



TEACHER TRAINING MANUAL

MULTIMEDIA APPLICATIONS
FOR EDUCATION

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Vilnius Pedagogical University (LT)

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PART TWO / B

EDUCATION

Chapter Two: Practical Methodologies of e-learning

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1. Introduction

Online learning is the latest trend in education. Its success will depend on the quality of its instructional design and the academic and technical support provided to learners and instructors.

E-learning itself isn't a unique field. It's a combination and extension of many other existing fields. As such, what happens in technology/learning theory/web design/network analysis, etc. impacts and shapes e-learning. The best way to succeed with e-learning is to understand the landscape, and to make choices based on the unique environment and concerns in the organization where e-learning is being implemented. E-learning implementation should be holistic.

Successful e-learning requires a "whole picture" approach:

- **Pre-starting.** E-learning can be initiated program wide in an institution or at an individual level with a trainer or instructor. Pre-starting include: overview (overlooking benefits/negatives), beginning (converting to online, integrating technology with teaching), and readiness (organizational – choosing learners and instructor).
- **Enabling.** Technology, in the context of e-learning, should enable and provide support for the learning (and resource development) components of the whole picture. Technology is used primarily to increase the effectiveness of learning, or to **increase access** to learning.
- **Doing.** At this level, the content is being created, delivered and learning is being assessed. An intense focus on the learner is critical for success. Components of this stage include instructional design, content management, usability, accessibility, learning objects, selection of media, assessment, adoption/promotion, and plagiarism/ethics.
- **Evaluating.** Evaluation refers to the actual e-learning program, not the learners. The e-learning initiative is evaluated using a variety of techniques.
- **Managing.** This stage represents the challenges in managing, organizing, and sustaining an e-learning initiative. It includes knowledge management, communities, and copyright too.

2. Beginning of the course

At the beginning of the course, the availability of technical support should be stated, and links to online technical information provided. The hours during which technical support is available have to be clearly identified.

Before starting the course should be reviewed by experts in content and design, to get evidence, that course is up-to-date – current in both content and technical aspects, and learners can achieve the objectives of the course.

The developers and reviewers of the course have to be listed. Brief biographies may be provided to assure students of the developers' knowledge and expertise. A copyright statement or disclaimer clearly identifies the owner(s) of the course and the source(s) of the material students are about to use.

Learners have to be provided with general information that will assist them in completing the course and in understanding its objectives and procedures. Brief description of the course should include information about:

- **a goal and learning objectives and outcomes,**
- **how this course is related to other courses in the program,**
- the **credit value** of each course,
- **estimated time** required to complete the module and course,
- special **technical requirements** (recommended modem speed, Internet bandwidth, etc),
- a list of required and recommended **resources** includes all textbooks, courseware, and online resources necessary to complete the course,
- a source for answers to "frequently asked questions" pertaining to online learning. This source may provide information covering many of the items listed above, as well as items related to plagiarism, virus protection, etc.
- **deadlines**, and clearly stated consequences of missing deadlines,
- clearly specified **expectations for participation in collaborative or team-based learning activities**, specified procedures for grouping learners for team-based learning activities. (Learners should be encouraged to interact with others and benefit from their experience and professional expertise).

Learners have to be informed about their **right to privacy** and the conditions under which their names or online submissions may be shared with others. Learners should be informed about the **consequences of plagiarism** and the failure to properly cite copyrighted material.

3. Accessibility

At the beginning of the course instructor should ensure, that the infrastructure and server can handle the number of learners enrolled in the course, the course material is easy accessible, and the learners can quickly find information, the function of each icon or button is explained and/or is naturally evident to the learners.

Every section of the course or module should begin with a preview. Summaries should be provided throughout the material, particularly at the end of topics, lessons, and modules. Every page should be linked to the previous page, the start of the module, the beginning of the course, and to e-mail so that learners may contact instructors and other learners for clarification and discussion.

A glossary should define unusual or technical terms used in the course and may provide links to sources of supplementary information.

