Definitions

**Week 1**

**Educational Technology** refers to the applications of technology in improving teaching and learning.

**Learning Science** refers to the systematic study and inquiry of psychological, social, and technological processes that support learning in various contexts. The purpose is to find out how people learn and how to improve their learning.

**E-learning** refers to the delivery of education (content and instruction) via all electronic media, including the Internet, intranets, extranets, satellite broadcast, audio/video tape, interactive TV, and CD-ROM. It covers a wide set of applications and process, including computer-based learning, Web-based learning, virtual classrooms, and digital collaboration.

Research Findings on Terms

**Relevant Terms for Research**

T1, OC3, CIR (Committed Information Rate), **E-learning (in the Definitions Section above)**, B-Learning, U-Learning, M-Learning, GLORIAD, Internet 2, WebEX, Cognitive Load, Metacognition, XML, SCORM, Gagne’s 9 events of instruction, Component Display Theory, Constructivism, Cognitive Apprenticeship, Behaviorism, Cognitivism, LTSC (Learning Technology Standards Committee),

**Week 1**

**T1** is a general term for a digital carrier, typically leased from a local or long-distance provider, capable of transmitting 1.544 Mbps of electronic information. A T1 line is point to point, as opposed to a dialable ISDN line. T1 lines may be used fractionally or at their full bandwidth.

The transmission speed on T1 is enough for general use. However, when used for audio and video streaming, it might be inappropriate.

When e-learning is delivered via the Internet, intranet, and extranet, T1 cable can act as its transmission media. Its speed may affect its delivery negatively in case that audio and video files are included in e-learning.

**OC3** stands for Optical Carrier 3, an optical fiber line carrying 155mbps. It is usually used only for major backbones and Intranet connection. It is a good candidate to transfer synchronous audio and video information, but it is expensive.

When e-learning is delivered via the Internet, intranet, and extranet, OC3 cable can act as its transmission media.
**CIR** stands for committed information rate, a specified amount of guaranteed bandwidth (measured in bits per second) on a Frame Relay service. Typically, when purchasing a Frame Relay service, a company or organization can specify the CIR level they wish. Higher the speed, more expensive the service. The Frame Relay network vendor guarantees that frames not exceeding this level will be delivered. While it is often possible to "burst" transmission rates higher than one's CIR, the frame network does not guarantee that data in excess of the CIR will be routed through the network.

When applications of audio and video are embedded in e-learning using the Internet, appropriate CIR level are required. When designing and implementing e-learning, CIR level should be taken into account.

**Week 5**

**B-Learning** refers to blended learning that delivers some training through one method (e.g., online), but also uses other methods to make up a complete training delivery service. These other methods may range from classroom sessions to mentoring arrangements, or the support of a subject matter expert in the same office or area.

An Example of B-Learning: A course may start with WBT to test and supplement the knowledge of the participants, and then end with a final exam which is in a classroom. The class will be more effective because all participants are likely to have the same level of knowledge after they finish online session.

**U-Learning** (Ubiquitous learning) refers to a flexible learning environment accessible from more portable devices, such as personal digital assistants (PDAs) and mobile phone and aims to provide the learning at any time and place.

**M-Learning** refers to mobile learning which uses mobile or wireless technologies, such as mobile phones, personal digital assistants (PDAs), or laptop computers with wireless Internet access, to deliver learning.

**Internet2 or UCAID** (University Corporation for Advanced Internet Development) is a non-profit consortium which develops and deploys advanced network applications and technologies for research and higher education, accelerating the creation of tomorrow's Internet. It is led by 207 US universities working with industry and government. Some of the technologies it has developed include IPv6, IP multicasting and quality of service.

Many news sources refer Internet2 as a network or next-generation Internet and even go further to suggest Internet2 is a network wholly separate from the Internet. This is misleading since Internet2 is in fact a consortium and not a computer network. Articles that reference Internet2 as a network are in fact referring to Abilene Network. Internet2 (and its members) created the Abilene Network. This forms a high-speed backbone by deploying many of the technologies developed by Internet2. Abilene, although a private network used for education and research, is not entirely an isolated network, since its
members usually provide alternative access to many of their resources through the public Internet. Abilene is not technically part of the Internet since it does not peer with the public Internet networks. The Abilene is supported greatly by Qwest Communications through the use of Qwest’s optical fiber networks.

**Week 6**

*WebEX* is a public communication company (NASDAQ: WEBX) which delivers online meetings, web conferencing and video conferencing services to companies of any size. It has a service designed specifically for interactive world-class training. It offers two ways to deliver the training: live web training and recorded web training. It has following features:

1. make training more accessible
2. deliver engaging, interactive presentations
3. conduct on-demand labs
4. organize breakout sessions
5. receive instant feedback
6. testing
7. online recording and playback
8. rapid authoring & access

*Cognitive Load* refers to the level of effort associated with thinking and reasoning (including perception, memory, language, etc.). Human memory has a limited capacity for processing information. Learning occurs by active processing in the memory system. First, the learner rehearses newly learned information in working memory to organize and integrate it with existing knowledge in long-term memory. In order to do the integration work, limited working memory capacity must not be overload especially when learners are novices to the new knowledge and skills. Then, new knowledge stored in long-term memory must be retrieved back on the job.

Optimum learning occurs in humans when the load on working memory is kept to a minimum to best facilitate the changes in long term memory. Working memory in humans can be likened to the RAM of the computer while long term memory can be likened to the hard drive or CD-RW. As the processing load in the computer's RAM increases, transfer of information to and from the hard drive or CD-RW slows.

Here are some instructional design recommendations provided by Sweller (1999).

