

This paper examines mobile communication technologies in educational settings, especially mobile-phone use in schools. It draws on journalistic accounts, survey data, published reports, interviews, and focus-group data to explore how personal mobile technology is changing the educational experience in education systems in the United States and other nations.

Recent Changes in Classroom Environments

Because people adapt rapidly to change, participants and observers sometimes have difficulty noticing alterations in prior routines and environments. Is it possible, for instance, that the university classroom has changed more in last few years than it did in the preceding hundred?

Physically, today's classroom is similar in layout and process to the classroom of twenty or even a hundred years ago. Blackboards still dominate. Despite many predictions since the 1950s, television supplements lectures and has not supplanted them. The internet has not inspired students to study science and math by looking at virtual laboratory benches and chatting online with researchers. Although students turn heavily to the internet for doing research, writing papers, playing games, and chatting, it has not altered the atmosphere of the classroom – something that even students have criticized.¹

Video cassette recorders, compact disc recorders, networked computers, and computer software have wrought some changes in classroom settings, but another digital technology may be forcing a change in the dominant paradigm of classroom-based education. Today more than one out of six people worldwide are mobile-phone subscribers, and mobile telephones, digital cameras, personal digital assistants (PDAs), and laptops that are enabled with wireless fidelity (Wi-Fi) are omnipresent.

¹ Andrew Trotter, "Students' Technology Views Solicited", *Education Week*, Oct. 15, 2003, <http://www.b-g.k12.ky.us/Tech/StudentsTechnologyViewsSolicited.pdf>, p. 1.

Both local and global dimensions of change have been brought together in the classroom in novel ways. A culture of perpetual contact² has come together with a loss of a sense of place and a potential for amusing ourselves to death: students now easily communicate with the world beyond the classroom and engage with nearly endless entertainments and distractions.³

Control of the Educational Environment

For some philosophers of education, students must be within controlled environments to learn successfully, and education inculcates information, values, and behaviour into the minds of others.⁴ These “total institutions” use coercion, denigration of the self, uniforms, and physical demonstrations of respect for authority to control the individual.⁵ They limit contact between individuals within the institution and between insiders and outsiders. In Kindergarten through 12th grade (K-12) schools, for example, hall passes are typical, and uncontrolled communication is frowned on. Public phones are generally near the principal’s office, but communications from outside the classroom typically are one way and local – via public-address announcements.

The Initial Reaction: Ban Mobile Technologies from Schools

Although the internet generated positive speculation about its potential effects on education, the mobile phone was identified as a source of irritation, delinquency, and even crime. Initially, school authorities banned pager and cell-phone use inside school buildings to prevent them from being used for selling drugs or organizing gangs. In the United States, at

² See James E. Katz and Mark Aakhus (eds.), *Perpetual Contact: Mobile Communication, Private Talk, Public Performance*, Cambridge: Cambridge University Press, 2002.

³ Joshua Meyrowitz, *No Sense of Place: The Impact of Electronic Media on Social Behaviour*, New York: Oxford University Press, 1985; Neil Postman, *Amusing Ourselves to Death: Public Discourse in the Age of Show Business*, New York: Viking Penguin, 1985.

⁴ Donald M. Scott, “The Social History of Education: Three Alternatives”, *History of Education Quarterly* 10 (1970), pp. 242–254; Michael Katz, Edward Stevens, Jr. and Maris A. Vinovskis, “The Origins of Public High Schools”, *History of Education Quarterly* 27 (1987), pp. 241–258. An intriguing suggestion of just how controlling this environment was can be drawn from the experiences of Charles Dickens (1812–1870), who recalled that after publishing a fictionalized account of brutalizing conditions at a boarding school, he received numerous threats of lawsuits from masters who insisted that what he was alleging about *their* school was an exaggeration.

⁵ Erving Goffman, *Asylums*, New York: Doubleday, 1961.

least 20 states banned their use in K-12 public schools.⁶ These early policies did not emerge from thoughtful technology assessments, and mobile phones were not integrated into the school curriculum.

Today the Los Angeles school district and many others continue to ban the use of pagers and cell phones,⁷ but state laws against them have been abandoned because of safety concerns, especially after the school shootings in Columbine, Colorado, on April 20, 1999, and the terrorist attacks in New York, Pennsylvania, and Washington, D.C., on September 11, 2001. Parents also have pressured school authorities to allow mobile phones in schools for their convenience in coordinating school and after-school schedules.

