

Inviting Discussion About Safer Tech Use in Schools

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A list of educators, physicians and researchers who join Katie Singer and the EMRadiation Policy Institute in calling for safer use of technology in education is posted after the Endnotes.

In one generation, use of electronic technologies has exploded, creating dramatic environmental and cultural changes, including in classrooms. As we read, write, research, meet and express ourselves, electronics offer extraordinary possibilities. Meanwhile, to develop self-respect, empathy, humor, awareness of themselves and others and social skills, children still depend on human contact in a real (not virtual) world.

Electronics are tools, not substitutes for human teachers or peers. Every community still needs children who are familiar with the real world around them; who learn (from other people) to think critically and ethically; who are well versed in biology, chemistry, physics, literature, music and art. Students need to create and imagine from their own minds, not to follow a computer programmer's choices or direction. For healthy development, children need time without electronics, in nature, socializing with each other and contributing to their communities. Youth need purpose. They need to participate in person-to-person conversation about real world problem and solutions.

Prudent integration of technology use in classrooms requires that school board members work with administrators, teachers and parents to clarify educational priorities, identify problems and determine best practices. Basing purchasing decisions solely on an IT director's recommendations may lead to technology dominating a classroom--rather than serving as a tool that enhances learning.

Indeed, most schools implement wide use of technology even though its effects (including among children) are largely unknown. Because no federal agency regulates children's use of electronics, schools must create their own guidelines.

This paper aims to encourage discussion about safer, more responsible use of technology in educational settings. It presents critical issues and options for consideration:

1. *Screen-time contact is no substitute for in-person relating.* For healthy neurological, social and emotional development, infants, children and teenagers need to relate with adults, each other and the natural world. Because technology use can contribute to aggressive behavior, depression and neurological problems including autism, ADHD and addiction, users need to learn limits.

2. *Common educational software tracks students' preferences, interests, social contacts and locations.* Software manufacturers collect this data from each student and can use it for lifelong marketing tools. Students and parents need protection from such tracking. Further, wireless technologies increase vulnerability to hacking. Schools therefore need wired Internet access.

3. *Wireless devices and infrastructure emit man-made electromagnetic radiation (EMR).* Scientific studies have shown the high likelihood that EMR exposure causes brain and heart cancer, DNA damage, neurological harm, general malaise, medical implant malfunctioning and more. To reduce students' EMR exposure, schools need to provide wired Internet access.

4. *During a power outage, schools without a corded telephone on a copper legacy landline may be unable to reach first responders.*

5. *Because current federal law regarding telecommunications prohibits municipalities from determining cellular antenna placement based on health or environmental concerns, parents, teachers and children may have little control over their EMR exposure.* School communities need to exercise their rights to reduce their exposure within existing legal parameters.

6. *In the event of security breeches or health damages caused by school-issued computers, who is liable?* To what extent can a school board ensure that students' data and health are safe? Before authorizing tech purchases, do school boards need to study whether computer use improves learning and/or harms development?

To begin discussion, school administrators, board members, teachers, parents and students might adopt a routine of asking questions such as:

- * What are the long-term consequences of using electronic devices--to health (including brain development), social skills and community?
- * Could we do this activity without an electronic device?
- * How can we balance time at a screen, in nature and with others?
- * How can we minimize exposure to man-made electromagnetic radiation?
- * What steps might prevent tech addiction?
- * What steps minimize hacking risks?
- * Online, how/can we maintain privacy? Why/does privacy matter?
- * Until what age (or the achievement of what skills) should children not learn computer coding or programming?
- * Given federal and municipal mandates, what limits can schools and households reasonably impose to support safer tech use?

1. Screen-time, addiction and ADHD

The situation: In the 1970s, four-year-olds who could delay eating a marshmallow for fifteen minutes (by singing to themselves, making up a game or napping) became more confident and skilled adults, more able to cope with stress.¹ Now, temptations are electrified. Microwaves (frequencies required for mobile devices to operate) increase activity of brain endorphins or endogenous opioids, the biological base of addiction to opium, alcohol and morphine.²

Like all electronics users, children need skills in delaying gratification (i.e. waiting to check messages) and limiting screen time.

