Hey, Your e-learning Courses are Giving me a Cognitive Overload

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ABSTRACT

Like many large organizations, the Norwegian Armed Forces rely more and more on e-learning to deliver cost-effective and high-quality learning to their employees. The main distribution method is through learning management systems and varies from low-cost courses, based on text and graphics, to more expensive productions containing video and advanced interactivity.

A continuous drawback however is the fact that many of the students do not complete all of the courses they have registered for, which is often called "dropout." The dropout rate varies from below 10% to over 50% in some courses. In a typical e-learning environment, the learner will go through the course alone, on a personal computer, with no contact with a teacher or a tutor.

This paper presents the findings from a first years' thesis conducted as a part of master's program in information computer technology & learning. It examines how the use of multimedia in e-learning courses might influence learner dropout. Research suggests that used incorrectly, multimedia can contribute to a so-called cognitive overload for the learner. This again can influence learner retention and decrease motivation, ultimately leading to dropout.

Recommendations from leading theories and research are used to analyze four different e-learning courses from the Norwegian Armed Forces and discuss any relevance between the theories and the dropout rate of each course. This paper summarizes the findings and delivers concrete recommendations on how to build e-learning course in the future, to minimize student dropout.

ABOUT THE AUTHOR

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Hey, Your e-learning Courses are Giving me a Cognitive Overload

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INTRODUCTION

This paper presents the analysis and findings from a thesis conducted as a part of the information computer technology and learning master's degree program at the University of Aalborg in 2013.

Through the last ten years, we have seen an increased use of e-learning courses, not only in the armed forces, but in many large organizations around the world. In recent years, it has become more common to combine e-learning with other learning methods into more "blended learning" solutions. In the Norwegian Armed Forces (NoAF) the use of the term e-learning defines a learning situation in which the learner will go through the course alone, on a personal computer, with no contact or communication with a teacher. Figure 1 shows an officer taking such a course.

Since 2001, NoAF have developed and published over one hundred different e-learning courses, from basic application training courses, to more advanced courses using video and graphics. The focus of the study was to look at those cases where a high number of students voluntarily enlisted for an e-learning course through the NoAF learning management system (LMS), but failed to complete the course, resulting in a so called "dropout." Dropout is a general problem for e-learning courses according to Karen Frankola:

> "There are no national statistics, but a recent report in the Chronicle for Higher Education found that institutions report dropout rates ranging from twenty to fifty percent for distance learners. Nine administrators of online courses concur, dropout rates are often ten to twenty percentage points higher in distance offerings than in their face-to-face counterparts" (Frankola, 2013).

Figure 1: The basic e-learning situation

According to Park and Choi (2009), student dropout can be related to both external and internal factors. These factors can influence the learner in different ways, both before and during an e-learning course. External issues like family-, health- and financial problems and time conflicts with other duties and tasks, are factors that are beyond the control of the course developer. Internal factors, however, are more relevant, since instructional staff can affect them in the development and conduct of an e-learning course. Internal factors cover areas such as interaction design, instructor follow-up, student activity, the use of tasks, learner motivation and technical challenges. The thesis was delimited to e-learning courses without any reported technical issues and where students enlisted themselves.

Development of e-learning courses must meet the same demands of learning theories, pedagogics and didactical considerations as any other learning method. It is important that instructors develop e-learning courses in a way that fulfills the learning goals and produces the desired outcomes, e.g., fewer errors by doctors. The thesis used dropout rate as an indicator of how well an e-learning course was designed and built. Based upon recommendations from relevant theories and studies, the group conducted an analysis of four different e-learning courses used in the NoAF. The main research question was:

> "How should an e-learning course be developed to minimize student dropout?"

