Topic: Wireless Data Communication

Target Age: 18 and above

Planning Framework: Philosophic

Unit Length: 8 to 10 lessons

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DESCRIPTION

Living in the information age, we are tremendously dependent on the ability to constantly exchange our assumptions, beliefs, thoughts and experiences, and to freely share our ideas, discoveries and knowledge. This exchange of all kinds of information, faster and more potent than it has ever been, has already become a foundation of our socializing, work, entertainment, business and education. Wireless data communication makes that exchange even stronger, more independent, less expensive and more communicative, by broadcasting an incredible amount of data over vast distances without a single wire. Although it is difficult to anticipate either utopian or dystopian worlds shaped by wireless data communication, it is certainly easy to realize that going wireless will profoundly and everlastingly change our civilization.

UNIT OUTLINE

1. Identifying Relevant General Schemes

What general schemes seem best able to organize the topic into some coherent whole? What are the most powerful, clear, and relevant theories, ideologies, metaphysical schemes, or meta-narratives?

The most powerful and relevant idea or theory in this topic:

Wireless data communication fulfills what appears to be the most important requirement of today's civilization: enabling continual, unrestrained communication between people who are increasingly on the go and cannot be related to one place of work or a single address. Eliminating wires eliminates restrictions to our communication. The freedom of being independent of physical, corded connectors and devices gives people unprecedented sense of mobility and all the power that comes with it.

An alternative:

Wireless data communication allows us to establish a greatly needed, continuous and uninhibited communication: everyone can be reached anywhere and everywhere, at anytime and in no time. This, undoubtedly, elevates and enriches the capacity and range of our communication abilities. However, this certainly makes us 'visible' and reachable even at times when we would like to hide into our privacy – once we would like to have our 'contact hours' to the rest of the world closed for the day. Eliminating wires eliminates restrictions to our communication – and our privacy.

2. Organizing the Content into a General Scheme

2.1 Initial Access

How can the general scheme be made vivid? What relevant content best exposes the general scheme and shows its power to organize the topic?

Content that exposes the scheme or theory most vividly:

The starting point might be a discussion about more or less noticeable benefits of wireless technologies: analog and digital cellular phones let us talk and exchange text and video messages while riding on a bus or drinking a cappuccino in our favorite coffee shop; wireless networking

spreads the internet everywhere, so we can send and receive email messages and search the 'net' on our laptops or PDAs by simply accessing wireless 'hot spots'; fridges inform our computers what items should be added to our electronic grocery lists; wireless broadband systems give transit vehicles priority through signalized intersections, facilitating remote telemetry and enhanced traffic communication.

We can then look at the nature of communication between different electronic devices. How this communication is initialized and how it is controlled to ensure that a message – text, image, voice, video and audio stream, or any combination of it – traveling between distant senders and receivers, is not lost, misplaced or altered?

The importance of the common language to the art of any communication should also be discussed. What digital language is used in an electronic dialogue, so that all the parties involved in such dialogue can understand each other? How can we, end-users, deal with an occasional 'miscommunication' between wireless electronic devices; what are our options?

We might also try to compare and contrast wired and wireless electronic communications. Different issues should be taken into consideration: mobility versus data security, freedom versus reliability, innovation versus traditionalism. Lastly, we might also ask students to visualize a life without wireless technologies. Or – what would the effects of adding wires to our cell phones, 'blackberries', laptops and global positioning satellite (GPS) devices be?

2.2. Organizing the Body of the Lesson or Unit

What content can be used to articulate the topic into a general scheme? What meta-narrative provides a clear overall structure to the lesson or unit?

Lay out the content that will present a strong meta-narrative of the topic:

Not quite long ago, information was electronically exchanged only between computers of different sizes, types and capacities. With the emergence of various mobile, portable but powerful and ever-

changing electronic devices, the emphasis is put on developing an information technology infrastructure that will enable all these diverse and somewhat incompatible devices to communicate between them. The challenge was how to peacefully unite these different electronic devices that were never made to communicate effectively with one another.

This need for unification could justify the story about Danish king Harald Bluetooth, who united scattered parts of Scandinavian communities in late 10th century, then introduced them to Christianity. Interestingly enough, one of the most common wireless data communication standards is named after king Bluetooth. The Bluetooth wireless standard facilitates wireless data, voice and image exchanges between cell phones, game controllers, peripheral devices like mouse pointers, keyboards and printers, portable computers, and a variety of other electronic devices.

We will start to articulate the topic by opening a discussion about most relevant electronic data communication elements. Topics that students should already be familiar with – for example foundations of LAN (Local Area Networks) and WAN (Wide Area Networks) – will not be repeated.

Like many other lessons about information technology, the unit about wireless communication can be presented from the two distinct but rather interrelated perspectives: hardware – a tangible, physical component of computing and electronic data communication, and software – a set of computer programs, instructions and rules, which regulate that communication.

We will try to explore the hardware basics of wireless communication that can include adapters, routers, expansion cards, microchips, radio transmitters and receivers, back-end wires, fiber-optic channels, antennas and satellites.

