Application of blended learning in air cargo security

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Summary: Container security and contraband interdiction in air cargo have become highly relevant topics at airports all over the world. The European Union (EU, 2010) requires detailed measures for standards in the field of aviation security that also cover training and certification of security personnel. In Sury, Riesen, Nef & Schwaninger (2011) we demonstrated how trainings are ideally designed according to Gerson (2000) and Murphy, Neequaye, Kreckler & Hands (2008) and how they are evaluated according to Kirkpatrick (2010). Based on these ideas, a complete training was created and tested with two participants who were to become screeners working with valuables’ cargo. Participants reacted very favorably (Kirkpatrick level 1) and displayed excellent gains in knowledge (Kirkpatrick level 2). However, instructors noticed that the amount of text inside the web based training (WBT) tempted participants to skip slides inside the WBT. In an attempt to create even more engaging WBT content, future editions of the cargo training will be built according to the four levels of interactivity as defined by the Department of Defense (1997).

Key words: blended learning, aviation security.

1. Introduction

Aviation is one of the key industries on a worldwide scale. The transportation of goods and passengers by means of airways is a major facilitator of the global economy. Because of its economic importance and the huge public interest in incidents involving aircraft, aviation is an attractive target for unlawful interferences based on a range of motives.

To protect human beings, goods, and infrastructure, various organizations connected with aviation have to implement extensive security measures. High quality security measures require high quality training of human operators. Despite the high evolution of modern technology, in the end it is still the human operators who need to assess a current situation and react accordingly.

In Sury, Riesen, Nef & Schwaninger (2011) a concept for blended learning (Bonk, 2006) was demonstrated for application in the field of air cargo security based on the ideas of Gerson (2000) and the research of Murphy, Neequaye, Kreckler & Hands (2008). In a first step, a complete cargo security training program was developed with the help of these two concepts to meet the requirements by the Federal Office of Civil Aviation (FOCA, 2010). In a second step, this training was then run at the premises of a company shipping highly valuable goods at a Swiss airport. To prevent robberies, this company already entertains a high security standard, but it needed to
acquire the hardware and the knowhow to scan for terrorists’ threats in the future, too. After the initial purchase of a capable x-ray machine, the cargo security training program was used to provide the new cargo screener with the necessary knowhow to operate the x-ray machine and detect potential threats.

For the purpose of evaluating the cargo security training program, the four step method by Kirkpatrick & Kirkpatrick (2006) was used. In a first step, the trainees’ satisfaction with the training program is being measured. In a second step, the trainees’ performance is measured in a test in order to decide whether they met their training objectives or not. In a third step, a work analysis is being run to test whether the skills acquired in the training are being transferred into daily work. In a fourth step, key performance indicators (KPI) are checked to find out if the training had a beneficial result on these, too. Kauffeld, Brennecke, & Strack, (2009) say that evaluations in modern organizations hardly ever go beyond the measurement of the trainees’ satisfaction with the training. However, for the training at the airport it was crucial to minimally measure the trainees’ satisfaction and their final performance in order to determine if they are fit for the certification tests later by the FOCA.

2. Methods

The cargo security training program was delivered for two trainees in July 2011 at the premises of a company located at a Swiss airport. The training covered a time span of 10 days as required by the FOCA (2010) and included initial lessons, repetitions of said lessons, a final exam including both a written test and a practical part, and a questionnaire to assess trainees’ satisfaction with the training.

All lessons were designed according to Gerson’s (2000) E-CLASS model (see Table 1) with the Act & Share part being designed according to Murphy, Neequaye, Kreckler & Hands (2008) where applicable. During the practical parts of the training, a strong emphasis was put on how to operate an x-ray machine and how to detect suspicious clues as this is the most important behavior expected on the job later.

Table 1: The E-CLASS structure of a blended learning lesson.