COGNITIVE LEARNING

In his book "Læringens Univers", Mads Hermansen defines cognition as "physical processes, that includes perception, thinking and learning" (Hermansen, 2006, p. 47) which follows Bruner's and Piaget's thoughts about how the human brain analyzes and stores new knowledge. Piaget is well known for his terms "assimilation" and "accommodation" and he argues that learning occurs when humans are active. Children develop new "schemas" in their interaction with the physical world. Schemas, according to Piaget are "a hypothetical construction or script, on how representations of activities are stored in the brain" (Hermansen, 2005, p. 47). These schemas change throughout a person's life. Assimilation is when humans accommodate new knowledge and adapt it to already known mental schemas. Accommodation, conversely, is when humans are not able to match existing schemas to their perception of the world around them, and as a result, have to do an adaption process and establish new mental schemas.

According to Bruner, pre-knowledge is a condition for the ability to perceive information and develop new schemas (Hermansen, 2005, p. 52). When something does not match a person's pre-knowledge of the world, he/she is forced to adapt to it and develop new strategies and terminology. Piaget and Bruner both theorize that perception, ability to visualize and the use of symbols are important for our learning process. Following these thoughts, an important question is how developers should use multimedia and design our e-learning courses to maximize students' ability to process and store new information. Piaget`s cognitive theory advocates that learners construct their own knowledge in interaction with the world around them. We could argue that when students learn though an e-learning course as described in the introduction, the e-learning course itself represents the world around them.

FACTORS INFLUENCING THE (E) LEARNING ENVIRONMENT

As discussed earlier, in an e-learning situation the learner will go thru the course alone, with no contact or communication with a teacher. According to Isaksen, Møller and Sander (2013, p. 50), there are three things that influence the learning environment during an e-learning course: how developers use (1) multimedia and (2) interaction design and (3) how the learner can meet his/her personal learning style. These elements are important and influence both student motivation and their self-efficacy[1]. Figure 2 illustrates the closed learning environment, in which the learner meets and interacts with the e-learning course. Through the interaction design, the course presents the content as a combination of multimedia elements and didactical techniques (Isaksen et al., 2013, p. 25).

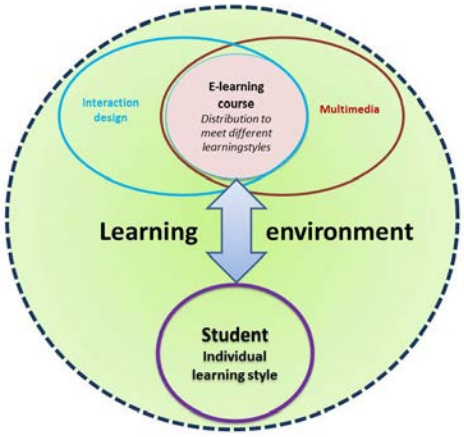

Figure 2: The e-learning environment.

Learning styles

Even though there is controversy around learning styles, we believe that how you present the content affects student motivation. So the question becomes whether allowing a student to choose how the course presents content has a positive effect on his/ her motivation.

Through his experiential learning style theory, David Kolb states that humans develop a preference in how they obtain new information as a child. Kolb describes a four stage learning cycle. Stage one is a concrete experience, where a learner meets a new experience or reinterprets an existing experience. In stage two, a reflective observation of the new experience occurs. Stage three is the abstract conceptualization, where the learner's reflections nurture new ideas and in the final stage, active experimentation occurs and the learner applies these new ideas to the surrounding world to observe the

[1] Student own belief in their ability to complete a course, study or education.

effects (Kolb, 1984, p. 77-78). According to Kolb, effective learning occurs when a learner progresses through all four stages of the cycle.

Kolb (1984) has defined four different learning styles, based on combinations from the learning cycle (see Table 1). The fours styles are the convergent, divergent, accommodating and assimilating styles. An accommodating learning style is when a learner prefers to have concrete experiences and actively test them out on the world (experimentations). This is opposite of the assimilating style, in which the learner prefers to solve problems, thinking in abstract terms and through observation and reflection.

Like Kolb, both Dunn & Dunn and the Danish National Center for e-Learning (DNCE) believe that each learner has a preferred learning style. Dunn & Dunn separate the analytic, holistic, reflective and impulsive learner (Illeris, 2006, p. 195), whilst DNCE divides between the reflecting, theoretic, pragmatic and active learner (Nordbøge, et al., 2001, p. 13-15).