Dr. Nicholas Kardaras, author of *Glow Kids: How Screen Addiction is Hijacking Our Kids--and How to Break the Trance*, has found treating heroin and crystal meth addicts easier than "lost-in-the-matrix video gamers or Facebook-dependent social media addicts." Dr. Kardaras reports that one out of three children now uses a tablet or smartphone before they can talk.³

Integrative child psychiatrist Dr. Victoria Dunckley, MD, author of *Reset Your Child's Brain*, reports that screen time overloads the sensory system, fractures attention and depletes mental reserves. It desensitizes the brain's reward system, can increase suicide risk and reduce physical activity levels.⁴ Even 30 minutes of computer use can disturb sleep; and *interactive* screen-time (playing video games and/or manipulating a screen with a keyboard, mouse or touch) is more detrimental to brain development than non-interactive, passive TV watching.⁵

Pediatric occupational therapist Chris Rowan explains that technology use's

* *sedentary nature* is causally related to obesity, diabetes, developmental delay, illiteracy and learning difficulties.^{6,7,8,9}

* *isolating factor* can escalate mental illnesses including ADHD, autism and depression and create difficulties in self-regulation.^{10,11}

* *overstimulation* factors into ADHD, aggression, sleep disturbance and chronic stress.^{12,13,14,15}

Screen-time based sedentary behavior can contribute to childhood and adolescent depression.¹⁶

Using a portable screen device also impacts sleep.¹⁷

"Distracted" walking and driving injuries and fatalities are on the rise. A Mayo Clinic study finds that text messaging appears to produce a unique brainwave form that can cause epileptic and nonepileptic seizures. This "texting rhythm" was also found in iPad users.¹⁸

Options:

* Minimize use of electronic devices until reading, writing and math skills are established on paper.

* Do not offer computer time as a reward, a babysitter or pacifier.

* Ban cell phones in classrooms. Some schools ban them during hallway and lunch breaks, confiscate the phone for 1-30 days with the first violation, and, with the second violation, until the school year ends. Bans require school board support and sufficient warning to parents and students. At Monte del Sol (charter high school) in Santa Fe, New Mexico, Principal Dr. Robert Jessen reports that with the ban, students face teachers during class and talk to each other during lunch breaks. A study from the Univ. of Texas and Louisiana State Univ. found that test scores rose by up to 6% in schools with strict cell phone bans.¹⁹

* Teach parents and students to identify symptoms of excessive screen time: aggressive behavior, disrupted academic or social performance. If use becomes problematic, consider Dr. Dunckley's three-week electronic fast to "detox" and determine the student's healthy tech threshold.²⁰

* Encourage movement, hiking, sports, chess, book reading, hand-writing, theatrical productions, painting, pottery-making, conflict resolution skills, research by in-person interviews, playing music, learning a second language, composting kitchen scraps and growing and preparing food.

- * According Jocelyn Gleib, author of *Unsubscribe: How to Kill Email Anxiety, Avoid Distraction and Get Real Work Done*, on average, people check email eleven times per hour. Such frequency decreases productivity. To help children develop healthy work habits, teach them to check email in batches--say two or three times per day.
- * Provide Wi-Fi-free and tech-free areas for students and staff.
- * Encourage teachers and parents to model self-awareness and self-regulation around screen-time limits.

Activities:

- * Create "Personal Tech Contracts" and ongoing discussions about responsible tech use.^{21,22}
- * Establish "crews" that meet daily over years with the same students and teachers to help children build real relationships.
- * Encourage discussion about how tech influences our relationships.
- * Recognize the danger of texting while driving. Encourage students and families to pledge to stop texting and driving. Texting takes your eyes off the road for an average of five seconds. At 55 mph, that's like driving the length of a football field--completely blind. Car crashes caused by texting and driving kill an average of *eleven* teens each day and injure 330,000 people every year.²³
- * *Invite discussion:* What is addiction? What are signs of tech addiction? What do camps in China do to remedy tech addiction?²⁴ What steps prevent tech addiction? What screen-time limits are healthy for you?
- * Read and discuss Jerry Mander's *Four Arguments for the Elimination of Television*, Quill, 1978.
- * View and discuss "Screenagers," Delaney Ruston, MD's documentary about teen cell phone use. www.screenagersmovie.com

