



## POSSIBILITIES OF E-LEARNING APPLICATION IN AVIATION

**Michal ONDRUŠ, Dorota LIPTÁKOVÁ, Tomáš PUŠKÁŠ\***

Technical University of Košice, Faculty of Aeronautics, Rampová 7, 040 21, Košice

\*E-mail: [dorota.liptakova@tuke.sk](mailto:dorota.liptakova@tuke.sk)

**Summary.** E-learning offers a wide variety of tools to be used in real-time but also asynchronous learning. The proposed paper starts with a review of research projects conducted in the field of aviation e-learning courses for different occupations. Further e-learning characteristics are described with an overview of e-learning components, pacing-approaches and time spacing of the courses. The aim of the article is to give the reader an overview and provide an impulse to considerations about further expansion and application of e-learning in aviation industry.

**Keywords:** aviation; cognitive domain; e-course; e-learning

### 1. INTRODUCTION

Many organizations and institutions use e-learning because it can be as effective as traditional study methods with compulsory attendance but with lower costs for the training. The development of e-learning tools is more expensive than preparation of study materials and lecturer trainings, especially when multimedia or highly interactive methods and tools are used. However, the cost of using e-learning (including the cost of web servers and technical support) is significantly lower than the cost for rental of property (study rooms) and equipment, instructor time, participant's travel time, and the productive time of employees lost during attendance in class.

In addition e-learning can be used by a wider audience involving students who have difficulty participating in regular classroom training because they might

- be geographically dispersed with limited time and / or travel resources;
- be in conflicting and post-conflict areas and have limited mobility for security reasons;
- be limited to classroom meetings for cultural or religious reasons;
- have difficulties with face-to-face communication.

### 2. E-LEARNING IN AVIATION

Aviation is well known for its fast development and open access to creation and implementation of new technologies. On the other hand safety has always been strongly taken into account, starting with the proper education and training of staff. New methods and means of access to information and thinking or information processing by humans allows as to explore new possibilities in this field as well. Several institutes have already started with e-learning activities and conducted thorough research on the performance of the students.

Sheviakov et al. conducted research on the organization of the foreign students' aviation teaching process using multimedia technologies at the Civil Aviation Institute of Ivan Kozhedub Kharkiv National Air Force University. The findings have shown that introduction of advanced

information technologies into the educational process forms a way to e-learning what is changing fundamentally the concept of the modern education [1].

The possibility to improve aircraft safety and reliability by aircraft maintenance technician training via e-learning was studied by Dalkilic, 2017. Field exercise showed that developed e-learning training model, which overcomes the disadvantages of traditional face to face training models, succeeded to improve the attendees' theoretical knowledge level and when combined with the practical trainings given to aircraft maintenance technician candidates in maintenance organisations during their experience periods, will be very successful in improving safety and reliability in aviation maintenance operations [2].

Paper published by Janiga, Rojcek and Cernak, 2017 deals with the implementation and sharing practical experiences of the Learning Management System Moodle, which was deployed for a specific group of educators. The group consisted of pilots in a private aviation training company where the system was being implemented and serves as educational support. The outcome of the study was a functional educational system developed according to flight standards and deployed in a flight school company. In the paper the authors described the functionality of the system [3].

E-learning in courses for flight attendants was more closely investigated by Araoz Camacho et al. 2016. Grades received by students using technological tools showed an increase in comparison to student using traditional workbooks. The authors conclude that the inclusion of technological tools in attendants training processes could help to improve the results of evaluations and the development of specific skills required by this kind of technical personnel [4].

Important research considering helicopter pilots was done by Potter, Blickensderfer and Boquet, 2014. Their prior research has indicated that ineffective pilot monitoring has been associated with aircraft accidents. Their study examined the effect of using e-learning to enhance helicopter aircrew monitoring skill performance. Subjects who completed the e-learning training module scored almost twice as high as did the control group on the administered knowledge test (experimental group, mean = 92.8%; control group, mean = 47.7%) and demonstrated up to 150% more monitoring behaviors during the simulated flights than the control subjects [5]. The opinion of the authors is that a relatively inexpensive and brief training course implemented through e-learning can foster monitoring skill development among helicopter pilots. This is a very important step to increase the safety levels expected in aviation operations [6].