1. Change problem solving methods to avoid means-ends approaches that impose a heavy working memory load by using goal-free problems or worked examples.
2. Physically integrate multiple sources of information whenever possible to eliminate the need for learners to have to mentally integrate that information which increases the load on working memory.
3. Reduce redundancy and repetitive information whenever possible so that the load on working memory is lessened.
4. Use auditory and visual information under conditions where both sources of information are essential (i.e. non-redundant) to understanding. This helps increase the capacity of working memory.
When designing e-learning courses, we should apply these suggestions.

**Metacognition** refers to the knowledge of one's own thinking processes and strategies, and the ability to consciously reflect and act on the knowledge of cognition to modify those processes and strategies.

Learners who have metacognitive skills can manage and adjust their own thinking processes and strategies learn better than learners who lack metacognitive skills. When designing e-learning courses, we should include some of the management processes needed for successful learning to benefit learners who lack metacognitive skills.

**XML** is short for Extensible Markup Language derived from the Standardized Generalized Markup Language (SGML) and developed by the World Wide Web Consortium (W3C). It is similar to the language of today’s Web pages, the Hypertext Markup Language (HTML), but allows information and services to be encoded with meaningful structure and semantics that computers and humans can understand. XML is great for information exchange, and can easily be extended to include user-specified and industry-specified tags. However, XML is not a replacement for HTML. In future web developments it is likely that XML will be used to describe and transfer data and HTML used to format and display the same data. XML can be seen as a cross-platform, independent tool for exchanging data.

**SCORM** stands for Shareable Content Object Reference Model. It is a standard for web-based e-learning which defines the specifications that enable interoperability, accessibility and reusability of web-based learning content. The standard uses XML and it is based on the results of work done by AICC, IMS, IEEE, and Ariadne.

**Gagne’s 9 Events of Instruction:** Gagne is known as a behaviorist, and his focus is on the learning outcomes - or behaviors. Gagne, in his book *The Conditions of Learning*, identified the mental conditions for learning and created a nine-step process called the events of instruction, which correlate to and address the conditions of learning.

1. Gain attention (reception)
2. Inform learners of objectives (expectancy)
3. Stimulate recall of prior learning (retrieval)
4. Present the content (selective perception)
5. Provide "learning guidance" (semantic encoding)
6. Elicit performance (responding)
7. Provide feedback (reinforcement)
8. Assess performance (retrieval)
9. Enhance retention and transfer to the job (generalization).

Gagne’s 9 events of instruction can be applied to the design of instruction in e-learning. Instruction should be designed to proceed step by step prescribed by Gagne’s 9 events of instruction.
Component Display Theory (CDT) classifies learning along two dimensions: content (facts, concepts, procedures, and principles) and performance (remembering, using, generalities). The theory specifies four primary presentation forms: rules (expository presentation of a generality), examples (expository presentation of instances), recall (inquisitory generality) and practice (inquisitory instance). Secondary presentation forms include: prerequisites, objectives, helps, mnemonics, and feedback. The theory suggests that instruction is more effective to the extent that it contains all necessary primary and secondary forms. Thus, a complete lesson would consist of objective followed by some combination of rules, examples, recall, practice, feedback, helps and mnemonics appropriate to the subject matter and learning task.

Week 8

GLORIAD stands for Global Ring Network for Advanced Application Development. It is a high-speed computer network used to connect scientific organizations in Russia, China, United States, the Netherlands, Korea and Canada that improve communications and data exchange, enabling active, daily collaboration on common problems. GLORIAD is sponsored by the US National Science Foundation, a consortium of science organizations and Ministries in Russia, the Chinese Academy of Sciences, the Ministry of Science and Technology of Korea, the Canadian CANARIE network, the Netherlands SURFnet team and has some telecommunications services donated by Tyco Telecommunications. GLORIAD provides bandwidth of up to 622 Mbit/s via OC-12 links between Russia and the United States, and 155 Mbit/s via OC-3 between Russia and China, among others.

Constructivism is a school of human learning which believes learning as a dynamic process in which learners construct new ideas or concepts on their current/past knowledge and in response to the instructional situation. It was originally developed by Piaget and is focused on characterizing the cognitive growth of children, especially their growth in conceptual understanding. Constructivism implies the notion that learners do not passively absorb information but construct it themselves.

Cognitive Apprenticeship is a term for the instructional process that teachers provide and support students with scaffolds as the students develop cognitive strategies. It permits peers to learn through their interactions, to build stories about common experiences, and to share the knowledge building experiences with the group.

Behaviorism is a school of human learning theory which believes knowing could be characterized only in terms of observable connections between stimuli and response and learning in terms of forming and strengthening or weakening and extinguishing those connections through reinforcements or nonreinforcement. It was first put forth by John Watson (1925), and then expounded upon by BF Skinner.

Cognitivism is a school of human learning theory. It believes that knowing is the understanding of concepts and theories in different subject matter domains and general abilities, such as reasoning, planning, solving problems, and comprehending language. According to cognitivism, learning is the constructive process of conceptual growth,
often involving reorganization of concepts in the learner’s understanding, and growth in
general cognitive abilities such as problem-solving strategies and metacognitive
processes.

**LTSC** stands for the IEEE (the Institute of Electrical and Electronics Engineers, Inc.)
Learning Technology Standards Committee. LTSC is chartered by the IEEE Computer
Society Standards Activity Board to develop accredited technical standards,
recommended practices, and guides for learning technology.

The LTSC coordinates formally and informally with other organizations that produce
specifications and standards for similar purposes. Standards development is done in
working groups via a combination of face-to-face meetings, teleconferences, and
exchanges on discussion groups. The LTSC is governed by a Sponsor Executive
Committee (SEC) consisting of working group chairs and elected officers.