
**Health informatics — Interoperability of
telelearning systems**

*Informatique de santé — Interopérabilité des systèmes de
téléapprentissage*

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
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An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO/TS 16058 was prepared by Technical Committee ISO/TC 215, *Health informatics*.

Introduction

0.1 General

The field of telehealth encompasses a broad delivery of health related services using telecommunication technologies at a distance. One of the areas included in the field of telehealth is “telelearning” which deals with the remote delivery of health related educational content. This Technical Specification for Interoperability of Telelearning Systems has been developed on the basis of the needs of healthcare instructors and learners to deliver health related distance learning. Its main purpose is to ensure that technologies deployed for healthcare telelearning can appropriately support and deliver distance learning as well as interoperate with disparate telelearning systems that comply with this specification.

Throughout this document, specific words are used to indicate whether an item is mandatory, recommended or optional. The usage of those words follows the guidelines in Annex G of ISO/IEC Directives, Part 2, *Rules for the structure and drafting of International Standards*.

0.2 Learning definition

Learning, in the context of healthcare, is focused on providing opportunities for continued learning in the area of health provider education and patient education. Types of learning situations include:

- professional development which covers upgrading and improving professional skills and knowledge,
- medical education for physicians and other health care providers,
- patient education to enhance clients’ abilities to manage disease, e.g. cardiac disease, osteoporosis,
- academic clinical conferencing where expert content is broadcast to receiving sites for purposes such as teaching rounds for residents and continuing medical education,
- case conferencing and grand rounds which are clinical department focused and content is delivered by departmental and visiting speakers,
- multidisciplinary, patient or problem based teaching with a multidisciplinary team providing specialist advice on pertinent clinical problems or issues, and
- other clinical, technical, educational and administrative teaching such as training for support aids, back clinics, diabetes clinics, general orientation, administrative meetings, discharge planning, just in time training, and computer training for regional employees.

0.3 Telelearning definition

Telelearning describes a learning situation where the instructor and learners are separated by a geographical distance. Telelearning can be defined as follows:

“Telelearning is making connections among persons and resources through communications technology for learning-related purposes” (Collis, B. (1996): Tele-learning in a digital world, the future of distance learning.)

The generally accepted definition of telelearning also covers situations where instructor and learner interactions are separated by both distance and time. For the purposes of this specification, telelearning describes “real-time” learning situations in which interaction between the instructor and learners occurs without substantial time delays.

0.4 Telelearning technology

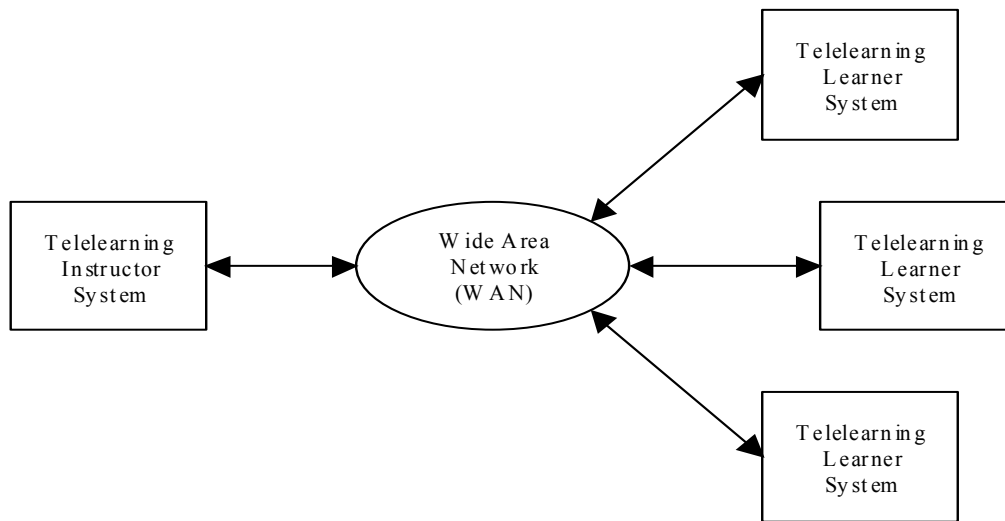


Figure 1. Typical telelearning system

Figure 1 shows the main subsystems of a typical telelearning system. An instructor uses a telelearning instructor system to give presentation to learners at remote learning sites. The instructor and learner systems interface with a wide area network (WAN) to exchange information. The WAN can be a circuit-switched network, a packet-switched network or a combination of both. It must provide sufficient bandwidth and the necessary inter-networking services. Telelearning systems make use of two modes of communications:

