

# Learning objects and training complex machines

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**Abstract.** There are situations in the operation of complex machinery which is significant pressure. In need of capturing, interpreting and processing information from instruments, often in seconds. This occurs in the middle where it operates the pilot and the aircraft will be established a set of operations that will culminate with a maneuver, consisting of a substantial and binding set of procedures performed for this driver. This has little time to evaluate and act, supported by aircraft instruments and external environmental signals captured by the senses, which will stimulate conditioned actions that, if executed without due accuracy, is reflected in a deadly mistake. These situations cause a state of tension and unpredictability, especially when there is bad weather and / or no visibility and bad wind conditions occur and are not supportive or even shrinkage, or even partial or total ability to operate the airplane happen..

Keywords: processing information, ergonomic, simulation

## 1. Introduction

In recent years, several authors have conducted investigations on the use of Learning Objects (LO) for the understanding of mathematical concepts [1] cites, for example, LO in the teaching of mathematics, its advantages and limitations on non-digital materials (manipulatives or concrete materials). Records even if the computers can be used for several purposes including: as an information source, resource to fuel the process of teaching and learning, as an aid in the construction of knowledge, autonomy as a means to develop the use of software that allow to think reflect and create solutions, and as a tool for performing certain activities.

Several authors have conducted investigations on the use of Learning Objects for the understanding of complex concepts and to help state education, with its advantages and limitations on non-digital materials (manipulative or concrete materials). Records even if the computers can be used for several purposes including: as an information source, resource, to fuel the process of teaching and learning, to assist in the process of building knowledge, as a means to

develop autonomy by the use of systems that think, reflect and create solutions, and as a tool to perform certain activities. Learning object is a term that emerged in the XXI century to indicate digital resources (video, animation, simulation, etc.) that allow instructors and students to explore specific concepts in several areas of knowledge. There is still no consensus on its definition. There is agreement that Learning Objects must: be digital and accessed by computer, be small and in time learned a lesson or two and focus on a single learning objective. Each object should help learners to achieve the specified goal. Objects can be assembled to represent a course or a body of knowledge. Learning concepts and practices are similar to those applied in the training of aircraft pilots using flight simulators. In general, Learning Objects include content that can benefit from the technological potential available, for example, notions of isometric transformations.

The applications of Learning Objects are been used to facilitate the use of technology by teachers and students. The facility should be restricted to technical aspects of handling the learning object and not the loss of complexity of content. It should create some interesting situations for the students allowing for reflection on fundamental concepts of the focus

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of learning. Must be based on theoretical elements of goal-machine [3].

The flight simulators: a common feature of the simulator is operating in imitation of real activity. We have various levels of abstraction and human involvement in a simulation. Since the purpose of flight simulators is to simulate the behavior of an aircraft, they involve a low level of abstraction and a high level of human involvement. The essence of flight simulator is to create a dynamic model of the behavior of an aircraft allowing the human user interacts with the simulator as part of the simulation. The shape of the simulation involves a combination of science, technology and art to create an artificial reality for the purpose of research, training or fun. A flight simulator is composed of a model, real or theoretical, a device through which the model is implemented and an enforcement regime, in which the model and the device are combined using a particular goal. The Link Trainer was a great success during the '30s. It was produced in several versions. In 1937 the first Coach of Link sold to American Airlines (aviation company) and Royal Air Force (England). In WWII, the major air forces performed their basic training in links or derivatives. Procedures occur during the flight that are considered critical, as the landing (figure 1).



Figure 1  
A critical moment of the flight – Landing

In this phase of flight requires that all of the pilot and learning where each of these events are never the same as above. A process that can simulate and train a pilot in these activities can save lives and contribute to flight safety.

## 2. Contextualization

Develop or select the Learning Object, means considering the most important aspects of lesson planning and aviation presents advantages over lectures. But only its use does not guarantee the total learning, if not created opportunities to acquire the underlying reflexes. The Link Trainers (flight simulators) have been developed to the stage of the duplication of tools, layout, appearance and performance of specific aircraft and they are fundamental in improving and maintaining the skills of pilots and crews, design, design of new aircraft and evaluating new systems relevant to aerospace activities.

In recent years, several authors have conducted investigations on the use of Learning Objects (LO) for the understanding of mathematical concepts [4], for example, LO in the teaching of mathematics, its advantages and limitations on non-digital materials (manipulatives or concrete materials). Records even if the computers can be used for several purposes including: as an information source, resource to fuel the process of teaching and learning, as an aid in the construction of knowledge, autonomy as a means to develop the use of software that allow to think reflect and create solutions, and as a tool for performing certain activities.