The Adoption of Mobile Technology by Young People

Prominent examples of research on mobile phones and young people include Leopoldina Fortunati's path-breaking studies of Italy⁸ and Rich Ling's authoritative investigations.⁹ Students of all ages seem to feel pressure from many "social engineering" sources to adopt mobile phones – from ad campaigns, from product placements in TV shows, films, and entertainment events, and even from parents.¹⁰

Some academic experts advocate giving mobile phones to 10- and 11-year-olds. In 2001, professors at the University of Gloucestershire found that about half of the 351 primary-school pupils they surveyed had phones and that 38% had used their phones in a crisis situation (one out of seven also had sent a "frightening" message to a student). They concluded that lack of ownership "could harm social development and learning and lead to negative self-feelings and isolation."¹¹ Another researcher

⁶ James E. Katz, *Connections: Social and Cultural Studies of the Telephone in American Life*, New Brunswick, NJ: Transaction, 1999. Some exceptions, such as the 1988 California law, were made for medical necessity, cf. Duke Helfand and Erika Hayasaki, "L.A. Unified to Study Campus Cellphone Ban", *Los Angeles Times*, Sept. 23, 2003, p. B1.

⁷ Helfand and Hayasaki, "L.A. Unified to Study Campus Cellphone Ban," p. B1.

⁸ Leopoldina Fortunati, "The Mobile Phone: An Identity on the Move," *Personal and Ubiquitous Computing* 5 (2001), pp. 85–98; Leopoldina Fortunati, ed., *Telecomunicando in Europa*, Milan: Franco Angeli, 1998.

⁹ Richard S. Ling, *The Mobile Connection: The Cell Phone's Impact on Society*, San Francisco: Morgan-Kaufman, 2004.

¹⁰ Jeeraporn Chaisri, "Parents Glad to Give Kids Cell Phones", *The Nation* (Thailand), January 29, 2001, retrieved from Gale InfoTrac on April 10, 2004.

¹¹ Tony Charlton, Charlotte Panting, and Andrew Hannan, "Mobile Telephone Ownership and Usage Among 10- and 11-Year-Olds: Participation and Exclusion", *Emotional and Behavioural Difficulties*, vol. 7, no. 3 (2001), pp. 152–163, quote from p. 162.

disagrees: “Cell phones don’t contribute to learning. ... There are no good reasons for children to have cell phones.”¹²

Teens in Scandinavia and Asia have near 100 percent mobile-phone ownership. A 2004 survey found that 47% of U.S. students age 12 through 19 carry cell phones. (A 1999 poll found that only 10% of young people from 13 to 17 years had cell phones.) Another 2004 survey of 8- to 10-year-olds found that 29% owned a cell phone (up from 18% in 2002) and that for 8- to 10-year-olds the mobile phone is “as much a status symbol as a communications device”.¹³

I was unable to find current national data about cell-phone adoption rates among U.S. college students. One survey of mostly 19-year-old students (N = 421) at Rutgers University found that rates of adoption were 98%. Based on my own informal discussions with students from Taiwan, Korea, and Japan, rates among students in these countries are high.

The Usefulness of Mobile Phones in Educational Settings

What are the pedagogical consequences of this tidal wave of technology that breaks long-standing arrangements of control and hierarchy in schools? Mobile technology is working with education in several ways. One way is as a form of tutoring. Wireless application protocols (WAP) that use cell phones to access the internet help users find definitions and reference information while on the move. A U.S. publisher, for instance, supplements its business textbooks with mobile-phone-supported educational services such as flashcards, key terms, and self-quizzes.¹⁴ Executives of the firm said, “Many students today have complicated schedules and need to maximize small increments of free time. Knowing this, we recognized the need for delivering flexible ways to study materials outside of the classroom.”¹⁵

Mobile phones connect students with teachers and other students and help them deal with class attendance issues, rearrange meetings, retrieve schedule and assignment data, discuss assignments, coordinate study

¹² Thomas Sherman, professor of education, quoted in “Cell Phones Don’t Contribute to Learning”, Virginia Polytechnic Institute and State University, public release dated July 12, 2002, retrieved May 13, 2004 from http://www.eurekalert.org/pub_releases/2002-07/vt-cpd071202.php.

