy sharing of educational resources, and collaborative learning in interprofessional groups</td>
<td>• instructor burnout as a result of being unprepared to meet new initiatives</td>
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<td>• better preparation of students for the digital age of dentistry and just-in-time learning when new clinical situations occur</td>
<td>• further distracting students from their main learning tasks</td>
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<td>• significant enhancements in students’ knowledge</td>
<td>• deficiencies in existing assessment system in meeting objectives of laptop integration initiative</td>
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<td>• streamlined assessment, including e-portfolios</td>
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Table 1. Summary of points made in Viewpoints 1 and 2
a desirable goal but advances interprofessional practice, which can improve patient outcomes and reduce health care costs as well as meeting Commission on Dental Accreditation (CODA) standards. Technology can enhance collaborative learning in interprofessional groups as currently seen in initiatives as the one funded by the National Institutes of Health (NIH) Pain Consortium, the aim of which is to develop pain management training and educational resources for medical, dental, nursing, mental health, physical therapy, pharmacy, and other health professionals to advance the assessment, diagnosis, and safe treatment of pain.

Evidence-based dentistry (EBD) can be fostered by faculty members’ asking a question instead of telling a story during a lecture. Specific techniques include having students perform searches on EBD databases, such as The Cochrane Collaboration’s Oral Health Group (http://ohg.cochrane.org/reviews), Trip (www.tripdatabase.com/), National Guideline Clearinghouse (www.guideline.gov), the ADA’s Center for Evidence-Based Dentistry (http://ebd.ada.org/), and PubMed Clinical Queries (www.ncbi.nlm.nih.gov/pubmed/clinical), and then compare the results with their electronic textbooks and/or a million dental records compiled from several dental schools. These searches can be done in seconds, all on students’ laptops—a process that in the past would have taken many visits to the library, reviews of textbooks, and travels to the chart rooms of dental schools thousands of miles apart.

**E-portfolios.** To comply with the new CODA standards, dental educators need to find effective and efficient ways to embrace some form of global assessment of students. The introduction of laptops in the classroom opens the door for students to assemble their e-portfolios. Portfolios are seen as tools to increase students’ self-awareness, to foster students’ ability to learn independently, and to encourage students to reflect on their own performance. As the dental educational process stretches beyond didactic sessions to incorporating patient care experiences, it seems obvious that portfolios, a “collection of evidence that learning has taken place,” need to include artifacts derived from the electronic health record. Thus, the use of laptops by students during all, or most, of their educational sessions constitutes an inevitable prerequisite for the successful introduction of e-portfolios to foster critical thinking and problem-solving and ensure the production of reflective health professionals.

**Conclusion**

While this viewpoint argues exclusively in favor of integrating laptops in classrooms, dental educators need to acknowledge that technology alone cannot change education. There have been many calls for change in dental education in order to facilitate long-overdue transformative changes in educational programs, which are “based on a century-old model that takes an inordinate amount of time to complete . . . [and are] behind the curve in utilizing technology for education and clinical practice.” Technology can not only support such changes, but can play a pivotal role as a catalyst for bringing dental education into the reality of the digital world that is increasingly embraced by patients and the public, mandated by payers and purchasers, enforced by policy makers, and supported by product makers.

**Viewpoint 2:**

**Deconstructing and Rethinking the Use of Laptops in the Classroom**

Dental educators who have immersed themselves in educational technology will likely agree with Hlynka and Yeaman’s observation about the hidden power educational technology holds, specifically the power to transform curricula and instructional approaches. However, before educational technology can truly unleash that power, we first need to perform what those authors call rigorous “thinking, rethinking, deconstructing, and criticizing.” For laptop use to contribute to student learning, rather than simply providing opportunity for students to take notes and access the Internet during class, dental educators need to think carefully about the purpose of this technology and develop appropriate pedagogical strategies to achieve their objectives.

Although educational technology covers more than the integration of laptops, this viewpoint focuses on challenging issues surrounding laptop use in the classroom. Three perspectives—regarding purpose, pedagogy, and product—are introduced to deconstruct this topic in order to stimulate reconceptualization of the issue. Relevant studies, specifically research on laptops in K-12 classrooms, are introduced to highlight issues surrounding this topic. (See Table 1 for a summary of points made in Viewpoints 1 and 2.)
What Is the Purpose of Laptops in the Classroom?