4. Goals and Objectives

A goal and learning objectives and outcomes should be provided to outline learning expectations at the beginning of the course and, where appropriate, at the beginning of each module. In some cases, it is possible to ask learners to select their own goals, objectives, content, learning strategies, resources, and evaluation scheme.

Goals and objectives should clearly and concisely state what must be done, should cover course content and be related to the program of study, and be relevant to the subject matter and to the "real world" in which the content may be applied.

Objectives have to specify learning outcomes related to knowledge, skills, competencies, behaviours, and attitudes.

Appropriate action verbs are used in goals and objectives. The accomplishment of objectives should be measurable; therefore, vague words such as "understood" and "realize" are not used.

5. Content

In the traditional instructor-led learning, one of the ways training and development programs differentiate is in the skill of the instructor. Weak material in the hands of a gifted trainer still resulted in valuable knowledge transfer and skill acquisition. In the world of e-learning, weak content has no ally. No matter how sophisticated the technology is or how flashy the graphics and images are, it's the quality and relevance of the content to the business issue.

Only complete, providing all the content or learning experiences needed to achieve the learning objectives, **accurate, relevant, current, directly related to learning objectives, linked to other sources, with reading assignments clearly specified, illustrated by examples** and case studies when new information is presented content is appropriate. The information delivered can be consistent to all users, therefore reducing the possibility for misinterpretations.

Content should be appropriate to the learners' characteristics (backgrounds, ability and maturity level) and experiences and related to other material the learners may have studied or experiences they may have had.

It is very important for experts to check, do writing conveys no explicit or implicit bias relative to age, culture or ethnicity, race, gender, or sexual preference.

6. Organization of content

All learning material should **be broken into small, incremental learning steps, and presented in a logical sequence** (numbers is recommended to be used to identify sequential steps in a task or process). Breaking content into searchable learning nuggets lets them be configured in unique ways based on learners' needs and objectives. The result is the ability to move ever closer to personalized learning experiences. The delivery of content in smaller units, called "chunks," contributes further to a more lasting learning effect.

The table of contents should give an accurate indication of how the material is arranged, required course elements should be clearly delineated from supplementary elements, links to other parts of the course or external sources of information be accurate, units of instruction or topics divided into subunits or subtopics (related to main topics). Material, organized in such a manner that learners can discern relationships between parts of the course, helps learners to cope with information and tasks and to maintain goals and objectives of the course.

The organization of components is consistent throughout the course. For example, **each module may have the following sections**: introduction, objectives, pretest, directions, explanatory text including learning activities such as case studies, suggested answers for learning activities and links to additional information, module summary, self-test, self-test answers, references, additional readings, and module assignment.

7. Language of content and tasks

One of the most important aspect for motivation of learners is supportive and encouraging tone of the writing. A conversational tone should employ **the second person**: you, not the learner. **Verbs should be active**, not passive, voice; for example, somebody developed the theory, not the theory was developed by somebody.

The other important thing is appropriate for the intended audience level of the language and clear and direct writing style - clear directions, familiar or common words, consistently used terms, defined abbreviations and symbols. All information should be

provided in short sentences and brief paragraphs. Especially instructions should be stated simply and easy to understand.

Spelling and grammar should be consistent and accurate.

8. Learning Resources

Learning materials should be **appropriate for**:

- the learners,
- the subject matter.

Easily accessible learning resource material should be accurate, current, and related to the course content. Lists of learning resources, divided into "required" and "optional" categories, links, provided to material within and external to the course will help to save time and not to lose orientation.

Most difficult task is to set the right amount of learning material. If it will be offered too short list of learning resources, educational process will be weak and inadequate. Overtaking of learning resources or undigested material will led to misunderstanding, controversy and unachieved results and goals.

Various learning resources, reflecting different points of view, and used to ensure compatibility with learners' different interests, abilities, and learning styles, will inure for the complete and well-rounded educational process. A bibliography or reference list may include a variety of material such as Web links, books and journals, CD-ROMs, and videos. The format of multimedia materials should be specified, and a direct link to a required plug-in provided. Multimedia clips, such as audio and video clips, may be included only if the learners have access to the appropriate hardware and software and these items are specified at the beginning of the course.

