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Designing a Homepage Creation Course

Helsinki Metropolia University of Applied Sciences
Master of Engineering
Information Technology
Mobile Programming
Thesis
18 May 2013

Author Title Number of Pages Date	Jan Lindholm Designing a Homepage Creation Course 49 pages 18 May 2013
Degree	Master of Engineering
Degree Programme	Information Technology
Specialisation option	Mobile Programming
Instructor	Dr. Antti Piironen, Principal Lecturer

A course about new techniques for creating homepages was created for the Kirkkonummi community college. The course was part of the course offering for the autumn of 2012. The techniques taught during the course were HTML5 and CSS3. Since no education kit that would also include pedagogic principles was available, it was necessary to create one.

The lessons were prepared using knowledge gathered from technical research about the subject matter and application of behaviorist and constructivist pedagogy.

The end result was four learning packages: the thesis itself, a course reference home page, printed student exercises, and a set of PowerPoint presentations for the lessons.

The thesis provides a pedagogic point of view when planning a course, and also some tools for creating the course materials. The aim was not to provide full course material, but to share ideas, topics and experiences to other teachers. Teachers from different levels of schools who are planning similar courses could use this thesis to their advantage. The lessons give students the ability to create high-quality, interesting and easy to use web pages.

Keywords	HTML5, CSS3, teaching, pedagogy, behaviorism, constructivism, homepage creation

Tekijä Otsikko Sivumäärä Aika	Jan Lindholm Kotisivujentekokurssin suunnittelu 49 sivua + 0 liitettä 18.5.2013
Tutkinto	insinööri (ylempi AMK)
Koulutusohjelma	tietotekniikka
Suuntautumisvaihtoehto	mobiiliohjelmointi
Ohjaaja(t)	Dr. Antti Piironen

Kirkkonummen kansalasiopistolle suunniteltiin ja toteutettiin kurssi, jonka aiheena oli kotisivujen teko. Kurssin aikana opetetut tekniikat olivat HTML5 ja CSS3. Kurssi pidettiin syksyllä 2012.

Koska sopivaa opetusmateriaalia joka myös sisältäisi pedagogisia ohjeita, ei löytynyt, niin oli tarpeen kehittää oma materiaali.

Aineistoa kerättiin tutkimalla kirjallisuutta jossa käsitellään kotisivujen tekoa sekä tutkimalla kasvatustieteitä kuten behaviorismia ja konstruktivismia. Lopputuloksena syntyi neljä opetuspakettia, jotka ovat: itse lopputyö, PowerPoint-esitys, harjoitustehtävät sekä referenssi kotisivu.

Jokaiselle luennolle suunniteltiin oma teemansa ja tavoitteensa. Teemana saattoi olla esimerkiksi värit, jolloin opitaan sekä CSS-värit että yleistä väriteoriaa. Kaikista luennoista rakentuu kokonaisuus joka antaa opiskelijoille valmiudet luoda hyvätasoisia, kiinnostavia sekä helppokäyttöisiä kotisivuja.

Lopputyö auttaa kurssin suunnittelussa sekä tarjoamalla työkaluja kurssimateriaalin tekemiseen että opastamalla opettajia pedagogiikan hyödyntämisessä. Tarkoituksena ei ollut luoda kattavaa kurssimateriaalia, vaan jakaa ideoita, aiheita ja kokemuksia muille opettajille. Opettajat eriasteisilla kouluilla voivat hyötyä näistä opetuspaketeista suunnitellessa vastaavia kursseja.

Avainsanat	HTML5, CSS3, opetus, behaviorismi, konstruktivismi, kotisivujen teko

Contents

Abbreviations and Terms

Internet

The Internet is a global system of interconnected computer networks that serve billions of users worldwide.

WWW (The World Wide Web)

WWW is one of the services that run on the Internet, and it contains websites. Websites may contain text, images, videos, and other multimedia. It is possible to navigate between webpages via hyperlinks.

HTTP (HyperText Transfer Protocol)

HTTP is a communications protocol used to send and receive webpages and files on the Internet.

W3C (World Wide Web Consortium)

The W3C is an organization that develops and decides on standards for the evolution of the WWW. Technologies such as HTML5 and CSS3 are W3C standards.

HTML (Hypertext Markup Language)

HTML is the markup language for displaying web pages and other information that can be displayed in a web browser.

CSS (Cascading Style Sheets)

CSS are a way to define the look of HTML web pages.

JavaScript

JavaScript is a scripting language that is usually run at the browser. With JavaScript one can create for example simulations or even games. Many of the homepage features are done with combining HTML5 with JavaScript.

1 Introduction

Since 2003 I have worked as a teacher at the Kirkkonummi community college (www.kirkkonummi.fi/kansalaisopisto). In the autumn of 2010 I began to study at the Helsinki Metropolia University of Applied Sciences, in the Master of Engineering Program in Mobile Programming.

For the autumn of 2012 I planned a course at the Kirkkonummi community college about techniques for creating homepages: HTML and CSS. I got the idea that this could be a good topic for my Master of Engineering Thesis. It was clear to me that it would be beneficial to start learning about the latest versions, HTML5 and CSS3, instead of creating a thesis about the old versions. Otherwise I would have made material that would have been outdated in the near future.

HTML, HyperText Markup Language, is a language that defines the content and structure of a homepage. For example, we can define that one part of a homepage is a heading element and it is followed by two paragraph elements (see the example below).

```
<h1>This is an important heading</h1>  ← heading element
<p>This is a paragraph.</p>            ← paragraph element
<p>This is another paragraph.</p>      ← paragraph element
```

The <h1> element is used to indicate the highest-level heading on the page. Other things defined by the HTML standard are, for instance, tables, lists, images and links. CSS, Cascading Style Sheets, is a language that defines the visual layout of a homepage. Using CSS, the designer can define for example the size, color and location of elements on the web page. HTML5 and CSS3 are technologies under development. HTML5 consists of many parts and new features are frequently added to the language. Therefore it is pointless to ask if a browser supports HTML5 or CSS3. Instead, one should ask which parts of HTML5 or CSS3 a browser version supports.

In addition to learning about web technologies, I also had to learn about pedagogy. Although I have many years of experience in teaching, I have no formal studies in ped-

agogy. Maybe the hardest part was to try to understand what different authors meant with the same terms. In normal courses there is a problem of how to target the material for both beginners and advanced students. This problem was solved by teaching the most experienced ones also JavaScript. However JavaScript is out of the scope of this thesis even though it is part of the course.

The goal of the course is that everyone would learn the basics of HTML, because without HTML one cannot do much with CSS or JavaScript. One first has to learn HTML. Using only HTML you get simple looking pages that are not visually pleasing. Therefore, it is wise to next start learning the basics of CSS in order to get, for example, color on text and some margins for the page. If one wants really fancy interactive homepages, one should also start learning JavaScript. One can even create games with JavaScript.

The structure of each lesson is always the same. PowerPoint slides are shown three times: at the beginning and at the end of the lesson, as well as during the main part of the lesson. This is done because repetition is important for learning. It is also much easier to follow the teaching when the whole evening's material is shown at the beginning of the lesson. Some extra time is allocated for communication between teacher and students, and also for discussions amongst the students themselves. In this way the students will process the taught topics, which will enhance their learning. Each evening has both a technical theme and a non-technical theme. The technical theme could be for example CSS3 colors and the non-technical theme could be for example color theory.

2 A Course for Creating Homepages

The course was provided by the Kirkkonummi Community College in the autumn of 2012 and intended for the citizens of Kirkkonummi. All households were sent a course catalog by the Community College. This course was also advertised in the local newspaper, Kirkkonummen Sanomat.

The material used in the course was in English, but the teaching was conducted in Finnish. This was a slight problem, because not all students understood English too well. Next year, the material will be translated into Finnish. The course was a level

three course (the most difficult level), and was intended for advanced computer users regardless of their previous experience with HTML and CSS. It is very helpful to know the previous version of HTML, for instance most of the elements in HTML5 are the same as in HTML 4. The initial idea was that there would be two types of students: those who had no experience in HTML and CSS, and those who had some experience of previous versions of those languages. The more advanced students would also learn JavaScript.