The question of what purpose laptops serve in classroom learning activities goes well beyond issues of access (e.g., whether students can afford to have personal laptops) and infrastructure readiness (e.g., whether the Wi-Fi is fast and robust enough to support a large number of students accessing the Web). The most common argument in favor of laptops in K-12 classrooms has been to use technology to enable twenty-first-century learning that is engaging, relevant, authentic, collaborative, inquiry-based, and ultimately serving the purpose of knowledge-generation. Two of the numerous laptop initiatives that emerged in the 1990s were the One-to-One Laptop Program, initially a North American educational initiative that aimed to enhance inquiry teaching and students’ academic performance by providing each student with a laptop and school-wide Wi-Fi access, and the One-Laptop-Per-Child (OLPC) program, which aimed to provide affordable laptops to children in developing countries for readily accessible information on the Web.53 These programs intended to put computers in the hands of hundreds of millions of children to support the design of twenty-first-century educational programs. Since the early 1990s, studies have been conducted on the implementation and effectiveness of One-to-One and OLPC programs.54,55 In a recent evaluation of the One-to-One initiative, the researchers observed that a disconnect still exists between “what students are able to do with the laptop” and “what they are asked or required to use as part of assigned learning tasks, activities, and projects in the classroom.”54

What Pedagogical Challenges Arise in Integrating Laptops into the Classroom?

In OLPC programs, access to laptops is not an issue, creating an ideal condition to examine this question: If there is no concern about hardware ownership, what is holding back the effective use of laptops in the classroom? The seemingly ideal condition of integrating laptops into the classroom, according to three studies on OLPC programs, was not achieved due to laptops’ being underused.55,57,58 Why? An instructional plan is only as good as the person who designs and executes it. Instructors who orchestrate the learning experience need to have the knowledge, skills, and attitudes to carry out a successful laptop integration program.

From studying teachers who won awards on successfully integrating technology into their teaching, researchers found critical evidence about the relationship between pedagogical beliefs and

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Table 2. Characteristics of computational thinking as described by Wing in 2006

- Conceptualizing, not programming
- Fundamental, not rote skill
- A way that humans, not computers, think
- Complements and combines mathematical and engineering thinking
- Ideas, not artifacts
- For everyone, everywhere
- Intellectually challenging and engaging scientific problems remain to be understood and solved

practice. These successful teachers held student-centered beliefs, valuing student choices, authenticity, and collaboration, which formed the foundation for their student-centered instructional practices. Internal factors, such as passion for technology and a problem-solving mentality, also played key roles in shaping these instructors’ pedagogical practices.

Passion for technology is an attitude not easily cultivated in an individual within a short amount of time. Even with passion, developing the kind of knowledge and skills needed requires time. Most OLPC program evaluations found that insufficient professional development was a failure indicator. Investigators researching information technology integration in dental education found that 25 percent of North American dental schools in 2002-03 required their students to purchase or lease laptops as a matriculation requirement in an attempt to embrace the e-curriculum movement. However, similar to K-12 studies on One-to-One or OLPC programs, strong advocacy for the movement was found, but with limited implementation. Why? Generally, implementation failed at the instructor level. Dental students surveyed reported that instructors had not modified their courses to incorporate the use of laptops in the classroom. The reason for this failure was identified by administrators, students, and faculty members as the lack of faculty development programs to support the initiative.

Hendricson et al. pointed out that “faculty development has the potential to help dental schools move forward toward implementation of the baker’s dozen curricular reform agenda, but only if appropriate skills are emphasized” (p. 1530). What are the “appropriate skills” needed to enhance laptop use in dental classrooms? Quality faculty development programs should be designed to develop those skills and should be coupled with the development of a learning culture among faculty members in order for dental schools to effectively implement laptop initiatives.

What Product Is Expected from Laptops in the Classroom?

Laptops in classrooms can possibly lead to undesirable results. Students who have laptops during class have been noted to have higher likelihood of distraction (using Facebook, Twitter, email, etc.), especially if they are not intrinsically motivated by the subject matter. Mazur’s statement about “students being no more distracted by laptops or mobile devices than the window of a classroom” is not supported by research data. The problem is that online content is usually much more stimulating to students than such traditional classroom distracters as looking out the window. Rather, students who use laptops in the classroom have been observed getting distracted moving from one website to another to the degree that Kraushaar and Novak estimated that students in a lecture-based course were “multitasking” for 42 percent of class time.