- real-time interactive mode typically implemented via videoconferencing technologies; and
- store-and-forward mode typically implemented by electronic mail, file transfer or multimedia messaging systems.
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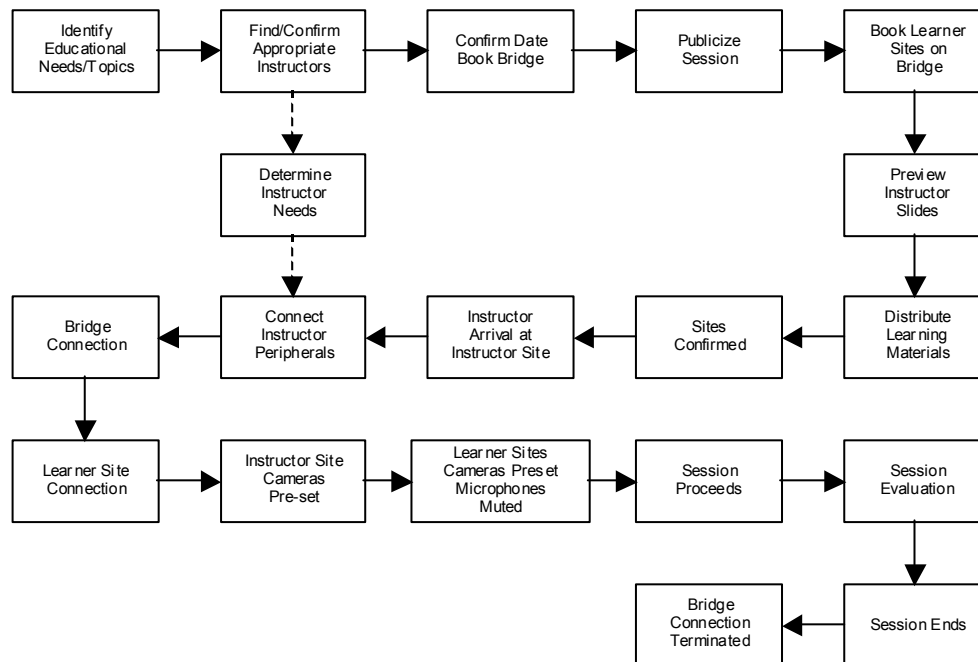
The primary component of telelearning uses real-time communications to transmit digitized visual, audio, textual and clinical information between the sending site and one or more receiving sites. Typically, this is accomplished through the use of “real-time” videoconferencing and document sharing technologies.

A secondary aspect of telelearning includes the use of store-and-forward communications for offline activities such as planning, scheduling, preparing, archiving and evaluating telelearning sessions.

The use of store-and-forward communications to deliver telelearning content is not addressed in this specification, which focuses on delivering real-time interactive learning sessions.

0.5 Telelearning workflow

A typical telelearning workflow is shown in Figure 2.



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Figure 2. Telelearning workflow

From the workflow, top-level use cases are identified to illustrate the context in which a telelearning system is used. Figure 3 is the top-level use case diagram.