2.1 HyperText Markup Language

HTML is a markup language, used to define the **structure** and **content** of a web page. The structure means for example that some text is a heading and some other text is a paragraph. The content is just the text of the heading and paragraph.

In 1989, when Tim Berners-Lee worked at CERN (European Particle Physics Institute) he invented what was later to be called the World Wide Web. This made it possible to use hyperlinks to move between different pages. He and a team at CERN released the first draft of HTML 1.0 in 1992. Two years later, in 1994 the HTML 2.0 was developed. [1.] The HTML 3.2 specification was released in 1997 by W3C. It added features such as fonts, tables, applets, superscripts and subscripts. The HTML 4.0 specification was released at the end of 1997 by W3C. It contained a few errors which were corrected in 1999 when the HTML 4.01 was released. [2.] HTML5 is based upon the HTML 4.01-specification and old HTML-pages and structures still work. This means that even though some elements have been deprecated in HTML5, the support for these elements still exists. That makes it possible to use new features of HTML5 in old style web pages without changing the structure.

Unlike HTML 4, many HTML5 elements have a semantic characteristic. Elements such as <header>, <footer> and <article> do not affect the appearance of the page directly; they are designed to provide information to search engines, for example. It is useful for a search engine to know whether a piece of text belongs to a normal paragraph, a header, or a footer. This is illustrated in Figure 1 and Figure 2.

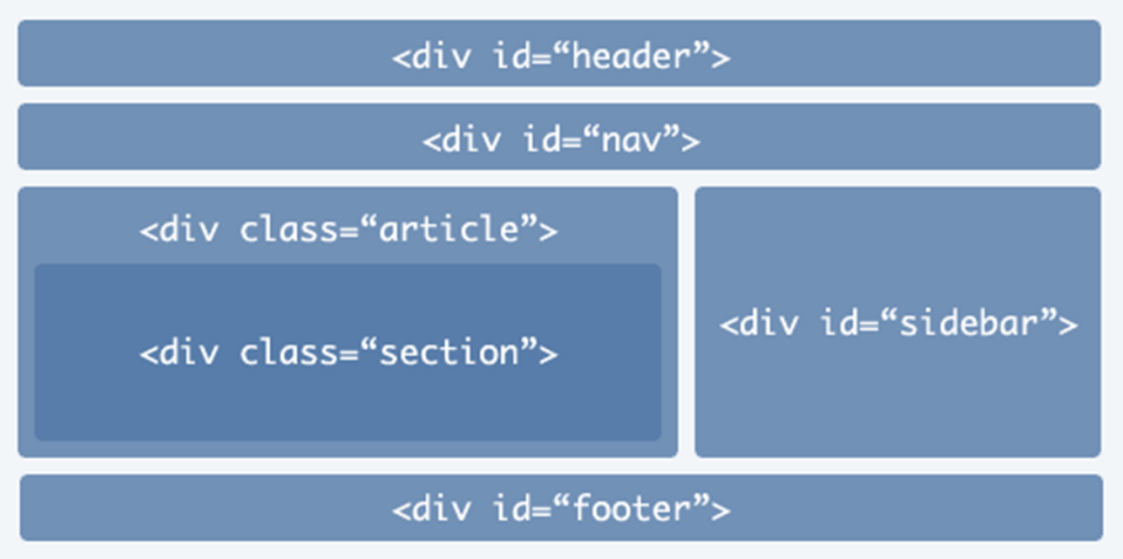


Figure 1. HTML 4 non-semantic elements

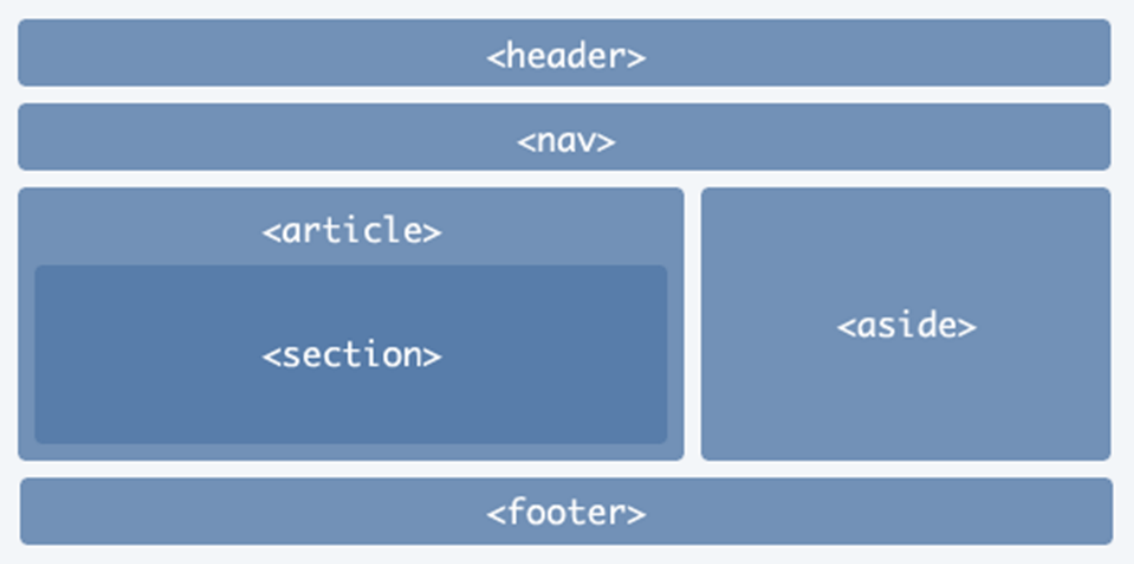


Figure 2. HTML5 semantic elements

Figure 1 and Figure 2 illustrate the difference between HTML 4 and HTM5 elements. In HTML 4, one creates the structure mainly with div elements, which are non-semantic. HTML5 introduces semantic elements such as <header>, <footer> and <article>.

The **<article>** element represents content that forms an independent part of a document or site; for example, a magazine or newspaper article, or a blog entry. The **<aside>** element represents a section of a page that consists of content that is tangentially related to the content around the aside element, and which could be considered

separate from that content [8]. A **<footer>** -element might be for example the footer for a whole homepage or the footer of an article. A **<header>** -element might be for example the header for a whole homepage or the header of an article. The **<nav>** element represents a section of a page that links to other pages or to parts within the page: a section with navigation links [3]. Not all groups of links on a page need to be in a <nav> element [3]. Only sections that consist of major navigation blocks are appropriate for the <nav> element [3].

<Video> In HTML-versions prior to HTML5, one had to install plugins in order to be able to watch videos on a browser. Browser vendors have not been able to agree on a general video format which all browsers could use. If we want to display videos in all browsers, we need to keep different formats of each video on the web server, so that each browser can choose the appropriate format. **<Canvas>** To draw on a homepage, HTML5 is used in conjunction with JavaScript. In HTML5 one defines a drawable area, on one's homepage, called canvas. With JavaScript one can then program for example animations on the canvas. **Geolocation API** can be used to retrieve the geographical location information for a client-side device. Geolocation is used with the help of JavaScript. With **Web storage** it is possible store data in a web browser. Web storage supports persistent data storage, similar to cookies but with a greatly enhanced capacity. Web storage is used through JavaScript and is not a part of HTML5.

2.2 Cascading Style Sheets

Cascading style sheets (CSS) are used to determine the appearance of HTML pages in a browser. They provide an easy way to change the visual appearance of a group of HTML files without changing each individual file. CSS allows the separation of web page content (for example, the text of a page) from the way that the content is displayed (for example, the font, size, and color of the text). The standards for CSS are maintained by the World Wide Web Consortium (W3C). [4.]

CSS3 is the latest edition of the CSS. Functionality in CSS3 includes features, such as support for rounded corners, box shadows, animations. CSS3 allows one also to transform elements on one's homepage. It is possible to move, rotate and scale the size of the elements.

