



THE USE OF VISUAL DESIGN IN E-LEARNING RESOURCES

Cassandra Haugen

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Faculty of Engineering and Science
Department of ICT

Supervisors:

Rune Andersen & Kåre Mosgren

Abstract

People expect to be bored by eLearning

- let's show them it doesn't have to be like that!

(Cammy Bean)

E-Learning as a computer-assisted instruction system has been a promise since the 1960's when the digital age¹ emerged and the first personal computers were created. Although there is no single evolutionary point to define where or how E-learning oriented, higher educational sectors have an agreed definition of what E-Learning is. "E-Learning" refers to the use of both software-based and online learning, whereas in business, Higher Education, the Military and Training sectors, it refers solely to a range of online practices (Campbell, 2004).

Instructional- , Human Centered- and Visual Design are factors that can determine the efficiency of any software or interactive tool and this also applies to E-Learning. Regardless of the pedagogical approach, from a developer's point of view - E-Learning can be considered to be like any other visual communication model targeting an audience.

The aim of this thesis is to investigate the effect that visual design has for the learning process through the use of E-Learning resources², focusing on on the main thesis research question: *Is it possible that a well designed resource leads to increased motivation compared to the basic-form designed one for the course presented?* In order to find the answers needed, the main thesis has been broken down to the following research questions:

- *Does a well-designed and visually stimulating resource promote more frequent use of the resource than the basic-form designed one will?*
- *What has empirical research found regarding well designed e-learning effectiveness, efficiency, attrition, and appeal to learners?*

A selection of students from Multimedia Technology & Design participated in an experiment where they were presented with two e-learning resources using the same theoretical content

¹ The present time, when most information is in a digital form, especially when compared to the time when computers were not used

² E-Learning resources meaning any digital product with the aim of teaching learners online.

but with different visual designs. Multimedia Technology & Design is a bachelor's programme at University of Agder, Faculty of Engineering & Science, where the students get the necessary skills needed to design and master a wide range of modern media³. Their objective was to explore the two resources and complete a survey regarding their experience with the programmes afterwards. The students in this target group have background in judging and analyzing visual design based on their educational field, making them eligible to answer not only from a personal point of view, but also with the professional expertise necessary to do so. The resources presented to the target group had relevance for their field by presenting the topic of "Visual Design", which is highly relevant⁴ to the ongoing course; DAT-222 - Visual Design⁵, that is a course in the bachelor's programme. These students have thorough knowledge and understanding of the field of multimedia, history of technology, graphic design and art history of the western world. Being familiar with the current research challenges multimedia faces, these students are very capable to affect a research like this with their previous knowledge and perspective in this field.

³ With knowledge in creating multimedia content for web, video, DVD, cellular phones, 2D and 3D graphics, sound and programming. (University of Agder, ECT Course Catalog, 2016)

⁴ When something is pertinent and applicable to learners' interests, workplaces, and lives.

⁵ Course included in the study Multimedia Technology and Design , Bachelor Programme & Programming and Multimedia, one year study.

Foreword

The most important principle for designing lively E-Learning is to see E-Learning design not as information design but as designing an experience.

(Cathy Moore)

E-Learning is a work in progress. Any learning resource published on the web is defined as electronic learning, but what qualifies as a high quality resource is yet to be defined. In order to learn, not only is accessibility needed, but also learner motivation. In a technological culture where so many activities are conducted online, the standards of E-Learning needs to be further reviewed, as it should evolve along with technological advances in digital culture⁶.

Today learning is not limited to the educational system, instructional learning is becoming a big part of our everyday life for example in written instructions, mobile applications and video tutorials. Any activity done in order to achieve a defined goal is learning (Rodríguez-Bonces, M., & Rodríguez-Bonces, J. 2010). And as learning is becoming available for anyone, anywhere and for lower costs, the quality of those learning activities is crucial to evaluate what criteria future learning will include.

In a society where everyone is hunting for attention, supply and demand is not only what makes stakeholders successful, but also the tools used to capture learner or consumer attention making them choose a tool or service above the other.

From a commercial view, a consumer will probably be likely to choose one product over the other just because the packaging is more appealing, although the actual content is the same. We prefer a presentation with enthusiasm and visual impressions rather than a static generic performance, and we choose possessions that reflect our personality rather than just for its function. What is interesting about this is the possibility of applying this knowledge to a learning situation. Will a more personalized relationship to learning make us better learners? Is design and aesthetics a motivational drive that can help us reach our learning goals even faster?

⁶ The period beginning around 1970 and noted for the abundant publication, consumption, and manipulation of information, especially by computers and computer networks.

In my experience in the field of visual design and marketing surely make me believe that this is true when it comes to learning as well. This curiosity concerning these questions, inspired me to conduct this experiment in search of answers.

The standards of E-Learning will have to be further evaluated in terms of motivational factors and use of creativity as the number of online learning tools definitely will continue to grow. Mass production of E-Learning is inefficient if learners are not using the resources and consumers because they are not being delivered the experience they were looking for.

Hopefully you will enjoy reading the results of my study and be inspired to demand higher quality from your E-Learning experiences, keeping visual design and user experience in mind. Anywhere, anytime combined with value and motivation should be the new definition of E-Learning.

Cassandra Haugen, Grimstad 16.05.2016

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Chapter 1: Background

1.1: Problem Area

THE FIRST MEDIA COMPARISON RESEARCH

In 1947 the U.S. Army conducted research to demonstrate that instruction delivered by film resulted in better learning outcomes than traditional classroom or paper-based versions. Three versions of a lesson on how to read a micrometer were developed. The film version included a narrated demonstration of how to read the micrometer. A second version was taught in a classroom. The instructor used the same script and included a demonstration using actual equipment along with still slide pictures. A third version was a self-study paper lesson in which the text used the same words as the film, along with pictures with arrows to indicate movement. Learners were randomly assigned to a version and after the training session they were tested to see whether they could read the micrometer. Which group learned more? There were no differences in learning among the three groups (Hall & Cushing, 1947).

Figure 1: The first media comparison research (Hall & Cushing, 1947).

“With few exceptions, hundreds of media comparison studies have shown no differences in learning” (Clark, 1994; Dillon & Gabbard, 1998). This first comparison between traditional classroom and media-based learning tells us that electronic distance learning is no more efficient than the traditional methods of face-to-face learning, but is rather a result of the technological revolution that has made us transfer learning onto media platforms.

This knowledge tells us that the medium itself is irrelevant for learning, but that the instructional method used is what is important.

Hardcover books for example, are expensive, self-paced and limited to text and still graphics. Traditional classroom teaching requires hands on practice, costs of tutors and the promise that every student acquires the same information at the same pace as everyone else in a limited amount of time. Computers and electronic learning on the other hand, provides more flexibility in content and learning pace, but requires the learner to have a working computer or mobile device at all time with the ability to access the internet.

What we today label as E-Learning tools is nothing new, as computer-based learning has been around for more than forty years and our hopes of revolutionizing learning through greater media capabilities has been proved to not necessarily ensure more learning. In the excerpt from the first Media Comparison Research (Hall & Cushing, 1947) we learn that the research made on a video instruction versus a traditional classroom presentation and a self study on how to read a micrometer, showed that there were in fact no difference in who learned more, that the medium delivering the information was irrelevant. With few exceptions hundreds of media comparison studies have shown no difference in learning with different media (Clark, R.E., 1994, 2001; Dillon & Gabbard, 1998). The quality of the course however, is what is important. Every media delivery has its tradeoffs and some may find blended learning⁷ to be an efficient solution.

Knowing this helps us to improve E-Learning by exploring the possibilities to make it more efficient and more user friendly, rather than just assuming that it is superior on its own. Being able to learn regardless of time and place, as provided through online learning, is basically the same function as books have had up till now. What we need to do is to analyze learning once again and decide what components it needs in order to be an efficient, valuable and a preferred way of learning. People enjoy E-Learning, and with our technological everyday life, the medium is definitely not the problem. What the recipients do not like is when the delivery is dull, feels mandatory and the potential problem of upkeeping self-studies (Hubbard, R 2013). With a variety⁸ of options on delivering E-Learning nowadays it is only a matter of choosing the techniques and options that will create the best learning experience for the users.

1.2: Background

Described as the essential element that is often overlooked is the use of visual design⁹ in E-Learning. Focus on aesthetic appeal is paid attention to, but is often a low rank on the list of priorities, as it can be time consuming and expensive. The web offers several tips for developers to enhance their E-Learning design from a interaction designers¹⁰ point of view,

⁷ The term **blended learning** is generally applied to the practice of using both online and in-person learning experiences when teaching students.

⁸ The means of including a mix of content (fact-based, process-based, or both), formats (self-paced, group-based, or both), and activities and technologies (synchronous, asynchronous, or both) when designing an online course.

⁹ The practice or profession of designing print or electronic forms of visual information, as for an advertisement, publication, or website.

¹⁰ Interaction design focuses on creating engaging interfaces with well thought out behaviors.

suggesting that small steps in layout and organization of visual elements makes navigation and flow of the elements easier to understand. No specific research on this field has been found, where comparison of two identical informative systems with the variable of visual design has been conducted. We do know that E-Learning is evolving quickly and that it is a competitive market that highly influences educational fields. Facts state that since the year 2000 the E-Learning market has risen by 900%, and by the year 2019 it is estimated that 50% of all teaching will be online (Christensen & Horn, 2008).

1.3: Thesis and research questions

This thesis embodies the investigation of quantitative and qualitative data in order to answer the hypotheses that visual design plays an important role in E-Learning resources. The problem thesis is defined as;

Is it possible that a well designed resource leads to increased motivation compared to the basic-form designed one for the course presented?

This means if there are significant evidence in collected data from the target population that states, indicates or proves that the resource influenced heavily by visual design is preferable over the generically designed resource, and on what terms these possibilities can be determined. Investigating whether there are noticeable differences in the desire to use an online resource that is well designed, compared to a generic designed one, or if there is no noticeable difference at all. Seeking to understand the user's experience may help detecting why one resource is chosen above the other, and the demographic characteristics that possibly can contribute to their evaluation. Other research hypothesis and questions to be investigated are;

Does a well-designed and visually stimulating resource promote more frequent use of the resource than the basic-form designed one will?

In order to answer this question, the collected data should indicate that the experiment population agrees with the statement of the resource being well designed, and that they express desire to proceed using or use this or a similar resource again in the future. Positive or negative results will indicate overall motivation and attitude towards this way of learning and whether or not visual design is stimulating to the attendants. Wanting to know if the well

designed resource is more, less, or equally prone to frequent use will be determined from the attendants' willingness to use either resource in the future and the attitudes presented towards the resources.

What has empirical research found regarding well designed e-learning effectiveness, efficiency, attrition, and appeal to learners?

Seeking information from gathered data in terms of learners experience with either resource, and if one in particular, determine how one program promotes effectiveness, efficiency, attrition and appeal above the other. What does this experiment tell us about the use of visual design in E-Learning resources, based on the data collected from the targeted demographic? And what assumptions or conclusions can be made from this knowledge?

1.4: About the Resources

The components of this experimental research include two E-Learning resources, a questionnaire and collected data. The resources presented to the attendants are defined as "Program A" and "Program B". Both are produced using Adobe Captivate¹¹ 9 for authoring, Adobe Photoshop¹² and Adobe Illustrator¹³ for production of visual examples and graphic design elements, and additional resources from the web, such as YouTube video links and Colourbox.com¹⁴ stock photos. To fully understand the implications of this research, background information about the resources are needed:

Program A is defined here as an online learning resource with a generic design, not to be confused with the lack of aesthetics, but provides the use of visual design in a simpler and less elaborated form. This means less customization of content, use of standard fonts, premade transitional effects and minimal use of colors. This resource is based on the templates provided by Adobe Captivate 9, and does not go to into extents in terms of utilizing the visual design possibilities available in this software. Program A is a predictable

¹¹ **Adobe Captivate** is a rapid responsive authoring tool that is used for creating elearning contents such as software demonstrations, software simulations, branched scenarios, and randomized quizzes in Small Web Formats (.swf) and HTML5 formats.

¹² **Adobe Photoshop** is a raster graphics editor developed and published by Adobe Systems for Windows and OS X.

¹³ **Adobe Illustrator** is a vector graphics editor developed and marketed by Adobe Systems.

¹⁴ Colourbox.com is a stock site providing free licenced graphic material for educational purposes.

resource that is true to its form, but offers no additional attention to visuals than what is absolutely necessary.

Program B is defined here as the resource with heavy use of visual design. What this means is that the graphic design content is more elaborated and pays attention to the design principles in a way where user experience is prioritized together with explanatory content. Use of creativity also influences content where it is not necessary but to provide users with inspiration and to set a mood. This program focuses not only on the possibilities of the visual design but the psychological effects it provides. Using visual design for navigation and chapter orientation while also being a decorative element is an example of multiple usages visual design has.

The two resources are meant to be contrasts to one another, using visual design with different intents. And although having many similarities in structure and form, the comparison of the resources marks a detectable difference in the way users perceive the program.

1.5: Reliability & Validity

The terms used in this thesis include reliability and validity, which are fundamental cornerstones of the scientific method. Together they determine whether results are transferable to other situations or not, and that these data are as reliable as possible.

Reliability has to do with the quality of measurement and is the "consistency" or "repeatability" of your measures. Being able to perform exactly the same experiment under the same conditions, generating the same results. This reinforces findings and promotes higher acceptance of the hypothesis.

Validity is an empirical matter that needs a theoretical basis that looks into if what is being measured is really what you intended to measure. When the requirements of the scientific method are met and experiment is consistent in design. Internal validity is the confidence we can place in the experiments cause and effect relationship, and external validity is the process of generalization and whether or not results can be used to make predictions about the entire population (Trochim, 2006).

1.6: Structure

This thesis is organized by five main chapters, appendix, list of figures, list of tables and references.

Chapter one is an introduction to the problem area and background needed for the understanding of the role of E-Learning has today and challenges it faces. Chapter one also includes the aim of this thesis, the research questions it wants to solve and what it desires to achieve.

Chapter two represents the theory of E-Learning, development and design and what components are needed to create online learning, together with target group demographics and user characteristics. This chapter also includes an introduction to visual design elements and principles together with Gestalt Theory relating especially to the two resources used in the experiment. Introducing E-Learning Software and moving onto learning theory for the 21st Century.