¹³ Jeffrey Selingo, “The Cellphone: A New Joy of Childhood”, *International Herald Tribune*, March 20, 2004, p. 18, retrieved April 10, 2004 from Gale InfoTrac.

¹⁴ See <http://www.mhhe.com/business/cellphone/images/phone3.html>.

¹⁵ “Study to Go for Cellphones Offers Next Generation of Mobile Student Tools”, http://www.pdatoday.com/comments/1352_0_1_0_C.

groups, and seek help with academic and life problems.

Cell phones also help teachers manage their own schedules more effectively. In an experiment conducted in a large Texas school district in the early 1990s, 25 itinerant teachers of children with visual disabilities were given mobile phones. Researchers – who investigated time-management efficiency, costs, changes in use patterns for both wired and wireless phones, and teachers' feelings of security – concluded that the technology was highly cost-effective, increased teachers' feelings of security, and improved their communications with parents, other professionals, and schools and base offices.¹⁶

Administrators can delegate many time-consuming, repetitive tasks to mobile phones. At Korea's Suk Myoung University, students use mobile phones to confirm attendance, enter libraries, buy food in the school dining hall, and prove identity.¹⁷

Finally, mobile phones allow parents to monitor their children remotely by helping them get to their appointments on time and reduce their anxieties about their children's whereabouts. A location-monitoring service at a Korean school allows parents to confirm the location of their child within a school environment.

Student Attitudes and Behaviour

Some authorities feel that student use of mobile phones is a positive development. A developmental psychologist has said, "By using technology, children are feeling more of a sense of mastery and are feeling good about themselves."¹⁸ Adoption behaviour certainly shows that U.S. students are using mobiles in colleges, high schools, middle schools, and even elementary schools.

A Pew Internet and American Life Project poll (N = 1,162) found that one-third of college students play video games on their cell phones and laptops during class. Respondents said that their academic performance was not affected by these practices,¹⁹ a claim that needs examination.

¹⁶ A. L. Corn, W. Patterson, C. Love and J. N. Erin, "The Use of Mobile Telephones with Itinerant Teachers of Students with Visual Disabilities", *Journal of Visual Impairment and Blindness*, vol. 88, no. 5 (1994), pp. 446–458.

¹⁷ Sookmyung Women's University, *The Hankyoreh: Introduction of "Mobile Campus"* [translated from Korean], August 26, 2002, retrieved March 9, 2004 from <http://www.hani.co.kr/section-005100006/2002/08/005100006200208261404059.html>.

¹⁸ Andrew Trotter, *op. cit.*

¹⁹ Marilyn Gilroy, "Invasion of the Classroom Cell Phones", *Education Digest* vol. 69, no. 6 (2004), pp. 56–61.

Rough comparisons can be made with other countries. A 2002 survey (N = 1,682) of Norwegian students who were mostly between 16 and 18 years old found that three-fourths of respondents had restrictions on their use of short message service (SMS) in class but still used the technology (Figures 1–2). A 2003 Korean survey of middle- and high-school students (N = 497) found that 45% of schools controlled the use of mobile phones but that 68% of their students used mobiles in class anyway. About 41% of students reported that they had been disturbed by another’s use of a mobile phone.²⁰