9. Layout

The technology of learning plays only a supporting role. What's most significant about technology isn't the technology itself. The technology improves and becomes easier to use, more people will give e-learning try. And as the collective experience improves, ever-broader audiences will embrace e-learning. Broadening the acceptance of e-learning by a wider and more diverse group of learners is the real opportunity for technology.

The aim of successful layout is to facilitate the learning. Material should be not only attractive, but appropriate for the course content and the intended audience. If learners are just beginners, a simple layout is the best.

The typeface should be appropriate for the content and common to all programs and computers, such as Arial or Times Roman.

The contrast between text and the background material makes the text legible. Uncluttered format, effectively used colours, easily seen illustrations, graphic elements such as diagrams, tables, and photographs helps not only create the aesthetical surroundings, but to illustrate or clarify information presented in the text. Properly used headings and subheadings are necessary for organizing of content.

Key words should be highlighted, especially when they are first used.

There are some other important regulations for forming layout: capital letters and underlining should not be used for emphasis, underlining used only for hyperlinks¹.

10. Evaluation

Progress and successes can and have to be measured and tracked. An essential aspect of an e-learning course or curriculum is the evaluation of e-learning. Evaluation

¹ Chapnick S., Meloy J. Renaissance eLearning: Creating Dramatic and Unconventional Learning Experiences. - Pfeiffer, 2005, p. 155 - 157.

consists of numerous attributes; however it basically means **assessing the effectiveness and possible improvement of a course/curriculum**. In addition to increasing the quality of training another critical reason for evaluation is to assess the value of the training. Ultimate purpose of e-learning is not to reduce the cost of training, but to drive educational results.

There are many methodologies for measuring effectiveness. These methodologies are used to measure effectiveness of specific targeted program and usefulness of a course.

Unlike traditional instructor-led training, with e-learning there is no possibility to look students in the eye, talk to them at the break, and get direct feedback on whether they're really learning anything. Instead, there is a lot of data. Wisely using this data is the key to determining effectiveness and getting a return on investment.

The five ranges for measuring of program effectiveness afford the trainer a meaningful evaluation of the training by looking at it from various angles².

- Range1: Participation

- Enrolments. The first and most obvious thing to measure is enrolments. Is the audience actually enrolling in the course or courses? One valuable exercise is to monitor enrolments (for example, weekly).
- If learners are not enrolling, maybe there are some marketing problems - people either can't find the course, or the course is named poorly, not well positioned in the advertisement programs. Maybe people don't know how to enrol, or they do not even know such program exists. One more problem may be not explained value of the course – maybe possible learners do not understand, why this course is important. It is very easy for people to ignore the program completely if they don't understand why they need it. You may have to engage in a more active marketing program.
- **Activity**. The next important find, are people moving through the course, have they started and what "percent completion" have they achieved. Organizers should demand that "percent complete" be built into any vendor or custom course-and tracked at every chapter, lesson, interactivity, or assessment. Instructors should monitor activity correlated to enrolment date. If learners are enrolling but not getting very far, then you have a content problem. Maybe the content is too hard to read, it runs too slowly, or it may just be boring or difficult. Typically, if the content is appropriate for the audience, people will progress at a reasonable rate. (Typically if a course is a few hours long, that people progress at an hour a week or so). If people go quickly and then stop at a particular point, it is a sign where some changes on content's usability, relevance, and performance have to be made.
- **Completion**. Finishing is just a case of "activity." But it is a very special case. People who truly complete, meaning that they actually take the entire course, deserve special recognition. These are the people who will give the best feedback on content quality and effectiveness toward the educational goal. They wanted to finish. In some cases students "complete", finishes the final lesson, but skips some parts in between. If this happens, it means a course was not well designed. It should be fixed to help to avoid all possible skips and have to be made in the way to be possible to measure whether a student actually touched every chapter or every page. Completion percentages may be interpreted in two different ways. A bunch of students that achieved 30 percent completion is not the same as one-third of the students who achieved 100 percent completion. If students achieve only part of completion, it means that program is poorly performing. If only part of students complete, it means that program is great, but it's not targeted very well. Targeting your program is important - it's like marketing. If you target

2 Khan B. Managing E-Learning Strategies: Design, Delivery, Implementation and Evaluation. - Information Science Publishing, 2005, p. 380 – 387.

the right content toward the right audience, you will achieve the desired educational result.

