Chapter 22

Human Factors in Distance Learning

Leon J. M. Rothkrantz
Czech Technical University in Prague, Czech Republic

Siska Fitrianie
Delft University of Technology, The Netherlands

ABSTRACT

In this chapter, the authors present a massive open online course (MOOC) on a flooding disaster in the city of Prague. The goal of the MOOC is to increase awareness of citizens of Prague about flooding disasters and to provide a training facility for first responders and the crisis management team of the city. The MOOC is modeled and organized as an IT project. A dedicated didactical model has been designed for distant-learning. To complete a MOOC successfully, three human factors have to be considered: physical ergonomics, cognitive ergonomics, and organizational ergonomics. As an example of interactive learning materials, the authors describe a game-based assignment, where students have to take a role in the virtual crisis management team and to save citizens, properties, and infrastructure as much as possible. This assignment is organized as IT projects, where the human factors play again an important role. The chapter will also discuss educational experiments.
INTRODUCTION

Recently we could observe an enormous grow in dedicated distant-learning courses, called MOOCs (Massive Open Online Courses). Much outstanding higher education, such as MIT and Harvard, started a consortium edX to develop MOOCs based on regular courses at those institutes. Many other universities started similar consortia to distribute courses for distant-learning. Students all over the world can enroll in MOOCs. MOOCs are free of charge; usually, they have no entrance requirements and are available 24/7. There have been many MOOCs developed for IT and business-oriented students.

Distant-learning courses have been developed for students who are unable to attend lectures because these students have regular duties, such as jobs, taking care of family members, live in remote locations, or suffer from disabilities. Nowadays, distant-learning material has also developed as supporting materials for regular students. Over the years, many ways of distant-learning have been developed. For example, the distribution of printed or digital books and lecture notes, and regular video lectures that have been recorded and are available online as video lectures. MOOCs differ in many aspects from traditional distant-learning. The learning material is highly interactive and composed of visual presentations such as images, audios, and videos. Gaming and simulations are also often used as learning materials. Others are based on cooperation using different social media tools.

One of the problems of MOOCs is the high dropout rate. Many students stop their course even before these students have been started or shortly after starting the course. Most MOOCs are self-paced courses, students can enroll anonymously and because of the massive character, there is no supervision individually. The challenge of the designers of MOOCs is to reduce the number of dropout students to a minimum. This can be realized by using dedicated didactic models with a focus on human factors. The process of teaching-learning is about transferring and processing information. Usually, the learning content of a course plays a dominant role. However, human factors such as cognitive abilities, motivation, self-paced behavior, and cooperation have their impact on the learning process. We developed a dedicated didactical model for distant-learning that included human factors covering the following three overlapping areas:

1. **Human anatomical, physiological and biomechanical characteristics.** To perform optimally, students should have a good physical and psychological condition. However, in the weeks of exams, students are supposed to study more than 60-70 hours a week, in which most of the time sitting behind a computer screen. This yields more and more students suffering a burn-out syndrome that emerges from bad physical-healthy conditions.

2. **Cognitive social characteristics.** An academic study involves cognitive abilities as perception, memorizing information, information processing, reasoning, task analysis, cooperation and performance evaluation.

3. **Organizational, environmental characteristics.** Study-learning processes should be structured according to an appropriate didactical model. The teaching-learning activities should be modeled and structured by a distant-learning tool, an online learning platform and learning management tool, supporting optimal access to the learning material, supporting learning activities and cooperation between students.

In 2019, we launched a dedicated MOOC on the flooding of Prague1. One of the goals of the MOOC was to increase awareness of flooding disasters of civilians of Prague. Another goal was to provide a training platform for the city council and first responders. Visualization, simulation, and gaming were