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# Introduction to Educational Technology

kultur- und  
sozialwissenschaften



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# 1 Introduction

**This course unit aims to provide an introduction to the field of educational technology.**

Educational technology can be defined as a **design science** or as a **collection of different research interests** addressing fundamental issues of learning, teaching, and social organization. Educational technology as a design science relies on and influences other academic disciplines; in particular the so-called **learning sciences** and **instructional design theory** (didactics).

## Learning goals

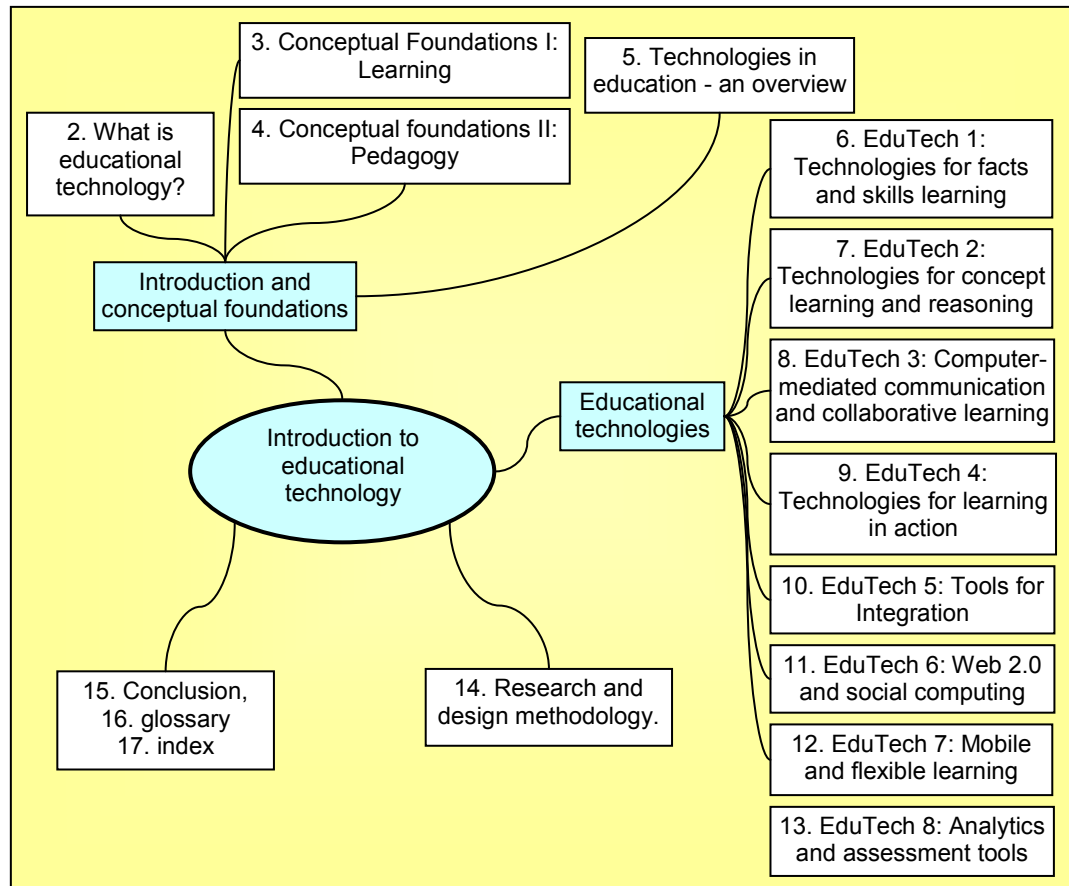
- Understand some conceptual foundations, in particular some principles from learning theory and instructional design and how they interact with educational technology
- Gain a global picture of the field
- Understand various strands of development, research and practice
- Be able to describe major educational technologies and the contexts in which they are being used
- Be able to map technologies to instructional design goals

## 1.1 Architecture of the unit and its chapters

This learning unit contains four parts

1. **Introduction and conceptual foundations:** We start with an introductory chapter that aims to define the field of **educational technology**, followed by two chapters on conceptual foundations (learning theory and pedagogy) and an introductory chapter on technology in education.
2. **Educational technologies:** Educational technologies will be introduced through several chapters. Each chapter refers to a major pedagogical approach that in turn relates to a given learning type.
3. **Research and organizational issues:** We shortly will discuss research and development methodology as well as some change management issues.
4. **Conclusion, glossary, and index:** The glossary includes definitions of some important terms. The index will help you find concepts and major authors.

The following mind map summarizes this organization:



## 1.2 Chapter architecture

Most chapters have a similar organization and we use some “boxes” to highlight important elements.

We start a chapter with a short introduction and preview.

### Introduction and preview

The introduction introduces the purpose of the chapter and includes a short preview.

I also will include a little mind map outlining the section structure.

The introduction is followed by an identification of the learning goals.

### Learning goals

These goals should help you understand what you will learn and sometimes why.

Chapters are structured in several sections. These sections may include taxonomies, examples and case problems or summary information:

Some boxes are used to highlight information, e.g. taxonomies, examples, or case problems.

Some boxes may include intermediate summary information or important taxonomies.

At the end of the chapter, we will present a short conclusion.

### **Conclusion**

The conclusion recalls the most important concepts. It also may be followed by some summary tables or other additional text.

We may then present some review questions.

### **Review questions**

Review questions are meant to help you go over the text and consolidate learning goals.