2. Security and Privacy

The situation: School-issued computers likely collect info about students' Social Security numbers, food preferences, friends' names, grades and discipline records. School-issued computers may contain geo-trackers that provide students' exact locations. Without regulations, manufacturers (i.e. Apple and Pearson) who sell computers and software to schools may collect students' info to create "data-mined profiles" for lifetime marketing tools.

Further, according to applied physicist Dr. Ronald M. Powell, "The second you go wireless, you expose yourself to greater risk of interception. Fiber optic systems (fios) will always be able to carry data faster and more securely than any wireless system." Staff and student data can be hacked.^{25,26} Thirteen percent of educational organizations have been hacked--more than three times the rate of ransomware (payment for releasing data taken "hostage") found in healthcare and more than that of the financial sector.²⁷

Computer-based assessments of students and Smarter Balanced Test Scores have led to unfair test administration, security and privacy issues related to test data, violation of students' rights, delivery of tests on faulty networks and technology, and long-term motivational problems that likely result from misdiagnosing students with unfit assessments.^{28,29}

Options:

- * Eliminate wireless service and devices. Opt for fiber optics (fios) and wired phones, computers, mice and printers. For affordable fiber connections, see Harvard's Berkman Center for Internet and Society's *Maximizing K-12 Fiber Connectivity Through E-Rate*.³⁰
- * Teach users not to use physical addresses or birthdates in email addresses or passwords, not to reply to email from strangers, and to open an attachment only when you know the sender and expect the attachment.
- * Teach staff and students that each device (i.e. a tablet, chromebook, or smartphone) has its own security practice.
- * Establish email security protocols, monitor key third party vendors, track vendors' security ratings and avoid file sharing.

Activities

- * Interview people who've been hacked. What happened? What advice do they have to prevent hacking?
- Invite discussion:* Do you prefer mobility (which risks hacking) or wired-only communications (which decreases hacking risks)?

2a. Critical thinking and tech design

The situation: According to Tristan Harris, former Design Ethicist at Google, tech product designers limit and even control users' thinking by creating a menu of choices. For example, in response to the question, "Where can we go to talk?" a server might offer a menu of bars--and not include nearby parks or diners.³¹

Activities:

* As they conduct research for school reports, encourage students to ask, *What are the menu providers' goals? What's not on the menu? Does the menu serve my real needs or distract me? Does the server provide websites with opinions or well-referenced reports?*

* Read and discuss Dr. Kenneth J. Saltman's *Scripted Bodies: Corporate Power, Smart Technologies and the Undoing of Public Education*, Routledge, 2017.

3. EMR exposure

The situation: In living creatures, every cell functions by electro-chemical signals.³² Our physiological functions (i.e. sleep, digestion, decision-making and locating home) ultimately depend on cues from the Earth's electromagnetic fields, the solar wind and other natural sources.

Electronics (including cell phones, tablets, compact fluorescent bulbs, cordless phones) and infrastructure (such as cellular antennas; Wi-Fi routers; "smart" digital, wireless utility meters; powerlines and transformers) emit man-made electromagnetic radiation (EMR). In May, 2011, The World Health Organization classified EMR as a 2B carcinogen.³³ In May, 2016, NIH's National Toxicology Program found that 2G cell phone radiation causes brain and heart tumors and DNA damage.³⁴ A Feb., 2016 report published by the journal *Neuro-Oncology* and funded by the American Brain Tumor Association finds that malignant brain tumors are the most common cause of cancer-related deaths in adolescents and young adults aged 15-39, and the most common cancer occurring among 15-19 year olds.³⁵ (Leukemia used to be the leading cancer among children, but now it is #2, behind brain cancer, signaling an environmental change.) In September, 2016, the American Academy of Pediatrics issued recommendations to reduce exposure to cell phones.³⁶

Because children's skulls are thinner and their brains contain more fluid than adult skulls and brains, children absorb proportionately more radiation than adults. The effects of EMR exposure on a child's development may have lifetime impacts,³⁷ including on their fertility.³⁸

Neither wireless devices nor the infrastructure that they require have been proven safe for children, pregnant women, people with medical implants, the general population or wildlife.