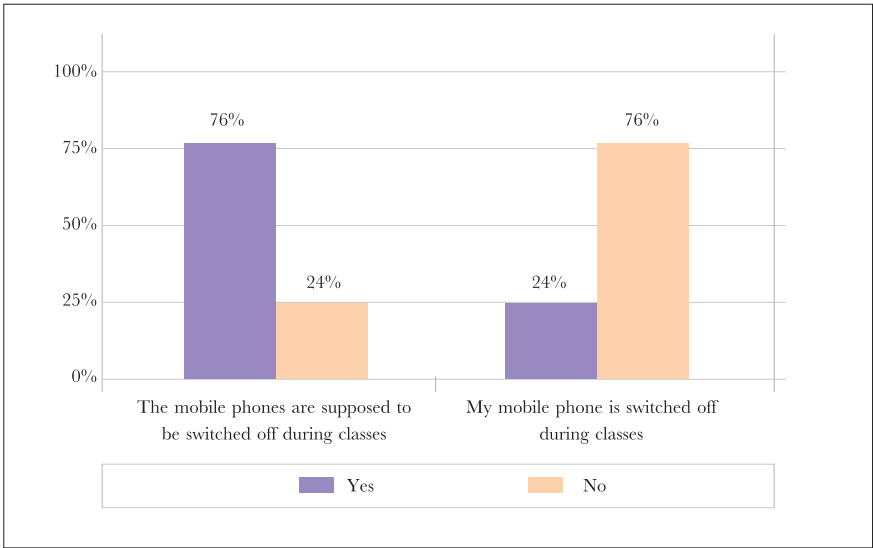


Figure 1

Survey of Norwegian students and mobile phones, 2002 (N = 1,682)

(Source: Berit Skog, personal communication)

At Rutgers, we surveyed a class of information-technology students who were mostly 20 years old (N = 221). Half had used a mobile phone during class in the preceding week to check for calls or messages (41%), to be distracted from a boring class (34%), to answer calls (29%), to talk to a friend (23%), to find out what a friend was doing (23%), and to

²⁰ Sung Nam citizen committee, “Research on Use of Mobile Phones in High and Middle Schools in Korea”, 2003, retrieved March 15, 2004 from <http://www.chosun.com/w21data/html/news/200312/200312260261.html>.

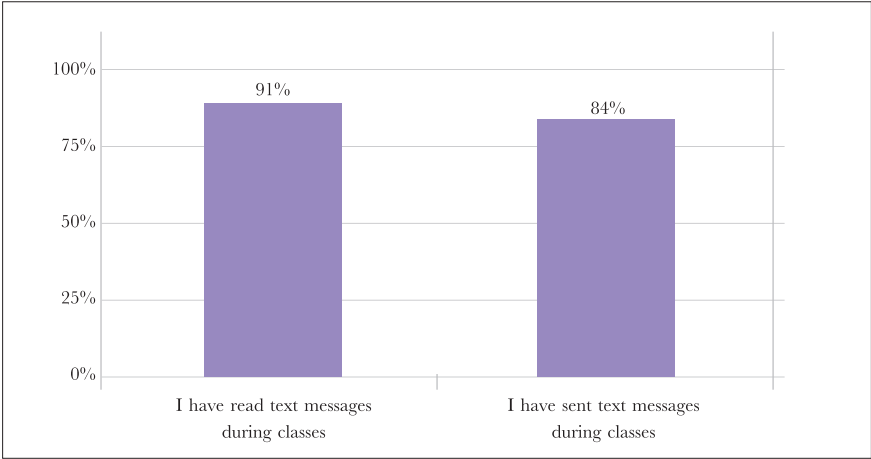


Figure 2

Survey of Norwegian students and mobile phones, 2002 (N=1,682)

(Source: Berit Skog, personal communication)

download (6%). About half found others’ use of phones in class to be distracting. Only 4% of students thought that it was OK to speak into a phone in class, but they thought that text messaging (45%) and game playing (30%) were OK.

In response to a question about mobile-phone addiction, one out of seven students said that they felt addicted to their phones. This sense of addiction may correspond with dependency and heavy usage.

Our survey also yields interesting clues about the social-contagion aspects of mobile phone use in class. About 44% of respondents agreed that if one student begins using a phone in class, others will use their own phones.

An Experiment

Reports show a pattern of intense in-class use of mobile-communication technology – to overcome ennui, to display a high-status item, and to perform functional or social tasks. It is not uncommon for students (and others) to say they could “not live” if they did not have their mobile phone.²¹

To investigate this dependence and understand the role played by

²¹ James E. Katz (ed.), *Machines That Become Us: The Social Context of Personal Communication Technology*, New Brunswick, NJ: Transaction, 2003.

mobile phones in their lives, we invited students to participate in an experiment to refrain from cell-phone use for 48 hours. The goal was for participants to appreciate (and describe for researchers) the role of mobile technology in their lives. Of the 102 students solicited, 82 participated in the experiment, and 12 finished the experiment (a mortality rate of 85%) (Figure 3). Students said that the experiment was too hard, urgent issues arose, people got angry with them, and responsibilities required them to use their phones.