We also need to look at software essentials, comprising of specific standards that determine the frequencies, speed and range of data communication, as well as regulations, languages and protocols, which control the communication modes as well as volumes and types of data to be transferred, including any relevant error control systems.

We can now return to the essence of electronic communication. We might all agree that it would be impossible to turn the clock back and eliminate the wireless communication from our civilization for

good. Or we could disagree, arguing that we are so close to reach the physical wireless bandwidth limits and is better for all of us to find other digital communication methods, sooner then later. Also, our principal difficulties and inefficiencies to define the ultimate network bandwidth limits could be a motivating discussion topic.

Furthermore, the students should be asked do determine the major force that drives expansion of wireless communication devices and related protocols and standards. Is this driving force a spoiled, ignorant and never satisfied user; or a profit greedy manufacturer of electronic devices; or it is a group of algorithm gurus who skillfully and joyfully reposition our definitions and boundaries of possible; or is it all of the above, which is also called a 'communication evolution'?

Freedom of physical limitations should also be revisited. What are the best ways to utilize this freedom of communicating with the world without wires? What are the most practical benefits of that freedom to our society? To each individual involved in wireless communication? Students' experiences in participating in wireless communication and utilizing wireless devices would be of a great help in discussing these and similar topics.

Finally, if there were no technological or social restrictions, what would be the future of wireless data communication? How would it look like, could it be absolutely uninhibited and without any considerable hardware and software constraints? What would be the very first new electronic wireless communication device, invented in this new era of no technological bounds? Would our lives be any better if we can reach a new wireless data communication stage – where our iPods could be able to talk to our neighbor's microwave ovens on our behalf?

3. Introducing Anomalies to the General Scheme

What content is anomalous to the general scheme? How can one begin with minor anomalies and gradually and sensitively challenge the students' general schemes so that they make the theory schemes sophisticated?

List the main anomalies to the general scheme:

We might start by questioning students' general ideas about wireless technologies being a valiant savior of our communication problems in this ever connected and global world. "The trick is to kickstart the dialectical process of anomalies that cause revision of the general scheme, which then demands further knowledge to deal with anomalies, which in turn suggests further anomalies." (Egan, 1997)

Wireless communication is set to replace all wired and physically connected electronic communication categories. How does it relate to our general notion about communication being most efficient and effective when it is interpersonal (is it true?) and when, both senders and receivers are physically close, so that they can eliminate a damaging role of the communication media? Do any of these typically oral communication rules apply to the digital communication principles? How does the distance affect electronic data communication?

Students may already have developed the idea that wireless communication provides us with an exceptional sense of mobility by freeing us of physical and corded connectors. We could ask them to compare the transfer rate of data transmitted over wireless devices with the transfer rate of wired transmission. Since wireless data networks are not able to offer the speed and quality of wired networks, the next set of questions should be discussed: do we care about how quickly our messages are processed? How important is the time involved in information exchanges? Should we neglect the significance of an instant response?

Beside the broadcasting speed, the data quality and security could also be compromised in wireless communication technologies. We need to make the students aware of these possible wireless disadvantages. Students should also be asked to investigate the data quality and security concerns, which could cause that a message becomes distorted in a way that is inaccurate or misleading, and therefore useless for any further wireless communication.

Some additional anomalies could also be presented to the students in order to encourage their curiosity and foster their learning.

4. Presenting Alternative General Schemes

What alternative general schemes can organize the topic? Which can best be used to help students see the contingency of such schemes?

Indicate the alternative theories or meta-narratives that will be used:

The major alternative to the unit topic is not wired versus wireless communication. Instead, the alternative scheme should be related to the alternative interpretation of freedom, to the effects of wireless data communication on our privacy. "It should be clear that considering a variety of general schemes contributes to a richer understanding of the topic." (Egan, 1997)

Any communication needs to bring together at least three parties: a sender, a receiver, and a message. There are certainly no doubts that current wireless technologies make the task of connecting these parties significantly easier.

Wired communication devices – regardless of how long their wires could be – are still limited to the cord's length; wireless devices are 'length independent' devices, and that independence and power of mobility relates to freedom, which is passed to us, end users.

We might want to explore the alternative side of this freedom: wireless communication makes us constantly detectable. Do we want to be reachable at all times? What are the advantages of this unique communication ability? Who is benefiting more from it – us, who cannot easily hide from our callers anymore, or the callers who are tracking us down? What are the disadvantages?

Does the further development of wireless information technologies (Wi-Fi, WAP, Bluetooth and other emerging standards) mean the end of our privacy? Does it speed the world toward an Orwellian Big Brother society? Do we need to feel ashamed and guilty when turning off our blackberries or cell phones in order to escape from our callers, simply because we wanted to be alone for a moment? Why do we quickly forget our cravings for own privacy and become impatient and anxious when the table is turned and we become callers whose call was rejected?

By discussing these and other related issues, students might accept and agree to the alternative general scheme and reflect on the wireless freedom being only partial, which should enrich and deepen their understanding of wireless data communication and its profound effects on people and their lives.

5. Encouraging development of students' sense of agency

What features of the knowledge will best allow us to encourage the students' developing sense of agency?