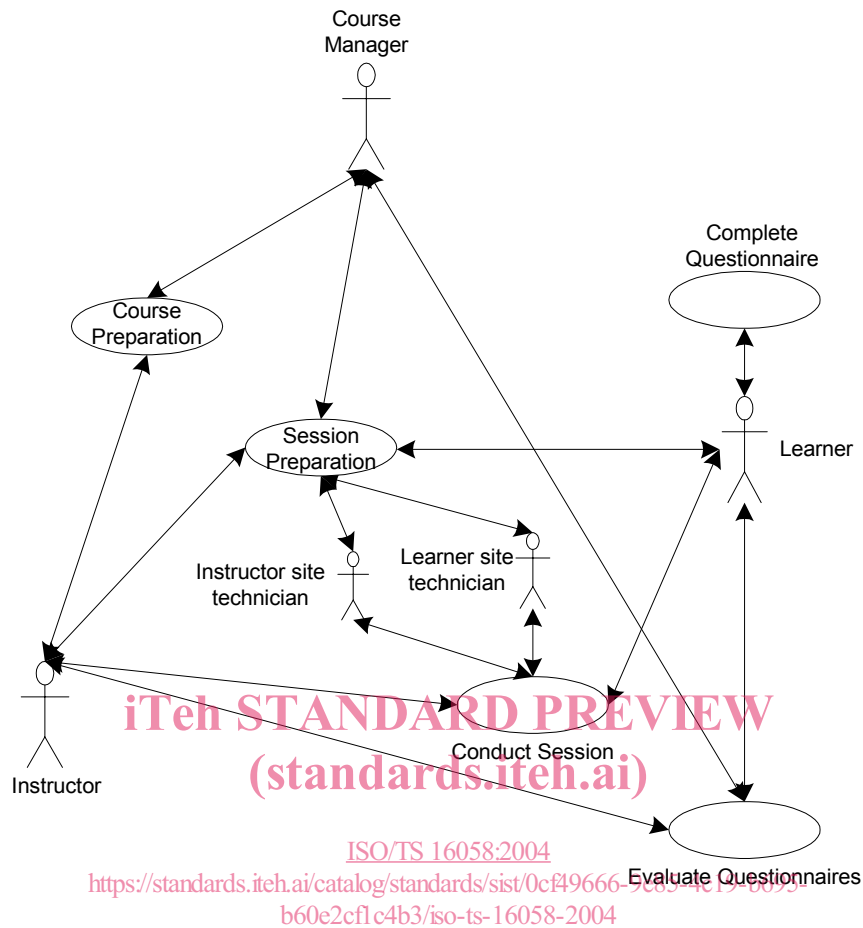


Figure 3. Telelearning top-level use case diagram

0.5.1 Course and session preparation

Telelearning workflow begins with course and session preparation. Course preparation is typically a one time activity that is independent of the time or place where the course is presented. Session preparation occurs each time the course or a portion of the course is delivered. The *Conduct Session* activity is divided into additional use cases representing the instructor and learner sites that are described in the next section. A telelearning system is utilized as part of the *Conduct Session* activity.

The actors within the overall learning context are:

- course manager,
- instructor,
- learner,
- instructor site technician, and
- learner site technician.

Course preparation

- i. the educational needs of learners (e.g. staff and patients) are identified and topics for educational sessions are chosen,

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- ii. appropriate instructors are found, their level of interest, qualifications and capabilities are determined and their availability is confirmed,
- iii. the presentation needs of the instructor are determined and support is given for preparation of material, and
- iv. it is important that any slides that the instructor will be using are previewed for their suitability for telelearning and changes are made to ensure readability.

Session preparation

- a) the date for the session is confirmed and the videoconference bridge (if required), telelearning room and system support technician are booked,

NOTE Ideally this occurs 3 to 10 weeks before the session is held in order to allow time for instructor and systems preparation, publicizing and attracting potential learners.

- b) the sessions are publicized by various means (e.g. monthly calendar of events, individual session flyers),
- c) learner sites enrol for the telelearning session and the instructor site books additional ports on the videoconference bridge,
- d) one day before the session is to occur, learner sites may be asked for final confirmation, and
- e) handouts and evaluation questionnaires for the session are distributed to learners in advance of the session.

NOTE The methods by which, and how far in advance of the session, the handouts and evaluation questionnaires are distributed, may vary.