Chapter three includes methodology and information about the research process, research questions and performed experiment. Choice of study design and background for thesis.

Chapter four presents collected data from the empirical research and provides results and assumptions based on theory and knowledge about the demographic population.

Chapter five presents discussion, judgement and conclusions based on the results presented in chapter four, and critically views what this experimental research have found in terms of research questions seen in context of background knowledge, theory and future aspects.

Lastly, list of appendix, list of tables, list of figures and references.

Chapter 2: Theory

This chapter displays relevant theory for understanding the background and fundamentals of E-Learning, visual design theory and the pedagogical theories that compose modern online learning. 21st Century Learning describes the skills and abilities required for being a modern learner and teacher in this day and age. Looking into what E-Learning is, and the components needed for creating it gives a perspective of what this thesis aims to do from a technological standpoint. Going beyond the basic understanding and introducing the fields incorporated for making online learning provides a deeper understanding of this multidisciplinary field and what it aims to do. Characteristics of the individuals using online learning prepares us for the implications and challenges faced when developing learning in general, but also those traits that especially targets online learners.

Visual design theory is needed for the understanding and value of resources used for this thesis, and the knowledge that visual design is both a technical and a psychological field.

2.1: E-Learning

Thanks to technology the way we can learn and share knowledge today is by the internet with personal computers, mobile phones and tablets. The unique nature of online learning is that the restrictions are few, and people all over the world can essentially collaborate on courses and projects twentyfour hours a day, making the world smaller and more connected. Learning anytime, anywhere. There are two types of learning events we encounter in a virtual classroom; asynchronous and synchronous learning. Asynchronous online learning is a student centered teaching method that uses online learning resources to facilitate information sharing outside the constraints of time and place among a network of people (Mayadas 1997). While synchronous learning refers to a learning event in which a group of students are engaging in learning at the same time. For example a livestream from a flipped classroom¹⁵ that can be viewed online by students in real time.

¹⁵ The flipped classroom is a pedagogical model in which the typical lecture and homework elements of a course are reversed.

E-Learning 2.0 - Characteristics
Multidirectional Content as conversation Peer to peer Multiple channels (combination of formal and informal)

Table 1: E-Learning Characteristics, (Ghirardini, 2011)

Types of E-Learning	
<u>Asynchronous</u>	<u>Synchronous</u>
<ul style="list-style-type: none"> - Communication is not in real time - Different time, different place - Flexible - Learners view information & respond at different times & from different places 	<ul style="list-style-type: none"> - Communication is in real time - Same time, different place - Learners view content at the same time - Not flexible - Responses are immediate - Learners must meet at the same time

Table 2: Types of E-Learning (Ghirardini, 2011)

There are several definitions of what E-Learning is supposed to be, but William Horton offers us a simple explanation: *E-learning is the use of information and computer technologies to create learning experiences.* (Horton, WK 2012)

Note that this definition of E-Learning is open as to what E-Learning can actually be. It does not require a course, a gamification¹⁶ experience, a discussion fora or anything else as long as the learning experience is delivered through a technological medium¹⁷. Derek Stockley provides a more elaborated definition of what E-Learning is;

¹⁶ Gamification is the use of game elements in non game environments

¹⁷ A *medium* is a third party or element through which a message is communicated

The delivery of a learning, training or education program by electronic means. E-Learning involves the use of a computer or electronic device (e.g. a mobile phone) in some way to provide training, educational or learning material in or out of the classroom.

(Derek Stockley 2003, emphasis is mine)

The term E-Learning was formed in 1999 by the company CBT (now by the name SkillSoft), where the E stands for “electronic”. The term CBT (computer-based learning) appeared in the mid 1970s, actually before we had computers in our homes, but we hear it often in terms of E-Learning. CBT means that the learning is delivered online by network excluding for ex. CD-rom at that time, and computer based training at that time was lessons delivered using early mini computers that were highly expensive and exotic. And the lessons created at that time, were actually not that different from what E-Learning looks today, neither form or shape. What differentiates early CBT from today's E-Learning is our modern computer processing power, technological accessibility and the use of multimedia. (Hubbard, R 2013)

There are several varieties of E-Learning, such as; Standalone courses, virtual classrooms, embedded E-Learning, learning games, learning simulations, blended learning, mobile learning and knowledge management and many more.

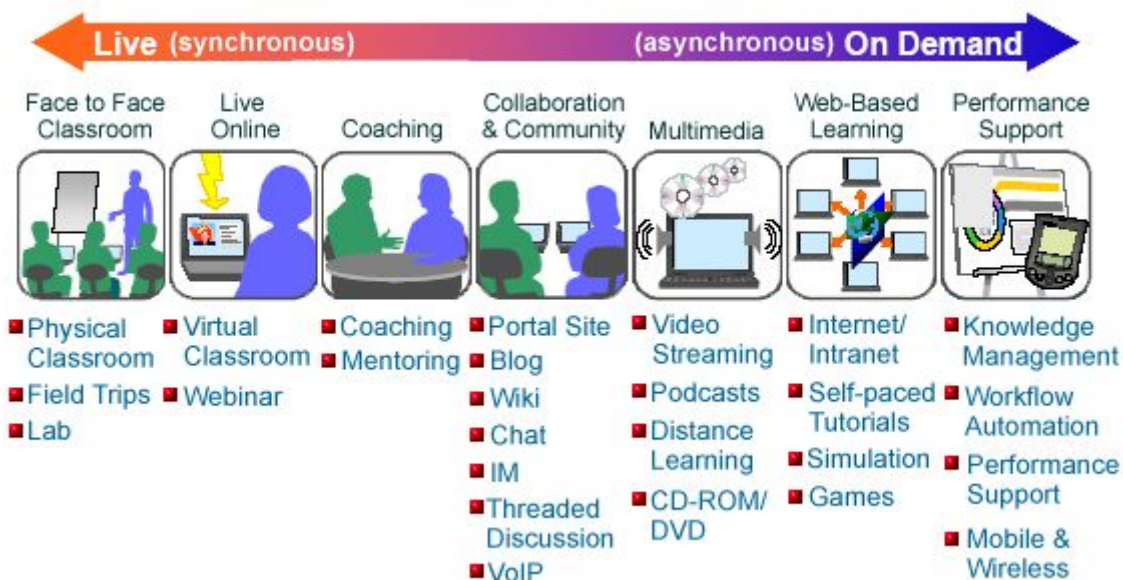


Figure 2: Various E-Learning resources.

As E-Learning evolves it is important to keep this definition open, and not try to limit what E-Learning can mean in the future. E-learning systems have evolved dramatically over the last forty years with the technological and interactive possibilities platforms¹⁸ like for example Moodle¹⁹ and Blackboard²⁰ has to offer. In regard of quality there is increasing concerns on how interfaces and task performance is completed in these systems, and usability of interfaces should be evaluated in terms of the efficiency it provides in the process of carrying out tasks. Researches of usability evaluation have been discussed since the eighties together with fields such as;

Participatory Design (PD)	An Approach attempting to actively involve all stakeholders in the design process, making sure the results meet their needs.
User-centered Design (UCD)	A process in which needs, wants and limitations to the users are considered as an extensive stage of the design process.
Interaction Design (IxD)	A field focusing on the user's interaction with the interface.
User-Experience (UX)	Refers to the overall experience a user has when using a product, service or a system.
Human Computer Interaction (HCI)	Focuses on the interfaces between user and computer.
(Horton, WK 2012, <i>E-Learning By Design</i>)	

Table 3: The fields influencing E-Learning development.

¹⁸ In computers, a platform is an underlying computer system on which application programs can run.

¹⁹ Moodle is a free and open-source software learning management system developed on pedagogical principles, used for blended learning, distance education, flipped classroom and other e-learning projects in schools, universities, workplaces and other sectors.

²⁰ *Blackboard* Learn is a virtual learning environment and course management system

Knowledge and observation of all these fields are crucial for the future development of E-Learning. Both technically, pedagogically and psychologically. (Horton, WK 2012, *E-Learning By Design*)

2.2: E-Learning Design

Regardless of the type of E-Learning you are creating, E-Learning consists of design and development. A learning experience in any form is really only as good as the best one or as bad as the worst one. Quality will always be the key to valuable learning, and through good decisions and good development that can be achieved. Addressing what is needed to learn and the way it should be executed are important steps in instructional design. As where potentially a great variety of individuals are going to encounter the same E-Learning product, it is crucial that every person in that target group will have the same potential for achieving valuable learning as anyone else. Because a product that gives value, is efficient and that the target group is likely to use again is at the end of the day - a successful E-Learning product.

From an E-Learning developers point of view, E-Learning consists of four major aspects; Instructional design, media design, software engineering and economics.

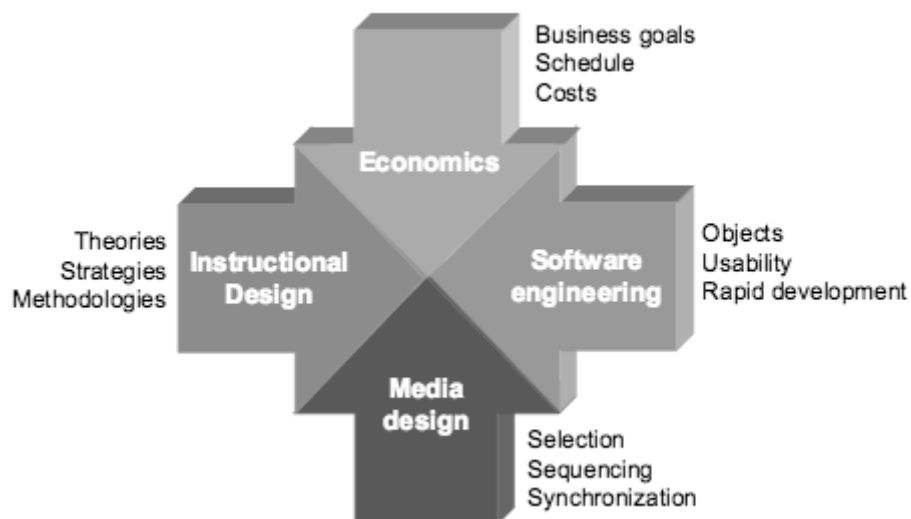


Figure 3: Four aspects of E-Learning

These fields together create the foundations and factors that determines the outcome of the E-Learning product, and the key is to harmonize and balance these fields. Planning, organizing and determine what is important for the E-Learning product at hand is one of the first and most important steps when creating E-Learning. If the methodology on how learners learn is wrong or misunderstood by the instructional designer, there is a risk of having a product that the learners will not use. If a media designer is allowed complete freedom there is a chance that the product come out being more of a showcase of the artist's work than a learning experience. If usability is compromised and the E-Learning product is difficult to use or operate, the users will avoid it. Budget is also a factor that has an effect on all other aspects, determining available resources, number of employees working on the project and the duration of the development. This table provides an overview of the four multidisciplinary fields in E-Learning development:

<p>Instructional Design Contributes theories about how human being learn, strategies for applying these theories, and methodologies to carry out the strategies. The knowledge of how human beings learn can guide selection and specification of new kinds of learning experiences such as simulations, learning games, online meetings and discussion forums.</p>	<p>Software Engineering Helps us build reliable computer programs. Like it or not, E-Learning is software. It runs on a computer, just as a spreadsheet or word processor does. It has a user interface and may draw content from a distant database. It transmits media over networks. It thus requires the same careful design and quality control as other forms of software. Software engineering contributes the concept of object design, usability design and rapid prototyping.</p>
<p>Media Design Helps us design digital media well. When the only media were the words on a chalkboard and the instructor's voice, we did not need to "design" media. Today we must select the appropriate mixture of text, graphics, voice, music, sound effects, animation and video. We must then sequence these various media and synchronize complementary media.</p>	<p>Economics Helps E-Learning deliver value. E-Learning costs money. It may generate revenue. It takes time, people and other resources to create, offer and maintain. It must be developed under a budget and on a schedule.</p>

Table 4: Overview of the four components in E-Learning development.

(Horton, WK 2012, *E-Learning By Design*)

Creating efficient and valuable E-Learning is strategic work that requires cooperation and assistance. With four components so different from each other, it is important to understand that every discipline may not be familiar with the other fields. Avoiding the most common pitfalls when making E-Learning is also majorly important. Often made mistakes are; Trying to learn too much, making users overwhelmed. Trying to learn objectives that the users are not interested in. Forgetting to add motivational elements. Making frustrated and bored learners by teaching objectives that are obvious to them. And use learning styles that make the users uncomfortable. Although we can never expect that everyone using our E-Learning product will achieve learning, no matter how great the product may be. Many factors play into the learning process and human factors will always be unpredictable. Some learners will fail, some learners will be compromised by disabilities, experience technical difficulties, struggle to find motivation or lack skills required for basic learning. Some learners may be opposed to E-Learning and find technology complicating their learning process and others may just prefer more traditional ways of learning instead. (Horton, WK 2012, *E-Learning By Design*)

There is no way of solving the 100% success-rate we hope to achieve when creating E-Learning, but we can use this experience, consider every pitfall and by narrowing down our goals and objectives get one step closer to succeeding by every step of the way.

Asking the right questions and make clear goals is a good start. Instead of teaching an entire course, we can teach a lesson or maybe just a topic learners tend to struggle with? Maybe a class of students that struggle with reading would prefer an archive of relevant video-lessons instead? Goals for online learning can be several things, and does not only have to promote learning. E-Learning resources can be an opportunity to increase a company's cash flow. It can also be motivational for employee staff to help morale, creativity and positive attitude and it can be valuable to provide security, in training staff with high risk jobs. It can even change or alter reputation of an organization by representing their core values. Creating online learning is a work in progress and there is no shame in making mistakes, it is actually very important to witness what happens when things go wrong so we can use that experience in order to make it right the next time.

2.3: Target Group Demographics

Knowledge about who we are creating E-Learning for is the most important aspect. No resource will be of any value if no one is using it. When determining target groups, we can always use gender, age, geographic, nationality, stereotypes and economic class, but in determining the target group of an E-Learning product that is simply not merely enough.