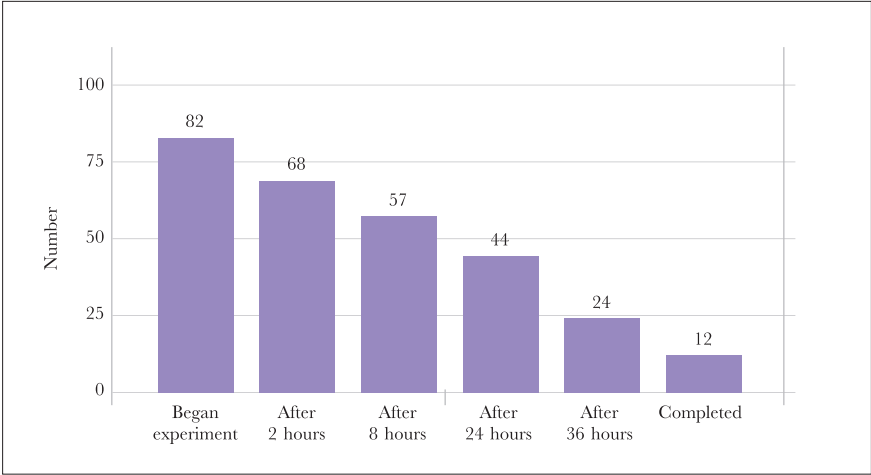


Figure 3

Levels of participation in a 48-hour experiment to forego mobile phones, April 2004

We also asked students how their lives were different during the two-day hiatus. Three respondents said that their life was happier without a mobile phone; 70% disagreed with this view. The mobile phone seems to have migrated from a luxury to a “necessary luxury” (in Fortunati’s phrase) and finally to a vital communication tool.

Some Behavioural Dimensions of Mobile-Phone Use in the Classroom

News stories about mobile-phone use by students in educational settings suggest a variety of problems, including disruption of class, delinquency, chicanery, and erosion of teacher autonomy.

Disruption of Class

Income inequality changes in 73 countries, 1960s to 1990s
In 2002, a pizza delivery man arrived at a Virginia high school with an order for a student who had ordered the pizza because he had missed lunch. Commented an astounded principal: “He didn’t see anything wrong with it.”²² A Connecticut principal reported that an eighth-grade boy “boldly took out a cellphone during history class and ordered a pizza”. The principal reprimanded the student and confiscated the mobile phone. Scrolling through the phone’s recently called numbers (“looking for numbers of known drug dealers”), he discovered that the boy “had called my house six times in the middle of the night. My wife and I remember the hang-ups vividly.”²³

Delinquency

In 2001 in Great Britain (I could not find comparable data for the United States) about 28% of robberies involved taking a mobile phone, and about 700,000 mobiles were stolen – nearly half from children under age 18 (Figure 4).²⁴ Some thefts occurred during a mugging or a violent attack that resulted in a knifing or death, and about 1,000 victims were 12 years old.²⁵ Moreover, bullying among children can be exacerbated by mobile phones.²⁶ (They also can help alleviate it.)

Chicanery

Mobile communication devices have been used for chicanery in educational settings, especially for truancy and for cheating on tests. Truants have had students inside a school building use mobile phones to tell

²² Jennifer 8. Lee, “As Gadgets Go to Class, Schools Try to Cope”, *New York Times*, Aug. 15, 2002, retrieved April 18, 2004 from <http://mathforum.org/epigone/mathedcc/zholalchend>. This is by no means a unique instance. See Gilroy, “Invasion of the Classroom Cell Phones”.

²³ Thomas B. Mooney, “Legal Mailbag”, *CAS Bulletin*, Connecticut Association of Schools, Feb. 2003, http://www.casciac.org/legal_mailbag/feb03.pdf.

²⁴ “Huge Surge in Mobile Phone Thefts”, BBCi website, January 8, 2002, <http://news.bbc.co.uk/1/hi/uk/1748258.stm#only>.

²⁵ “Teenager Stabbed for Mobile Phone”, BBCi website, June 12, 2002, <http://news.bbc.co.uk/1/hi/england/2040337.stm>.

²⁶ Angela Pacienza, “Proliferation of E-mail, IM Makes Cyberbullying Common Activity Among Youth”, March 17, 2004, disseminated by Canadian Press.