Options:

- * Get informed about the health and environmental effects of EMR-exposure. Studies are posted at www.saferemr.com (from UC/Berkeley's School of Public Health) and www.bioinitiative.org.
- * Recognize that every reduction in EMR-exposure is worthwhile.
- * Encourage students and staff to keep mobile devices off when not in use. To ensure that a device is off, test its EMR emissions. www.magneticosciences.com/ rents meters for reasonable fees.
- * Choose wired connections--for phones, web access, mice, printers.³⁹
- * For affordable fiber connections, see Harvard's Berkman Center's *Maximizing K-12 Fiber Connectivity Through E-Rate*.⁴⁰
- * Avoid or correct equipment that defaults to wireless.
- * Teach school nurses, teachers, parents and students to identify common symptoms of EMR exposure, including bloody noses, sleep disturbances, headaches, fatigue, rashes, migraines, dizziness, nausea and aggressive behavior.^{41,42}
- * Recognize the short and long-term effects of near, whole body, second-hand, combined and cumulative EMR exposures.⁴³
- * See "Schools, Unions and PTA Actions," an int'l list of schools that have removed Wi-Fi, posted by the Environmental Health Trust.⁴⁴
- * Create Wi-Fi and tech-free zones for children and staff.

Activities:

- * Learn which diseases correlate with different kinds of EMR exposure. <http://www.bioinitiative.org/rf-color-charts/>
- * At parent-teacher meetings, encourage family time without electronics and keeping Wi-Fi off for at least 12 hours each night. Read "Calming Behavior in Children with Autism and ADHD."⁴⁵
- * Stage contests between classrooms and schools to reduce EMR emissions.

3a. Cell phones and health

The situation In the mid-1990s, to determine cell phone safety, the FCC took the temperature of a 220-pound mannequin's head before and after six minutes of cell phone use. Because this mannequin's temperature did not change by two degrees Celsius, the FCC determined that mobiles are safe.⁴⁶ In other words, to determine safety, the FCC considered only the immediate, thermal effects of cell phone use.

The FCC has not tested non-thermal effects of EMR exposure, including for children's or pregnant women's cell phone use, nor for combined, chronic or cumulative exposures.

In 2015, Dr. Om Gandhi, Professor of Electrical Engineering at the University of Utah, co-chair of the Institute of Electrical and Electronics Engineers' (IEEE's) Subcommittee on RF Safety Standards (1988-97), wrote: "it is very hard to understand why" FCC's safety guidelines only consider the head of a mannequin whose size is in the 90th percentile of US military recruits--and do not consider children's head size when creating safety guidelines.⁴⁷

Cell phone radiation contributes to brain and heart tumors and damages DNA.⁴⁸ It weakens the blood-brain barrier.⁴⁹

In utero EMR exposure results in an 85% greater risk for behavioral problems by the time children reach school age.⁵⁰

Options:

- * Keep devices in airplane mode with Wi-Fi and Bluetooth off, especially in class and around others.
- * Do not keep a phone in a bra, pant pockets or shirt pocket. Make the bra a no-phone zone.
- * To decrease RF exposure, download images and videos only via a wired (fiber optic, cable or DSL) connection.
- * Maintain landlines and corded telephones as long as possible and/or until fiber optics are in place.
- * Mitigating EMR emitted by a cell phone or voice over Internet protocol (VOIP) is unique to each situation. Could local electrical engineers help students to measure and reduce emissions?
- * Create protected areas to prevent second-hand EMR exposure (received by people and wildlife near cell towers, routers, "smart" meters and/or people using mobile devices).