Being aware of the potential learner skills, disabilities and challenges help better preparing how problems can be solved when they occur prevents frustrated learners and can promote the desire and willingness to complete an online course or topic because knowledge about the users have been accounted for.

According to William Horton (E-Learning By Design, 2012) the aspects to be considered are:

Motivation	What does the learner gain from using our E-Learning product, and are they likely to put down the time and effort required? Is it to get better grades, a work promotion or gain desired personal skills? And who pays for their training?
Attitude	How do the learners feel about learning and authority? Are they introverted, extroverted, solitary or social? Is there an obvious way of teaching these learners or are they likely to respond best to a learning system with a lot of freedom?
Mental discipline	Are learners focused or easily distracted? Do they prefer learning alone or together in groups? Self-disciplined and self motivated? What workload are they prone to master in a realistic timeframe?
Psychomotor skills	What level of speed, coordination and memory do the learners have? Is their abilities sufficient for interacting with devices and retrieving information?
Communication	Are the learners skilled enough to speak, listen, read and write in the course language planned?
Social skills	Can your learners work with others? Will they provide motivation and constructive criticism for others and being able to handle that themselves? Will they provide a supportive empathic environment for each other online?
Learner Intelligences	What types of learners are we dealing with? Do they have special characteristics such as verbal, visual, logic, mathematical, musical, athletic, performance, interpersonal or intrapersonal skills?

Media preferences	What type of media do your learners prefer primarily and secondary? Graphics, video, sound, image or text?
Background knowledge	What do the learners know prior to this course? Are they familiar with the principles and vocabulary or do they only have basic knowledge in the field?
Prior education	What have the learners done beforehand? What methods are they used to learn from? Can we play up their familiarities and avoid their negative associations?
Control	How can learners control their learning? Can they change the conditions of their learning environment, and can they make use of their learning in their every-day life?
Digital fluency	Is technology a part of their life in terms of communication and entertainment? Is use of digital tools something they are efficient in doing, and do they have digital talents?
Learning conditions	What type of environment will they be using E-Learning in? Is it noisy and stressful or quiet and focused? And in what time table are they able to work with it?

Table 5: Characteristics of learners (Horton, WK 2012, *E-Learning By Design*)

These points are important questions that everyone making E-Learning should be able to answer, but remember that no group or learner is the same. As people are individuals in both life and learning, consider all these factors and base your choices on what compliments the course as well as the target group. Focus on what is essential for reaching the main goals and eliminate what is not important or helpful. Goals should be clear, precise and worthy.

By experiencing this lesson or topic, the learner will be able to:	
Primary objectives	Secondary objectives
▶ Do procedure X to accomplish Y.	▶ Believe X.
▶ Create or design an X that does Y.	▶ Feel X about Y.
▶ Decide X, given Y.	▶ Know X about Y.

Figure 4: Instructional intent format, William Horton (E-Learning By Design, 2012)

Six types of objectives explaining three primary and three secondary goals. The primary goals (performance goals) should be the ultimate reasons for learning, while the secondary ones (enabling goals) can enable accomplishment of the primary ones. This is an excellent way of targeting as many learners as possible, by creating goals and objectives that has more than one way to reach them. E-Learning designers should tailor their courses in order to let the learners apply their learning, not merely accumulate knowledge (William Horton, 2012).

<p>Quantifying the degree of success is not easy, but we can at least set metrics such as these:</p> <ul style="list-style-type: none"> ▶ Percent of learners who will accomplish the objective perfectly. ▶ Average error rate. ▶ Time required to perform the task. ▶ Results produced in a specified period of time. ▶ Reduction in frequency of problems or increase in rate of favorable incidents.

Figure 5: Quantifying Success, William Horton (E-Learning By Design, 2012)

2.4: Visual design

Regardless the medium and technique, the principles of visual design has existed since the first humans, and as digital technology has become integrated into every aspect of visual communication an artist or designer can not ignore what defines design. (Hashimoto, Alan, 2003)

Visual design should be used purposely with the intention of effective communication. The “visuals” are the elements we can see, and whether it is text, images, textures or shapes, the organization of these elements is where we use the Principles of Design. Like a composer writes musical notes to create harmony, a designer arranges elements to create aesthetically pleasing design pieces. Visual design is used as an artform, in marketing, as information, as a function and basically every visual stimuli you can discover around you is a product of design.

Although we hear that art is subjective and believe that everyone has their own taste and definition of beauty, the principles of design works towards the common and mathematical definition of what we as human beings are programmed to discover as “beautiful”. The golden ratio, otherwise known as the divine proportion (Latin: *sectio aurea*) is a mathematical constant that appears repeatedly in nature and artwork where two quantities` ratio is the same as the ratio of their sum to the larger of two quantities. Emerging from the ancient Greece, to Leonardo of Pisa and Johannes Kepler, the properties of the golden ratio has been practiced throughout the years and inspired several fields with its mystery and appeal, and harmonical aesthetics. (*Livio, 2002*). Today we also apply the golden ratio especially in european design, and it only shows that visual aesthetics is believed to be a product of science and mathematics. Note that several theories of harmonic numbers and laws have been developed in many cultures and the golden ratio is just one of them.

The psychological effect visual perception has on humans is a necessity for a designer to understand which guides us to the The Laws of Gestalt. The understanding of visual design regards not only the pure technical understanding, but also psychology, mathematics and adaption to the medium it is to be created for. (*Livio, 2002*). A painting that goes in your living room will obviously need to look different than an IKEA-instructional pamphlet, but they are indeed both examples of visual design, and the laws applied for them are the same as any other visual product made. It is so important to understand that good visual design requires a deeper understanding of all these aspects, and just mastering a software, a paintbrush or a hammer simply is not enough.

2.5: Gestalt Theory

Most histories of psychology states that Gestalt law originated from perception - sensory and perceptual psychology in the 18th century where Max Wertheimer's paper on the Phi phenomenon contributed in founding the school of Gestalt. But as we know, the early Greek culture had already contributed a holistic perspective that formed the Western thought for

millennia. The fundamentals of understanding the principle of Gestalt can be seen from the perspective of *Weltanschauung*, a late nineteenth-century Jewish subculture when Wertheimer was raised.

The universe was seen as a complex dynamic structure characterized by order, reason, and purpose. Its parts are all interdependent and interactive. The parts of any whole are in a dynamic equilibrium and are incomplete in isolation; each part must be understood as part of the whole to which it belongs. (Wertheimer, M 2014)

Kurt Koffka, a Gestalt psychologist known as the chief spokesperson of Gestalt Psychology, had the famous phrase explaining Gestalt; "The whole is *other* than the sum of the parts". (Koffka) He, together with Wolfgang Köhler and Max Wertheimer was representatives of the gestalt movement and helped establishing theories that later formed the School of Gestalt Psychology. Humans inherently look for order or relationship between various elements, and are able to analyze individual parts as both separate components and as a whole.

The human mind desires unity and the idea that single components work together to generate something bigger than itself, and our understanding of the universe is a great example of this. Gestalt fits into visual design because cognitive holism is the effect any visual design piece wants to achieve. Gestalt is not only a historical anchor point of this way of thinking, but it also formed the analysis of what makes functional aesthetic visual design today.

2.6: Design Elements

The elements of design can be placed into the categories of line, shape, volume, value, negative space, texture and color. These elements form the principles of design and are used to create all visuals.

The line represents the first sketch, an outline and the starting process of a visual work. As the child draws his first stick-man using lines, and the architect student sketches out linework to design buildings, the line is the start of it all. Combining lines, making them into curves and change thickness it is the basis of any art, any font and any creative, mathematical or psychologically implied visual impression. Lines can create the illusion of depth, the feeling

of movement and suggest stability or unbalance. When combined with the other elements the line is a powerful tool to our perception.

A designer's mission is to communicate visual information in an efficient and unique way, and getting attention is a necessity, and not overdoing it is the key. What we often first notice in a piece of design is the shape of it. Either it is close or from afar, the shape tells us something about what we are looking at, whether it is a letter, a person or a symbol. A shape can be used as an informative clue on what we are approaching visually and it is seen before lines, structure, values or color. Identification often starts with the visual aspect most identifiable, which is the shape. Examples of shape can be artistic eras with their variations in style, as where cubism provides us abstract overlapping or connecting rectilinear shapes, and surrealism which applauds the organic and curvilinear shapes. Simple graphics, such as logos for branding are often inspired by shape, as it is to have a high visibility from far away and needs to be memorable within its simplicity.

Negative space is a product of gestalt theory, where the shape emerges from empty space meaning the figure/ground relationship between them. Allowing the silhouette to be blank while the surrounding shapes generates the image.

Volume defines the three dimensional visuals, meaning that design elements recreate the observation of an actual environment using depth, length and width. Often using light and shadow, a visual genre that can be linked to interior design, industrial design and architecture to make two-dimensional visuals looking as if they were three-dimensional. Value is describing light and dark, as where light does not exist there is no value. Value can create contrast, emphasis and dynamic to visual work. Something as simple as an artwork where all light is reflected from the sun and all darkness represents the absence of light.

From value we have **color**, which is an element of light. As the prism breaks light into the colors of the rainbow, we know that any colored surface will reflect the given color and absorb the rest. Subtraction and addition, color theory which is crucial for any visual designer to be familiar with.

Texture represents the quality of an object's surface, and when working with digital visual design there obviously is no actual quality of texture, but we are referring to an implied one, the illusion of texture. Recreating the surface of a shiny apple or a rough brick wall is what we mean by texture in visual design.

By identifying these elements of visual design it becomes much easier to analyze any piece of visual work. As gestalt learns us, it is the combination of the elements that generates the whole.

2.7: Principles of Design

Knowing about the elements, knowing about their characteristics lets us move forward onto how we can use them efficiently which is basically where visual design becomes successful. We call the arrangements of the design elements - the principles of design. There is no answer on how to correctly use a design principle, it all depends on the individual problem you want to solve.

Unity and harmony are terms in visual design that are based on finding the ideal placement of the elements where the relationship between them generates the perception of what belongs together and what does not, as Gestalt theory has taught us. The opposite of chaos, that is. To obtain this harmonic feeling of unity in visual design work we can apply repetition, rhythm or continuation to the design elements, and even play with placement. Objects that are close to each other are perceived as belonging together (Koffka).

We especially see these principles applied to magazines, newspapers and any work that contains a majority of text. Text as an element is rarely just a visual piece, it also has the hugely important trade that it is going to be read, and using text in visual design means that the designer has to prioritize unity and harmony in order for the reader to have a pleasant experience and that reading can be done as efficient as possible. We also want to avoid any objects colliding into each other or the edges of the interface unless it is meant to do so. Order and system creates harmony, and the use of empty space as in between letters should be applied to design elements as well. In western culture we read from left to right, while other cultures do the exact opposite. Commonly western readers prefer that any visual element “starts” from the left and flows to the right before moving downwards. This is what we should keep in mind when designing readable material with graphic elements, and make sure that the order is logical and your eyes easily flow through the elements in the order we desire. Using elements or color purposely over and over again is called repetition, and this can be a nice trick to remind a reader of either a “chapter color” or the theme that is being presented. Repetition can also be a layout that appears when a certain topic, summary or page is being presented, which provides the reader security and stability.

2.8: E-Learning Software

An e-learning environment provides flexibility for students to learn across different times and locations, allows self-paced learning, and provides a non-traditional learning alternative.

(Carver et al., 1999, Graff, 2003 and Terrell & Dringus, 2000)

Although we can assume that technology is widely adopted in workplaces and universities, and that E-Learning is on the verge of being a part of our daily lives, we need to keep in mind that the traditional classroom very much still exists and the transition and adaption to E-Learning may be overwhelming for some. Students adapt differently and the assessment of their performance is necessary to evaluate, which brings us onto the importance of personalized learning²¹ and learner personalities. In any type of setting where learners learn, there has been those struggling to adapt, and very often it is not because of disability and unability to actually learn, but simply that the individual prefers another way of learning. In a traditional classroom there is no time or funds that allows each and every student to have their own tailored learning environment, but E-Learning has allowed us to do so, by personalized learning.

E-Learning comes in many varieties, as mentioned before; Standalone courses, Virtual-classroom courses, Learning games and simulations, Embedded e-learning, Blended learning, Mobile learning and Knowledge management²². Deciding what solution to choose can and should be based on the hypothesis about your learners, because their influence and use of your resource will determine whether it will be an economical success as well as an educational one. Creating for the purpose of creation, and using expensive technological solutions for an E-Learning resource that could have been solved much more efficiently, are to be avoided.

²¹ or *personalization*, refers to a diverse variety of educational programs, learning experiences, instructional approaches, and academic-support strategies that are intended to address the distinct learning needs, interests, aspirations, or cultural backgrounds of individual students.

²² *Knowledge management (KM)* is the process of capturing, developing, sharing, and effectively using organizational knowledge.

2.9: Learning & Education

Different methods of learning has emerged, evolved and created important questions about whether there is a preferred or correct way of acquiring learning objectives. What methods benefits the learner in the best way possible? In what context should the teaching be applied? And is the approach fair, realistic and potentially successful for everyone? In order to understand these approaches and how they are applied to online learning, we need a definition of the word “knowledge” in order to understand what goals they are meant to support. And someone that addressed several of pedagogical questions was the American educational psychologist Benjamin Bloom, the author of the publication “*Taxonomy of Educational Objectives*”, which contained educational goals in terms of instructive and cognitive ways of mastering of learning objectives. He believed that knowledge consists of many sets of levels that can be assessed to confirm whether or not the students learning is successful and the goals of the learning objectives have been achieved.

He defines knowledge as: “*Knowledge, as defined here, involves the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting.*” (Bloom, 1956, p. 201)

If we accept Blooms definition of knowledge it is easy to see that these steps are quite general and what this means to an individual may vary from one to another, but what they do have in common is the part of recollection. What we mean by recollection is the ability and power to be able to bring back information from memory with processes and patterns and being able to apply them in new situations, and this is of course a crucial aspect of learning and education. Is the way you and I recall information necessarily the same? Do we apply it in the same matter? When we talk about online learning we imagine all kinds of different individuals with various backgrounds, experiences and starting points. Some may have a lot of previous knowledge about the subject being taught while others do not have any at all. Origin, language and culture may also vary within the learners creating a diverse online community that holds a lot of innovative and exciting potential but also many dangerous pitfalls. The aspect of being able to obtain knowledge at - anytime, anywhere - sounds promising and efficient, but is that necessarily always the case for everyone? The science of pedagogy is not and probably cannot be defined in any true form, and in order to have any chance at narrowing it down at all we need to see what context it is being executed in.