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Conduct session

- a) one hour before the session, the instructor arrives at the instructor site. The telelearning system support technician gives an introduction to instructor system,
- b) the telelearning system support technician connects the instructor peripherals to the instructor system,
- c) the telelearning system support technician turns on the instructor system and connects to the videoconference bridge ideally 30 minutes before the session is to begin,
- d) the learner sites connect to the videoconference bridge, preferably 20-30 minutes before the session,
- e) the cameras at the instructor site are pre-set to focus in on the instructor,
- f) the cameras at the learner sites are pre-set appropriately and the microphones are muted,
- g) the session proceeds and the system support technicians monitor the session to ensure fluid movement of the session (if needed, learner sites are dropped and cues are given to learner sites to mute microphones etc.). The telelearning system support technician ensures that all peripherals are working and assists the instructor as needed. In a multipoint telelearning session, the instructor site technician can change the presentation mode of the multipoint control unit (MCU) bridge,

Example At the beginning of the session, the presentation mode is set to voice-activated to conform/welcome the remote learner sites. When the session starts, it is changed to continuous-presence mode or presenter mode. During the question period, it is then switched back to voice-activated mode.

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- h) all learners are encouraged to complete the evaluation questionnaire at the end of the session,
- i) the session ends, and
- j) the telelearning system support technician informs the WAN provider of the end-of-session, the videoconference bridge is dropped and the telelearning system is turned off.

Complete questionnaires

Learners complete the questionnaires after the session and learner site sends the completed questionnaires to the instructor site.

NOTE This is usually an offline activity.

Evaluate questionnaires

Course manager gives the completed questionnaires to the instructor for evaluation. The course manager sends the evaluations to the learner site.

NOTE This is usually an offline activity.

0.6 Telelearning use cases for the conduct session activity

Further analysis of the workflow pertaining to the *Conduct Session* activity produces these use cases for the instructor system and the learner system.

0.6.1 Telelearning instructor system use case [ISO/TS 16058:2004](#)

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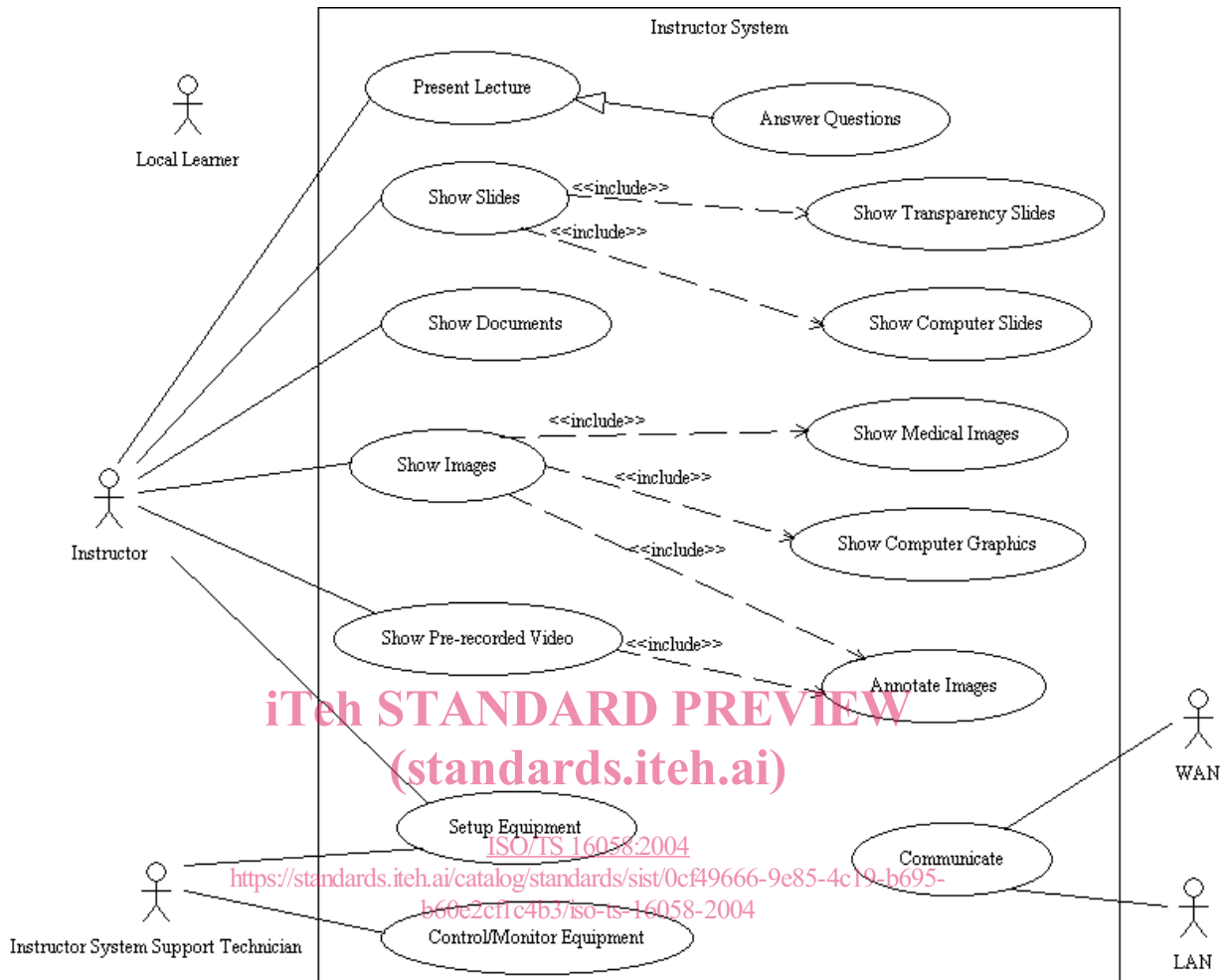