List areas in which students' sense of agency can be engaged and encouraged:

Particulars of Wireless Markup Language (WML), 802.11a, b, and g standard specifications and ability to distinguish between TDMA and CDMA – all of these are to be learned in this unit – might not have any significant impact on students' awareness of their role in the society. It could, however, encourage students' sense that there should be no limits to technological and any other knowledge. Additionally, we should emphasize that there are no frontiers to any exploration of the world surrounding us: discoveries of any kind are driven by challenging curiosity and dissatisfaction with the limits that are halting us. Discovery of the wireless data communication technologies is a great example of that.

Continuing with discoveries, we could ask students to imagine one inventor of wireless data communication (although, realistically, a particular inventor does not exist) and have them compare that person with other great adventurers or inventors, like Ferdinand Magellan, Sir Francis Drake, Archimedes, Johannes Gutenberg, or Charles Darwin. What all these people have in common? What could be the first question they might ask each other? Is there anything that would distinguish the wireless communication inventor from other great minds? How would wireless communication inventor be rated on the scale of the greatest discoveries of all time?

We might also ask students to think about some unusual application of wireless communication technologies. For example, how would an extensive use of wireless handheld GPS (Global Positioning Satellite) devices affect different sport competitions or a theatre performance rehearsal? Would an avid fly fisherman be any better if his fishing rods, reels, and hooks could be able to connect to the internet? Students should be encouraged to brainstorm and analyze any other uncommon applications.

Another activity could invite students to discuss situations where wireless technologies have not been used sufficiently or properly, or have been overused. What could happen if it was possible to connect remote villages in Amazon jungles or African deserts, by introducing them to cell phones? What would be the greatest benefits of such possibility? What would be the hardest obstacles to this communication? Would people, particularly teenagers, survive a brand new bylaw that would limit their use of cell phones to 30 minutes per day? Would it be considered a vicious attack on general human rights, or an attempt to protect users from possibly damaging effects of the excessive use of mobile phones?

Further discussions should be related to the need of proper promotion of wireless technologies. How do we train people to use electronic wireless communication devices in order to most benefit from their valuable, but sometimes not so obvious features? Do we teach them at all and who should perform such an important task? What would be the most appropriate training methods? Any other discussion on effects of wireless communication devices to individuals and societies would help building students' sense of agency.

6. Conclusion

How can we ensure that the student's theories or general ideas are not destroyed but are recognized as having a different status from the facts they are based on? How can we ensure that the decay of belief in the Truth of theories or general ideas does not lead to disillusion and alienation?

What concluding activity will help to both support and show problems with students' theories, ideas, met-narratives, ideologies, etc.:

A possible concluding activity could be dividing students into groups that will be asked to build a virtual high-rise, using a computer application of their choice. Each storey of the virtual building should represent one distinct characteristic of wireless data communication. More distinct attributes could be identified – and the taller the high-rise would be. By presenting their virtual building to the rest of the class, each group will demonstrate its understanding of the complexity and wide-raging application of the wireless technologies. And, by the way, the group with the tallest virtual high-rise will be the winner!

Supplementary concluding activity could be asking students to research various stores that sell electronic devices. After returning to the classroom, students will be asked to identify wireless devices that are most popular and that draw the biggest attention of potential buyers, and also wireless devices that seem to be the least popular. It should be followed by a discussion about what determines attractiveness of electronic wireless devices among consumers. Is it their general purpose and functionality, or their performance, or the brand, or the looks and design, or the price, etc? This discussion will furthermore exhibit students' grasp of the concepts and importance of wireless communication technologies to individuals and to society as whole. It will also attempt to "ensure that students recognize that their general schemes have potential utility, rather than objective truth." (Egan, 1997)

7. Evaluation

How can we know whether the content has been learned and understood, whether students have developed a theory or general idea, elaborated it, and attained some sense of its limitations?

What forms of evaluation will give adequate evidence that the students have learned and understood the content and also have developed and used some theory or abstract idea:

Two categories of evaluation need to be performed in order to ensure students' proper knowledge and thorough understanding of the wireless data communication concepts.

Since the unit topic strongly relies on technical and quantitative details, a conventionally designed exam should be used to test students' knowledge about the most relevant hardware and software facts, including any necessary calculations. The conventional examination should consist of multiple choice and short answer questions, including definitions of terms. Any formulas needed for the exam should be given to students along with the exam paper, because we want to evaluate students' calculation logic – and not just rudimentary formula memorization.

Additional evaluation tools should test the breadth of students' knowledge, their comprehension of the full meaning of the electronic wireless theories, ideas and utilization issues. This evaluation could have the title: "To Wireless or Not to Wireless". For the purpose of this evaluation, we might consider dividing the class into two opposing groups, each answering the puzzle of should we go wireless or not. Both "for wireless" and "against wireless" groups will have to justify their statements and notions with the technical, analog and digital, tangible and intangible components, of the electronic wireless communication, as well as with an array of their implementation capacities. We will require from students to prepare a written paper and an oral in-class presentation. It is very important that the students' work on the papers and presentations should be strictly individual, although the entire class will be invited to discuss each individual presentation.