How to use simulators

TOOLS FOR SKILLS
INTEGRATED LEARNING OF ENGLISH AND FORESTRY
TEACHER TRAINING
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History of simulators

Edwin Link was the inventor who designed one of the world´s first flight simulators which was especially suitable for flight in training purposes. Simulator of Edwin Link was called Link Trainer after its inventor. The Link Trainer was based on the use of pneumatic air which moved the cockpit part of simulator. This movement simulated the feeling of flight when the student pilot was sitting in the closed cockpit, the moving cockpit was responding to the simulator´s control stick. Student pilot was also receiving accurate information from the different indicators mounted on the instrumental panel. This function was crucial when simulating flight under instrument flight conditions or flight in poor conditions. All of this was because there were no visibility outside of the closed cockpit, student pilot was forced to rely on the information provided by the simulators instruments.

Link Trainer proved to be a commercial success during the 1930´s when several different civilian and military aviation interested of simulator. In some countries the Link Trainer were used still at in the late 1960´s an early 1970´s.

Picture 1. Link Trainer at Finish aviation museum.

Simulators for forest machines

First simulators for forest machines became at the end of 1980´s. Simulators were just simple handlings for harvester head with light indicators. When student pressed the button of some movement or action of harvester head, there was light indicator that shows for the student which button he/she has pressed.

Forest machine simulators as modern time were established at the end of 1990´s beginning of 2000´s. These days simulators have a lot of different task and evaluation possibilities. In many simulators there are both types of simulations, forwarder and harvester. Pedagogical aspects have taken a giant leap. That helps evaluation and debriefing.

Picture 2. Forest machine simulator from Komatsu.

The benefits of simulator training

The use of simulators in training and educational field is increased a lot in last decades. It offers a lot of benefits on many different fields. For example in medicine field use of simulations in training have been described as revolution. It is possible to learn skills in risk-free environment while previously such learning could only be learned on actual patients.

There is also many reasons for use of simulations in the training of new forest machine operators. Mainly these reasons are connected to the improvement of prerequisites of learning, safety, financial aspects, effectivity and development of simulation training techniques and pedagogical aspects.

What makes simulator training more effective?

Simulators teach the skills that are needed in a certain profession, including decision-making skills, planning skills and problem solving skills. Simulators make the learning more efficient and safe than we can be achieve through traditional learning methods. When student can transfer the skills from training to the working life, they are more able to deal with real-life situations. Simulator training can then focus on certain practical skills.

When comparing simulator training to the traditional training methods, simulator training produces professionals who learn the needed basic skills faster before the practical training periods. This means, that the practical training period can be shorter than before simulators. This makes it possible for students to engage in practical work on the job learning period earlier.

Use of simulators and simulations in training opens open´s up totally new possibilities that are better that we have never had before. Simulator fidelity are much higher than they used to be in the past few years earlier. Simulation models has evolved and also graphics and user interfaces have development a lot. A functional user interface which is a big part of user-friendliness and applicability to training purposes is the central requirement for using a simulators in training.

It is not only about the development of simulators but also of understanding and learning of practical skills training with simulators. We have more knowledge how to use simulators when we are teaching practical skills with simulators and different simulations.

Use of simulators does not eliminate needed study through other methods. Training with simulators is based on the assumption that certain theoretical knowledge has already been acquired. Example when using driving simulators, students must be familiar with traffic rules. Without basic theoretical knowledge student is not able to perform the exercises in the desired manner. Therefore, theoretical basics and knowledge should be teach more with traditional learning methods.

Benefits of simulators use for instructors:

Use of simulators makes it much easier to arrange the practical part of training. This is because practical exercises are performed in a simulator environment which is much simpler to organize and repeat than an authentic environments. Simulator training is also risk-free which makes the instructor´s job easier. Economical costs and risks cause no concerns.

Benefits of simulators use for an educational organisation:

Using simulators makes training more cost-effective which is general a big advantage to the economy when comparing training with real forest machines. Learning results and time that each student spends in training are also advantage for educational organisation.

Knowledge and skills of the trainees can be development exactly in areas where improvements are considered most necessary, like teamwork skills and communication skills.

Benefits of simulators for students:

Students can acquire decision making skills and many other skills needed in practice earlier than before, when simulators are used in training. When they start working and training at workplace they are able to survive better of challenges of their work. Simulator training gives such skills that is needed further than before.

When training periods with simulators are planned so that they are meaningful to the students that improves their motivation. Motivation is really important for learning new skills as we all know.

Basic structure of simulator training

Planning of the simulator exercises is the most important issue when simulation training is started. Planning of simulator training requires usually more time than traditional training methods. It is really important that the instructor familiarize themselves with the simulator and its functions. Teaching and working with simulators will be more effective when instructor knows how to behave in the simulation environment. It is recommended that instructor participate in training for simulator instructors.

Basic structure of simulator exercises comprises three parts:

1) Briefing
2) Simulator exercises
3) Debriefing

1) Briefing is about guidance for student to what to do and practice. Students familiarize themselves with the assignment either by themselves or under the instructor's guidance. If the practice includes various parts, then instructor's guidance

is necessary. Briefing part can include also some demonstration how the practice should be done at right way. Example there can be a video where experienced professionals perform the task question, or the instructor can also do the demonstration. Instructor can also cover all the issues that are crucial for the practice. Students can have also some other background material that supports for right performance.

