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In the award winning play *Inherit the Wind,* the character Henry Drummond discusses the costs of progress. "Gentlemen, progress has never been a bargain. You've got to pay for it. Sometimes I think there's a man behind a counter who says, 'All right, you can have a telephone; but you'll have to give up privacy, the charm of distance. Madam, you may vote; but at a price; you lose the right to retreat behind a powderpuff or a petticoat. Mister, you may conquer the air; but the birds will lose their wonder, and the clouds will smell of gasoline!'" Our course has studied and reflected different aspects of education in history and our current digital age. As society moves into this current Information or Knowledge Revolution, there has been a growing debate between those who see technology in education as progress and transformation and those who are skeptical. As we have seen significant changes in schools and higher education, the question is how do our minds respond to what is offered in these new technologies. What are the gains, and at what cost?

Every technology is an expression of the human will. Nicholas Carr explains that through our tools, we seek to expand our power and control over our circumstances and, in so doing, transform our minds. Looking historically, one can see in past technological revolutions, especially with intellectual technologies, that new tools of man have led to progress, but also have had a strong effect on the human brain. Inventions made for practical purposes have other byproducts. Examples are the map made to depict physical space actually led to abstract thinking; the clock, through its measurement of time, was able to influence the scientific revolution; the printing press, which mass-produced the book, led to more attentive ways of reading and thinking. In the 1960s, the media theorist Marshall McLuhan wrote that media is is not just passive; it actually shapes the process of thought. Moreover, brain research has shown us how malleable the human brain is and how it can adapt to new environments and functions. It is important, therefore, to look at the effects of new technologies, especially on the human mind.

We have covered in this course how the Internet has transformed education, but perhaps the most obvious recent technological development is the convergence in mobile technologies and their integration of Web 2.0 sites and applications. Mobile devices are increasing tremendously and are vastly outgrowing traditional computer ownership. The average 8-18 year old spends over 50 hours a week as reported by the Kaiser Foundation. Educationists, such as Cochrane and Batemant are pushing to take advantage of this technology in a paradigm called M-learning as students have the capability of internet connection, blogging, email, social networking,media uploading and downloading, GPS, and high resolution screens. They see advantages of "authentic learning" facilitating ubiquitous, anytime-anywhere student learning which will lead to more engagement and education at a lower cost. As educators are willing to take advantage of this technology, we should try and step back to look at the impact. What are ways these technologies are changing our thinking? We are seeing the rise of a "hyperconnected" generation tethered to multiple screens fully embracing this life of devices and applications. Although technologies are changing so quickly to really study their effects, one

can look in areas of reading, attention, knowledge and memory, social interaction, and self-directed learning for any ramifications.

With the influx of new technologies we see a change in reading from traditional print to the form of screen reading in all aspects of their lives. Our culture has shifted from print to digital material, and we are seeing a tremendous rise in e-books and electronic versions of textbooks which can now be accessed on multiple devices. Almost half of all Americans 16 and older admit to reading an e-book or electronic versions of traditional print content. Moreover, e-reading can occur across an array of devices--computer or mobile. Mark Bauerlein warns of the changes in e-reading. Eye-tracking tests show skimming or skipping around the screen with a lower success rate for completing tasks online. Maryanne Wolf is concerned that a reading style more concerned with efficacy and immediacy will weaken our capacity for deeper reading. Carr is concerned about the ability to process long, complex texts, making us less capable of reading books. William Powers discusses concerns with sustained attention if there are interruptions or other "screen" distractions. Although thinkers like Clay Shirky bring up that new, shorter forms of communication and expression are needed and will replace outmoded literary forms of expression, there will continue to be a need for learners to become deep thinkers and comprehend, analyze, and reflect on complex and dense texts or speeches.

Our devices allow us to switch from task to task instantaneously. The hyperconnected are able to blur the lines of personal and educational/professional use leading to a more demands of attention and fragmenting of time through distractions of multiple directions. The "Digital Natives" praise themselves of being effective multitaskers. Jenkins sees multitasking, or the ability to shift attention quickly, as a skill for the future. Clifford Nass's studies at Stanford have shown that we may have more of a superficial processing as well as a decline in long term memory, analytical reasoning, and ability to actually switch tasks effectively and in a timely manner. Even those who feel they are good multitaskers did not perform as well as they thought they did.

With the proliferation of "screens" of the mobile devices with video, digital photography, gaming and different mashups, thinkers like Henry Jenkins and Peter Felton have pushed to add visual literacy, to "new literacies" of 21st century learning. In 2009, Cisco Systems predicted that by 2013 90% of Internet traffic would include video. With YouTube, another web 2.0 technology, students AND educators are producing as well as consuming video content. Video and multimedia projects and products are replacing traditional written assignments, which can allow for more "authentic learning." A difficulty, however, is that educators are more and more fighting for attention from their students. To go against the influx of media and screens in their students' lives, educators are having to become more entertainers. Nicholas Oppenheimer warns us as we move to more instant gratification and multimedia extravaganzas in education, what will happen to the older values in schools such as discipline and perseverance?