## 3. Applications of learning objects to operate machinery training complex: the flight simulators

A common feature of simulators is the attempt to provide an operating imitation of real activity. We have various levels of abstraction and of human involvement in a simulation. Since the purpose of flight simulators is to simulate the behavior of an aircraft, they involve a low level of abstraction and a high level of human involvement. The essence of a flight simulator is to create a dynamic model of the behavior of an aircraft in order to allow the human user to interact with the simulator as part of the simulation. The shape of the simulation involves a combination of science, technology and art to create an artificial reality for the purpose of research, training or fun. A flight simulator is composed of a model, real or theoretical, a device through which the model is implemented and an enforcement regime, in which the model and the device are combined through a technique used to achieve a particular goal.

#### 4. Descriptive of learning objects

Learning objects is a term emerged in the early twenty-first century to indicate digital assets (video, animation, simulation, etc.) which allow instructors and students to explore specific concepts in several areas of knowledge. Although there is still a consensus on its definition points out that several authors agree that learning objects are to: (1) be digital, ie, can be accessed through the computer, (2) be small, ie can be learned and used at the time of one or two classes and (3) focus on a single learning objective, that is, each object must help learners to achieve the specified goal.

A collection of objects can be assembled to represent a course or a body of knowledge. These concepts and practices of learning are similar to those applied in the training of aircraft pilots using flight simulators. In general, learning objects include content that can benefit from the technological potential available, such as notions of isometric transformations

#### 5. First simulators

The simulators were built for the purpose of saving pilots and aircraft accidents. "Professor Sanders' presented in 1910 was among the first to enter the field. He was an airplane mounted on a modified universal joint attached to the ground. In it a student could learn the moves needed to control the aircraft and maintaining balance in flight. We can see in figure 2 the idea of using an airplane to the ground to set basic training was patented in England in 1910 by Billing P.

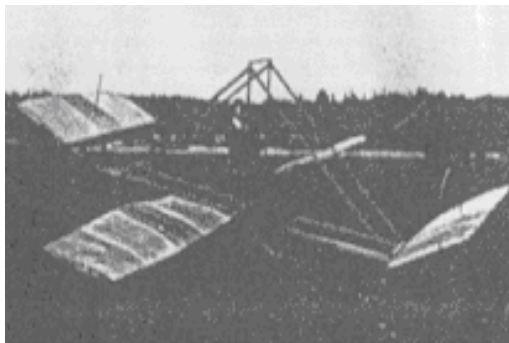


Figure 2  
The first simulator

The Link Trainer was a great success during the '30s. During the II war, It was produced and sold in various versions for various countries, including Japan, USSR, France and Germany. In 1937 he was given his first Coach of Link sold to an airline, American Airlines. The RAF also received his first this year Link. At the beginning of World War II, many of the largest air forces did their basic training or derivative instruments links as shown in figure 3..



Figure 3  
Simulator of second War age

#### 6. Considerations

When selecting or developing learning objects, one must consider several aspects. One of the most important is the planning of the lesson to the PDB, where the aircraft must also have advantages compared to lectures. Only its use is no guarantee that there will be a learning by the student, if it does not create opportunities for students to acquire underlying reflexes. The links Trainers (flight simulators) have been developed to the stage where the layout and appearance of the instruments and performance of specific aircraft were duplicated.

Second Dekker (2007), some teachers argue that the LO motivate students. However, the motivational aspects of an LO should not be restricted to the mere use of technology or the presence of colors, sounds, or games in LO. These elements are important, but the key is that the LO present a problem situation that is challenging for students to develop and instigate hypotheses to solve it. The flight simulators are widely used for training pilots and crews intact; its main advantages are:

- Reducing the cost of education and training of personnel The purchase price of a flight simulator range from 30 to 65% of the aircraft price and the cost of operation is around 8% of the cost of operation of the real aircraft.
- The reduction of training time and training of personnel training can be focused on a specific maneuver or procedure, not having to repeat the flight.
- Safety-simulator potentially dangerous situations can be experienced without risk of life or loss of equipment. Prior to the adoption of simulators for this type of training, in some cases more accidents occurred during training for emergencies than in their actual occurrences. One such case was the practice of driving asymmetric after the simulated failure of one engine, which resulted in the loss of the aircraft.
- Timeliness and availability-for a training flight is necessary for the aircraft and airspace available, besides being necessary the collaboration of the weather.

The flight simulators play a key role in training, improvement and maintenance of the skills of pilots and crews, but also play an important role in the conception and design of new aircraft and new systems of assessment relevant to aerospace activities. The figures 4 and 5 present the modern simulators.



Figure. 4  
Modern simulator (external)



Figure 5  
Modern simulator (internal)

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