2.3 Heterogeneous Groups of Students

Planning the pedagogy begins with mapping the students´ current level of knowledge, their expectations, and what their goals are with regard to the course. It is important to find out the skill level of the students right at the beginning of the course, so that the teaching can be adjusted accordingly. The difficulty, teaching speed and appropriate pedagogic methods have to match the skill level of the students.

The group was in fact very heterogeneous, which made the adjustments quite challenging. The students were between age 38 and 50. A few students had some experience of creating homepages and most had no previous experience at all.

2.4 Notepad++ as a Tool for Creating Homepages

There are basically two ways to build homepages. The first one is to create pages using commercial WYSIWYG editors like DreamWeaver. This can be easier for beginners, because they do not have to know much about HTML code. Another way to build homepages is to use a text-editor like Notepad++. This makes it necessary to understand the HTML code. In this course, Notepad++ was used.

One of the students claimed that most homepages are made using WYSIWYG editors, which is why most of the students would have wished to use those kinds of editors. However, the cost for the school to acquire for example DreamWeaver licenses for every student would be too expensive, considering that the software would be used only for one course per year. Using a text-editor also makes the students understand HTML-code, which can be quite beneficial.

2.5 Course Material

There are four different learning packages created for this course. Each package is presented in this chapter.

The **1st** package is the file you are reading right now - the **thesis** itself. This package, the main part of the thesis, is meant for other teachers who want to teach a homepage creation course. The thesis contains useful pedagogic tips and principles for teachers.

The **2nd package** is a **PowerPoint** presentation. At the beginning of each lesson, the teacher goes through the techniques needed for the evening's exercises, with some examples, using PowerPoint. The presentation is shown on the wall using a projector. The amount of text on a slide is always kept at a minimum because it is tedious to read complete sentences on the wall. The presentation is also given as a file to the students so that they can review it at home.

The **3rd** package is a **homepage** that works like a reference cite and also contains exercises. Students are told to check the site for reference, for example when they do not remember how to use an element. The reference site contains only briefly explained examples, so it is not intended to be used as a standalone tutorial.

The **4th** package is the **paper-exercises** given to the students at all lessons. Most exercises are first done together on paper and then on a text editor, for example Notepad++. The reason for doing the exercises twice is because repetition enhances learning. When you write things down, you tend to remember it better than by just listening to the teacher.

3 Pedagogy Theories for Teachers

The task of the teacher is to guide the study process using various methods that help in understanding the big picture of the subject matter. These methods must also develop cognitive abilities and help maintain an interest in learning. [5,20.] Teachers usually take influence from different theories when teaching students. The chosen theories often vary according to what kind of information is to be taught. For example physics and history teachers might benefit from different kinds of theories.

The thesis concentrates on two pedagogic theories. They are Behaviorism and Constructivism. Constructivist learning requires a more active approach by the student, while the student can be more passive in Behaviorist learning. Constructivism is more student-centered and Behaviorism is more teacher-centered.

3.1 Behaviorism

Behaviorism was a very common pedagogic theory, especially in the first half of the 20th century [6,16]. The focus of behaviorism is mostly on how the teacher teaches. What takes place in the student's mind is of less importance.

According to behaviorism, learning is strongly based on reactions to external stimulus and reinforcement. The teacher asks a question, which is answered by the student. The answer is followed by immediate feedback, which acts as reinforcement. The topics and questions will become gradually more difficult, so that the student gets the feeling of success and positive feedback when he/she answers correctly. [5,84.] Repetition is considered to be one of the most important topics in behaviorism. An exercise, that implements repetition in order to increase learning, is handed out at every lesson. See Figure 3.

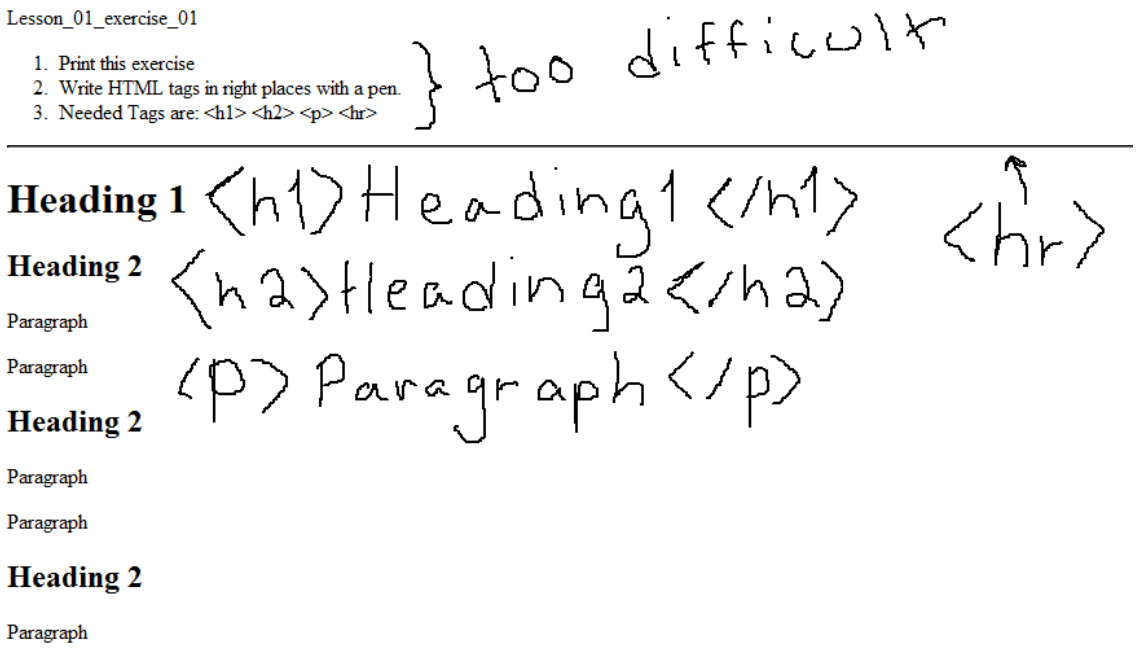


Figure 3. HTML elements exercise

Figure 3 is an example of an assignment used in class. The assignment is distributed on paper. Naturally, the paper does not contain answers written using a pen when it is

handed out. The students see the part where it is written: ”Needed Tags are: <h1> <h2> <p> <hr />”. First the teacher asks the students which tags surround the text “Heading 1”. Someone already familiar with basic HTML may answer this correctly. I reward the student for the correct answer, and then write the answer on the paper that is projected on the wall. The students will also write in the tags on their own papers. Little by little the other students will start to understand the logic behind the syntax requirements of the tags. The end tag is the same as the starting tag with an additional slash (/) sign, and these need to surround the text, for example <tag>You see this text in your browser.</tag>

At the start of every lesson, the theme of the lesson is introduced, with the help of a PowerPoint presentation. Also, the PowerPoint presentations from the previous lessons are repeated since repetition is considered to be an important part of the behaviorist teaching method [9,26.].

In behaviorism, learning can be measured by the change in the students’ behavior. Behaviorists think that only the behaviors that can be noted and measured are important. Figure 4 illustrates that we do not know what happens inside our head.

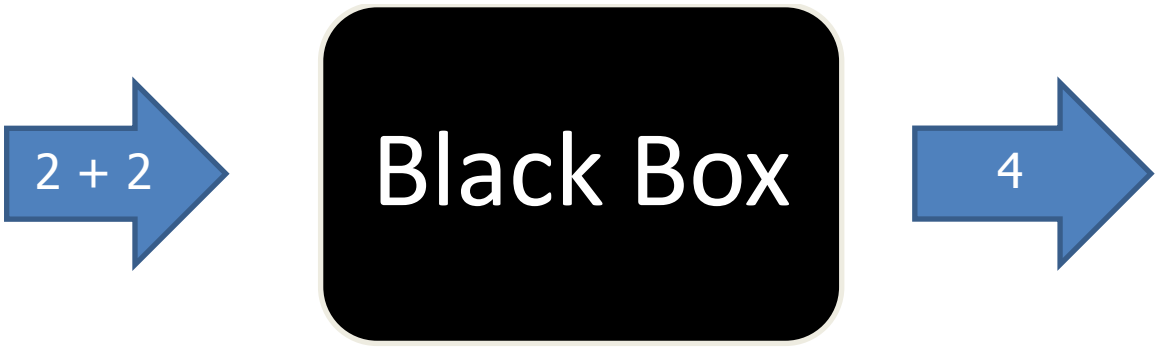


Figure 4. Behaviorism

Behaviorists see the mind as a "black box", as shown in Figure 4, in the sense that they are only interested in the outer activity of a person. The activity inside the mind is not considered important in itself. [9,43.]