### 3. CHARACTERISTICS OF E-LEARNING

A training program can focus on developing skills in different learning domains:

- cognitive skills, which may include knowledge and understanding (e.g. understanding of scientific concepts), ability to follow directions (process skills), as well as training to apply new methods to solve problems (thinking or mental skills);
- interpersonal skills (e.g. skills related to active listening, presentation, negotiation, etc.);
- psycho-motor skills that involve gaining physical perception and training of movements (e.g. sports or driving)
- Affective skills based on the ability to build attitudes, motivation, willingness to participate, valuing what is being learned, and ultimately incorporating the values of a discipline into a way of life.

#### 3.1. E-learning education areas

Most e-learning courses are developed to build cognitive skills. The cognitive domain is best suited for e-learning, as the development of thinking skills may require more interactive learning activities, as these skills are most effectively trained by „action“. The e-learning method allows for self-paced learning with repetition and even assessment of previous activities and attempts.

Interpersonal domain can also be addressed by e-learning using specific methods. When using an interactive form of teaching with appropriate feedback, e-learning can also be used to change attitudes and behaviors, specific for affective domain.

E-learning is a good choice when:

- there is a large amount of content to be delivered to a large number of students;
- students come from geographically dispersed places;
- students have limited mobility;
- students have limited time of day to pursue education;
- students do not have effective listening and reading skills;
- students have at least basic computer and internet skills;
- students are required to develop a homogeneous basic knowledge of the subject;
- students are very motivated to learn and appreciate progress at their own pace;
- content will be re-used in the future for different groups of students;
- education focuses on building cognitive skills rather than on psycho-motor skills;
- the course deals with long-term rather than short-term learning needs;
- data needs to be collected and monitored [7].

Since e-learning is not ideal for all purposes, it is unlikely to replace classroom training in all organizations. The most cost-effective application of e-learning can be complementary to conventional training so that as many students as possible can be approached by combination of these two methods.

### **3.2. E-learning pacing approaches**

E-Learning courses can be paced by two approaches:

- self-paced;
- instructor-paced.

Pacing refers to how the course administrator runs the course, and whether there are fixed deadlines for completion of the course materials on a set schedule. In self-paced regime students are alone and completely independent, while e-learning led by instructors provides them with different levels of support from tutors and instructors and collaboration between students. Often e-learning courses combine both approaches, but it is easier to compare these two options separately for clarity.

### **3.3. Self-paced e-learning:**

Students are offered an e-learning course (also called „web based training“), additional resources, functions as well as evaluation of final tests. Courseware is usually placed on a web server and students can access it from an online learning platform or on an offline application. Students can learn at their own pace and define an individual approach based on their own needs and interests. E-learning providers do not need to plan, manage or track students through the process. The content is developed according to the set of learning objectives and provides elements such as text, graphics, audio and video using various media. The content must provide as much educational support as possible through explanation, examples, interactivity, feedback, glossaries, etc. So it is self-sufficient for the students. However, students are usually offered some support, such as technical support by email or e-tutoring, live chat consultation. If an e-learning self-study course is offered through an internet connection, there is a possibility to track student actions in a central database.

### **3.4. Instructor-paced e-learning**

In this model, a linear curriculum is developed that integrates content and activities into a chronological course or curriculum. The course is planned and led by an instructor and / or facilitator through an online learning platform. E-learning content for individual study can be integrated into an instructor's lecture, individual assignments and/or collaboration between students. Students and instructors can use communication tools such as emails, discussion forums, chats, polls, boards, application sharing, audio and video conferencing for communication and collaboration. The last step in learning process usually involves exercise or assessment, test to measure the learning process.