Activities:

- * View "Cell Phones Cause Cancer."⁵¹
- * View "Save the Girls"⁵² and "Save the Males."⁵³
- * View Dr. Devra Davis' talk at the University of Melbourne.⁵⁴
- * Read your cell phone manufacturer's warning. For one week, abide by it--i.e. keep your phone at least 7/8" from your head.
- * Make your own flier with warnings and solutions about cell phone use.
- * *Invite discussion:* Should cell phones have warning labels at the point of sale, as Berkeley, California requires?⁵⁵ How/could pregnant women limit their cell phone use? For ideas see www.babysafeproject.org.

3b. Wi-Fi and health

The situation: No medical organization has deemed that Wi-Fi is safe. No pre-market safety testing (including by FDA or EPA) was conducted on Wi-Fi. Wi-Fi presents whole body EMR-exposure to users and non-users. Faculty and students who work or study near routers may receive more intense exposure.

British biologist Dr. Andrew Goldsworthy, retired lecturer from Imperial College, explains: "Just after birth, a child's brain goes through an intense period of becoming aware of new sensory input. He or she recognizes his or her mother's face, her expressions, and eventually, other people and their relationships. During this process, the neurons in the brain make countless new connections, and the brain stores what the child learns. Connections that are rarely used are pruned. This pruning process is completed by the time of sexual maturation."⁵⁶

"If the child is exposed to radiofrequency fields during this pruning process, the production of too many and often spurious signals will generate frequent random connections. These will not be pruned, even though they may not make sense. Because the pruning process in children exposed to RF fields may be more random, these children--who may have more brain cells than the rest of us--may lack the mindset for normal patterns of social interaction. This may then contribute to various autistic behaviors.

"Like mobile phone signals, Wi-Fi signals can also cause cell membranes to leak and calcium ions to flow through them in a relatively uncontrolled manner."⁵⁷ In the classroom, this may result in children's brains losing the ability to concentrate.

"Further, electromagnetic radiation (such as that emitted by Wi-Fi, cell phones, cell towers and 'smart' meters) may affect the body like light does at night--and inhibit melatonin production. Melatonin is a sleep hormone and a powerful antioxidant. It can reverse oxidative stress that results from radiation exposure."⁵⁸

"While scientists explore further how EMR exposure reduces melatonin production and study whether EMR-induced oxidative stress contributes to autism--along with many other questions--we ought to *first do no harm* to our children. Wi-Fi should therefore be considered an impediment to learning, rather than an aid. Wi-Fi may be particularly hazardous to pregnant teachers, since exposing the brain of a fetus or a very young child to EMR may prevent normal brain development."⁵⁹

In a 2013 letter to the Los Angeles Unified School District, Dr. Martha Herbert, MD, PhD, pediatric neurologist at Harvard Medical School wrote: "EMF/RF from WiFi and cell towers can exert a disorganizing effect on the ability to learn and remember, and can also be destabilizing to immune and metabolic function." She urged the LAUSD to "opt for wired technologies."⁶⁰

Dr. Hugh Taylor, MD, head of Yale Medical School's Ob/Gyn Department, recommends that pregnant women (including pregnant teachers, students and parents) "avoid prolonged or direct exposure to Wi-Fi routers." (www.babysafeproject.org.)

A recent study from the California Department of Health found that three percent of Californians (770,000 people) experience radio-frequency sickness (headaches, rapid heartbeats, memory problems, insomnia, nausea, fatigue, tinnitus) with EMR exposure.

[Www.ehtrust.org](http://www.ehtrust.org) has compiled an international list of schools and countries that have banned Wi-Fi.⁶¹

Options:

- * Read applied physicist Dr. Ronald M. Powell's report on school Wi-Fi.⁶²
- * Read Dr. Joel Moskowitz's report on Wi-Fi in schools.⁶³
- * Install wired connections. Until Internet access is wired, every router needs an on-off switch. When not in use, keep routers off.
- * Encourage students and teachers to keep routers off at night.