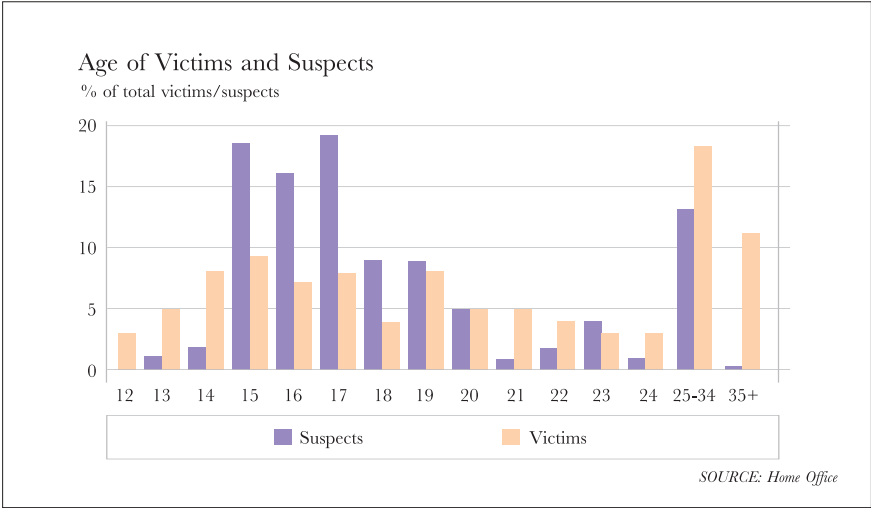


Figure 4
Age of victims and suspects of crime, 2000–2001

(Source: BBCi Website, based on data from U.K. Home Office)

them when to return to avoid detection.

A teacher in California reports that a student showed her a cell-phone picture of a test question that had been sent to him by another student in the class.²⁷ A University of Maryland professor posted a bogus answer key on the internet after a test had begun. By comparing students’ answers with the bogus answer key, the teacher uncovered a dozen cheaters, who appeared to have independently had friends send them answers from the key.²⁸

Similarly, a Tokyo university failed 26 students (out of about 500) for cheating on their e-commerce final exams when a student left the classroom during the exam and sent his classmates e-mail messages containing answers. Professors noticed that these students produced identical answers, including mistakes.²⁹

²⁷ “Cheating by Mobile Phone Reaches America”, March 18, 2004, <http://www.mobileyouth.org/news/mobileyouth1258.html>, 2004.

²⁸ Stephen Manning, “University of Maryland Students Admit to Using Cell Phones to Cheat”, Jan. 30, 2003, <http://www.signonsandiego.com/news/computing/20030130-1331-cellphones-cheating.html>.

²⁹ “Japanese Students Caught in Cellphone Cheating Scam”, *Chronicle of Higher Education*, Jan. 3, 2003, p. A44; Sarah Mae Brown, “Collegians at Moscow State University

Erosion of Teacher Autonomy

Teachers have required students to leave phones outside test settings. At the University of Maastricht, “mobfinders” make a beeping sound when they detect mobile-phone use in their vicinity. University officials anticipate that alerting students to the possible use of the device might eradicate the practice.³⁰

In spring 2003, the National Education Association asked members of its higher-education division if professors should ban cell phones in their classrooms, and 85% answered yes.³¹ About 74% of California’s secondary school principals support a ban.³²

Some teachers enforce rules that govern classroom mobile-phone behaviour. In a 2002 course syllabus, a social psychology professor at the University of New Mexico–Albuquerque included this notice:

Turn off mobile phones when in class. I do not want to hear your phones ringing. If your phone rings, I will ask you to leave class immediately and not to return until the next class. If it keeps happening, I will ask you to drop the course. The only exceptions are if you have a child or other dependent for whom you have to remain available in emergencies; if so, please let me know this is your situation in advance (i.e., send me an e-mail before the second class meeting, August 22), and get a phone with a silent vibrating call alert rather than an audible ring.³³

A systematic approach is outlined in a syllabus for a cellular biology class offered at a Massachusetts technical college:

Students can remain in the course until they have accumulated 10 points, at which time they will be removed from the course. Absence from class or lab, coming to class or lab late, and leaving class or lab for extended periods of time count as 1 point each. Interruption of class or

Use Cellular Phones and Beepers to Get Answers to Exam Questions – One Professor Even Praises Their Initiative,” *Los Angeles Times*, April 26, 1998, p. 13; Amy Argetsinger, “U-Md. Says Students Use Phones to Cheat; Text Messaging Delivers Test Answers,” *Washington Post*, Jan. 25, 2003, p. B1.