## **4. E-LEARNING COMPONENTS**

E-learning activities can combine different types of e-learning components, including:

- content of the e-learning course;
- e-tutoring, e-coaching, e-mentoring;
- community learning;
- virtual class.

Below these components will be described more closely.

### **4.1. Content of e-learning course**

The content of e-learning course may include:

- simple educational resources;
- interactive e-lessons;
- electronic simulations;
- work tools.

Simple educational resources are non-interactive resources such as documents, PowerPoint presentations, videos or audio files. These materials are non-interactive in the sense that students can only read or watch the content without performing any other action. These resources can be quickly extended. When they are created according to defined goals and in a structured way, they can provide valuable learning, even if they do not provide any interactivity.

The most common approach to self-paced e-learning is through the use of interactive e-lessons. Electronic lesson is a linear sequence of screens that can include text, graphics, animation, sound, video, and interactivity in a question and feedback form. Electronic lessons can also include recommended reading and links to online resources, as well as additional information on specific topics.

Simulations are highly interactive forms of e-learning. Basically, the term „simulation“ means creating a learning environment. It „simulates“ the real world, allowing the learner to explore it in a safe environment. Simulation is a specific form of web training that creates a learning situation and allows the learner to react dynamically.

Work aids provide instant knowledge. They can take several forms and can be delivered on different platforms (e.g. as printed document, via smart mobile devices etc.). They usually provide immediate answers and specific questions, helping users to perform their tasks.

### **4.2. E-tutoring, e-coaching, e-mentoring**

Services that provide a human and social dimension can be offered in the form of passing on learning experiences.

E-tutoring, e-coaching and e-mentoring provide individual support and feedback to students through online tools and facilitating techniques.

### 4.3. Community learning

Collaborative activities range from discussions and knowledge sharing to collaborative project work. Social software, such as chats, discussion forums and blogs is used for online collaboration between students.

Synchronous and asynchronous online discussions are designed to facilitate communication and knowledge sharing among students. Students can comment on and exchange views on course activities or contribute to group learning by sharing their knowledge.

The work within the collaborative project presupposes cooperation between students during fulfillment of the task. Collaborative activities can include project work and scenario based tasks.

## 5. SYNCHRONOUS AND ASYNCHRONOUS E-LEARNING

E-learning activities can be synchronous or asynchronous.

Synchronous events run in real time. Synchronous communication between two people requires them to be present at that time. Examples of synchronous activity are conversations in interviews and audio/video conferences.

Synchronous activities include

- online chat;
- video;
- audio conference;
- live webcasting;
- application sharing;
- blackboard;
- poll.

Asynchronous events are time-independent. An example is the so-called asynchronous e-learning course, as online learning takes place at any time. Email or discussion forums are examples of asynchronous communication tools.

Asynchronous activities include:

- e-mail;
- discussion forum;
- Wikipedia;
- blog;
- webcasting.

The flexibility of internet technologies creates gray areas around the concepts of synchronous and asynchronous. For example, video and audio sessions may be recorded and made available to students who cannot attend the live stream.

## 6. CONCLUSION

E-learning offers a wide variety of tools to be used in real-time but also asynchronous learning. While the use of electronic form of study material might indicate only a passive way of information consumption, in fact e-learning courses can be interactive. Interaction can take place between the student and course interface (through questions, call for action etc.), with the lecturers or other students through chat rooms, forums or knowledge sharing [8].

Depending on the goals and structure of the course students can proceed through the course instructor-paced, or they can determine their own pace in self-paced courses, usually in a recommended timeline.

Although e-learning courses are usually used to develop skills in the cognitive domains, skills in other domains can be also impacted. The research of Potter, Blickensderfer, and Boquet shows a great example of utilization of e-learning for training the psycho-motor domain, namely training monitoring skills in helicopter pilots [5].

As shown in the research review in the second chapter of this paper, e-learning and its utilization in aviation has already been studied in a wide variety of aviation occupations such as helicopter pilots, maintenance workers and flight attendants. In all of these cases e-learning proved as a great tool to raise the knowledge-level of the course attendees.

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