All these theories advocate that humans have a preferred way of learning and it is likely that all types will be found in a large group of e-learners. The theories describe different preferred ways of receiving and processing new information. The objective when developing an e-learning course is to try and meet multiple learning styles in order to maintain motivation and prevent cognitive fatigue in as many students as possible. In the perfect course, the learner would be able to customize his/her course activity, look and feel as well as the organization of the content to fit his/her preferences. An example of adapting to different learning styles is when the learner can choose between graphics/text and graphics/narration. Another option could be to limit the text in the course, but offer the opportunity to read more in incorporated manuals or pdf documents. A general analysis question was if the e-learning courses support different learning styles.

Kolb	**Convergent** Solving practical problems	**Divergent** Observation, more than acting	**Assimilative** Likes to fit the reality into existing schemas	**Accommodative** Active experiments and development of new schemas
Dunn & Dunn	**Analytic** Like to divide tasks into smaller parts	**Reflective** Like to consider several options before acting	**Holistic** Looks at the whole picture, like the overview of a problem	**Impulsive** Learns through action
Danish National Center of e-learning	**Theoretic** Learning through theoretic terms and thinking	**Reflector** Learning through reflection and consider several options	**Pragmatic** Likes to experiment with new ideas and to test them in real life	**Activist** Learning through actions and likes to do thing himself

Table 1: Aggregation of learning styles.

Interaction design

An e-learning course is asynchronous learning, without the physical presence of a tutor. It means that the course must "stand on its own feet," because there is little room for detailed explanations or coaching. The fact that the designers have no or little impact on how the users will use their design is a serious challenge (Levinsen, 2012).

When designing an e-learning course, the designer must ask some basic questions. What are the dominating learning principles? Who is going to use it? How are they supposed to use it? What kind of activities will the users perform? According to Preece, Rodgers & Sharp (2011, p. 25-30), the *"key question for interaction design is: how do you optimize the users' interaction with a system, environment or product, so that they support and extend the users' activities in effective, useful and usable ways"* The following general principles will help organizations to develop a good e-learning design:

- **Visibility:** Make all functions and information visible in a manner so that the user can easily determine the next logical step;
- **Feedback:** All actions should provide feedback to the user, so that he/she knows what happened and can continue in due course;
- **Limitations:** Limit the number of actions the user can make at any given time. For example, hide buttons when they are not relevant;
- **Consistency:** Use the same elements and buttons throughout the course, to avoid misunderstanding and confusion.

- **Accessibility:** Use attributes and symbols that will instinctively tell the user how something is supposed to be used. For example, the use of a button with an open or closed padlock symbol (Preece et al., 2011, p. 25-30).

A basic rule of thumb is to drive for simplicity and to make sure the developers test the courseware on a representative number of users before it is used. Developers build a good e-learning design to fit its primary users, reduce cognitive load, and embed a navigational system that is easy and intuitive with a clear structure and a consistent look and feel. To operationalize these elements, we looked at how each e-learning course we examined provided information about structure and organization of the content, whether it used a consistent, intuitive and visible design and whether it provided feedback on progress and results.

THE USE OF MULTIMEDIA

The term "multimedia element" describes the combination of video, graphical elements, animations, sound effects, narration and different types of tasks used to convey the learning content. Knowledge about how to use multimedia elements in order to maximize learning outcome, is important for any course designer. Richard E. Mayer primarily developed the cognitive theory of multimedia learning (CTML). According to this theory, the foremost question is, "How we can adapt multimedia to enhance human learning?" (Mayer, 2009, p. 13).

CTML is based on the fact that the human brain is not an empty shell, waiting to be filled with knowledge, but rather a "thinking box," which processes information received from all five senses and uses that information to create new knowledge (Learning-Theories-Com, 2013, p. 29). The main purpose of CTML is to find the best way to use multimedia elements in combination with effective didactical learning strategies. In his book "Multimedia Learning", Mayer claims that used correctly, multimedia improves our brains ability to store new information. He has developed the so called "multimedia principle" that states: *"people learn better from words and pictures than from words alone"* (Mayer, 2009, p. 4). CTML is based on three preconditions that forge the basis of the theory:

1. Humans have a double channel structure in their brain that is used to process senses, from both the visual and verbal (sound) channels;
2. There is a limitation in the brain's ability to process information in the working memory; and
3. The brain uses three memory areas (sensory-, working- and long-term memory) to store information (Sorden, 2013, p. 3).