During the lessons I actively observe the students as they learn. This way I can see when someone understands or does not understand something.

Classical Conditioning

Classical conditioning is a type of learning based on an animal or a human responding to environmental stimulus. A textbook example of classical conditioning is when a dog hears a bell at the same time as it smells food. If a bell is ringing and food is given a few times, the dog soon learns that when the bell is ringing, it receives food. Ivan Pavlov was a Russian scientist who developed the concept of classical conditioning. [9,2.] Figure 5 illustrates classical conditioning.

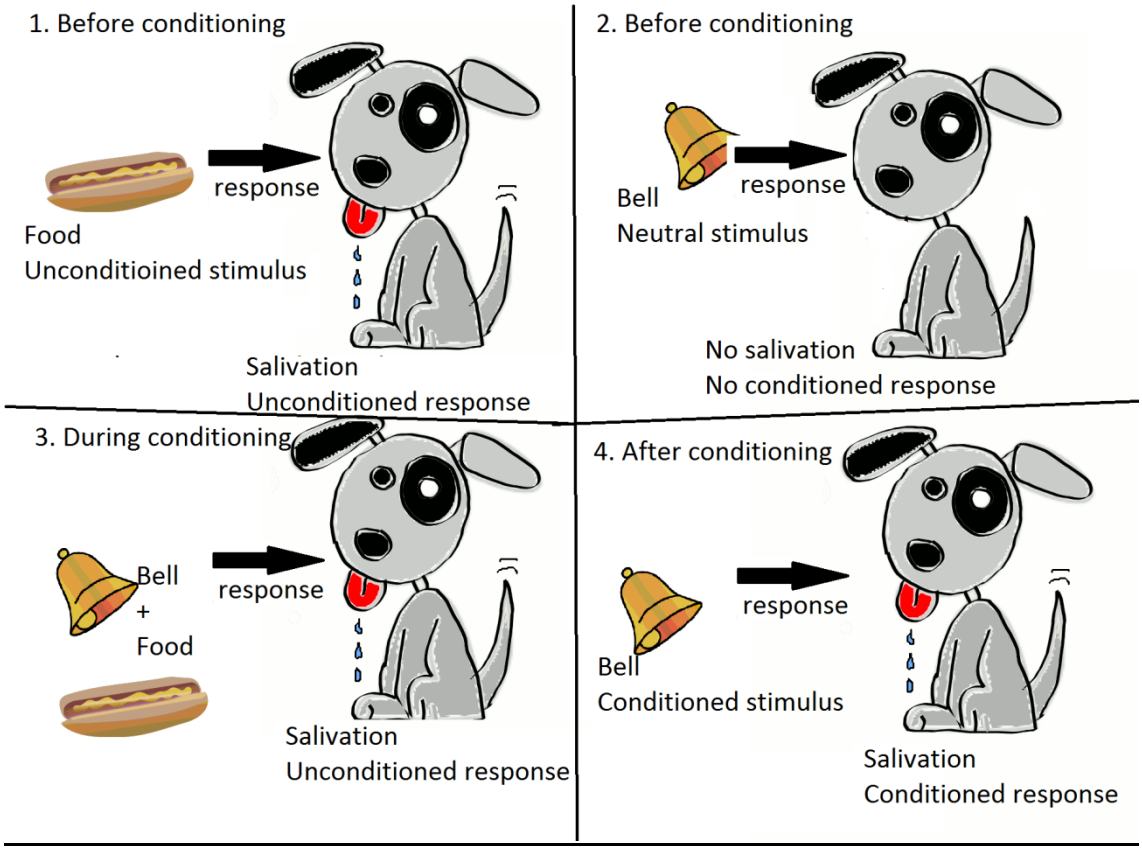


Figure 5. Classical Conditioning (bell and hotdog images collected from openclipart.org [21])

In Figure 5 (part 1.) the unconditioned stimulus triggers the unconditioned response. This means that without learning, a dog will salivate when it smells food. In Figure 5 (part 2.) the neutral stimulus does not trigger any response. In Figure 5 (part 3.) during conditioning the dog hears the bell and gets food at the same time. This results in salivation as an unconditioned response. In Figure 5 (part 4.) the dog has learnt that when it heard the sound of the bell, it will receive food. The dog salivates even if it hears the bell without smelling food. [9,2.]

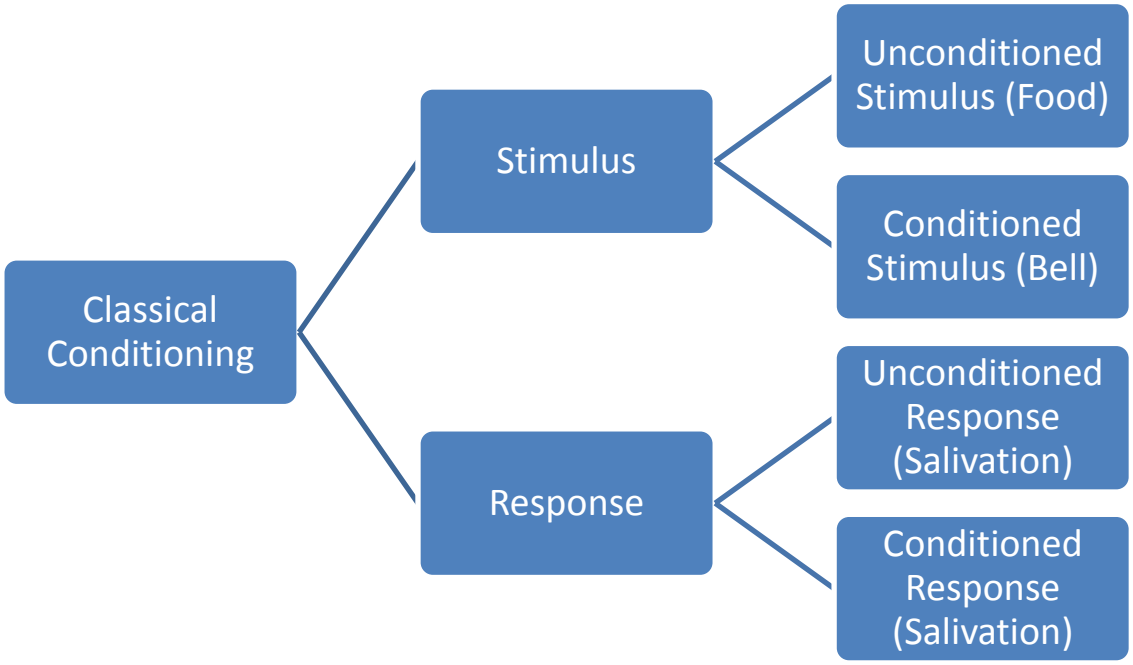


Figure 6. Classical Conditioning

An example of classical conditioning in a classroom can be, for example, related to the atmosphere during the lessons. If there is a teacher that often criticizes the students instead of offering better explanations, repetition and more support, then these students can become classically conditioned. When they know that the class with the criticizing teacher is coming up, they will feel unmotivated and might even drop out of the course.

Operant Conditioning

In operant conditioning, learning is achieved by reinforcing or punishing the student. Operant conditioning can be categorized depending on the type of feedback, as shown in Figure 7.