Figure 4. Telelearning instructor system use case diagram

The instructor system support technician (the technician) sets up the telelearning instructor system (the system) before the telelearning session begins. The first phase of equipment setup includes:

- going through a checklist to verify that the system is functioning,
- providing the instructor with an orientation to the system, and
- assisting the instructor in setting up the presentation equipment.

Example Putting the slide tray into slide projector, placing paper documents under or next to document camera, connecting laptop computer to system and checking LAN connection for accessing presentation material.

Next, (typically while the local learners are arriving) the technician makes a WAN connection to the videoconference bridge (for multiply learner site sessions) or remote learner site (for single learner site) and confirms that connections to all telelearning learner systems are established. The technician may alternatively wait for a connection request from the remote learner site if that was agreed upon in the session preparation phase.

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The technician ensures that one of the instructor system cameras is focused on the instructor and that another camera is focused on the local learners. Finally, the technician switches on the instructor's microphone and signals that the telelearning session is ready to begin.

Throughout the telelearning session, the technician monitors the status of the system and the videoconference connection. The technician communicates with other system support technicians at the remote learner sites in the background (e.g. through a text messaging channel), to control and adjust the instructor system accordingly to ensure the smooth operation of the telelearning session.

The instructor gives the lecture to the remote learners via the telelearning instructor system. A microphone captures the instructor's voice while a video camera captures the instructor's movements and gestures. The system sends the captured voice and video of the instructor to the remote learner systems via the videoconference connections. The local learners can hear the instructor's voice on the speakers in the room as well.

A lecture is usually presented using transparency or computer (e.g. MS PowerPoint®) slides. The instructor uses a remote control, pointing device or keyboard to advance or reverse the slides as needed. The instructor system provides a document camera to allow the showing of paper documents or close-up views of small objects to the learners. A videocassette player is used to playback pre-recorded video (e.g. beating heart, fetus movements, surgical procedure) to the learners. Frequently, healthcare lecture material includes computer-generated graphics and medical images such as x-rays and ultrasound pictures that are stored on a computer. The instructor system may provide the capability of allowing the instructor to annotate still images or freeze-frame video images in order to draw the learners' attention to specific areas of interest.

Both the local and remote learners interact with the instructor by asking questions. The questioning process requires moderation and coordination so that learners from different sites do not attempt to ask questions simultaneously. One effective method of moderation involves the instructor asking each site, in turn, if there are questions. When a local or remote learner posts a question, the learner's voice and image are captured by a microphone and a video camera and sent to all connected telelearning sites so that learners at all the sites can see and hear the person asking the question.

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When a telelearning session ends, the technician terminates the WAN connection to the videoconference bridge or the remote learner system and disconnects the instructor's presentation equipment from the instructor system.