2.10: Learning Theory

The most common learning theories are behaviorism, cognitivism and constructivism, although these theories were developed at a time where learning was not impacted by technology. Technology has changed the way we live, communicate and learn and while only forty years ago we were educated for life long jobs, we now can be re-educated several times throughout our lives because information development is much faster. Many learners move onto new, different and also unrelated fields in their life, and informal learning lets learning occur in a variety of ways. Learning is not limited to work, but has become a part of our daily life. Our technological tools define and challenge the way we think, and many of the processes handled by learning theories can now be supported by technology. (Siemens 2005)

2.10.1: Behaviorism

Behaviorism is an approach based on the systematic approach of understanding humans through animal behavior. Based on the principles of reinforcement and punishment it focuses on changing external behavior. Desired behavior is rewarded, while undesired behavior is punished. Behaviourism in education views the teacher as the “dominant” person in the classroom that holds all control, determining right behavior from wrong. It is an emotionless approach where learners has to accept rules and know what is demanded from them. Fields like mathematics and military are some examples that are using this pedagogical approach (Skinner, BF 1976).

2.10.2: Cognitivism

Cognitivism, as a response to behaviorism focuses on the inner mental activities and believes that the human mind is valuable and necessary for learning. Knowledge as a series of mental processes, such as thinking, knowing, memory and problem solving is defined as a change in learners schemata. Seeing people as more than programmed animals, but rather rational beings that are information processors.

2.10.3: Constructivism

Constructivism or constructivist learning states that learners attempt to foster understanding by meaning making tasks.

This is a branch of the philosophic field of epistemology which is concerned with the nature and scope of knowledge and justified belief. *"...Epistemology is about issues having to do with the creation and dissemination of knowledge in particular areas of inquiry."* (Déirdre Dwyer - 2008)

What this means in terms of learning and education is that this approach works to confirm whether or not learning objectives are actually being learnt or just perceived to be. A way to put this is seeing constructivism as an educational detective - confirming that knowledge is a result of learning and that it is truly existent.

2.10.4: Connectivism

Most learning theories are concerned with the actual process of learning, not the value of what is being learned. To see these theories through technology raises many important questions, and keep revising them several times modifies them to the point where they stop being sensible makes them lose value. George Siemens` article; Connectivism: A Learning Theory for the Digital Age, suggests that "learning is a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual." (Siemens 2005). It is a theory driven by the understanding on rapidly altering foundations where new information is frequently acquired.

Siemens principles of connectivism are:

- Learning and knowledge rests in diversity of opinions.
- Learning is a process of connecting specialized nodes or information sources.
- Learning may reside in non-human appliances.
- Capacity to know more is more critical than what is currently known
- Nurturing and maintaining connections is needed to facilitate continual learning.
- Ability to see connections between fields, ideas, and concepts is a core skill.
- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities.

- Decision-making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision.

While behaviorism, cognitivism and constructivism focuses on the individual's ability to obtain knowledge, connectivism attempts to address the challenges of organizational knowledge and transference (Siemens 2005).

2.11: Learner Intelligences

Gardner's Theory of Multiple Intelligences (Gardner 1991) identifies seven distinct intelligences that emerged from his cognitive research, and according to his theory the way students learn is distinctive. Combo is a combination of two or more learner intelligences. The seven styles of learning shows 7 types of learner intelligences we can detect in a learning environment are further explained in this chapter:

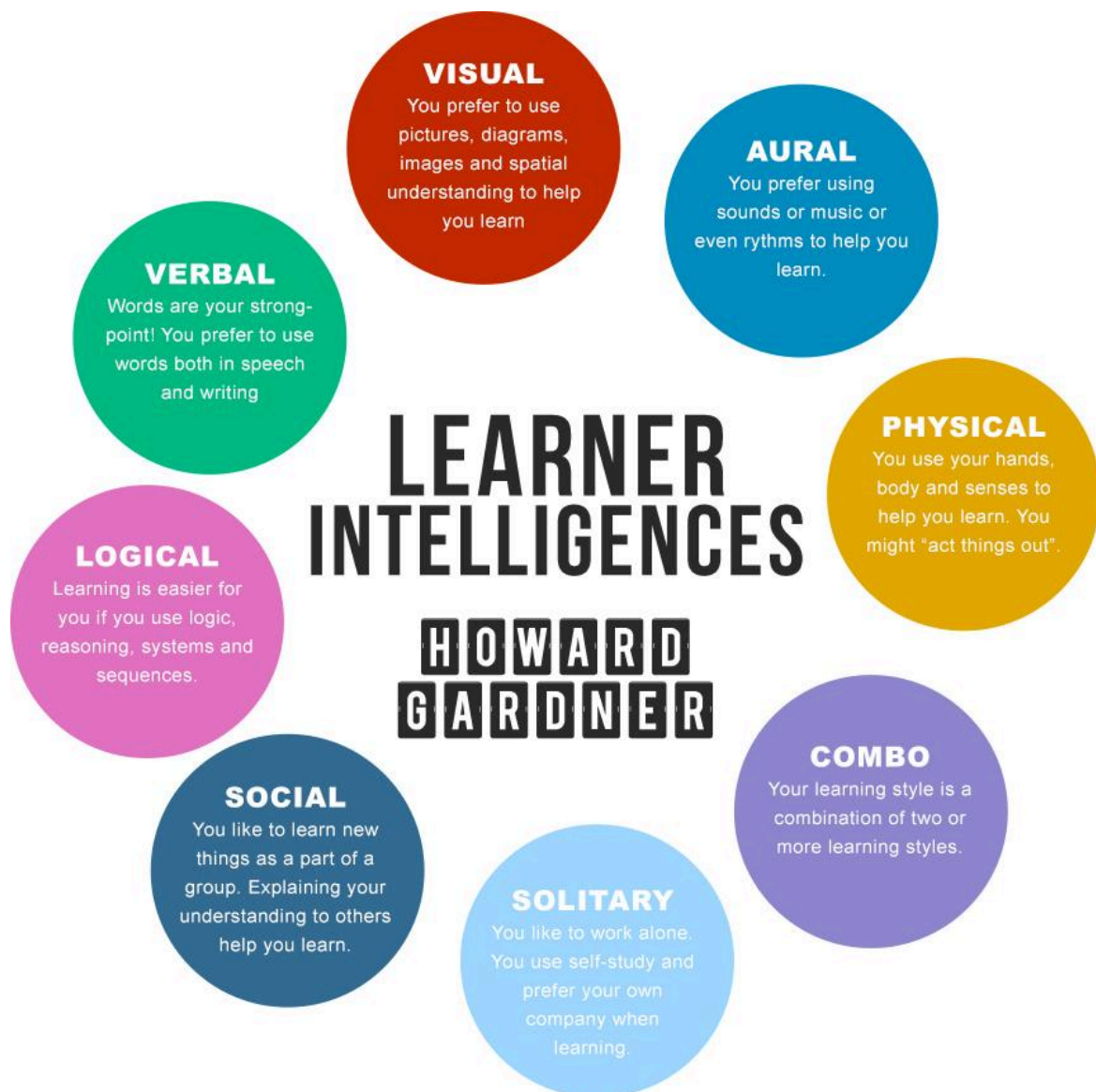


Figure 6: *Visual presentation of Learner styles by Gardner*

Visual/Spatial learners prefer visual aids to gain knowledge, and responds best to images, colors, layouts, mind maps and visual stimulation that brings the content to life. They avoid distractions and interpret by using spatial understanding.

Aural (Auditory-Musical-Rhythmic) learners are learners that connects music and sound to their knowledge and are most likely to be in an auditory field of education or work. They are driven by patterns, rhythm and structure. They respond better to sound-books, movies, video and lectures than reading and visuals alone.

Verbal (linguistic) learners are learners that are driven by the spoken word, written text and literature. They prefer these methods over anything else, and are prone to be good public speakers, good readers and good writers. They are likely to enjoy discussions or role play, and prefer verbal explanations rather than visual ones.

Physical (kinesthetic) learners are learners that are driven by applying their physical being into the learning process. They prefer using their bodies, emotions or hands in order to learn. This could mean the use of physical tools, computers or other interaction that connects their actions to the task they want to solve. They are often restless and easily bored if they cannot apply sensation to their learning.

Logical (mathematical) learners are learners that are driven by logic, reason and pattern recognition. They are prone to be good mathematicians, systemizers and seeing the bigger picture, as they detect the key information needed for the task at hand. They are great problem-solvers that see links in patterns and detects any abnormalities.

Social (interpersonal) learners are learners that prefer working in teams and collaboration with others to obtain knowledge. They are social beings that would rather interact with others than working alone. They thrive at solving problems with others, and are the ones most likely to enjoy role play, discussions and creating new associations together. These learners are often explorative, good listeners and love sharing.

Solitary (intrapersonal) learners are learners that prefer to work alone, rather than in a group. They are focused and independent and likes to reflect and solve problems by themselves even if it could be more efficiently done together with others. These learners spend time on self-analysis and reflection, are driven by internal goals, beliefs and values. (Gardner 1991)

Combo learners are those who identifies themselves with more than one of the learner intelligences and prefer a combination of two or more.

Knowing of these learning styles, it is arguable that one is either one or the other type of learner. One might discover that several ways of learning or that a combination of two of them is most suitable. What this tells us is that by using this theory, we become aware of what needs our learners potentially can have, therefore adapting learning for their needs.

2.12: 21st Century Learning

P21's *Framework for 21st Century Learning (2015)* states that the skills needed for students to succeed in work, life and citizenship are; Creativity & innovation, research & information, communication & collaboration, research and information and digital citizenship.

What makes 21st Century Learning different from 19th and 20th century knowledge is the access to existing curricula through the use of design and digital technology. The Assessment and Teaching of twenty-First Century Skills Project (ATC21S) expresses that knowledge in network learning and lifelong learning strategies are essential competencies for living and working in the future (Griffin et al. 2012).

Assessment and Teaching of twenty-First Century Skills presents the KSAVE-model, an acronym for: Knowledge, Skills, Attitudes, Values and Ethics, where the authors broadly presents the forms of competence and skills needed for 21st Century Learning with the ethical values that are necessary:

Ways of thinking
<ol style="list-style-type: none"> 1. Creativity and innovation 2. Critical thinking, problem solving, decision making 3. Learning to learn, metacognition
Table 6: KSAVE model - Ways of Thinking

Ways of thinking describes the ability to use creativity, create innovation, perform critical thinking, problem solving and decision making. Learning to learn and metacognition are also valuable skills, believing that in a changing society being able to find new solutions is of great importance. (Binkley et al., 2012)

Ways of working
4. Communication
5. Collaboration
Table 7: KSAVE model - Ways of Working

Ways of working is divided into communication and collaboration, underlining the importance of interdisciplinary fields and outsourcing across borders. This helps globalization in both work and education across the globe, which ICT and digital tools allows us to do with the right competence. Knowledge in language, positive attitudes and seeing cultural potential instead of stereotyping is essential for the ways of working. Johnson & Johnson focus on what benefits a cooperative culture as opposed to a competitive one. (Johnson et al., 2006)

Tools for working
6. Information literacy
7. ICT literacy
Table 8: KSAVE model - Tools for Working

Tools for working is an area of competence we define as digital competence. Information literacy and ICT literacy is knowledge needed for interpretation expertise in an increasing stream of information in different mediums. A critical view is needed to evaluate, sort and use information creatively and with purpose. Knowing what tools are beneficial to serve what purpose and the ethical and juristic rules that are applied to those areas is a part of digital competence. (Assessment and Teaching of twenty-First Century Skills)

Living in the world
8. Information literacy
9. ICT literacy
10. Personal and social responsibility including cultural awareness and competence
Table 9: KSAVE model - Living in The World

Living in the world defines knowledge; of one's home country, understanding roles and responsibilities of policy-making authorities, political knowledge, concept of democracy, citizenship and international declarations, world history and cultural movements. Skills in decision making at a local and international level, display solidarity, interface efficiently and profit from international programs. Not assuming, but knowing what it means being a citizen of the world and recognizing that respect, equality and integrity are applied values (Assessment and Teaching of twenty-First Century Skills).

21st Century Skills are important to remember when we develop E-Learning, as it is in the category of *Tools for Working*. The TPACK model explains what knowledge areas a teacher needs to be efficient in digital tools; Technology, Pedagogy and Content. (Shulman, 1986) In educational technology this model is becoming more popular building on core ideas through the inclusion of technology.

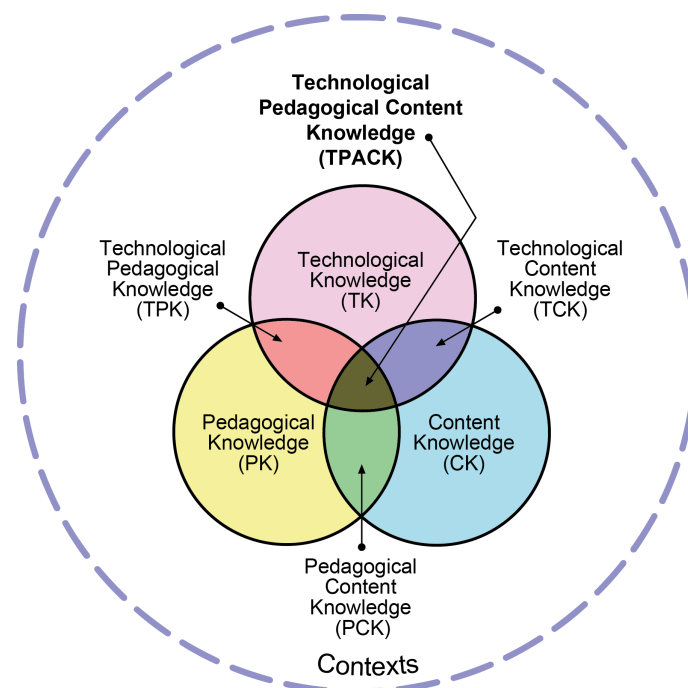


Figure 7: Mishra & Koehlers - Technological Pedagogical and Content Knowledge Model.