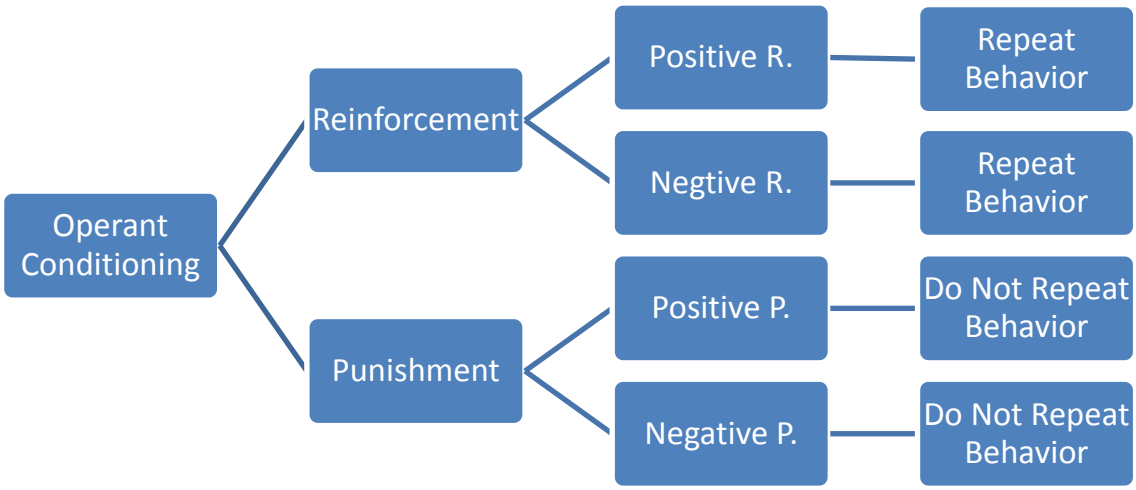


Figure 7. Operant Conditioning

As Figure 7 shows, there are two types of feedback: reinforcement and punishment. Reinforcing is done by adding something that the student does like (positive reinforcement) or removing something that the student does not like (negative reinforcement). Punishment is done by adding something he/she does not like (positive punishment) or removing something the student likes (negative punishment). [9,2.] In practice I use reinforcement and never punishment. An example of positive reinforcement is when I reward a student by complimenting on when he/she does a good job as shown in Figure 8.

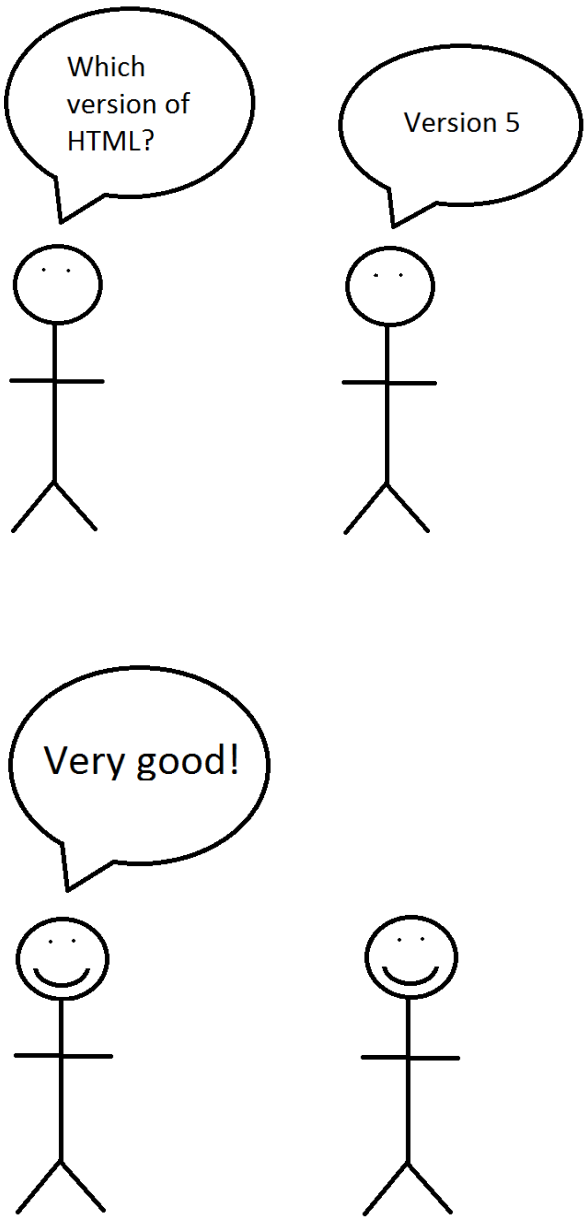


Figure 8. Positive Reinforcement

When a student answers correctly to a question, positive feedback is given immediately as illustrated in Figure 8. Doing this rewards the student, and motivates him/her to repeat the behavior. An example of negative reinforcement is when I notice that a student is lagging behind a taught subject and I give him/her some personal support so that he/she catches up with the rest of the students. When he/she catches up with the rest of the students he/she does not feel uncomfortable anymore. The removal of the uncomfortable feeling is the negative reinforcement.

3.2 Constructivism

The constructivist learning theory has gained ever more ground as education practices become more dynamic, individualistic and flexible. Constructivist learning is focused on learning instead of teaching, the student instead of the teacher, and building on earlier experiences and learning instead of ready-made information. The student has many possibilities, but is on the other hand responsible for his/her own learning. The most important thing is the will to learn. [5,44.]

Constructivism emphasizes that the student needs to modify information in an active and independent manner. According to constructivist thinking, the earlier experiences of the student affect the learning process. [5,242.] In behaviorism, the students mind was seen as a black box. In constructivism, there is an interest in understanding the learning processes inside the mind of the student as Figure 9 shows.

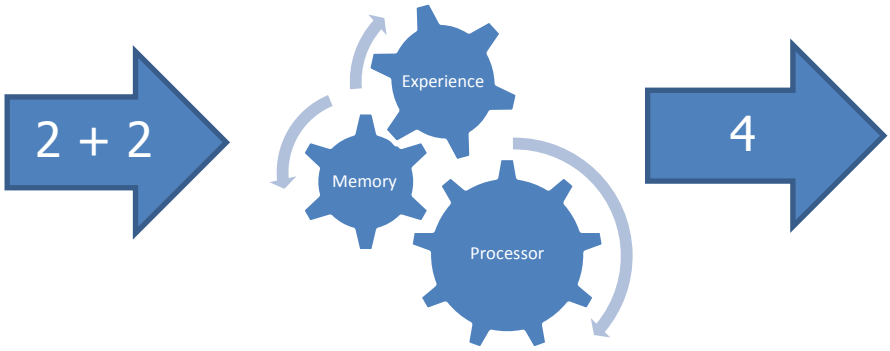


Figure 9. Constructivism

Figure 9 shows that the answer to the teacher's question is a result of the student's earlier experiences, ability to recall from memory and analytical skills. In this very simplified representation of constructivism, the black box is replaced by different cogwheels. The cogwheels represent different parts of the student's mind that affect learning.

Constructivist learning is self-regulating and student-focused learning. This does not mean that students are left by themselves with their tasks. It has meant that teachers

and educators are challenged with new tasks: helping students evolve as self-regulating and skilled learners. Skill requirements for teachers have grown from subject matter expert skills to learning guidance skills. [10.]

According to constructivist theory, the more structured that the information is, the more likely it is to be saved in long term memory. If students are left by themselves to structure information, they will spend a lot of time and effort in vain. It is not likely that they will be able to form comprehensive information structures. A good teacher is the subject matter expert who is able to see the big picture, and choose the most essential information for the students. If the teacher is able to provide this information to the students in a well-structured form, he/she is at the same time providing a shortcut to the understanding of the concepts of the subject matter. When the teacher explains the comprehensive principals and how they are connected, he/she will provide a basis for understanding the details. [5,256-257.]

In practice, constructivist principles are implemented especially in distance learning and self-learning: situations where the individual effort of the student has a large impact on success. New learning environments are based on constructivist thinking, which does not mean that for example web-based learning is automatically constructivist just because it is implemented by using the web. [10.]

3.3 Implementation of Theories

In this chapter I will introduce some simple and clear ideas which help teaching. Interactivity is emphasized during the lessons. The teacher, by his own actions, makes sure there is room for participation in the classroom. Discussions between both teacher and students, and also amongst the students themselves, are encouraged.