According to CTML, the best way to construct knowledge through the use of multimedia elements is to combine words (both text and speech) and pictures (graphics, pictures, animations). Humans' ability to obtain information is depending on our capability to construct new schemas and to transform previous learned procedures from controlled to automated processes. Humans use all three memory areas when processing and storing information perceived from the world around them (Sorden, 2013, p. 3). A main challenge is that humans have a limited capacity in the working memory, limiting how much information we are able to process during a short time frame. Overloadign the working memory hampers the construction of new knowledge (De Jong, 2009, p. 9). There are two mechanisms used to prevent working memory overload: organizing the multimedia in a way so that it's possible to divide the information into smaller chunks and using automated thinking processes.

According to CTML, students engage in meaningful learning when they are able to focus on both relevant words and pictures, organize them through verbal and pictorial processes and store them in the long-term memory.

Principles for use of multimedia in e-learning

Based on more than a hundred studies, Mayer has developed several instructional principles for the use of multimedia in learning activities to improve human learning (Mayer, 2009, p. 52). These principals are:

- **Signaling:** when students receive information about how the course material is organized and important features are highlighted;
- **Redundancy:** when a combination of graphics and narration are used, rather than graphics, narration and text. Narration and text together results in an information redundancy and may cause a cognitive overload.
- **Temporal contiguity:** when graphics and narration that belong together are presented at the same time;

- **Modality:** the combination of graphics and narration that complies with the dual channel principle. The use of graphics and text uses only the visual channel and tends to overload it;
- **Personalization:** when the course uses an informal language rather than a formal style;
- **Multimedia:** when the course uses words and pictures together, rather than just words alone;
- **Voice:** when the words are spoken by a human voice rather than a computer voice;
- **Spatial contiguity:** Place important words close to corresponding graphics on the screen (Mayer, 2009).

Based on the recommendations from CTML, we developed analysis spots that looked into several areas: how the course used narration, text and graphics; whether the learner could repeat important parts of the course; how the course placed multimedia elements on the screen; and when and if the content presentation complied with the dual channel principle.

AGGREGATION OF ANALYSIS SPOTS

We developed a number of analysis spots (AS) based on the principles previously highlighted in this paper. The AS were used to analyze existing NoAF e-learning courses that some students never completed. All AS are important to prevent cognitive overload and to maintain student motivation and self-efficacy. Table 2 aggregates the eleven AS used in the analysis. A positive answer on each AS means that the course supports the defined principle, except for AS 5, were a negative answer means that the course avoids using narration and text at the same time, which is a violation of the redundancy principle. In addition the analysis group took an overall subjective look at how these courses maintained a certain degree of motivation and self-efficacy. The importance of motivation is underlined in CTML and Roxana Moreno even states that *"Without motivation, there is no cognitive presence"* (Sorden, 2013, p. 5). It emphasizes the importance of maintaining a high level of student motivation and reducing cognitive overload.

Purpose	Number	AS questions: Does the e-learning course :
All e-learning courses should display the overall goal of the course, to inform about topics and length. The learner must be assured that the topic is relevant for him	1	*Display an overview over learning goals and length?*
Learners have different individual learning styles and therefore it's important that e-learning courses should use functionality that supports different learning styles. An example is if the leaner could choose between narration and text on screen.	2	*Use elements that support different learning styles?*
An important factor in meaningful e-learning is student activity, to maintain focus & motivation	3	*Allow the learner to perform tasks and exercises, throughout the course?*
To reduce cognitive load, it's important to consider in what way we use multimedia elements and how this affects the learning process.	4	*Allow the learner to repeat previous shown interactive elements?*
	5	*Use narration together with on screen text? (negative impact)*
	6	*Place corresponding multimedia elements close to each other on the screen?*
	7	*Present corresponding multimedia elements at the same time?*
	8	*Display content, using both the visual and audible channel?*
It's important that the course design is intuitive and understandable for the learner.	9	*Provide information about course structure and organization of the content?*
	10	*Use a consistent, intuitive and visible navigation design?*
	11	*Use feedback and progress update throughout the course?*

Table 2: Analysis spots.