Activities:

- * Per classroom, have students make signs to encourage keeping Wi-Fi off when not in use.
- * Research policies about Wi-Fi in schools and libraries in France, Israel and other countries.⁶⁴
- * *Invite discussion:* What do we win and what do we lose with mobility? With wired connections? Which is better for the short-term: mobility or wired connections? Which is better for the long-term? How/can we orient ourselves for the long-term?

3c. Cellular antennas and health

The situation: Studies find that people living near cellular antennas experience fatigue, headache, sleep disruption, irritability, depression, memory loss, dizziness, nausea, increased risk of cancer, tremors, loss of appetite, rashes, visual disruptions and overall discomfort.⁶⁵

People who live within 350 meters (about 1000 feet) of a cellular antenna for more than a decade experience a four-fold increase in cancer rates. Among women, the increase is tenfold.^{66,67}

People who live within 200 to 500 feet of an antenna report genetic, growth and reproductive effects; increases in the blood-brain barrier's permeability; behavioral, molecular, cellular and metabolic effects; and an increased risk of cancer.⁶⁸

Many schools already have cellular antennas on campus.⁶⁹ Do staff and parents deserve to know about antenna sitings? Should staff and students be able to work and study in a building without cellular antennas?

5G will support the Internet of Things (IoT, machine-to-machine communication) at speeds 100-fold faster than 4G.⁷⁰ 5G will operate with millimeter wave signals that have been tested only minimally for health and environmental effects. (Skin and eyes may have most significant effects.)⁷¹ What choices will schools have regarding 5G antenna placement?

Options:

- * Provide easy access to a map of routers, smart meters, cellular antennas, wireless chargers, electrical/mechanical rooms, solar power inverters and other electrical hot spots on school property.
- * Learn diseases associated with exposure to hot spots and transmitters.⁷²
- * If EMR levels on campus are high, allow students and staff to transfer to a school with lower levels.
- * Explore legal options for preventing cellular antennas on campus.
- * Read applied physicist Dr. Ronald M. Powell's "Cell Towers and Health."⁷³

3d. EMR exposure on school vehicles

The situation: In a moving vehicle, every time a mobile device connects to a new cell tower (approximately every mile), the device goes to maximum power. Much of the EMR gets trapped within the vehicle (a metal box).

Wi-Fi on school buses traps yet more EMR.

Computers used by vehicles including hybrid and electric cars can emit especially high electromagnetic fields.

Options:

- * Keep mobile devices off in school vehicles.
- * Do not allow Wi-Fi on school buses.
- * Test vehicles' EMR emissions. Do not allow children, pregnant women and people with implants to sit in seats with high levels.

3e. Electronic interference with medical implants

The situation: According to NIH, in year 2000, 8-10% of the American population had a medical implant (i.e. an insulin pump, cochlear implant, pacemaker or neurostimulator).⁷⁴ Nearness to a metal detector, refrigerator, air conditioner, mobile phone or tablet, Wi-Fi router, wireless recharger, an electric or hybrid car can cause a medical implant to malfunction or shut off.⁷⁵ For example, walking through a library's metal detector can shut off a person's deep brain stimulator. The person would have a few seconds to reset--or they'd shake so badly that they could not reset the implant without help.

Option:

* Post signs to alert and protect people with implants, i.e.:

WARNING
electromagnetic radiation (EMR)
in this area
could cause a medical implant
to malfunction or shut off

Activities:

* View 2009 talk by Dr. Gary Olhoeft (geophysicist and electrical engineer about electronic interference with his deep brain stimulator).⁷⁶

* Read Katie Singer's 2015 talk, "Aiming to First Do No Harm: The Education of an Electronics' User," about the FCC's definition of "harmful interference" and the reality of living with an implant.⁷⁷

3f. Grounding and wiring errors and “chopped” current

The situation: Buildings that have no wireless service may still generate dangerous magnetic fields and/or stray voltage from grounding and/or wiring errors. If clean, man-made electricity (which may not exist, in practice) is a smooth AC wave at 50 or 60 Hz, high frequencies or pulses on the wires can "chop" current, disrupt power quality and harm health. "Smart" meters, wiring errors and any device with a switch-mode power supply or electronic ballast (including compact fluorescent bulbs) can chop current, disrupt power quality and harm health. "Chopped" current is also called harmonics or "dirty" power.