<http://tpack.org>

The TPACK framework highlights complex relationships that exist between content, pedagogy and technology knowledge areas and may be a useful organizational structure for defining what it is that teachers need to know to integrate technology effectively (Archambault & Crippen, 2009).

Technological competence is needed technological educational training, whether it is through smartboards, internet or a pedagogical software. Combining this knowledge with pedagogical methods that compliments the course content while being aware of the possibilities and limitations, is what makes a 21st century teacher that can be seen as a role model for their students. The TPACK model could be further explained than it is in this thesis, but it is worth mentioning that learners need competent teachers and role models when learning through technology. The teachers may not be limited to the traditional classroom, but their pedagogical competence is still needed online, and through the use of digital tools (Krumsvik, 2007).

Digital immigrants and *digital natives* are terms for understanding the needs of learners with conflicting generations. Digital immigrants describes the learners born after 1980, that had a different approach to technology than the younger generations which were “born digital”²³ native speakers of technology (Prensky 2001). Many teachers today have the role of being digital immigrants, meaning that their relationship with technology has been a process of adaption, and that it is not necessarily something they have been introduced to until later in life. For modern teachers to be role models according to the KSAVE model, TPACK model and 21st Century Skills, we need to acknowledge that this adaption can be more challenging for them than their digital native students who have grown up alongside technology. The teachers that are now transitioning into online learning become students themselves, understanding, adapting and practising the use of digital tools and new technological skills. 21st Century skills requires both teachers and learners to evolve, and although the term *student* is mostly used regarding these skills it is helpful to consider that it applies to anyone learning in the 21st Century.

²³ Born digital, in reference to people, is a description of individuals who have grown up with the current state of ubiquitous computing and communications, typified by technology like smartphones, social media and near-continuous Wi-Fi networks.

2.13: Motivation

To achieve high quality learning, an individual needs to be fully involved with the learning activity driven by motivation, flow - wishing to do what one does. (Csikszentmihalyi, 1989) We have two types of motivation, intrinsic and extrinsic. Intrinsic motivation²⁴ is the natural inclination toward assimilation, mastery, spontaneous interest and exploration that represents a source of enjoyment and vitality through life (Csikszentmihalyi & Rathunde, 1993; Ryan, 1995). Intrinsic motivation can be enhanced by positive performance feedback, while as negative performance feedback diminishes it. The most basic distinction is between intrinsic motivation, which refers to doing something because it is inherently interesting or enjoyable, and extrinsic motivation²⁵ which refers to doing something because it leads to a separable outcome. (Deci, 1975) Desire to do something trumps the finesse of a neatly designed E-Learning resource, and willing motivated learners are the ones who will walk that extra mile to achieve their goal. Unmotivated learners have different needs and they are hoping to find that motivation within the resource.

Increased demands in flexible learning has higher education going through major changes and developing online education is a transformation in the educational landscape. Although online learning provides freedom, a personal computer or a mobile device provides access to so many other activities that are not learning related and can create distractions for the learner. An ongoing course may be at a standstill where learners are lacking motivation and the temptation of informal activities becomes much stronger. An online community needs guidance and support in order to keep learners engaged in learning activities. Another factor that plays a role in terms of motivation is that the lifespan of one technology is short lived, and adapting to new programmes and software is essential to upkeep knowledge of the given learning platform. Creating a presence, interact and enhance communication with others are qualities that learners value but that can be faded in online learning environments which means E-Learning has to recreate the social and psychological motivation that used to occur in the physical classroom. (Conceicao & Lehman, 2013)

Studies support the effectiveness online learning has compared to traditional classroom learning, although students often fail to complete online courses and programs, in some studies a rate as high as 50-70% drop out. (Carr, 2000; Roblyer, 2006; Rovai & Wighting, 2005; Simpson, 2004.)

²⁴ This comes from within (such as self-feedback) and is the most rewarding and long-lasting type of motivation.

²⁵ refers to behavior that is driven by external rewards such as money, fame, grades, and praise.

Chapter 3: Methodology & Research Process

To find out how the use of visual design affects E-Learning from a learner's perspective, this study was conducted by a two step quantitative research model. The first part of this experiment was to allow the users to examine the two different E-Learning resources, and the second part consisted of a questionnaire. This chapter represents the methods used for looking into the research questions and analyzing the approaches that provide reliable answers. The positivist approach to research aims toward the philosophy of knowing, rather than the methodologist approach, where the results obtained from this experimental research are scientific but with the focus on provision for human interest. Minimal interaction with participating attendants combined with a fast speed conducted research point towards a positivist paradigm. (Wilson, 2010)

3.1: Background

Two E-Learning resources was creating using Adobe Captivate²⁶, including text, images, video and interaction, to teach the course "Visual Design" (Program A and Program B).

Testing was directed towards students attending bachelor/master in multimedia and were the primary target group for this research. One resource had a more basic and generic visual with simpler graphics and colors, while resource number two was very colorful, with elaborated designs and decorative elements than the other. Standard text fonts, the information presented and chapter structure remained the same in both programmes. The only difference between them was the overall visual design and visual examples.

The intention was to see which one learners prefer over the other and what attitude they had towards the use of design in E-Learning resources, personal familiarity and if this was an appreciated method of learning. Users were asked to complete a questionnaire upon the exploration of each programme where they could answer anonymously about their experience. User testing and the questionnaire were given the students online, meaning there was no controlled testing environment. The purpose of this was to let the users decide the environment themselves and participate only if they had the desire to do so, simulating

²⁶ **Adobe Captivate** is a rapid responsive authoring tool that is used for creating elearning contents such as software demonstrations, software simulations, branched scenarios, and randomized quizzes in Small Web Formats (.swf) and HTML5 formats.

the portrayed way this resource would be used as if was a part of their education programme.

3.2: Two Stage Quantitative Research Model

The online tools used for this testing and questionnaire was Fronter LMS²⁷ (Learning Management System) and Google Forms²⁸, which lets us monitor the user's activity and data collection. Fronter LMS hosted the two programs interface, tracking how many and at what time users were interacting with the resources. Google Forms collected data from the questionnaire allowing graphic presentations and statistics over delivered answers. The rationale for this study design was to measure the statistical answers for Program A and Program B and compare them, and also get a documented overview on the attitudes the users had towards both these learning programmes as well as E-Learning in general.

This study has used a positivistic approach within the field of empirical research. The questionnaire represents a quantitative research as a quasi experiment for estimating the impact of an intervention on the target demographic. This experiment does not include a control group and is subject to concerns regarding internal validity.²⁹

Positivism has science as an underlying ground and relies on the following aspects:

1. *Science is deterministic.* Scientific approach is based on assumption that X causes Y under certain circumstances. The role of researcher when following the scientific approach is to discover specific nature of cause and effect relationships.
2. *Science is mechanistic.* Mechanical nature of scientific approach can be explained in a way that researchers develop hypotheses to be proved or disproved via application of specific research methods. Things brings to the fact that
3. *Science uses method.* Chosen methods are applied mechanically in order to operationalize theory or hypothesis. Application of methodology involves selection of sample, measurements, analysis and reaching conclusions about hypotheses. Therefore,

²⁷ Fronter is a Norwegian Learning Management System used in education.

²⁸ With Google Forms, you can create and analyze surveys right in your web browser—no special software is required. Multiple people can work at the same time, and every change is saved automatically.

²⁹ reflects the extent to which a causal conclusion based on a study is warranted. Such warrant is constituted by the extent to which a study minimizes systematic error (or 'bias').

4. *Science deals with empiricism.* In other words, science only deals with what can be seen or measured. From this perspective, science can be assessed as objective. (<http://research-methodology.net/research-philosophy/positivism/>)

This experiment is in no way a definite conclusion of what role visual design has in online learning. The aim was to look into and familiarize with the current status in the selected target group to familiarize with the attitude towards both E-Learning in general - and combined with visual design.

Visual design attracts, therefore motivates and leads to more frequent use. Being from the same study programme, assumptions came to be that this population may feel the same way. But I would never assume from these results that this would apply to any individual or any other course out there. Teaching visual design through visual design is most likely the best way to do it, but aware there are learners out there who prefer a pdf with no pictures, no clicking, just scrolling through bland contrast less text and being completely satisfied with that. - Learning completely fine by doing that. So this is not a point of promoting heavy use of visual design as a motivational technique or stating it is the solution to rid of online learning dropouts. This research is the thought and application of the possibility visual design has to do that, for some. Maybe this specific group of creative, visual people learn best this way. Maybe they enjoy learning more? In this testing, visual design has no impact on the information presented at all, meaning that the written content were less important to judge, but rather the packaging it came in.

3.3: Choice of Topic

Being a multimedia student, and with a passion for visual design, my encounter with E-Learning technology spiked my interest in searching for answers in terms of what visual design means for E-Learning. Hypothesis was that visual design can be used as a motivational tool that attracts learners, promotes positive feelings and more frequent use of the online resource. When first discovering E-Learning the impression was that mass produced online solutions suffered from the lack of visual design and that learners lacked motivation to use them, because they were plain, boring and generic. Teaching visual design to tomorrow's visual designers, should be a motivating inspirational process for the learners, appealing to the actual reason they desire to use the resource.

This field of education is being trained to expect more from digital technology and form thoughts and ideas on future developments, envisioning how creative technology can be

even more valuable in the years to come. Challenging this specific group is especially interesting for me, but also useful for their own level of introspection, where they are faced with the opportunity to provide their personal and honest opinion on what they believe E-Learning should represent. Communities and environments concerned with the field of online learning can also benefit from these results.

Chapter 4: Empirical Data Presentation & Results

4.1: Introduction

This chapter represents the key findings of the conducted experiment, the quantitative and qualitative data sampled from the population of interest. The questionnaire had 23 participants from the targeted representatives with data gathering using Google Forms.³⁰ Population focuses on the collected data that describes the target demographic reached, the volunteering attendants by their characteristics and what implications these results provide. Program A vs Program B are the results considering the differences between Program A (generic designed) and Program B (heavy use of visual design), comparing what we have learnt from the target demographic in terms of unique observations that differentiates the two resources. General observations embodies the overall data that is useful for understanding attitudes towards E-Learning courses in general, but also what attendants attitudes suggests regarding the use of visual design in E-Learning resources. Illustration captions in this chapter are in Norwegian, as this was the selected language in the attendants questionnaire.

4.2: Demographics

This section shows the demographic of the attendants, their gender, age and field of study and what implications these results provide. Demographics focuses on the experiment population, the collection of individuals that are the objectives for this thesis.

4.2.1: Population

Results show that within the 23 attendants a total of 12 women (54,2%) and 11 men (45,8%) answered this survey, which provided an equal selection of testers in terms of genders. This experiment do not seek to promote gender perspectives or mainstreaming, and holds a

³⁰ Google Forms is a free tool from Google that allows you to do the following:

- Create forms, surveys, quizzes, and such
- Share the forms with others
- Allow others to complete the forms online
- Collect all the responses in a spreadsheet
- Provide you with helpful summaries of the collected data with charts and graphs

holistic approach with the intent to provide an equitable distribution of resources and benefits regardless of gender. (Green, 2010)

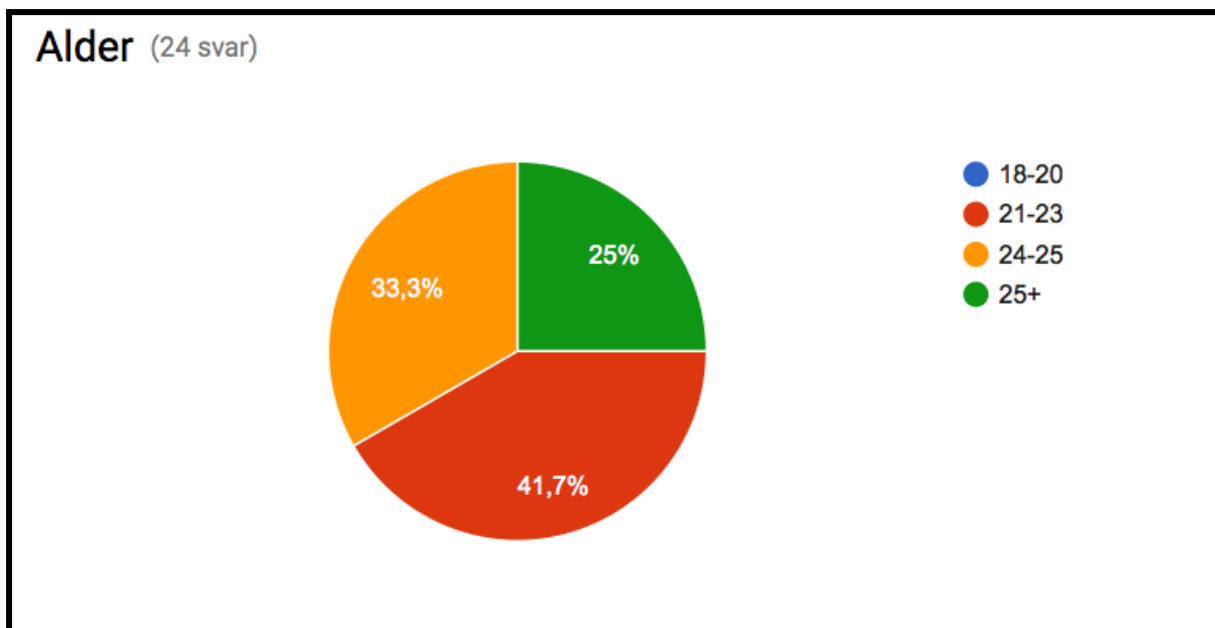


Figure 8. Age Figure showing attendants age

Figure 1 shows that the majority of testers were in the age 21-23 (41,7%), but also that 25% of them were over the age of 25. Marc Prensky (2001) formed the definition *digital immigrants* and *digital natives* to understand the needs of students with conflicting generations. Digital immigrants describes the students born after 1980, that had a different approach to technology than the younger generations which were “born digital”³¹ native speakers of technology (Prensky 2001). Acknowledging that late 20th Century generations had to be introduced to technology, as where later generations are being digitally included, meaning; *that you are innately able in using a smartphone or computer tablets: modern technology has enabled the non-speaking to speak, the non-hearing to hear and the non-seeing to see* (Nachimuthu & Vijayakumari 2012). This information suggests that the 25% attendants over the age of 25 are possible candidates for being digital immigrants, or digital settlers that have had to adapt to technologies to the changing environment. As all attendants are in some way a part of the Multimedia community at University of Agder (either Bachelor in Multimedia or Master in Multimedia), they are most likely to be digital settlers that rise with different behaviour and attitude characteristics by the use of technology to keep

³¹ Born digital, in reference to people, is a description of individuals who have grown up with the current state of ubiquitous computing and communications, typified by technology like smartphones, social media and near-continuous Wi-Fi networks.

up with the times. To determine learner characteristics in a digital divide world in order to reduce controversy between them is a part of 21st Century Skills (Adile Askım; Günüş, Kurt 2013)



Figure 9. Resource Explored *Figure showing what program attendants has explored.*

Although assuming that all attendants explored both resources, results show that 62% explored Program A (generic design) and only 37% explored Program B (heavy use of visual design). This implies that a number of attendants have failed to complete the experiment objective to explore both resources and complete the survey for each exploration, compromising the reliability of this experiment with a lack in consistency of performing the desired tasks. Estimates indicate that 80%–95% of college students engage in procrastination³² (Ellis & Knaus, 1977; O'Brien, 2002), which suggests that attendants in this experiment have possibly engaged in procrastination and not choosing the desired course of action because the motivational factors were non-existent. Although being informed that the experiment were valuable for their educational programme, choosing another course of action based on other interests, preferences or goals is a definition of procrastination (Ellis & Knaus, 1977; O'Brien, 2002).