## **1.3 Keywords**

Educational Technology, educational technologies, instructional technology, technologies, learning theory, pedagogical theory, instructional design

## 2 What is educational technology?

**Educational technology** is a wide field. Therefore, one can find many definitions, some of which are conflicting. Educational technology can be considered either as a **design science** or as a **collection of different research interests** addressing fundamental issues of learning, teaching, and social organization.

Nevertheless, there are a few features on which most researchers and practitioners might agree:

1. Use of technology is principled: Technology means the systematic application of scientific knowledge to practical tasks. Therefore, **educational** technology is based on theoretical knowledge drawn from different disciplines (communication, education, psychology, sociology, philosophy, artificial intelligence, computer science, etc.) plus experiential knowledge drawn from educational practice.
2. Educational technology aims to **improve education**. Technology should facilitate learning processes and increase performance of the educational system(s) as it regards to effectiveness and/or efficiency.

In this short introduction, we will try to give a preliminary definition of the field.

Educational technology as design science

As a design science, educational technology looks at complex multi-dimensional processes involving people, procedures, knowledge, technical devices, and organizational structures. Finding solutions to various problems of learning and teaching implies a process of design, implementation and management and finally evaluation.

Educational technology as engineering science of education

Educational technology research has always had an ambitious agenda. Sometimes it only aims at increased efficiency or effectiveness of current practice, but frequently it aims to improve education by inventing new designs.

*“Technology provides us with powerful tools to try out different designs, so that instead of theories of education, we may begin to develop a science of education. But it cannot be an analytic science like physics or psychology; rather it must be a design science more like aeronautics or artificial intelligence. For example, in aeronautics the goal is to elucidate how different designs contribute to lift, drag maneuverability, etc. Similarly, a design science of education must determine how different designs of learning environments contribute to learning, cooperation, motivation, etc.” (Collins, 1992:24).*

Educational technology as a “place” for fundamental research

Educational researchers often engage in fundamental research in various other fields such as learning theory, didactics and instructional design, change management, etc. Educational technology, in this case, is a medium through which research is conducted.

Terminology

Let us now look at a few **terminology issues**: *Educational technology* is a **field**. **An educational technology** refers to a specific technology that is particularly suited for education. Beyond this distinction and according to research tradition, there are other names for educational technology, e.g.:

- Instructional technology
- Educational communications and technology
- Learning technology

Finally, there exist many technical sub-fields that we shall introduce throughout this text. There are many pedagogical and technical designs: cognitive tools for learning, computer-assisted language learning, computer-based assessment systems, computer-based training, computer-mediated communications, computer-supported collaborative learning, distributed learning environments, electronic performance support systems, interactive learning environments, interactive multimedia systems, interactive simulations and games, intelligent agents on the Internet, intelligent tutoring systems, microworlds, and virtual reality based learning systems.

Educational technology as a collection of sub-fields

We can quite safely claim that educational technology is not a well-defined field, but rather a collection of sub-fields within which both researchers and practitioners may specialize.

In addition, researchers adopt different stances of what it means to practice academic research. One may initially distinguish a series of levels going from the conceptual to the technical:

Conceptual vs. technical research

1. **Fundamental research:** Many researchers in the field choose to adopt a more fundamental research stance focusing on small well-defined problems such as “under which conditions can multimedia animations be effective”.
2. **Technology-supported instructional design** applied to various **domains** of education; major categories are distance teaching, blended teaching, computer-enhanced classroom teaching, industrial training. Other specializations may concern subject matters (e.g. science or language teaching) or approaches (direct instruction vs. project-oriented learning for example).
3. Research on the **design and application of technologies:** Researcher may specialize on subjects like the use of computer simulations in education or more technically, how to build authoring and learning environments for simulations.

To further complicate things, some researchers may combine a fundamental research perspective with a particular kind of instructional design and a particular kind of technology. Depending upon these options, research interests and research methodology will not be the same. From the possible combinations, we probably can identify two major strands of thought:

Learning sciences vs. instructional design

- Educational technology as part of the **learning sciences**. Research is inspired by and contributes to modern learning theory. This strand includes research communities like computer-supported collaborative learning, intelligent tutoring systems, ubiquitous computing.
- Educational technology as **instructional technology**. It is inspired by and contributes to **instructional design theory** and methodology. This strand includes research communities on e-learning, distance teaching, multimedia design.

Even from a pure engineering perspective, it does not make much sense to talk about Educational Technology just in terms of instructional design models or instructional design methods. Any instructional designer should feel concerned by more fundamental disciplines like general learning theory or pedagogical theory. These theories provide interesting insights on issues like the relation between learning type or learning level and appropriate pedagogic strategy, how affect and motivation may influence the learning process, what multimedia design can learn

Relation to fundamental research in learning theory and pedagogy

Research approaches  
and methodologies

from theories on human information processing or cognitive load, why metacognition and collaborative learning is important, etc.

Educational technology can be considered as a design science and as such, it has developed some specific research methodology like "Design-based research". However, since it addresses also all fundamental issues of learning, teaching and social organization, educational technology makes use of the full range of modern social science and life sciences methodology.

### **Summary**

It would appear from our short discussion that defining the field is difficult. Hopefully the reader will build his own definition in the end.

It also appears that research and practice in educational technology strongly relates to other fields. We will continue this tutorial by looking at some conceptual foundations in the next two chapters.