Options:

- * To correct grounding and wiring errors, refer to Karl Riley's *Tracing EMFs in Building Wiring and Grounding*, 2nd ed. www.magneticosciences.com
- * To locate and correct electric, magnetic and RF fields and "dirty" power on school property, hire independent engineers to conduct an annual survey. Follow up corrections with another survey. Encourage students to participate in the surveys and the corrections. Shut down rooms with dangerous levels of exposure. Note that finding a reliable surveyor may not be easy. (See applied physicist Dr. Ronald M. Powell's review of a survey of RF levels in Montgomery County, Maryland Schools.⁷⁸)
- * Read the American Medical Association's 2016 paper about LEDs' human and environmental effects.⁷⁹ Do not use mercury vapor lights, compact fluorescents or LEDs with electronic ballasts. These produce "dirty" power that radiates out from electrical wires. Prefer incandescent bulbs. (They do not generate chopped current.)

Activities:

- * Read "Is Dirty Electricity Making You Sick?" by Michael Segell, *Prevention*, Nov. 3, 2011.
- * Learn to install battery and/or solar-powered DC lights.
- * *Invite discussion:* Should wiring and grounding errors be determined and cleaned up before deploying new technologies?

4. Emergency preparedness

The situation: In the event of a power outage, only hard-wired, corded telephones on copper legacy landlines will work. Cell phones and voice over Internet protocols (VOIPs, i.e. Magic Jack and Skype) require electricity and therefore will not work in a power outage.

Note: the FCC and 13 states have passed legislation that will "sunset" copper legacy landlines by 2020. Only cell phones and VOIPs will be available.

Options:

- * Maintain copper legacy landlines and corded landline telephones as long as possible.
- * Maintain industrial strength battery backup for phone systems that require electricity.

4a. Lithium ion batteries

The situation: Lithium ion batteries are used in laptops, smart phones, e-cigarettes, “smart” meters and many other electronic devices. They are light and store lots of energy per weight. They can also explode; they are also flammable.⁸⁰

Option:

* In the event of an explosion or fire caused by a device with a lithium ion battery, keep a fire extinguisher nearby.

5. Rules, regulations and liability re cell towers and phones

The situation: Section 704 of the 1996 Telecommunications Act prohibits municipalities from denying a permit to install a cellular antenna based on health or environmental effects of exposure to radiofrequency emissions.

Underwriters like Lloyds of London will not insure for health or property damages caused by wireless radiation.⁸¹

Activities:

* Teach staff and students to measure electric, magnetic and radiofrequency fields and "dirty" power emitted by their own devices.

[Www.magneticosciences.com](http://www.magneticosciences.com) rents meters for reasonable fees.

* When introducing students to an electronic device, encourage them to read and abide by the manufacturer's warnings in the product's manual.

* View "Broadcast Blues," a documentary about the Golden, Colorado area's health and legal battles in the late 90s around radio and TV broadcasting antennas placed on Lookout Mountain.⁸²

* View "Blood in the Mobile," a Danish documentary about coltan, a mineral mined primarily in Congo that holds charge in every mobile device. More people have been murdered over coltan than were murdered in any other event since WWII.⁸³

* View "We the People 2.0," Matthew Schmid's documentary about municipalities like Pittsburgh enacting ordinances that effectively prevent fracking or toxic sludge in their areas.⁸⁴ Could such a community rights ordinance work with cellular antenna placement?

* *Invite discussion:* Given that federal and manufacturers' guidelines regarding EMR emissions do not recognize non-thermal, biological harm, and some people want to reduce exposure, what regulations can individuals, households, schools and/or businesses reasonably create? What regulations should they create? Could you create model guidelines for a household or school?

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Further Resources

Erica Mallery-Blythe, MD's talk, "Children, Radiation and Health."