³⁰ Andy Reinhardt, “Your Cheatin’ Phone”, *Business Week*, Sept. 3, 2001, p. EB4.

³¹ Gilroy, “Invasion of the Classroom Cell Phones”.

³² Helfand and Hayasaki, “L.A. Unified to Study Campus Cellphone Ban”.

³³ Geoffrey Miller, “Syllabus for Social Psychology 271”, c. 2002, retrieved on April 20, 2004 from <http://www.hbes.com/HBES/syllabus-miller-socpsych.htm>.

lab by a mobile phone or beeper also counts as 1 point.³⁴

Some teachers strike back directly at phone calls that disturb their classes. One professor takes a ringing phone and asks the caller to add to the class discussion. She reports that after one episode of this kind, her students seldom let their phones ring during class time.³⁵

Students are not the only ones who disrupt class with mobile phones. One interviewee reported that her daughter's third-grade teacher regularly took personal calls during class, which led administrators to ban the practice. In a 2004 survey, nearly two-thirds of 100 Rutgers students reported that their professors had taken calls during class. Indeed, I witnessed a professor receive a call during a lecture and leave the room to discuss a medical condition with his physician.

Some Consequences of Mobile-Phone Communication for Education

Mobile-phone communication benefits education on at least three levels. Operationally, it makes class management, including attendance and administration, easier and more effective. On the time-management level, it enhances coordination between teachers and students. Finally, it provides students with greater access to course and supplementary educational resources.

On the other hand, mobile-communication activities in classrooms have negative aspects, including cheating, harassment, and delinquency. Additional problems may also be emerging, including damage to attention spans, critical-thinking skills, and respect for learning and teachers. Students who are distracted lose the ability to concentrate, to plan, and to work with complex ideas³⁶ and sometimes seem to reflect a general decline in civility.

A Death-Knell for the Classroom?

Mobile-communication technologies introduce a “blooming buzzing confusion” (in William James’s memorable phrase) that younger teachers

³⁴ Dawn Tamarkin, “BIOL351-D01: Cell Biology” syllabus, 2004, retrieved on April 20, 2004 from <http://distance.stcc.edu/cellbiology/syllabusS04.htm>.

³⁵ Mary Beth Marklein, “Hanging Up on Class Disruptions”, *USA Today*, Oct. 29, 2003, p. D5.

³⁶ Gilroy, “Invasion of the Classroom Cell Phones”.

seem to accept more easily than their older counterparts. Public-school authorities do not have the political power to overcome parental and student resistance to a classroom cell-phone ban, when in an era of both local and global violence, parents view this technology as a lifeline to their children. But this lifeline has transmogrified into an entitlement. It cannot realistically be banned but can be controlled (even though smaller and smarter phones will be harder to detect).

Mobiles are further accelerating changes that are already underway – fostering student autonomy while encouraging clique involvement, helping parents affect how classes are run and what their children are doing even as they are more distant physically, and allowing greater monitoring of and accountability for teachers. Moreover, the predictions of advocates of “distance learning” (where students are physically dispersed but mentally present) have been turned on their head. Instead, students might be mentally absent even while being physically present.

By allowing students to defect from the class environment and pursue their own amusements, mobiles could allow the classroom to become as much about entertainment as about discipline. In some ways, when the “here and now” needs of a physically present group are sacrificed for the needs of group members who are distant in space and time, personal pleasures supersede public norms.

The image of schoolchildren staring out the classroom window, minds preoccupied with daydreams, could be supplanted by one of students staring forward – not daydreaming but interacting with vibrating gadgets, chattering with offsite friends, and accessing materials from outside the classroom. Tomorrow’s mobile technology may be the perfect tutor in the local/global biomachine that many futurologists anticipate.³⁷

³⁷ I thank Rutgers University graduate students Yi-Fan Chen, Seong Eun Cho, Yoon Cho, Kalpana David, Dan Su, and Ferhan Tunagur for their research collaboration.