Studies related to laptops in the classroom have often been conducted in a lecture-based environment. Successful lecturers not only inform learners; they also engage learners’ imaginations and inspire them. But would educators argue that most lectures in dental schools are great ones? Research has found that students who use laptops during class report low satisfaction with their education, are more likely to multitask, and are more distracted. In a simulated classroom study, in-class laptop use was found to hinder the learning of both the students who used the laptops and those who had direct view of the others’ laptop screens.

Students may claim they are able to “multitask” (i.e., pay attention to the class’ focus while accessing the Web), but a study of attention found limits to how well multitasking can be carried out. As Sullivan and Thompson emphasized, “As economics students know, switching involves costs. But how much? When a consumer switches banks, or a company switches suppliers, it’s relatively easy to count the added expense of the hassle of change. When your brain is switching tasks, the cost is harder to quantify.” Bailey and Konstan have shown that it takes time and effort to refocus after switching from one task to another. Although many students believe they can switch back and forth between different tasks with no serious consequences to their academic performance, researchers have found that multitasking dramatically increases the number of memory errors and the processing time required to “learn” topics that involve a significant cognitive load. Foerde et al. found that multitasking has a negative impact on productivity and that attempting to “learn” while engaged in multitasking behavior can result in acquisition of less flexible knowledge that cannot be easily recalled and/or applied in new situations. In dental schools, when what is learned in a classroom setting is to be applied in the clinical setting, these research findings should alert dental educators to the need to rethink introducing laptops into the classroom.
Conclusion

Whether laptops in the classroom can lead to effective learning outcomes is a complex and multifaceted research question that urgently begs for careful examination. Without a thorough discussion of the purpose of laptop use and a strong commitment to implementing pedagogical change, it is likely to lead to an undesirable learning product. With ongoing curricular changes occurring in many North American dental schools, both clinical and preclinical time has increased. As students spend more time in clinic, most likely equipped with workstations, what role do laptops play in this nearly 50 percent portion of their academic program? Presentation of this viewpoint does not intend to offer solutions, but to urge readers to rethink the why, how, and what of laptops in the dental classroom.

Response by Dr. Spallek to Viewpoint 2:

I agree with the opposing viewpoint that dental educators need to explore the “why, how, and what” of laptops in classrooms. However, twenty-first century dentists will need new abilities in order to function in a digital environment, and we as dental educators have an obligation to prepare them for that by preceding the implementation of technology with faculty development. Such faculty development efforts must be multifaceted, including technology training and pedagogical help supported by dedicated instructional technology and instructional design staff members. Dental educators also need to think beyond the graduation of their students. No one would deny that dental practice is rapidly moving toward the digital age, exemplified by the high penetration of electronic health records and federal incentive programs calling for computerized decision support systems. Thus, banning laptops from the classroom parallels Plato’s critique of writing, which in his view substitutes real knowledge with written words so that writers “cease to exercise their memory and become forgetful.” As Ray Kurzweil has written, “Technology is the continuation of evolution by other means.”

Response by Dr. von Bergmann to Viewpoint 1:

The premise of Viewpoint 1 is that technology can add efficiency to the new learning system. While the general ideas expressed by the author of Viewpoint 1 are admittedly of potential value, the reality of implementation needs to be carefully considered. Given limited space to respond, here I will question the implementation of “just-in-time learning” with laptop integration as one example. An online platform does make resource-sharing much more efficient. When Wikipedia first launched in 2001, many users immediately embraced such an information-creation/sharing platform. Wikipedia reported that, at the end of February 2014, the site had more than 4.5 million entries written in English and that, each hour, there were more than 10 million views. Thirteen years after its introduction, however, educators have to constantly remind their students not to rely on Wikipedia content as authoritative. Although the resources posted on the sites mentioned in Viewpoint 1 are—unlike Wikipedia—created by content experts, the content creator or site manager must constantly review the material to ensure it remains accurate and up-to-date if it is to satisfy the purpose of “just-in-time learning.” Having information accessible does not necessarily mean it meets the learners’ needs, pointing again to the critical necessity of instructional strategies to accompany use of any technology.

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REFERENCES