<https://www.youtube.com/watch?v=sNFdZVeXw7M>

Hugh Taylor, MD, head of Yale Medical School's ob/gyn dept., warns pregnant women to avoid cell phones and Wi-Fi.

<http://www.electronicssilentspring.com/primers/wi-fi-schools/baby-safe-project/>

Child psychiatrist Dr. Victoria Dunckley offers a four-week electronic fast for children to end meltdowns, raise grades and boost social skills to reverse the effects of Screen Syndrome. www.resetyourchildsbrain.com

Dr. Dunckley writes about screen-time's negative effects on children with autism: <https://www.psychologytoday.com/blog/mental-wealth/201612/autism-and-screen-time-special-brains-special-risks>

Martha Herbert, MD, PhD and Cindy Sage, MA. "Autism and EMF? Plausibility of a pathophysiological link--parts 1 and 2," *Pathophysiology* 2013. <http://www.marthaherbert.org/library/Herbert-Sage-2013-Autism-EMF-PlausibilityPathophysiologicalLink-Part11.pdf>

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Dr. Roxana Marachi's letters to the California State Board of Education regarding concerns about the Smarter Balanced Assessments administered to over 10 million students in 18 states in Spring, 2015 document the numerous technological barriers, design flaws and contract breaches in the development of computerized assessments now pushed by the U.S. Dept. of Education.

<https://eduresearcher.com/2015/09/08/openletter/>

Dr. Marachi also posts updates about screen-time and radiation exposure. www.eduresearcher.com

Michele Molnar reports on whether "personalized learning" is an educational imperative, a marketing strategy for an ed-tech product, or both in "'Red Flags' to Look for When Evaluating Personalized Learning Products," 10.18.16. <http://www.edweek.org/ew/articles/2016/10/19/red-flags-to-look-for-when-evaluating.html?cmp=eml.enl.eu-news2&PageSpeed=noscript>

Cris Rowan's Fact Sheet contains over 300 referenced research papers on technology's effects on children.

<http://www.zonein.ca/zoneinworkshop/fact-sheet/zonein-fact-sheet/>

See Tech Talks for Families to help balance tech use with healthy activities. <http://www.zoneinproducts.com/tech-talk-families-learn-more.html>

Katie Singer's *An Electronic Silent Spring*, Rudolf Steiner Books, 2014. Reports on regulations and peer-reviewed studies about health and environmental impacts of exposure to electromagnetic radiation.

www.electronicssilent.spring.com posts a monthly newsletter.

www.ehtrust.org Lists schools that have eliminated Wi-Fi; posts videos about cell phone radiation's effects on fertility.

<http://ehtrust.org/policy/international-policy-actions-on-wireless/>

Environmental Health Trust also posts <http://ehtrust.org/key-issues/cell-phoneswireless/wifi-in-schools/>

<http://www.parentsfor safetechnology.org/five-reasons-to-turn-off-the-wireless-.html>

<http://www.parentsfor safetechnology.org/five-steps-to-safe-tech.html>

Peer-reviewed studies about health and environmental effects of EMR exposure. www.bioinitiative.org

Peer-reviewed studies about health effects of EMR exposure, posted by the School of Public Health at UC/Berkeley. www.saferemr.com

A tech expert on decreasing chances of being tracked:

<http://www.npr.org/sections/alltechconsidered/2012/08/10/158505688/simple-ways-to-avoid-being-hacked>

"Questions we should be asking about 'Future Ready' schools,"

<https://wrenchinthegears.com/2016/10/03/personalization-or-surveillance-what-school-redesign-really-means/>

A writer, teacher and international speaker, **Katie Singer's** most recent book is *An Electronic Silent Spring* (Rudolf Steiner Books, 2014). She has worked on public policy with the Electromagnetic Radiation Policy Institute since 2009. From 1983-89, Singer taught at South Boston High, the school that became famous with court-ordered desegregation. Anthologies of her students' autobiographical stories and photographs were used as texts for Reading, Writing and ESL classes throughout the Boston Public Schools. www.electronicssilent.spring.com

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