<table>
<thead>
<tr>
<th>E-CLASS Step</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explain</td>
<td>Used to motivate the student by explaining the lesson’s purpose and connected benefits.</td>
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<tr>
<td>Clarify</td>
<td>The main part where theory and the learning content in general is being presented.</td>
</tr>
<tr>
<td>Look</td>
<td>In this part, one or several examples are being presented to illustrate what previously was discussed in theory.</td>
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<tr>
<td>Act &amp; Share</td>
<td>In this part, students are supposed to act and work with the learning content for example by solving problems, write summaries, give presentations, engage in groups discussions, etc.</td>
</tr>
<tr>
<td>Self-Evaluate</td>
<td>In the self-evaluate part students solve test questions autonomously to verify whether they have reached the lesson’s learning objectives or not.</td>
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<tr>
<td>Summary</td>
<td>The summary provides a “take home message”, in other words the most important parts of the lesson condensed into a couple short sentences to be remembered.</td>
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</tbody>
</table>

A full list of the training content can be found at FOCA (2010).
3. Results

At the end of the training, trainees’ satisfaction with the cargo security training program was measured in a first step according to Kirkpatrick & Kirkpatrick (2006). For that purpose, a questionnaire was developed where trainees had to rate 20 items (see Table 2) on a five point interval scale covering the following range of topics: impression of overall success, basic training conditions, quality of training sessions, the performance of instructors, and the quality of the software products used in the blended learning process.

Table 2: Distribution of trainees’ answers when asked to rate various aspects of the cargo security training program in terms of satisfaction. (n=2)

<table>
<thead>
<tr>
<th>Question</th>
<th>Failed</th>
<th>Nearly Failed</th>
<th>Unsure</th>
<th>Successful</th>
<th>Very Successful</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to this point, how would you rate the success of the training course altogether?</td>
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<tr>
<td>Basic Conditions</td>
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<td>2 Organization</td>
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<td>3 Room</td>
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<td>4 Infrastructure</td>
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<td>5 Handbook</td>
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<td>Training sessions in regard to:</td>
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<td>6 Length of training sessions</td>
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<td>7 Time management</td>
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<td>8 Variety of learning content</td>
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<td>9 Well defined learning objectives</td>
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<td>10 Level of difficulty</td>
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<td>11 Quality</td>
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<td>12 Practice Orientation</td>
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<td>13 Atmosphere</td>
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<td>Evaluation of instructors</td>
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<td>14 Competence</td>
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<td>15 Didactics</td>
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<td>16 Ability to help</td>
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<td>17 Organization</td>
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<td>18 Friendliness</td>
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<td>Quality of software products</td>
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<td>19 X-Ray Tutor (x-ray training)</td>
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<td>20 CASRA LMS (e-learning)</td>
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<td>TOTAL</td>
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In a second step, the trainees’ performance was measured with a written test and a practical exam with a strong focus on how to operate x-ray machines and the detection of suspicious clues. (Test items are confidential) The test allowed a maximal number of 76 points to be scored with a minimal score of 50 points required to pass. Both trainees passed this test with a score of 75 and 76 points respectively.
4. Discussion

Although the data presented in the results section only stems from two trainees, it can be seen as a confirmation that the design of the cargo security training program succeeds at providing said trainees with the skills required in cargo screening. In a next step, additional trainings are planned on a larger scale with the same evaluation process applied again. Furthermore, a research program shall be launched where Kirkpatrick & Kirkpatrick’s (2006) third step, the transfer of skills from classroom training to daily work routine, shall be examined.

An important observation not reflected in the results is that there seem to be factors tempting the learners to take shortcuts in the WBT. Although the WBT parts of the training were designed with as little text and as many pictures as possible, trainees seemed to skip text based on the shorter than expected amount of time they took for reading said texts. The presence of instructors was therefore very valuable as they were talking through and repeating all lessons together with the trainees, discovering and filling gaps in trainees’ knowledge. For future editions of the cargo security training program it is therefore important to further reduce the amount of written text and using other forms of representation for the same amount of information. This can be achieved with the guidance of the Department of Defense’s taxonomy of multimedia instruction (1997) and the various levels of interaction it offers. When learning content at higher levels of interactivity is being offered, it is possible to cut down the amount of text while still meeting the same learning goals.

5. Literature