- o Range 2: Knowledge

Formal and informal testing, self assessments at the beginning (pre - test) and end (post - test) of the training, observation and feedback from participants, managers, and supervisors are the main sources for getting information about achieved results. Range 2 data can describe the extent to which participant attitudes changed and if relevant knowledge and skills were increased by the training. Range 2 data helps to measure, did the learners assess the learning, also known as knowledge, skills and attitude.

Interviews and observations can be useful, but it should be considered that this data could be subjective and may reflect other factors that do not apply to this level of evaluation. The pre - test and post - test are developed before the content is complete. This will ensure that the content meets the learning objectives. The pre - tests are often used to determine the knowledge of the content before the training. The post - tests are used to measure the amount of knowledge and understanding of the content after the training. The score of the pre - test and post - test are summarized so that the trainers can monitor if the training has made an impact on learning.

Score and completion percentage tell a lot. It gives an opportunity to see that people fall into different segments based on completion percentage and scores.

But sometimes people wrongly think scores is the one and only way to measure effectiveness of learning. Sure, if people score highly, they have learned something. But in e-learning it is difficult to be sure about scored high. Maybe learners did not really learn the material, but copied from someone else, or already know the material, etc. If the course did not count the number of times a student attempts a question, the score data may be useless, because people will keep guessing until they get it right.

It is important to have multiple assessments, not only scores taken at the end or are there assessments. In case of multiple assessment it is possibility to measure progress toward the final learning goal. And the best content actually will categorize assessments by learning objective, so it will be possible to measure what exactly someone has scored well on and where they have fallen short.

- o Range 3. Reaction (feedback)

Feedback is a vital part of e-learning. There is little or no face-to-face contact with learners. Because of it learners should be regularly request and enabled to give feedback-in numeric and written form.

Feedback may tell important things like: Did they like it? Did the content play? Did the assessments work? Did the video, audio, and other media work? Were the material and interactivities engaging? Was the material useful? Were the graphics informative?

Feedback reports if participants liked or disliked the training. Learners will appraise activities that were relevant for them, as the activities have been designed with their ages, cultural backgrounds, and experiential needs in mind.

This would resemble a customer satisfaction questionnaire in a retail outlet. At the first step of evaluation, the goal is to find out the reaction of the trainees to the instructor, course and learning environment. This can be useful for demonstrating that the opinions of those taking part in the training matter. A evaluation is also a vehicle to provide feedback and allows for the quantification of the information received about the trainee's reactions.

The intent of gathering this information is not to measure what the trainee has learned, but whether the delivery method was effective and appreciated. Non-training items may have a deep impact on the training session and need to be considered. These items include, but are not limited to environmental and other conditions surrounding the learner at the time of training. Feedback shows all good and bad aspects of concrete e-learning process.

Measurement is important. Phrase "if you can't measure it, you can't manage it" is well known. Only thinking about measuring effectiveness early and often, will help to make entire e-learning program effective, powerful, and successful.

- Range 4. Results

Range 4 evaluations normally take place three to six months after the training has occurred. By waiting three to six months the learners are given an opportunity to implement the new skills and knowledge learned in the training. It is the most validating assessment for the training program's effectiveness, give concrete evidence as to overall value of the training program. The observations are performed by the teachers to observe that the knowledge, behaviour, and skills are being applied to their daily educational life.