³² To defer action, especially without good reason.

4.3: Program A vs Program B

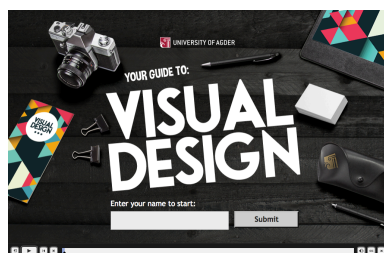
This section shows comparisons between answers given by attendants that have explored Program A vs Program B, and the assumptions based on this data. Both resources are made using Adobe Captivate 9, and share the same course display through a centered floating window as an interface. Integrated by SCORM³³ via Fronter LMS the users gained access to the resources through their personal University of Agder - username and password login credentials. Especially designed for desktop view, these resources are meant to mimic a classroom setting where learners have access to personal computers, excluding optimal view on mobile devices. With Captivate's ability to publish through HTML5, resources can also be explored outside an LMS, but with the feedback information that the resources are *"unable to acquire LMS API, and content may not play properly and results may not be recorded"*. In this case however, resources are not limited to be used through LMS and can be used externally without any complications. Publishing through Fronter was a way for attendants to get easier access to the resources.

Resources are available for viewing under these links (external):



PROGRAM A (generic design):

http://elearning.cassandrahaugen.com/index_scorm.html



PROGRAM B (heavy use of visual design):

http://elearning02.cassandrahaugen.com/index_scorm.html

When asked if the E-Learning resource presented the topic in a good way, all attendants (100%) exploring program B (heavy use of visual design), answered that the resource presented the topic in a good way. Program A however (generic design), shows three

³³ **Sharable Content Object Reference Model (SCORM)** is a collection of standards and specifications for web-based electronic educational technology (also called e-learning).

attendants (13%) are disagreeing with this statement. Considering more attendants explored program A than B, it is difficult to form any valid conclusion from this knowledge, other than the assumption that this group of demographics possibly are prone to be visual/spatial learners that are more likely to respond positively to resources that emphasis on the use of visual design. Spatial ability “represents visual spills, spatial manipulation, recognizing the similarity of visual images, and imagining how visuals might appear in other orientations” (Jonassen & Grabowski, 1993).

Attendants preferring Program B over Program A, are more likely to find the heavy use of visual design most useful for their learning, as the ability to envision learning material through graphic design is preferable for spatial learners. Also when asked whether or not they would prefer a similar resource for future use, results display that 8 out of 9 would reuse a resource similar to Program B (heavy use of visual design), and 10 out of 14 would use Program A (generic design) again. Although being marginal observations, there are tendencies throughout collected data that implies heavy use of visual design trumps the favors for the generic resource.

Hva synes du om E-læringsprogrammets layout og design? *

	1	2	3	4	5	6	7	8	9	10	
Uoversiktlig, rotete	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Oversiktlig, ryddig

Figure 10. Opinions on layout & design Rating scale from the questionnaire

The questionnaire used for this experiment also provided attendees with the possibility to rate statements on a scale from 1-10 as a measure of agreement. This is a response scale that offers a clearer view of users attitude and opinions, where each side of the scale represents a statement they can agree or disagree to, considering a rating of 5 to be a neutral opinion. A graded response model (GRM) provides a numeric rating scale that becomes translatable into suitable indicators by observable variables (operationalisation)³⁴ of relevance (Frary 1998).

³⁴ In the social sciences, operationalisation has come to mean the process through which (abstract) concepts are translated into (measurable) variables.

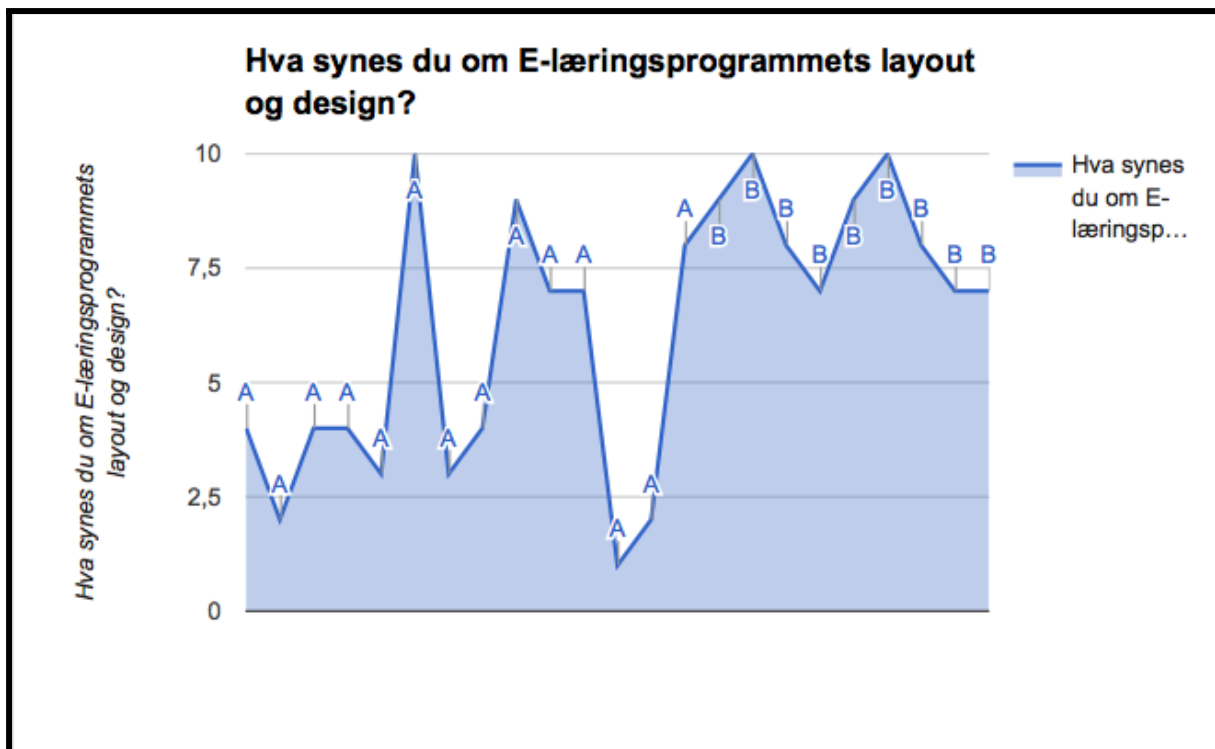


Figure 11. A/B Opinions on layout & design Comparison of Program A & B

When asked to rate each resource on a scale from 1 to 10, where 1 equals “messy and complex” and 10 equals “straightforwardly and orderly”, we can observe that Program B (heavy use of visual design) trumps the rates with every attendant giving a higher score than 7. Program A (generic design) shows various ratings all the way from a rate of 1 to 10. Reasons for these ratings may stem from the fact that Program B emphasises more on instructional graphics, color and personalization which promotes metacognition³⁵, a skill included in twenty-First Century Skills, by the KSAVE-model (Assessment and Teaching of twenty-First Century Skills). Metacognition improves the quality of the dynamic relationship between student and E-Learning environment, and being able to not only recognize information but also access it quickly will affect the usability, simplicity and clarity of the content. The more useful an E-Learning environment is, the more successful it will be (Kirsh, 2005).

³⁵ higher-order thinking that enables understanding, analysis, and control of one’s cognitive processes, especially when engaged in learning.

4.4: General Observations

This section shows observations regardless of the resource explored, but overall statistical information that describes the attendants feedback on overall factors regarding E-Learning resources. This includes attitudes towards visual design in E-Learning, favourite aspects and future aspect.

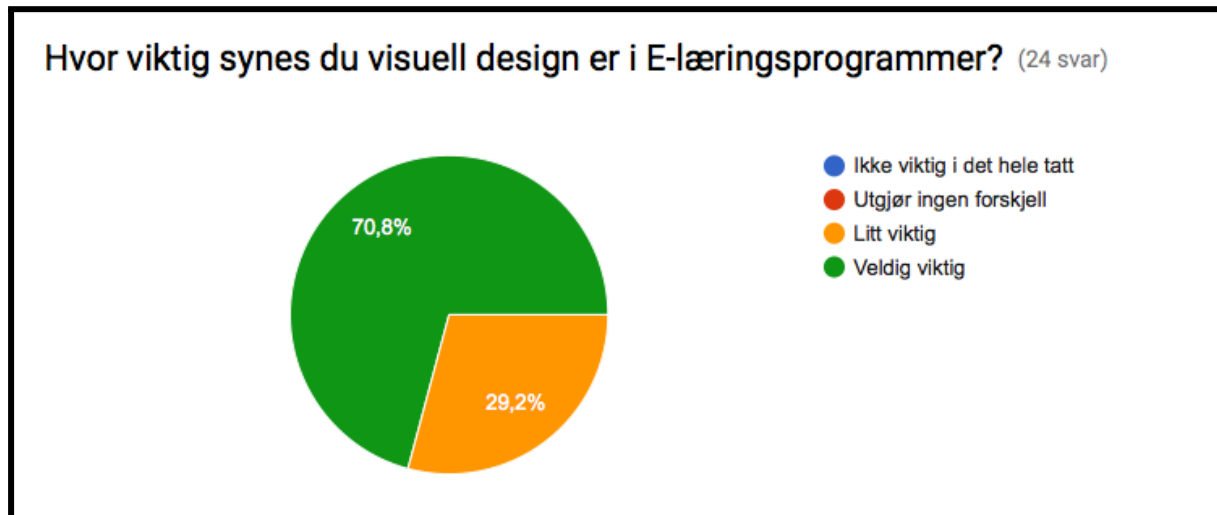


Figure 12. Importance of visual design in E-Learning resources

“How important do you think visual design is in E-Learning resources?” had 70,8% of the attendants answering that visual design is very important, and 29,2% stated that it is a little important. No one agreed that it made no difference and no one claimed it to be unimportant, meaning that all attendees considered visual design in E-Learning to matter.

What makes this experiment somehow biased ³⁶is that the topic being taught is visual design, while attendants are being questioned about visual design. This can possibly guide the attendants to automatically feel like they should mark this question as one of high importance and especially since it is a part of their educational field. The self - serving bias has been extensively studied in social psychology and the concept is closely connected with self - enhancement, which refers to a general sensitivity to positive self - relevant information (Taylor and Brown ,1988).

³⁶ Bias: Tending to yield one outcome more frequently than others in a statistical experiment.

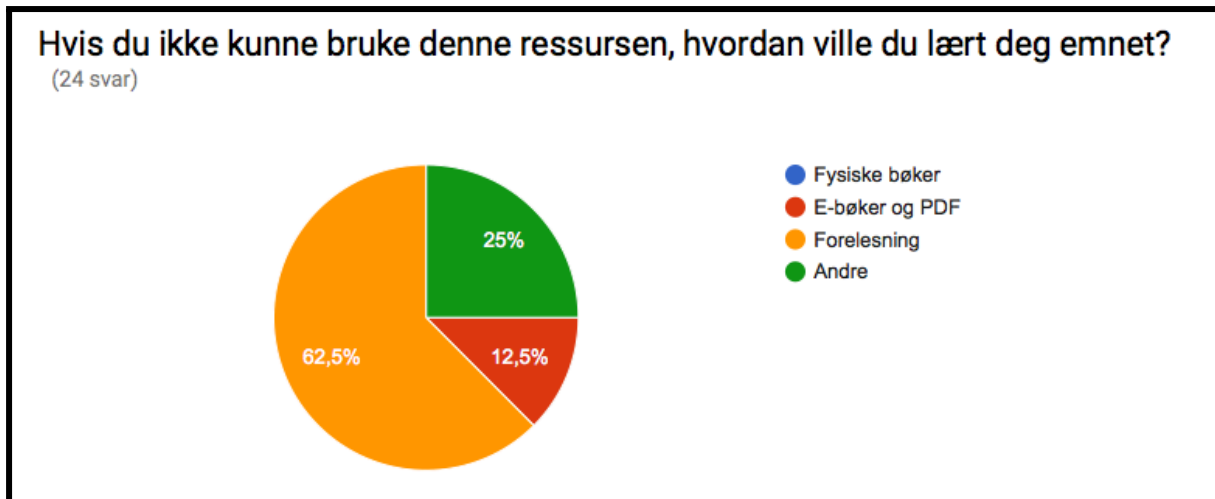


Figure 13. How else would you learn this topic?