What are ramifications of these emerging technologies to knowledge, learning, and memory? There is a concern we will rely more on the Internet as an extension of our memories. Students now have access to the compendium reference of human knowledge for reference in Wikipedia, just one example of on-demand access to content anytime, anywhere, on any digital device. Google has become a verb and provides instant results to questions, queries, and searches. Filtering, rather than remembering, may be a more important skill for the digital age.

Even though there is quick access to a world of knowledge 24/7, what is the real learning or knowledge being constructed? Education still requires background information to understand context, critical thinking skills to ask questions and evaluate information, and reflect on one's learning. Many educators applaud the new technologies that allow learners to use personal networks, groups, or connection to experts to construct their own knowledge. Larry Sanger, one of the co-founders of one of the great products of social collaboration Wikipedia, reminds us, however, that a good scholar is still one who is capable of thinking independently. "Reading, writing, critical thinking, and calculation, however much they can be assisted by groups, are ultimately individual skills that must, in the main, be practiced by individual minds capable of working independently. And such claims dismiss the depth of thinking that results from a critical reading and evaluation of many long and complex books."

Web 2.0 technologies are a sign of convergence where students can be both consumer and producer of information, media creators and sharers. Students need to be prepared in a changing world of communication, whether it's face to face or with different media. Digital tools allow for more interaction and exchanging of information among diverse communities and increase the ability to see different perspectives. Technology enthusiasts applaud Web 2.0 technologies for allowing students to be active learners and participants in a greater dialogue. They are actually reading more; they are writing more. Tim O'Reilly in his description of Web 2.0 creates new networks dependent not on hardware but content and participation. Whether it's shopping sites, Wikipedia, or even Google's algorithms in its searches, students can participate in the collectivization of information. Jenkins praises how students can network which improves the ability to search for, synthesize, and disseminate information. Larry Burbules writes that people can be smarter because of the access to networked intelligence. With the transformation of the rise of Web 2.0, we see the decline of mainstream media and the "democratization" of content. Yet we have yet to come to grips of what knowledge is necessary in education. Although students may no longer rely on the gatekeepers of knowledge for expertise, they still need to be reflective on how they know what they know and how they need need to learn.

One area where can see technology being a "disruptive" force in learning is in the area of higher education. Kamenitz in *DIY U* addresses the problems of rising college costs, a troubled job market, and a questioning value of a college degree. Technologies can bring teacher and student together over large distances and can offer instant information on almost any subject. New technologies allow for individuals to seek their own "out of the box" sources for higher education as traditional universities are putting course content online, and for-profit institutions are experimenting with different approaches to reach more students. More students are accessing courses online in their own universities, and new models are being created to use these open resources for credit in other institutions. Just as with other web 2.0 technologies OER are able to be added to, improved upon, and taken up by different learning communities. Learners are also able to use nontraditional sources for learning such as peers and experts such as Peer2Peer or Unclasses. This open education can be difficult and time consuming for an individual to navigate, but the ubiquity of knowledge does facilitate lifelong learning. This concept usually addressing adult education becomes important also in higher education and K-12 as we shift away from content-based curriculum to "learning how to learn." Educators, however, are still needed to help students evaluate and integrate these varied learning

experiences.

As explained in the 2011 Horizon Report, the adoption of electronic books, blogs, multimedia pieces, networked presentations, and other scholarly work can be difficult to classify and assess, yet educators are increasingly experimenting with new forms of expression and scholarly activity. Moreover, keeping pace with the proliferation of new tools can be challenging for educators. Although we are dealing with emerging technologies of web 2.0, e-readers and m-learning, there will be new technologies down the road with more game-based learning, augmented reality, and gesture-based computing. We are still learning how to use this technology effectively and find a balance in our lives and in in ways that are most nourishing and sustaining. The "Man in the Google Glasses" can use all the benefits of mobile technology with mastery, but at the same time lives a life of isolation. Turkle, on the other hand, asks, are teens becoming tethered to devices and others, never disconnecting or allowing time for self-reflection and growth? As both Turkle and Powers ask, are we leaving enough time away from our devices to take our time on things that really matter.

While there are incredible advantages, we must tread warily. Even an enthusiast, Harry Jenkins says the question is how to balance the new skills with the old, how to embrace the capacity of the young to process multiple channels of information with the values of contemplation and meditation, which were the virtues of older forms of learning. As educators, we do need to appreciate and explore how the technologies of the digital revolution improve education for our students. We must look at new literacies but still keep older values of diligence, contemplation, and reflection. To address these changes, we perhaps need a NOT-SO-FAST button so we can reflect on the Henry Drummond's bargain of progress on our lives.