In behaviorism, we begin from the details and expand to the whole. On the contrary in constructivism, we begin with the whole and expand to include the details that the whole consists of. After some years of experience as a teacher, I have come to the conclusion that in this kind of education, the best way is to use a combination of both behaviorism and constructivism. One can use the Average retention rate pyramid to understand which methods of learning are the most effective. The pyramid can give a rough idea about which methods lead to the highest retention rate. See Figure 10.

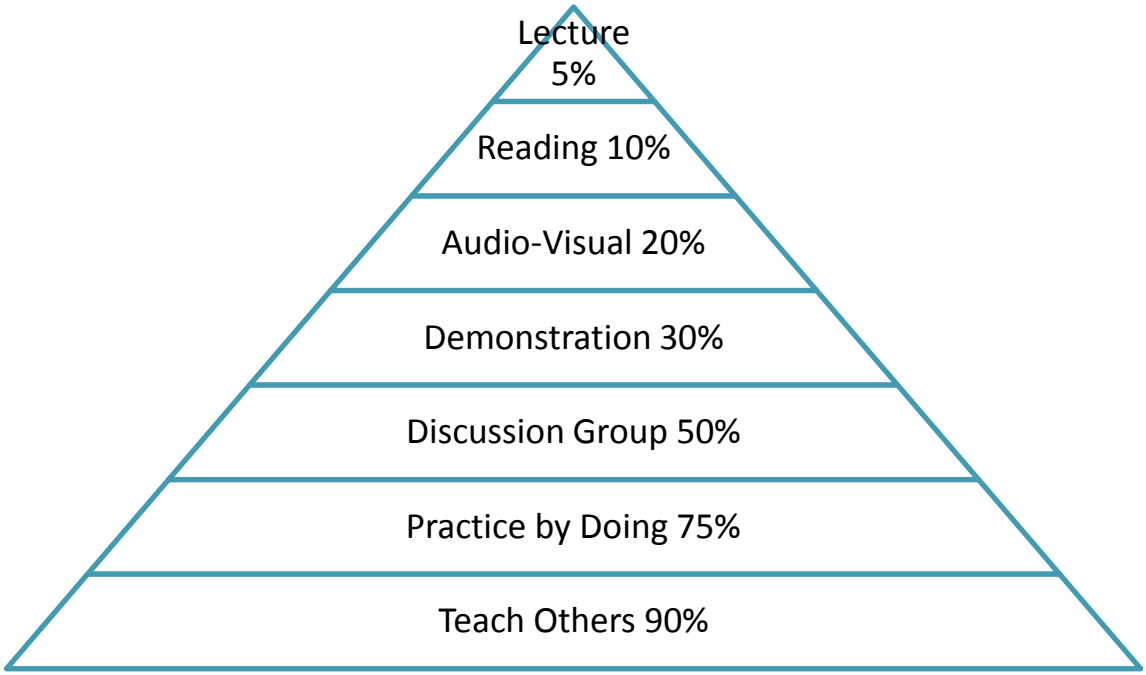


Figure 10. Average Retention Rate

According to the pyramid in Figure 10, the most effective way of learning is by teaching others. This way one will remember 90% of what he/she has been teaching. The most ineffective way to learn is by listening to a lecture. This way one will only remember 5% of the lecture.

In class, every student is working on either individual or group tasks using their own computer. This ensures that all students stay active, and learn according to the curriculum. When the teacher follows up how each student is performing the tasks, he/she will notice already at an early stage whether or not the students can keep up with the pace of the lesson, and act accordingly.

Repetition is an important part of behaviorist learning and teaching theory. The key points of the lesson are therefore told at the beginning, so that it is easier to follow the lesson. At the end of the lesson, the most important points are repeated in a nutshell. At the beginning of each lesson there is an at least 10 minute long repetition of the topics covered in previous lessons. One reason for this that usually at least one student is slightly late for the lesson. This way it is not necessary to repeat new material just for the student who has shown up late.

It is important that all the students understand what they are taught. This way they do not have to memorize so much [11]. “The more deeply you force your brain to think, the better chance you have of learning and remembering [11]”. If you understand the reason why certain things are done in certain way, it will be easier for you to apply the same ideas in other scenarios. It is possible to build on already acquired knowledge much better than on knowledge that has been gained by learning by heart.

It is easier to use previously unfamiliar elements, if one understand the principles of a few elements. For example, by knowing the principle of the element <tag>Hello World</tag>, we can understand elements like and <h1></h1>, because we understand that a text needs to be surrounded by beginning and ending tags.

Having pauses during the lessons is important because of at least three reasons:

1) People tend to remember best the first and last things of a session.
2) If students get stuck in a task, it often happens that after a break the subconscious has solved the problem.
3) During the pauses students do usually discuss amongst themselves. Talking about their previous experiences can help them recall the topics better. Speaking aloud also makes people remember things better.

Every assignment is done first using pen and paper. Only after that step are the tasks performed with a computer using a text-editor. This is done because, according to behaviorism, repetition improves learning [12]. However, not all exercises are suitable to be done on paper, because some of the longer HTML elements do not fit on the paper. This is especially troublesome in HTML when there are elements within other elements. In these cases, doing the exercises only in Notepad++ is the best way. Simple HTML elements and simple CSS should always be done on paper.

80/20 principle

The target of this course is that every student would learn the most important key points of HTML5 and CSS3. Therefore more weight is put on more commonly used features. Many of the very seldom used features are left out of the scope of this thesis.

Actually we learn less than 20 percent of all HTML5 tags during the course. Still this is enough to manage perfectly for over 80 percent of the time. [13.]

At the beginning of the course, there were two types of students: those who will learn HTML and CSS, and those will learn the former two along with JavaScript. However, some adjustments had to be made, because there were students attending the course whose skill level was weak, even though the course was marketed as an advanced course in the community college course description.

The students were divided into three categories:

1) Those who wanted to learn the most important and basic HTML and CSS features. This is about 10 percent of the total amount of features.
2) Those who wanted to learn all HTML and CSS features that were part of the scope of the course. This is about 20 percent of the total amount of features.
3) Those who wanted to learn all HTML and CSS features of the course, and also something more advanced. In this case: the basics of JavaScript.

An image is worth 1024 words. Images make things easier to remember [11]. “Images are far more memorable than words alone. It also makes things more understandable. [11]” If a lesson consists only of the teacher lecturing, it often tends to lead to somewhat boring lessons. Usually interaction between students and the teacher is more fruitful. It also helps the teacher notice faster if the students can’t keep up with the pace of the lesson.

4 Topics for Lessons in a Homepage Creation Course

4.1 Lesson 1 – Students’ Skills

The most important issue in this lesson is to find out the students’ learning abilities. What do they know about computers? Do they have some previous knowledge of some

version of HTML? Have they done some programming? What kind of education do they have, and ultimately how fast do they learn things related to homepage creation?

In the 1st lesson the behaviorist teaching methods are used. The students are considered black boxes with only input and output; we cannot see what happens inside their head. In this lesson we create homepages using only HTML. The reason to use only one technique in the beginning is to not make the learning curve too steep. Also in this lesson we do not make for example lists, because that can be difficult for beginners (see the next HTML code snippet).

```
<ul>
     <li>HTML5</li>
     <li>CSS3</li>
</ul>
```

The previous HTML code snippet can be difficult for beginners because of the nested elements. By nested is meant that inside the <ul> element are <li> elements.