When asked “*If this resource was not available, how would you learn this topic?*”, 62% of attendants answered that they would learn this course through lectures. 25% preferred a combination of online resources such as E-Books, youtube, PDFs or all of the above, and 12,5% would prefer strictly E-Books and PDFs.

Since knowledge tells us that the medium itself is irrelevant for learning, but that the instructional method used is what is important (Clark, 1994; Dillon & Gabbard, 1998), may indicate that the 62,5% answering classroom lectures are prone to prefer a connectivist approach of learning. Where “*learning is a process that occurs within nebulous environments of shifting core elements – not entirely under the control of the individual.*” (Siemens 2005). Data shows that no one answered physical books for learning the topic, and only a minority would prefer E-Books or PDFs. These tendencies could suggest that these learners needs to be influenced by social factors in a nurturing and dynamic learning environment or that they believe that learning and knowledge rests in diversity of opinions. (Siemens 2005).

When asked “*What do you especially appreciate with the resource you explored?*”, 66,7% answered that explanatory visual examples was what they liked best, followed by 58,3% answering text and Information and 50% layout & structure. Not able to choose more than one option, this section forces attendants to only choose the one they prioritize during the exploration of the resources. A dominant response for exploratory visual examples suggests that those users viewed this experiment from a learner's point of view, and maintained focus on what visual design actually accomplished in order for them to gain knowledge using the resources. Attendants choosing text and information suggests that they appreciated the information presented in the course which immediately makes the course valuable

regardless of visual design, but with the assumption that these factors combined is what the attendants enjoyed about these resources in general.

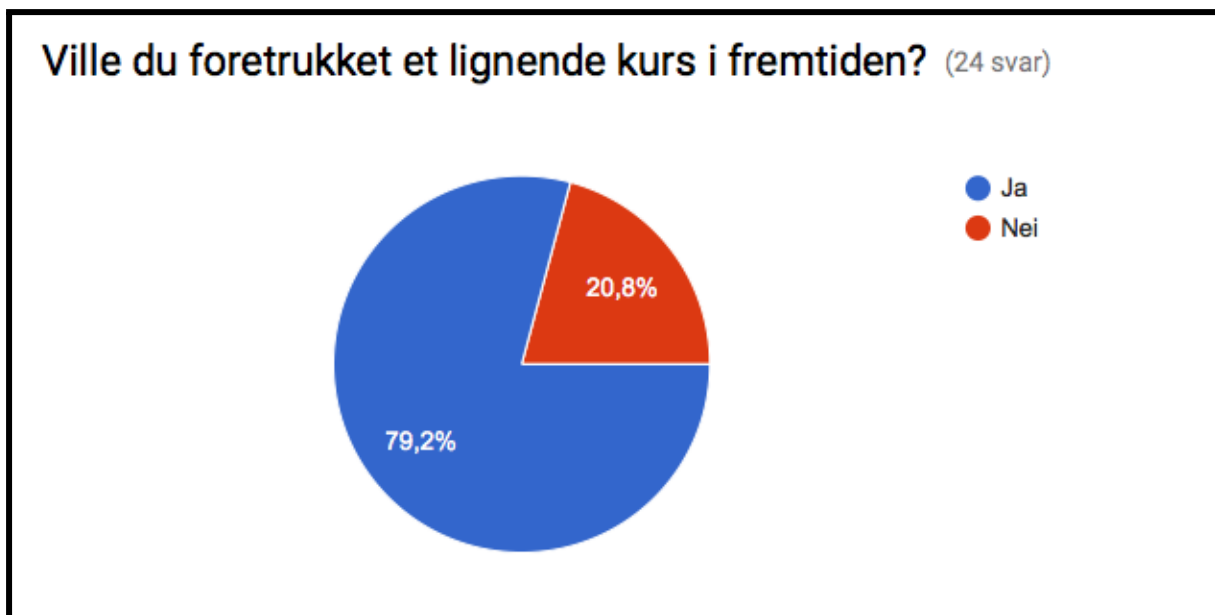


Figure 14. Future aspect

When asked “Would you prefer a similar course in the future?”, 79,2% of attendants answered that they would, and 20,8% answered they they would not. This indicates a positive future aspect, which suggests that E-Learning resources similar to the ones presented in this experiment are preferable methods of learning for these attendants. Within the 20,8% that answered “no”, only one attendant exploring Program B has given this response, meaning heavy visual design influence is more attractive to this population than a generic design. Overall this data suggests positive attitudes toward both resources and the use of E-Learning in general. This population are very familiar with digital tools and using the web for learning, but do not encounter resources like these on a daily basis. This can indicate that the structure provided through the use of an E-Learning resource like the ones used in this experiment is attractive to this demographic, and combined with the use of visual design a majority would prefer this solution in the future.

Chapter 5: Summary & Conclusions

This testing and survey is directly aimed towards students at University of Agder, Multimedia & Technology (2016), and the given results may not reflect the overall students at this course. However, the participants volunteered freely to take their time and effort into performing these tasks and answer the questionnaire making their opinions value. In an uncontrolled testing environment we do not know the limitations of their experience performing these tasks and whether or not they discovered technical difficulties along the way. The time limitation of creating these resources, questionnaire and recruiting volunteers in the target demographic was obviously challenging, but what is of an unique value is that the target demographic reached has enough field competence to be eligible to provide answers that are useful for the future. The main purpose in this thesis was to observe the use of visual design in E-Learning resources and revealing opinions from the attendants.

5.1: Limitations

The two resources that the target demographic was set to explore had clear differences in visual design, that is - if they were compared to each other. Although none of them suffered from bad visual design, one was more extravagant than the other when it came to use of visuals. The intention of this experiment was that each individual was to explore both programmes, something a selection of them failed to do. Working with human factors, there will always be limitations, and the participants may misunderstand information, refuse to finalize all steps of testing or not give their honest opinion. Although this experiment design attempts to mimic an actual situation where learners are introduced to a course topic, the experimental scenario that makes attendants aware of the research situation, is at the expense of the external validity.³⁷ The timeframe for creating both resources, questionnaire, recruitment and user testing was a duration of less than four months, meaning that there was several challenges along the way. Gathering material for the resources that were theoretically correct and that efficiently represented the topic of visual design, was an important part of the process to ensure the learning value. Implementing course content into two different, strategically designed Captivate projects is a time consuming process, but is inevitable for obtaining any fundament for the research. Being my first encounter with Adobe

³⁷ *external* validity refers to the approximate truth of conclusions involving generalizations.

Captivate, there was also a learning process that took place during this research, demanding more time and focus to obtain the desired results in terms of technical completion and implementation. With the population being active full-time students, recruiting a satisfactory amount of participants in this amount of time was a limitation to this research. It was desirable to recruit as many attendants as possible within the selected population, but with busy schedules and other educational priorities that was also compromised by the amount of time and resources.

5.2: Reliability and Validity

To attain absolute validity and reliability is an impossible goal for any research model.
(Le Compte & Goetz, 1982)

Mentioned in chapter one, the terms used in this thesis are reliability and validity, the fundamental cornerstones of the scientific method, that together determines whether results are transferable to other situations, and that this data is as reliable as possible. (Trochim, 2006). All qualitative data can be coded quantitatively, and in this experiment every attendants opinion or feedback holds a numeric value, where the quantitative data consists of numbers with the assistance of Google Forms sheets. With no written text answers, all feedback provides either a numeric value or an ability to compare a factor, for example "Program A" with number of attendants exploring that resource. Debating these quantitative-qualitative data results is more philosophical than methodological, as the respondents answers are subjective. In anonymous testing where there is no options of asking additional questions about the experiment, there is a need to make underlying assumptions. Not knowing if the respondents understood the questionnaire correctly or how their value of a numeric value rating differs from another. There can be numerous judgements about what these numbers actually mean, but combined with qualitative data and demographic knowledge the phenomenology makes it possible to understand how the experiment appeared to the attendants. It is always to be assumed that external validity is a concern, especially when experimenting with a small group of attendants, but the quality of this research remains valuable for the knowledge of this specific population only. The results can be transferred into better understanding how this group and those with similar characteristics experience E-Learning resources and their attitudes towards them, but with no guarantee that another experiment would provide identical results on a generalized basis.

Traditional Criteria for Judging Quantitative Research	Alternative Criteria for Judging Qualitative Research
internal validity	credibility
external validity	transferability
reliability	dependability
objectivity	confirmability

Table 10: *Criteria for Judging Research, Guba & Lincoln, 1994*

The internal validity of this experiment is high, because the targeted population provides characteristics that suggests a repetitive experiment on the same students could generate quite similar results in the future. The credibility of their answers are not definite, but has high value in analyzing qualitative data for this specific group based on theory and knowledge about them. External validity on the other hand, is more difficult to obtain, and based on this research model, results are not conclusive enough to be able to transfer this knowledge to a variety of populations and a more forough wide range experiment would be needed to obtain a stronger external validity. An extension of this research experiment would include a larger number of participants, a control group and user testing in a controlled environment to provide results with higher reliability and validity. This would help control variables, easier determination of cause and effect relationship, and generate better results. Disadvantages with this research are attendants failing to do the experiment, artificial situations and the possibility of human error. (Guba & Lincoln, 1994)

5.3: Summary & Conclusion

This chapter summarizes the findings obtained during this experiment and answering the research questions relevant for this thesis. The first section summarizes the gathered data and conclusions based on the qualitative and quantitative data collected. The second section regards the debate of the importance visual design has in E-Learning resources in the light of this experiment. This study only embodies a small selection of the desired population, and how visual design truly affects E-Learning resources should be researched even further,

conducting an experiment of a bigger scale with a more generous timeframe. However, the selected population are stakeholders in the future of visual design and E-Learning, making their qualitative and quantitative answers subjects for further research. Results obtained from this research are scientific in nature, but with the focus on provision for human interest combined with minimal interaction with participating attendants and a fast speed conducted research point towards a positivist paradigm. The positivist paradigm depends on quantifiable observations that leads to statistical analysis . (Wilson, 2010)

The empirical data presented in the previous chapter may not be eligible for conclusions determining the entire truth about the importance of visual design in E-Learning, but the results provided make ground for important assumptions that should be considered in the future development of online education. Primary research question for this thesis was:

Is it possible that a well designed resource leads to increased extrinsic or intrinsic motivation compared to the basic-form designed one for the course presented?

Both quantitative and qualitative data collected from this experiment suggests that Program B, the one heavily influenced by visual design is preferred above the other resource. With more positive feedback and overall attitudes, regardless of gender and age, there is a marginal difference suggesting that a well designed resource motivates the attendants more than the generically designed one. Collected data also suggests the assumption that the population are prone to be characterized as connectivist spatial learners with 21st Century Skills. And with almost 80% of participants acknowledged that they would like to use a similar resource in the future, tells that the overall participants of this experiment are enthusiastic to the use of online learning for obtaining knowledge. Being anonymous gave them the option of discard this idea completely if that was their true opinion, and only one attendant exploring Program B (heavy use of visual design) claimed to not wanting to use a similar resource in the future. This shows that the prospects of the population being motivated to use the well designed resource is absolutely present.

The secondary research questions were as follows: *Does a well-designed and visually stimulating resource promote more frequent use of the resource than the basic-form designed one will?* Results indicate an affirmation to this research question. However when asked about favourite aspects of the two resources, there are variations of answers that indicate that design and layout is more appreciated if text, information and visual examples also is of a high quality. This suggests that a visually stimulating resource promotes more frequent use, *if* the other components of the E-Learning resource is of high quality. As this

demographic possesses the ability to critically determine the effect of visual design and has a current relationship to learning and education, it is assumable that the participants viewed this experiment as an opportunity to make their influence on this experiment. That they took their time and effort without force, anonymously and with the option to cancel at any time, means their interest in this field is truly existent. This group are probably likely to explore, use and even create online learning in the future, and their volunteering involvement in this experiment suggests that regardless of the resource favored they are prone to be frequent users of online learning resources both now and in the future.

What has empirical research found regarding well designed e-learning effectiveness, efficiency, attrition, and appeal to learners? Attendants were not asked to define themselves what they considered well designed E-Learning, and it can not be accounted for whether or not a selection of them found both programs to have good design. What is defined in this thesis however, Program B being the best designed resource out of the two, shows clear signs that it attracts more positive attitudes and higher frequencies of desire to use regardless of gender, age and previous experience with E-Learning.

Although no definite conclusions can be made of external validity, this research summarizes that this particular population, with its characteristics, previous knowledge and study programme show tendencies and attitudes pointing towards an appreciation of well designed resources. Their openness and willingness to contribute with their opinions on the topic suggests that they feel a desire to affect these matters, meaning that E-Learning is not overall perfected as is, and users like these can offer valuable information to improve it.

5.4: Future Research

Due to the limitations, this research follows a simple recipe for getting a good overview of a situation as answers to the research questions. Indications confirming an hypothesis of a specified population promotes interesting thoughts and ideas for how a bigger scale experiment could be conducted in the future. Elaborating on this research design could include a bigger population, various categories within it or target individuals with defined learner intelligences. Extending the user's ability to leave feedback, for example with personal post test interviews or elaborated questionnaires could promote more detailed opinions for putting E-Learning under the microscope, and discover meaningful opinions that tend to go unnoticed from research on a smaller scale.

What this thesis suggests is that there are many objectives that can be considered in terms on the future of online learning, and visual design may just be one of them. Knowing there are competent and interested users in this population, willing to provide answers to these questions create hope and inspiration for future learning. That users are intrigued, critical, and positive for exploration of resources means that there is a possibility for cooperation between all stakeholders in E-Learning, creating the new definition of E-Learning together.