ANALYSIS METHOD

Three graduate students from University of Aalborg was conducted the analysis. The analysts completed at least one module from each of the four courses and recorded these sessions using Camtasia[2]. The group then examined the

[2] Screen recording application

recordings to evaluate the courses using the analysis spots from Table 3. Whenever a course would comply with an analysis spot, they would score it positively (except AS number 5, which looked for a negative compliance). We used the eleven AS to control the overall interaction design, use of multimedia and how the course met different learning styles (Isaksen et al., 2014, p. 51-60).

ANALYSIS

All four courses in this analysis were developed according to SCORM 1.2 and published on an LMS accessible from the closed defense intranet. All NoAF employees have access to this LMS through their intranet user account and can register for published e-learning courses. We chose these courses for the analysis because were voluntary and they had experienced students dropping out without having technical difficulties. The assumption was that these courses had dropouts, even though there were no visible external factors explaining why. All the AS used in the analysis are related to internal factors as described by Park & Choi (2009), and can be influenced by the e-learning developer. The four courses used in the analysis are shown in Table 3.

Course Name	Dropout	Registered students
Laws of Armed Conflict (LoAF), Basic intro, Knowledge/attitude course:	32%.	8399
ISAF, Pre-deployment course, Knowledge course:	59%.	222
SAFIR, Naval incidents report system, Application training course:	51%.	698
Attitudes, Ethics & Leadership (AEL) in NoAF, Attitudes course:	6%.	16919

Table 3: Course Data

Figure 3: Screenshot from LoAF course.

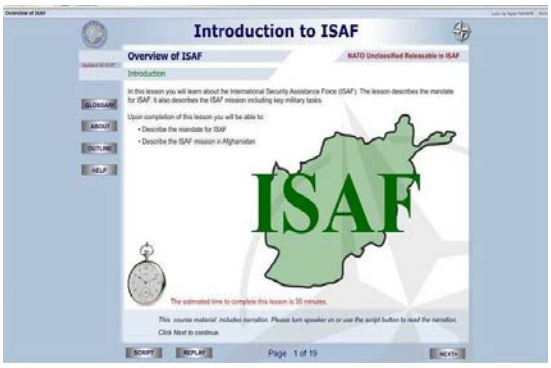

Figure 4: Screenshot from ISAF course.

LoAF e-learning course

The LoAF course, shown in Figure 3, is about ninety minutes long[3] and consists of seven modules covering humanitarian law. It is targeted toward all officers and soldiers in the NoAF. All modules start with a video that outlines an ethical dilemma, to which the learner must respond. The learner then completes the learning module before returning to the dilemma, were he/she gets a chance to change his/her response. The course uses tasks like multiple-choice questions, drag & drop and other types of exercises to maintain a high level of student activity. The learner can get information about how to navigate through the course and it uses a consistent interaction design. Information about learning goals and structure can be found in the menu. The course often uses narration together with a lot of text and graphics and the analysts considered some of the video sequences a little long. On the other hand, the analysis group found the ethical dilemmas both intriguing and motivating. A critical point in each module is the case video introduction producing a cognitive presence, which is required to benefit from what comes next. In some of these introductions, the course violates AS 5 and this was considered a critical issue by analysis group. It is impossible to skip parts of the course, but narration can be replaced by text.

ISAF e-learning course

The ISAF e-learning course, shown in Figure 4, covers basic knowledge about the ISAF operation in Afghanistan, Afghan culture and IEDs. The target group is personnel deploying to

[3] "Click time", time the learner spend on conducting the course without using extra time for reflection or repetitions.