2) When students have understand the aim of practice is time to begin the performance. Students perform the given exercise either by themselves or as a group. Simulations that are performed in group teach more than just practical skills, students can learn also team work and communication skills.

Simulator exercise turns theoretical part to practice. Student must apply knowledge and skills they have acquired earlier and through other methods to different situation. This is the important point when theoretical knowledge became a skill.

The instructor must be ready to support the student during performance if it is needed. Role of the instructor can be active or the instructor can also remain in the background. These things about the instructor's role depend of the performance and students skills level. However, instructor´s should remember that detailed feedback concerning performance will not be given until at the debriefing phase.

3) Debriefing is important for students because that is the moment after performance when the instructor gives feedback for students. Without debriefing students do not know what they did well and what they should still work on. Usually students are unable to analyse causes and effects what has happened during performance. Evaluating performance in detail, taking into account all affecting factors is often quite difficult. When working in real environment receiving feedback is more obvious than the feedback in a simulation environment. On the other hand a real environment delivers more "punishments" for mistakes and failures.

During debriefing students evaluate their own performance and in addition students can give also feedback to one another. Because of those few things feedback from instructor is really important for learning process.

Feedback that is given for students should be more describe and focus their performance, not point just out the mistakes they have done. Debriefing is a safe way to receive feedback. Those issues that have been discussed during the debriefing, example some failures during performance will not be discussed after debriefing.

How to organize simulator training?

When educational organisation invest a forest machine simulator they should remember that the simulator alone does not solve any pedagogical problems. Organisation who plans simulator training is important to understand that the

planning of teaching methods with simulators takes a lot of time. When organisation starts to take first steps in use of simulators, those steps can be hard.

It is really important that the support of organisation and management is essential. Use of simulators means changes in teaching methods. If simulators have not been used earlier extensively, this change is significant. All significant changes require the support of management.

Simulator exercises should automatically be included as a part of courses and different training programs. Then it will be more likely that the use of simulators will become everyday routine for organisations.

Principles that should be used in the planning of the training with simulators. Some common misconceptions are reviewed regarding training based on experiential learning, or learning by doing.

When the learning situations begin, students should became mentally involved in the situations. Students should be put to situations that they should use their problem solving skills and think how to achieve and develop for better results. A mere mechanical performance does not ensure the learning process.

Learning environment should be created so that there is payed attention for physical and psychological fidelity of learning event. Simulations and the realistic sight of them is also really important, practices should became more and more as the learning process.

Scenario of simulation should be founded on the student's earlier knowledge or experience. Then it is possible to create accurate mental models by providing them on opportunity to process information. Experiential learning consists of experience, observation/reflection generalization and testing. When practice is planned thoroughly there is included all those elements, which promotes learning.

Understanding cognitive fidelity requires that the student use act or information as they would act in real environment. Different and realistic scenarios are helpful in this issue. Then student get information in the same way as in real conditions. So cognitive processes in the learning environment should correspond to the same process at work. High physical fidelity, real like environment or devices is necessary for learning some skills but not all.

Transfer of learning

One of the most important things to transfer into the real life situations are the skills that are learned while students practiced with simulators. Especially in simulated learning environments it is important to pay attention to the transfer of learning, it is pivotal concept related to learning.

Transfer of learning will happen when the student applies something that he/she has learned before a new situation. New situation can differ some extent from earlier experiences. Then, one has to be able to apply earlier learning. When we understand the transfer of learning we can plan training in a way that it is supporting and strengthening to the process of learning and transfer of learning.

Transfer of learning is positive when practicing and training facilitate the right skills in the real operational environment. Negative transfer of learning happens when learning environment is not arranged properly and does not match for reality or the guidance and support for students has failed. Neutral transfer means that something is learned with simulators but does not affect skills and knowledge in the real operational environment.

Transfer of learning functions in many different and different levels. It can be best seen in a practical working situation. Transfer of learning is strengthened when the skills to be learned are practiced varying conditions in which they are used later. It can also been strengthened by searching for connections between assignments and conditions as well as by seeking of rules and principles between the skills to be learned. Especially the learning of metacognitive skills promotes transfer of learning. The skills of controlling his/hers own learning has huge effect on skills learning.

Problems of simulator training

There are many things that can also cause mislearning. Simulation environment does not work necessarily as in real environment. In these cases the simulator cannot be used to practice certain activities since the models of simulation do not properly replicate the situation in real life.

The task which is being practiced with a simulator may lack some critical factors that are crucial for performing this task. Problem can be solved by improving the scenario in question. It is extremely important to give the student a debriefing of his/her performance and inform them about their deficiencies. Otherwise there is a danger of mislearning.

Use of the right type of simulator and simulations have big role in securing the right process of learning. There are different types of simulators and one must be aware which type to use when learning new skills. Using the wrong type of simulator or simulations causes mislearning. There also needs to be a balance between simulator training and real life training. Otherwise there is again danger of mislearning.

References

Salakari, H. 2011 The Simulator Instructor´s Handbook. Finland: Eduskills Consulting.
Picture 1 Kari Kytömäki
Picture 2 Komatsu Forest