Appendix List

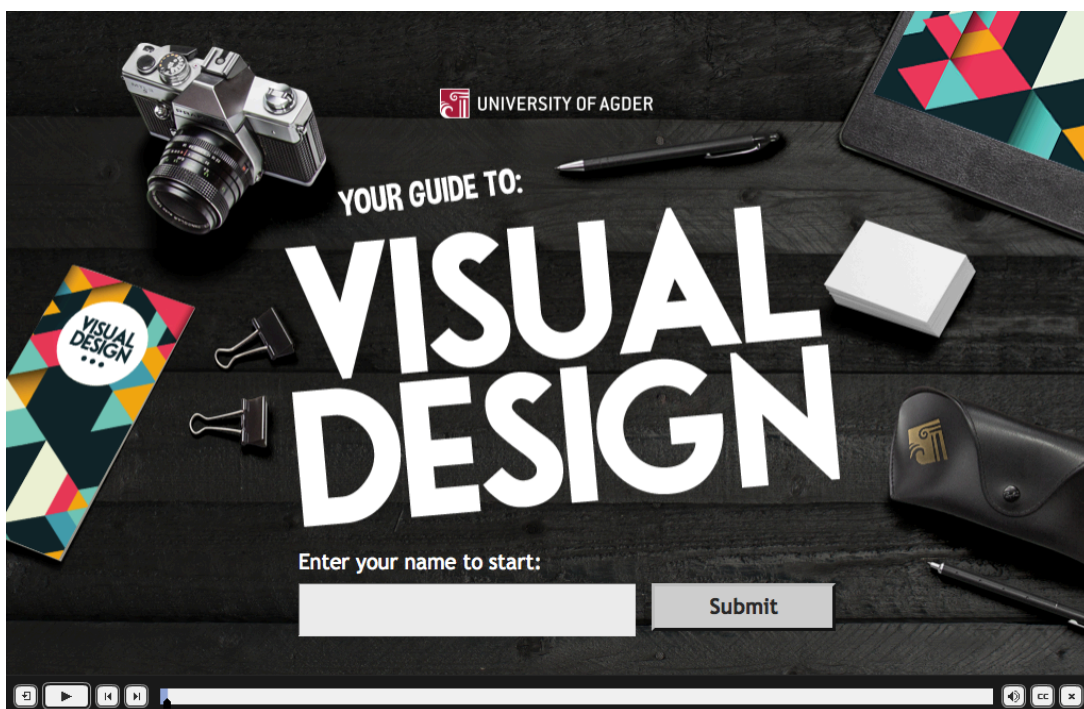
- Appendix 1: E-Learning Resources (Program A and Program B)
- Appendix 2: Questionnaire
- Appendix 3: Collected Data
- Appendix 4: Press Release

Appendix 1: E-Learning Resources

Program A - Landing http://elearning.cassandrahaugen.com/index_scorn.html



Program B - Landing http://elearning02.cassandrahaugen.com/index_scorn.html



Appendix 2: Questionnaire

Part 1: About you: Gender, Age & Educational Programme

SPØRSMÅL SVAR 24

Del 1 av 2

Kort om deg:

Denne undersøkelsen er anonym, vi ønsker bare å vite noen generelle opplysninger om deg.

Alder *

- 18-20
- 21-23
- 24-25
- 25+

Kjønn *

Mann

Kvinne

Utdanningsprogram og årstrinn *

Kort svartekst

Part 2: User opinions: Visual examples, layout & design, importance of design and alternative to using the resource.

Hvor hjelpsomme er bildeeksemplene som tilhører teksten? *

	1	2	3	4	5	6	7	8	9	10	
Ikke hjelpsomme i det hele tatt	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Veldig hjelpsomme

Hva synes du om E-læringsprogrammets layout og design? *

	1	2	3	4	5	6	7	8	9	10	
Uoversiktlig, rotete	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Oversiktlig, ryddig

Hvor viktig synes du visuell design er i E-læringsprogrammer? *

- Ikke viktig i det hele tatt
- Utgjør ingen forskjell
- Litt viktig
- Veldig viktig

Hvis du ikke kunne bruke denne ressursen, hvordan ville du lært deg emnet? *

- Fysiske bøker
- E-bøker og PDF
- Forelesning
- Annet

Part 2: User opinions: Presentation of topic, favourite aspects and desire for future use.

Presenterer E-læringsprogrammet emnet på en god måte? *

- Ja
- Nei

Hva synes du er spesielt bra med programmet du testet? *

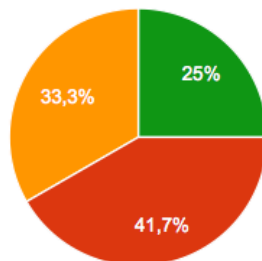
- Tekster og informasjon
- Layout og utseende
- Forklarende bildeeksempler
- Ingen av delene
- Annet

Ville du foretrukket et lignende kurs i fremtiden? *

- Ja
- Nei

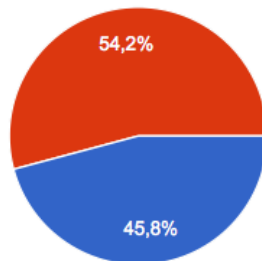
Appendix 3: Collected data

Alder



18-20	0	0 %
21-23	10	41.7 %
24-25	8	33.3 %
25+	6	25 %

Kjønn



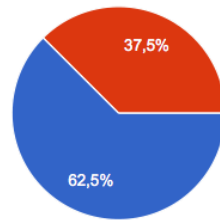
Mann	11	45.8 %
Kvinne	13	54.2 %

Utdanningsprogram og årstrinn

multimedieteknologi og -design
Multimedieteknologi og design 1.år
Multimedia and Educational Technology
Master Multimedia 2.år
multimedieteknologi og design 2015
2. Klasse, Multimedia
Multimedia 3.

Om E-læringsprogrammet

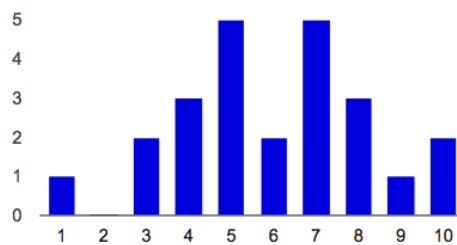
Hvilket E-læringsprogram har du utforsket?



A 15 62.5 %

B 9 37.5 %

Hvordan vil du beskrive din tidligere erfaring med å bruke E-læringsprogrammer på nett?



Ingen erfaring: 1 1 4.2 %

2 0 0 %

3 2 8.3 %

4 3 12.5 %

5 5 20.8 %

6 2 8.3 %

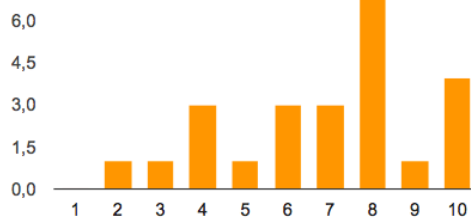
7 5 20.8 %

8 3 12.5 %

9 1 4.2 %

Mye erfaring: 10 2 8.3 %

Oppløve du navigasjonen som intuitiv, lett å forstå?



Svært vanskelig å forstå: 1 0 0 %

2 1 4.2 %

3 1 4.2 %

4 3 12.5 %

5 1 4.2 %

6 3 12.5 %

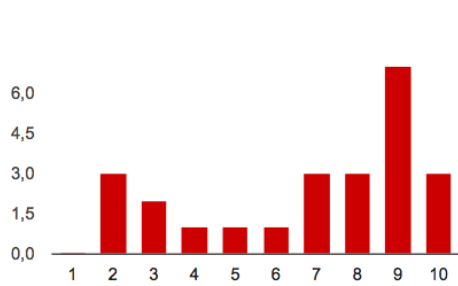
7 3 12.5 %

8 7 29.2 %

9 1 4.2 %

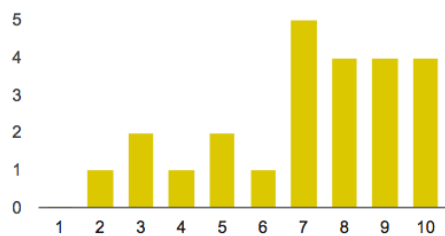
Veldig lett å forstå: 10 4 16.7 %

Med tanke på tekst og fonter, hvordan opplevde du generelt lesbarheten?



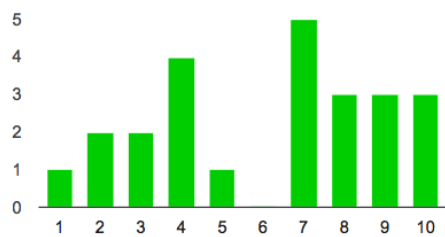
Dårlig lesbarhet: 1	0	0 %
2	3	12.5 %
3	2	8.3 %
4	1	4.2 %
5	1	4.2 %
6	1	4.2 %
7	3	12.5 %
8	3	12.5 %
9	7	29.2 %
Svært god lesbarhet: 10	3	12.5 %

Hvor hjelpsomme er bildeeksemplene som tilhører teksten?



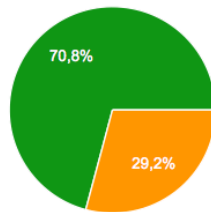
Ikke hjelpsomme i det hele tatt: 1	0	0 %
2	1	4.2 %
3	2	8.3 %
4	1	4.2 %
5	2	8.3 %
6	1	4.2 %
7	5	20.8 %
8	4	16.7 %
9	4	16.7 %
Veldig hjelpsomme: 10	4	16.7 %

Hva synes du om E-læringsprogrammets layout og design?



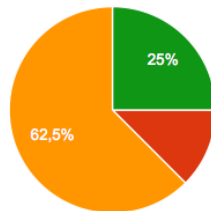
Uoversiktlig, rotete: 1	1	4.2 %
2	2	8.3 %
3	2	8.3 %
4	4	16.7 %
5	1	4.2 %
6	0	0 %
7	5	20.8 %
8	3	12.5 %
9	3	12.5 %
Oversiktlig, ryddig : 10	3	12.5 %

Hvor viktig synes du visuell design er i E-læringsprogrammer?



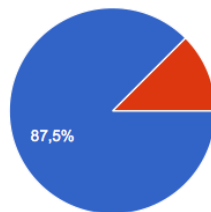
Ikke viktig i det hele tatt	0	0 %
Utgjør ingen forskjell	0	0 %
Litt viktig	7	29.2 %
Veldig viktig	17	70.8 %

Hvis du ikke kunne bruke denne ressursen, hvordan ville du lært deg emnet?



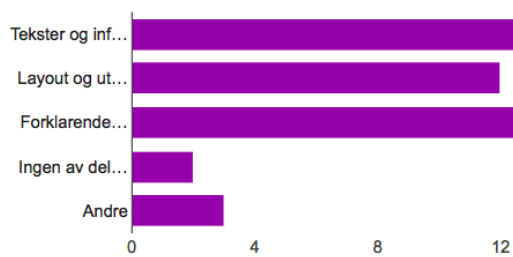
Fysiske bøker	0	0 %
E-bøker og PDF	3	12.5 %
Forelesning	15	62.5 %
Andre	6	25 %

Presenterer E-læringsprogrammet emnet på en god måte?

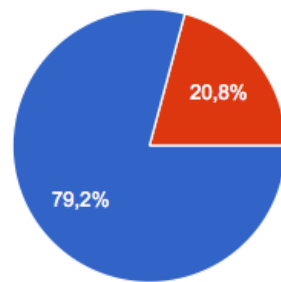


Ja	21	87.5 %
Nei	3	12.5 %

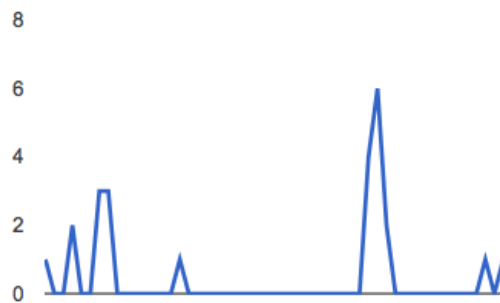
Hva synes du er spesielt bra med programmet du testet?



Tekster og informasjon	14	58.3 %
Layout og utseende	12	50 %
Forklarende bildeeksempler	16	66.7 %
Ingen av delene	2	8.3 %
Andre	3	12.5 %

Ville du foretrukket et lignende kurs i fremtiden?

Ja	19	79.2 %
Nei	5	20.8 %

Antall svar per dag

Appendix 4: Press Release



Master's Thesis in Multimedia & Educational Technology 2016

	<p>Candidate Cassandra Haugen cassah10@student.uia.no</p>	<p>Supervisors Rune Andersen Kåre Mosgren</p> <p>Principal Frank Reichert University of Agder</p>
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The Use of Visual Design in E-Learning Resources

We live a society where students can learn through digital technology, such as computers, tablets and mobile phones. Therefore it is important to define what it is about online learning which is attractive to the student. This experiment looks into the effect visual design, such as graphics, colors and video has on online learning resources.

Students from Multimedia - Technology & Design at University of Agder were presented with two different

E-Learning resources where one was heavily influenced by graphic design and the other one was not. They were asked to share their opinions on the subject by participating in an anonymous user testing and answering a questionnaire regarding the resources they had explored. 23 students took part in the experiment, 11 men and 12 women. This ensured an even gender selection.

Their feedback to this experiment showed clear signs that visual design was important for their learning experience and that the resource using visual design the most, was the one preferred by the students. Consequently, e-learning resources will benefit from conscious use of visual design in order to reach optimal user motivation.

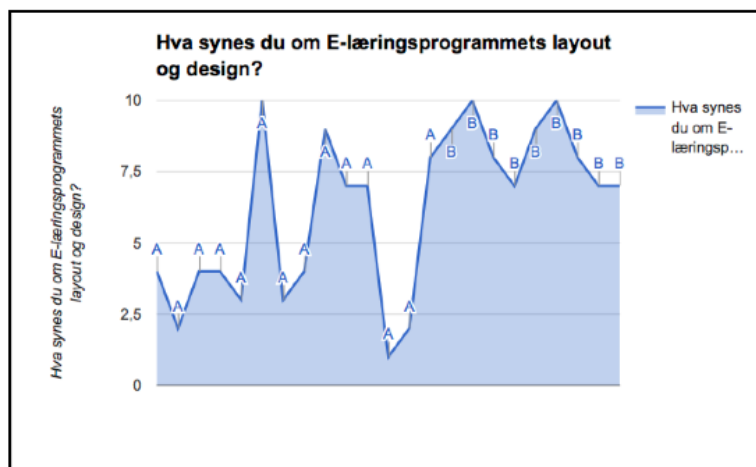


Figure 1. A/B Opinions on layout & design Comparison of Program A & B

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