In a normal HTML-page there are tags like <head> and <title> but they are not used in today's exercises in order to make things easier for beginners. Beneath are two homepages that show the same thing: a heading and a paragraph:

First, simple example:

```
<h1>Heading 1</h1>
<p>Paragraph…</p>
```

Second, more complex example:

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="utf-8" />
   <title>HTML5</title>
</head>
<body>
   <h1>Heading 1</h1>
```

```
    <p>Paragraph…</p>
</body>
</html>
```

The HTML code in the first example seems correct when viewed in a browser, but according to a validator it is not standard HTML.

Elements for lesson 1

The HTML elements / tags used in this lesson are the following: headings <h1> to <h6>, paragraph <p>, horizontal ruler <hr />, line break
, strong and emphasis . At the end of the lesson, the teacher points out the most important tags and elements. In this lesson the most important ones are headings and paragraphs.

The following are the five topics of the lesson exercises:

1. Elements
2. Lorem Ipsum
3. History of HTML
4. Curriculum Vitae
5. What is HTML, CSS & JavaScript

The five exercises are printed out and the tags are inserted by the students using a pen. After all the five pen exercises are done, the same exercises are done again but this time with a text-editor (for example Notepad++) and viewed in a browser. This time we start with the more important exercises #4 and #5 and proceed to #1, #2 and #3 only if there is time left.

Introduction to Elements

The idea of this exercise is that students get a paper copy of an exercise and then fill in the right elements using a pencil with the help of the teacher. The ordered list is too difficult in the beginning so it can be left out of the exercise as shown in Figure 11.

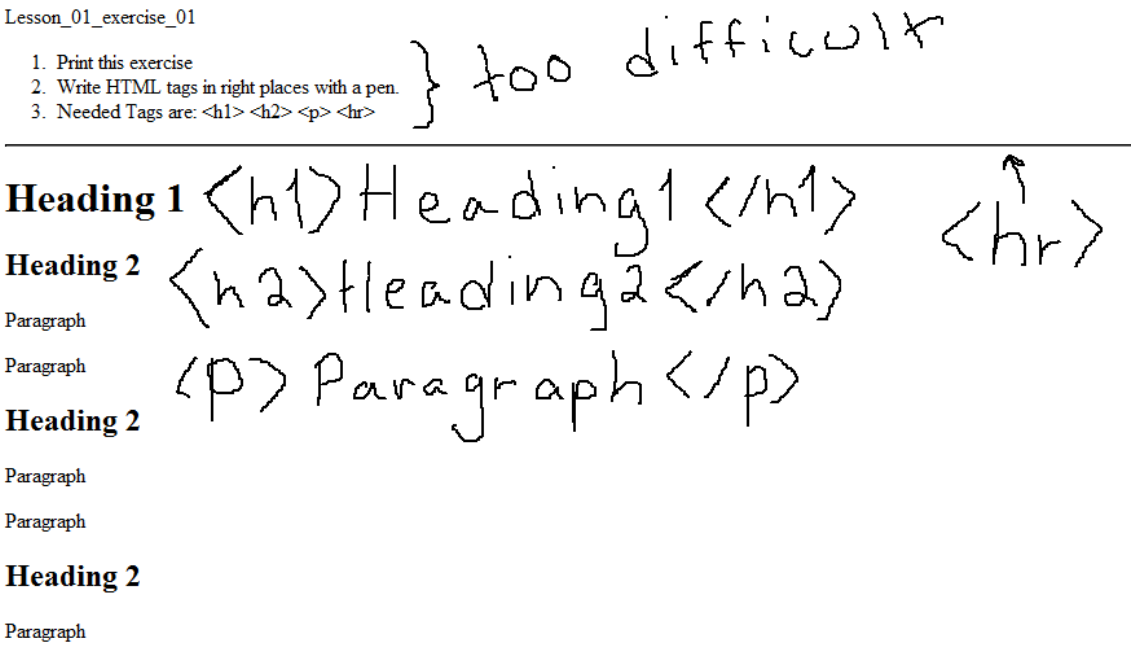


Figure 11. Pen exercise

The first exercise is just copying what the teacher does on the projector. Pure copying is considered a part of behaviorism and “Lorem Ipsum” is dummy text in Latin, and it has no real meaning. It is used as filler text when you have not yet done your final text for your homepage. There are two good reasons to use “Lorem Ipsum”. 1) First you see how the page layout looks like when you have more text. 2) Secondly it is rare that any Latin text remains mistakenly in the page when published because it is so easy to detect from for example Finnish or English text. This exercise is also considered a part of behaviorism because the teacher does the work and the students just copy.

History of HTML

The exercises contain a brief introduction to HTML’s different versions. A few students wanted to know more about the history of HTML. I promised to prepare a presentation about the history of HTML and CSS for the next lesson, however stressing the new features of HTML5. It is more important to know about the present and future versions of HTML, rather than concentrating too much on the older versions.

Curriculum Vitae

It is essential to get information about the students' ability to learn. People also like to talk about themselves. We get information about the students´ education, about their work experience and if they have some programming experience from before.

HTML5, CSS3 & JavaScript

This exercise is a quick review of the techniques in the thesis. Even though JavaScript is not part of this thesis, we still briefly mention what can be done with JavaScript.

Evaluation

The students thought it was a good idea to write the needed HTML element on paper first with the aid of the teacher, and only after that using Notepad++ by themselves. The repetition was useful. I thought that there were too many exercises, because there was not much time left for discussion. In the upcoming lessons, I will hand out fewer exercises, so that more time can used for discussion. The students' feedback was that the big picture was slightly unclear, but that the teaching speed was appropriate.

4.2 Lesson 2 - Computer Malware

Clear Theme - Computer Malware

The theme of the second lesson is computer malware and some new HTML5 elements. To make it easy to remember and fun we start with an exercise about real viruses and living bacteria. One reason for choosing malware as the topic is that the audience on advanced computer courses like this is usually interested in topics like computer malware.

Virus

Relating the new information to existing knowledge makes it easier to remember. So if we know about human viruses, then it is easier to learn about computer viruses. This is