0.6.2 Telelearning learner system use case

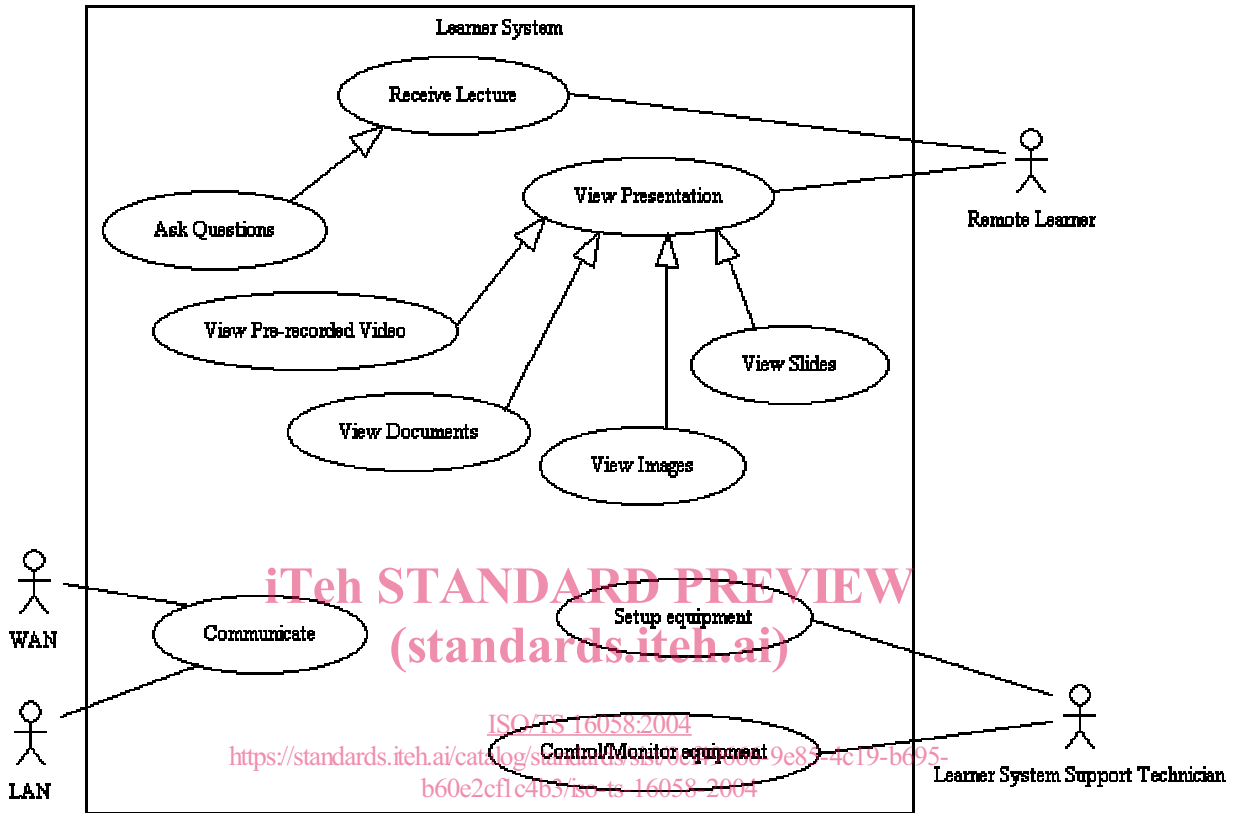


Figure 5. Telelearning learner system use case diagram

The learner system support technician (the technician) sets up the telelearning equipment before the telelearning session begins. The first phase of equipment setup includes:

- going through a checklist to verify that the telelearning learner system is functioning, and
- sets a video camera to get a view of the learners’ sitting area and mutes all microphones.

Next, (typically while the learners are arriving) the technician makes a WAN connection to the videoconference bridge (for multiply learner site sessions) or remote instructor site (for single learner site) and confirms that a connection to the telelearning instructor system is established. The technician may also simply wait for a connection request from the remote instructor site if that was agreed upon in the session preparation phase.

When the technician receives indication from the instructor site that the telelearning session is about to begin, the instructor’s video image is shown on a video monitor and the instructor’s voice is played on the speakers. With the instructor’s permission, the telelearning session may be recorded on videotape for viewing or reviewing by learners at a later date.