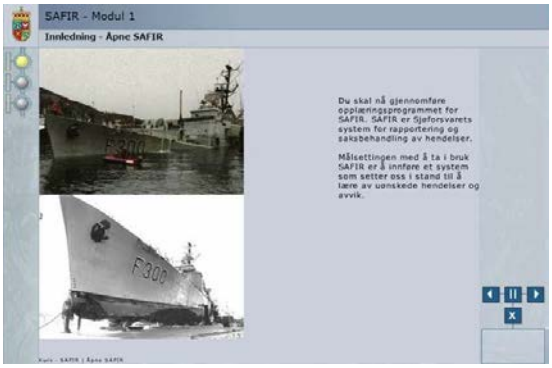

Figure 5: Screenshot from SAFIR course

Figure 6: Screenshot from AEL course

ISAF It provides an overview, covering basic information about the course content. Introduction to ISAF covers almost ten hours of click time and this can certainly damage students' self-efficacy. The course uses large amounts of text, narration and graphics throughout the course, but provides few tasks for the user, except for the multiple-choice tests concluding each module. There are no elements supporting different learning styles and little use of multimedia elements. The course presents corresponding multimedia elements at the different times and provides little information about how to navigate the course structure.

SAFIR e-learning course

The SAFIR course, shown in Figure 5, is a NoAF in-house production, covering how to use the naval incidents report application. The target group is all personnel in the Royal Norwegian Navy and the course is about one hour long. There is no description of the course's purpose, only a description of the application itself. The student cannot perform tasks on his/her own, but is shown how to perform specific tasks in the application. Narration is used together with text and graphics throughout the course and often corresponding multimedia elements are presented separately. Basically, there is no real interaction between the learner and the course. The very structured presentation of the content will only appeal to the pragmatic learning style and overall the course was considered to be boring by the analysis group.

AEL e-learning course

The AEL e-learning course, shown in Figure 6, is a ninety-minute long e-learning course. It uses videos extensively, which focus on relevant cases and ethical dilemmas to convey defense rules and regulations about work ethics and leadership. A mock news broadcast introduces the scenario that the entire course is based upon. Before starting each module, the learner gets information about the course structure, navigation concept and content. The learner can choose the order he/she wishes to take the modules. Tasks are used throughout the course and secure learner activity. The course never violates AS 5 and uses narration in combination with graphics throughout the course. The course only uses text is to convey important words, unless the learner chooses to replace narration with text. Users can repeat a sequence and the design provides an intuitive menu and information about learner progress.

Summary

As the analysis results show in Table 4, the AEL course, with the lowest dropout rate (6%), gets a positive result on all eleven AS. The LoAF course, with the second lowest dropout rate (32%), also got a good result from the analysis, with only one negative score. With three negative results, the SAFIR course (dropout rate 51%) comes third and finally the ISAF course gets a total number of six negative scores (dropout rate 59%).

Both the AEL and LoAF course use cases and ethical dilemmas and are highly interactive. They have the similar interaction design and same length (ninety minutes). The only difference is that the LoAF often uses narration, with text and graphics and thereby violates the redundancy principle (AS 5), which according to CTML can contribute to cognitive overload in the learner.

The SAFIR course violates the temporal contiguity principle, failing to present corresponding multimedia elements at the same time in addition to violating the redundancy principle. It has almost no tasks and interactivity to secure

leaner involvement and activity. Even though it's a relatively short course, it still has a very high dropout rate (51%). Failing to comply with the redundancy principle and temporal contiguity principle seems to have an extra negative effect, compared to the LoAF course. It is also easy to suspect that the lack of tasks, reducing the student to a passive receiver of information, negatively impacts learner motivation as well, thus resulting in many dropouts.

The ISAF course has the highest dropout rate (59%) and has the lowest score from the analysis. In addition to violating the same three principles as the SAFIR course, ISAF also does not support different learning styles and provides neither information about course structure nor feedback on learner progress. We must also consider that the course is very long. A ten-hour course has a high risk of giving the learner cognitive fatigue and is bound to lose many students along the way. Even though the learner can take a pause, the "overwhelming" length will most likely negatively impact students' self-efficacy.