This aspect of evaluation involves results – the impact that can be derived from training. Tangible results are developed skills (social, cognitive), used in further educational operations or in life. American educator Mathew Lipman (*in Thinking in Education*) says there are four major varieties of **cognitive skills**, which should be attained in learning process:

- **Inquiry skills** (customary, traditional and conventional practice + self correcting practice results in inquiry).
- **Reasoning skills** (knowledge originates in experience. By means of reasoning people extend the knowledge and defend it).
- **Information organizing skills** (for purpose of cognitive efficiency, people have to be able to organize the information they receive into meaningful clusters or units – sentences, concepts and schemas. These conceptual clusters are network of relationship, and every relationship is unit of meaning).
- **Translation skills** (it is not only transmission of meaning from one language of one nationality to other language. It can occur among different models of expression, among different fields of life, for example, politics and economics).
- **Developed cognitive skills**, educated critical thinking will not only produce better **problem solving**, but it will also produce better problem deterrence and **problem avoidance**.

- Range 5. Financial return

The last range of evaluation of e-learning is financial return on investment of the training program.

Conclusion: evaluation should include making sure the training is liked by the learners, ensuring that the learners gained information in the process, assure that learners are accountable for the information they obtained in the training, assess learning outcomes, and find and fix quality issues in the training as well as learn how to make training courses and curriculum better in upcoming projects. Each of these reasons can improve the training. For example, if after the evaluation the training is altered to make sure the training is liked by the learners it can lead to an increase participation in the training, an increase in learner retention, ensuring that it helps comfortably and quickly get valuable amount of knowledge.

11. Methodology of evaluation

Clearly specified relationship between individual assignments and the final course grade, provided detailed step-by-step instructions for each evaluative exercise may guarantee **clear, explicit evaluation and grading procedures**.

The relationships between course learning outcomes, evaluation strategies and course assignments should be evident to each learner. Situation will be much clear, if evaluation procedures, congruent with the objectives, will reflect any priorities that have been established for the objectives.

Students should be informed about the criteria that will be used to evaluate their participation in online activities such as discussion groups or project based tasks. Criteria and procedures for self assessment, for peer review and evaluation (if these elements are included in the course) should be clearly specified.

Learners should be given clear expectations and criteria for credit assignments. (Examples of assignments that meet the criteria may be included for students to review).

Feasible, relevant, accurate, and congruent with the objectives, content, and practical applications of the content evaluative activities, a variety of feasible and content-relevant assignments or evaluative exercises, provided in each step of the course, will give possibility for full and versatile estimation.

Giving feedback is reciprocal process. Not only learners should be expected to contribute the feedback. One of the main tasks for instructors is to administer apropos and exhaustive response. Learners should be in advance informed, when they can expect to receive feedback from the instructor.

Delivering of content. The number of activities should be sufficient to support learning. Activities should be realistic and appropriate and can be performed with the resources and time available to the learners, sequenced logically in order of difficulty, a hierarchical or chronological manner.

Activities should ***engage and motivate the learners***. Learners must frequently respond to questions, select options, provide information, or contact others. Learners should be told which activities must be performed synchronously and which may be performed asynchronously, whether learning activities are sequential or whether they can be completed in any order. Learners should have possibility to proceed at a pace that is appropriate for them and repeat sections as often as they need to.

12. Moodle

Moodle is one of well spread web and distance learning programs. Moodle (Modular Object Oriented Dynamic Learning Environment) is a course management system - a free, open source software package designed using sound *pedagogical principles*, to help educators create effective online learning communities.

Moodle has been evolving since 1999. It has been translated into more than 70 different languages. The real number of current active Moodle installations is unknown, but Moodle is downloaded over 500 times a day. As there are no license fees and growth limit, an institution can add as many Moodle servers as needed.

Moodle has many features expected from an e-learning platform including: Forums, Content managing (resources), Quizzes with different kinds of questions, Blogs, Wikis, Database activities, Surveys, Chat, Glossaries, Peer assessment, Multi-language support.