When conducting a study, researchers should look for alternate hypotheses that could explain their results. All the e-learning courses in the survey are accessible from the same network and all NoAF employees use a standardized PC to access them. This minimized the likelihood that technical problems influenced student dropout in these courses. Other external factors, like family problems and work-related conflicts, cannot be excluded, but are outside the control of the survey. Any presence of such external factors is unlikely to explain such significant differences in the dropout rates for the four courses. Through analysis and discussion of relevant theories, the analysis group defined a set of AS that aggregates the most important recommendations, covering possible internal dropout factor. In addition to using the eleven AS, the group evaluated how the courses maintained motivation on general level.

AS nr	AEL	ISAF	SAFIR	LoAF
1	Yes	Yes	Yes	Yes
2	Yes	No	Yes	Yes
3	Yes	No	No	Yes
4	Yes	Yes	Yes	Yes
5	No	Yes	Yes	Yes
6	Yes	Yes	Yes	Yes
7	Yes	No	No	Yes
8	Yes	Yes	Yes	Yes
9	Yes	No	Yes	Yes
10	Yes	Yes	Yes	Yes
11	Yes	No	Yes	Yes

Table 4: Analysis Results

CONCLUSION

This research is important because it uses a scientifically conducted study to confirm that following recommended practices for creating effective e-learning courses will contribute to minimize dropout in the resulting course. Of the four e-learning courses surveyed, the course with the lowest dropout rate scored best on the analysis. The course with the worst result from the analysis had the highest dropout rate. Because the ISAF course is much longer than the other courses, we cannot preclude the possibility that this is contributing to the very high dropout rate as well. On the other hand, both the LOAF and SAFIR courses had dropout rates above 30% with course lengths of less than two hours. These facts support the somewhat obvious theory that there is a connection between how a designer develops an e-learning course and the learners' ability to stay motivated and complete an e-learning course.

According to Isaksen et al. (2013), good interaction design, proper use of multimedia elements and supporting different learning styles seem to have an effect on how many students actually complete an e-learning course. The overall goal of course developers is to produce e-learning courses that meet the learners' preferred learning styles and present the content in a way that optimizes the information process in the working memory and the

establishment and storage of new knowledge in the long-term memory. This underlines the significance and importance of why course developers must carefully consider how they use multimedia elements, how to develop the interaction design and how they can support as many learning styles as possible. The only thing that that separates the two best courses is the fact that the LoAF course uses both narration and text, together with graphics. Avoiding this seems to be especially important in order to maintain motivation throughout the course and reduce the risk of student dropout. To force a learner to read a lot of text and at the same time listen to a voice saying the exact same thing is bound to be considered boring, thus resulting in cognitive overload.

RECOMMENDATIONS

Based on the analysis and findings in the study, the group developed recommendations related to the main research question on how to develop an e-learning course, to reduce the risk of student dropout. These recommendations are:

1. The course should convey information about the purpose of the course, the expected outcome and the organization of the content;
2. The course should adapt to as many learning styles as possible;
3. The course should use a tasks and elements promoting activity throughout the course;
4. The course should seek to reduce cognitive overload through:
    a. Positioning and timing multimedia elements correctly on the screen;
    b. Adding the possibilities to repeat important parts of the course if needed;
    c. Avoiding using text, together with narration and graphics;
    d. Only use text to highlight important words;
5. Convey the message so that lets the learner uses both the visual and audible senses (narration and graphics, rather than text and graphics);
6. Seek to develop an interaction design that is as intuitive as possible, consistent throughout the course and that conveys information about content organization, course structure and learner progress (Isaksen et al., 2013, p. 65).

WAY AHEAD

The Norwegian Defense University College/ADL office will continue, together with our ADL partners, to investigate how to optimize the use of multimedia, develop more intuitive interaction design suitable for all types of platforms and how we can support more learning styles in our e-learning courses. This will be significant, as the use of e-learning will continue to increase in the coming years. The NoAF invests considerable resources in the production of e-learning and it is very important that we reach our learning goals, minimize the learner dropout and produce the desired effect from these courses.

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