Moodle is also a verb (in the big dictionaries only), which describes the improvisational process of doing things as it occurs to you to do them, an enjoyable tinkering that often leads to insight and creativity. As such it applies both to the way Moodle was developed, and to the way a student or teacher might approach studying or teaching an online course.

The stated philosophy of Moodle includes a *constructivist* and *social constructionist* approach to education, emphasizing that learners (and not just teachers) can contribute to the educational experience in many ways. Moodle's features reflect this in various design aspects, such as making it possible for students to comment on entries in a database (or even to contribute entries themselves), or to work collaboratively in a *wiki*. Moodle is flexible enough to allow for a full range of modes of teaching. It can be used for simple delivery of content or assessment, and does not necessitate a constructivist teaching approach. Moodle is also useful in an outcomes-oriented classroom environment because of its flexibility.

Users are divided to 4 major groups:

- Administrators,

- Teachers,
- Learners,
- Guests.

The role of administrators is minimal. The main part of teaching process is on teachers and even learners. In Moodle there can be different kinds of evaluation – self assessment, peers evaluation, or evaluation made by teachers.

Many different activities (lessons, individual tasks, workshops, synchronous and asynchronous discussions, tests, wikis) help to provide purposeful and learners – oriented educational process.

Chapter Three: How and why to use videogames in didactics

Vilnius Pedagogical University (LT)

1. Basic principles

The aims of any educational activity (face to face or on e-learning platform) is triple. Each valuable activity consist of three parts and provide three types of abilities:

- Cognitive – epistemic abilities (provide information and **knowledge**).
- Thinking and social *skills* (helps to obtain skills of critical and creative thinking, information handling and managing, problems solving, prosperous and fruitful communication, etc.), like:
 - description,
 - classification,
 - evaluation,
 - criterion identification,
 - sensitization to context,
 - analogical reasoning,
 - self-correction,
 - sensitization to consequences,
 - adjusting means and ends,
 - adjusting parts and wholes,
 - prejudice reduction (avoiding of making a premature judgments).
- Normative abilities (helps to mould **values and attitudes**). Normative abilities may be skilled in two ways:
 - “directly” - working in the group,
 - “indirectly” - playing simulation games.

Education involves more than skill development. People may acquire a skill but may misuse it.

Truly educational computer games have to keep knowledge – skills – values approach. Games, devoted only for developing of reaction or kinetic skills, are poorly valuable.

Games should be meant to educate, train, or inform. Examples exist in education, government, health, first response, science. A particular brand of serious game, games for change, includes games created with the goal of **effecting positive social change**. Another subset of serious games is games for health, which are being created by researchers, medical professionals, and game developers for health care applications. The developers aim to use game technologies to create new ways of improving the management, quality, and provision of healthcare worldwide.

Video games and computer simulations have been used in education since their appearance. Many of the video games in use in schools are merely edutainment, games meant first to entertain and second to educate. Often such games are the worst of both worlds - neither entertaining nor particularly educational. Edutainment games also often

fall back on traditional educational strategies such as repetitive drill-and-skill activities that are only more engaging or motivating than a worksheet or quiz because of their multi-media and interactive nature.

Many web-based games are mere edutainment, but others are both entertaining and truly educational.

Many of the most popular and successful games are not violent or overly sexualized - and many address topics of educational value.

One of most important learning skills that children may get from games are those that support the empowering sense **of taking charge of their own learning**. This is most evidenced when learners engage not only in playing, but in the design of games. In the gaming world this practice is widely recognized and encouraged - game remodelling allows players to make the game their own.

Games encourage learning through the provision of what a student needs to know in a context where it will be immediately used. Knowledge is only meaningful when they can be related to experiences. The science text doesn't make any sense to someone who has not done any science (though it makes a great deal of sense to an experienced scientist).

Of course, individual students will learn different things playing a game, and the teacher plays an important role in mediating student understanding. Also, such a game will not be engaging and motivating for all students. Not all games will appeal to all students, not even all gamers.

Ideally, students can design the new game, even if the game is never produced. In the same way that teaching a subject is one of the best ways to learn it, designing a game or simulation about a subject is another great way to gain a deeper understanding of a subject. Some school programs, and after school programs, already exist for the purpose of helping students create their own games. Although most game design tools are prohibitively technical for many teachers or students to use without significant technical learning, newer easier tools are consistently being developed and put to use. This still exercises the design skills necessary to create a game, and it requires an in-depth working knowledge of the subject being simulated in the game.

Games can provide students the opportunity to **practice strategy, develop systems thinking concepts, learn social and studies concepts**, has the educationally beneficial properties of complexity, flexibility, and replayability. More importantly, the game is very simulation-like and encourages student choice, **experimentation, and learning through failure**.

2. Simulations

Simulations are most successfully used in areas where judgment skills, not facts, are being taught. Simulations can be used in many corporate training areas, including leadership training, sales and customer-service skills, new-hire orientation and operations management. Simulations are fun and engaging and allow learners to internalize knowledge by applying new skills in a risk-free environment³.

Communication skills and team-building skills are hard to model well in simple scenarios—they require the simulation designer to create complex real-world scenarios and rules to govern interpersonal dynamics.

Sometimes interactive screenshot walkthroughs of applications and courses with multiple-choice assessments are wrongly called simulations, even though they do not create a simulated environment. Such training applications have their place in corporate

³ Lipman M. Thinking in Education. – Cambridge, 1991., p. 201.

training, but they don't allow learners to **engage actively and learn from their own mistakes in a simulated environment**.

If learners are studying presented materials, it is not a simulation. True simulation is if they are learning from the outcomes of their own actions. If learners are mostly engaged through lecture or presentation material, they do not learn from the consequences of their actions. In a true simulation, the users make choices that lead them down different paths toward different outcomes. The learners' individual choices determine where they find themselves later in the simulation.

Three eligible essential characteristics for narratives or simulations are:

- Literary acceptability (literary and problematical quality of the content),
- Psychological acceptability (games should be suitable to the age, interests, needs, cultural surroundings),
- Intellectual acceptability (not too facile and not too complex).

In simulation task learners should to proceed each of this steps (if not, it means the game is not really based on simulations):

- identification and formulation of problem (in some games problem may be enounced),
- identification of *cause* of problem,
- formulation of purpose - choice of desired end-state or goal,
- devising of hypotheses - identification of means,
- anticipation of possible consequences of each approach,
- selection among alternatives,
- devising plan of operations - finding, how chosen decision may be executed,
- evaluation of effects.

If effects are undesirable and unsatisfactory, learners *themselves* should find, in which stage was the wrong step maid. Mistakes may be maid in one of three stages:

- maybe in identification of problem,
- or in choosing of the best problem solving approach,
- or in planning of the operation for main goal seeking.

Only possibility to learn from own mistakes make e-learning game truly educational.

People might have some intuitive sense of what went right and wrong during the exercise, but clear feedback allows the experience to become tangible to the learner's experience. And because learners have just made mistakes in a simulated environment, they're probably more open to internalizing knowledge than if they had passively listened to a lecture.

In simulations the role of instructor is important. The less familiar students are with the environment being simulated, the more handholding they need—either in the classroom or through virtual collaboration. Simulations can work as stand-alone online tools without a live tutor or instructor, but only if the learner is familiar with the environment that is being simulated.

Epistemic games are a kind of simulations. Epistemic games are computer games that can help players learn to think like engineers, urban planners, journalists, lawyers, and other innovative professionals, giving them the tools they need to survive in a changing world.

When students play epistemic games, they participate in simulations of a society that they might someday inhabit. These games help them to develop ways of thinking and knowing that are valued in the world, giving them a way to imagine who they might someday become. For example, in **The Pandora Project** players become high-powered negotiators, deciding the fate of a real medical controversy: the ethics of transplanting

organs from animals into humans. Along the way, they learn about biology, international relations, and mediation.

Technical barriers and the cost are preventing the widespread use of simulations as learning tools.