a classic example of constructivist learning theory, because the virus concept is something that is familiar from the student´s previous experiences. See Figure 12.

Figure 12. Worm image from www.openclipart.org [21]

It is much easier to remember the term “worm” when one sees a picture of a worm. Without a picture the association to the term is not as strong.

Evaluation

The students found the comparison between computer viruses and real viruses funny, and that it helps them remember the theme better. Also the amusing, cartoonish pictures support memorization. If a larger number of senses are used in a learning situation, it is usually easier to recall the teaching.

Many of the students would have liked to start making their own homepage already at this point. They wished that they could upload their pages to the Internet, and wondered how to do this. I will make an effort to find out what free or low-cost webhosting services there are available.

4.3 Lesson 3 – Databases

This lesson promotes an upcoming course about databases scheduled for the spring of 2013. That is the reason why the semantic theme is databases. The technical theme is mostly new HTML5 tags, so no actual databases are created during the lesson. Databases are everywhere: at the office, in libraries, in hospitals etc. For example, libraries store information about all their books and customers in a database. Many library users do not even know that a database is involved; they just use a computer system to search for books.

Elements for the 3rd lesson

The new HTML tags used in this lesson are: <header>, <footer>, <nav> and <table>. <header>, <footer> and <nav> are new tags in HTML5. The header tag can be used as a page header, or for example as a header for an article or section. Likewise the footer tag can be in the bottom of a page, or for example as footer for an article or section.

Overview of Databases

A database is a system which manages data. There are four pictures in this lesson. They make understanding database concepts easier. To understand for example a form without seeing one is not trivial, and the picture clarifies the concept. Pictures also greatly enhance the memorizing of topics.

Here are the four types of database objects:

1. Tables
2. Queries
3. Forms
4. Reports

In Access 2010 there are four types of database objects. Tables are the most important ones because that is where your data is stored. If someone is using forms, queries or reports he/she are still working with tables. As tables are at the heart of any database, it is important to understand how to use them. [14.]

The tables contain all the data that is stored in the database. The data inside a table is organized into rows and columns as seen in Figure 13.

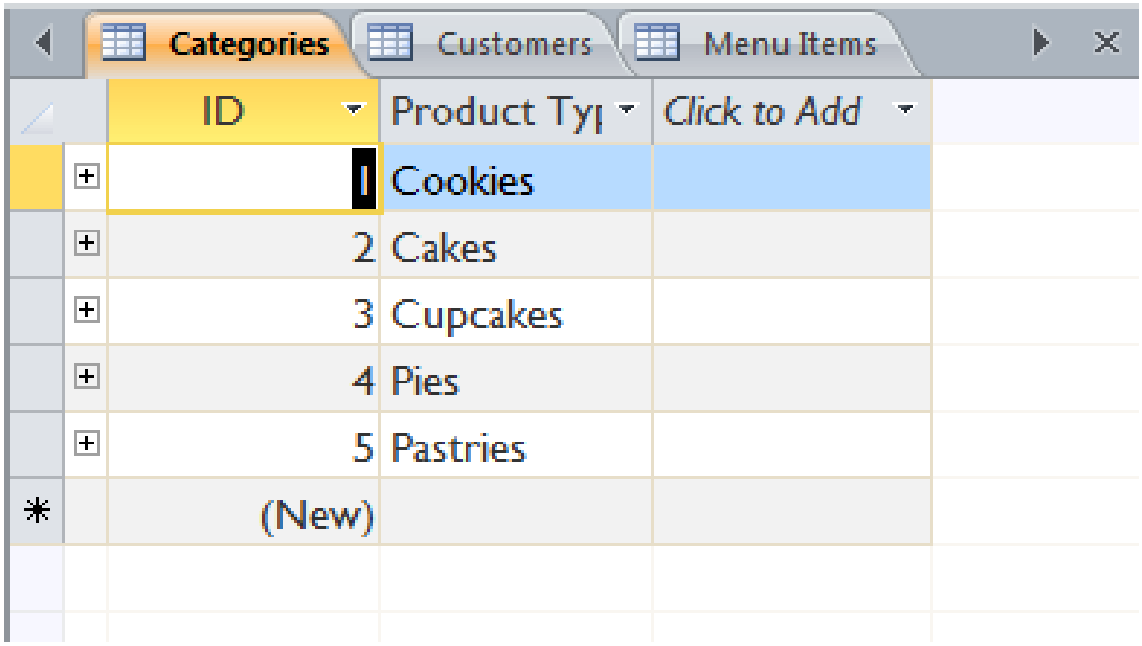


Figure 13. The "Categories" table

The categories table has an id number column and product type column. This table seems to be related to bakery products as seen in Figure 13. Queries are used in order to find data from the database tables that correspond to certain search criteria. One can search for all books published in 2012; or for all cellular phone models with a list price over 400 euros.

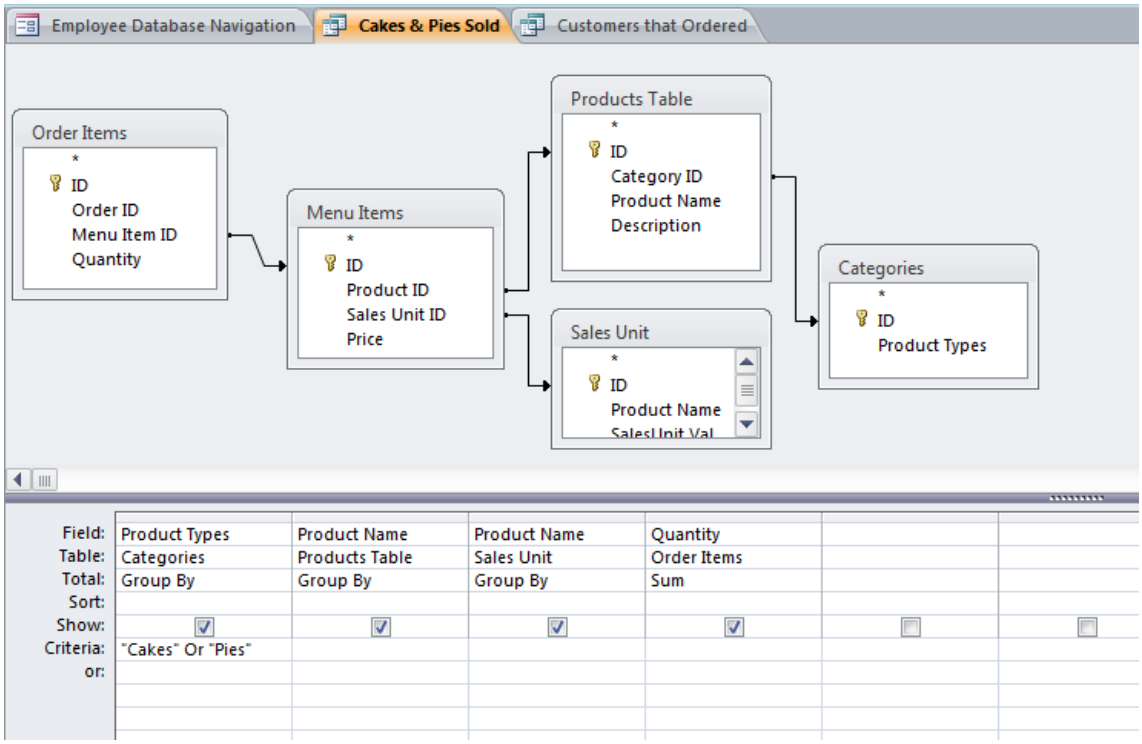


Figure. 14 Database Query

Figure. 14 Database Query is an example of a query that retrieves information about the quantity of cakes or pies sold. This query needs to use the data from five different tables in order to find this out.

Forms

We can make the entering of data much easier if we create forms for our database. We can design a form so that it works with our database and makes sense to the user. [14.]

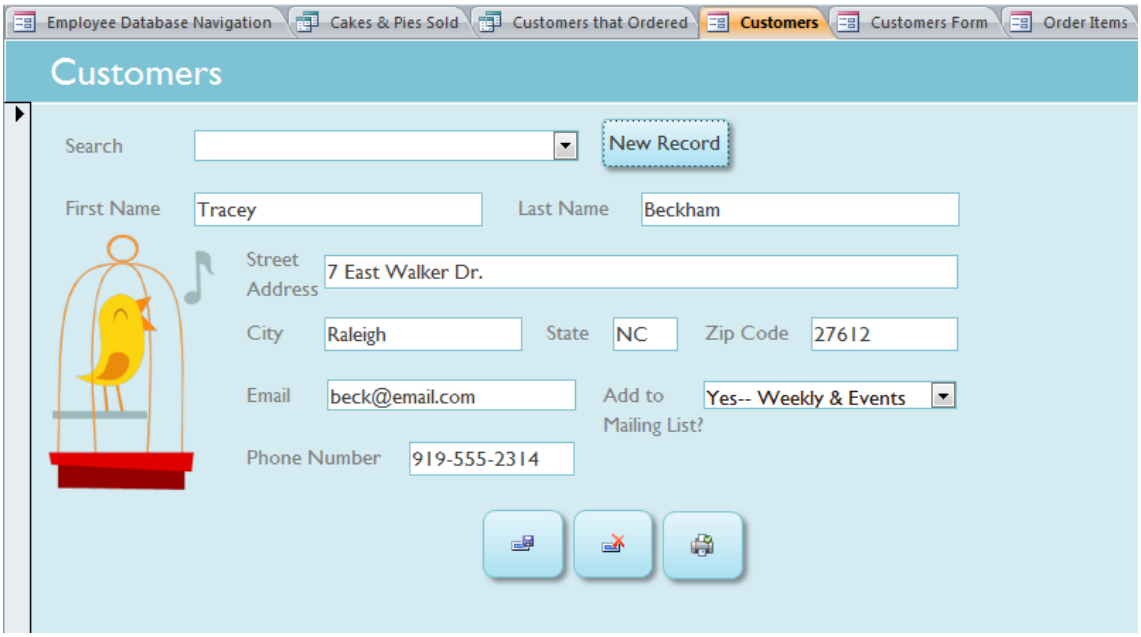


Figure 15. Customer input form

Forms are the most common way to enter data into a table. Library staff can enter information about new books using a form. When we want to share information from our database with someone, we can create a report. Reports allow us to organize and present our data in a reader-friendly and visually appealing way. Access 2010 allows us to create and customize a report using data from any table or query on our database. [14.]

Reports

A report is not used for modifying a table; it is for viewing the data. When a user of a computer system has searched for information, the result is a report. The report is based upon one or more tables, or a query referencing the table. Often computer systems allow the user to print the report and save it in different data formats, such as Excel and PDF. In the library example, some common reports could be all books by a certain author, or every book published in 2012.

Figure 16. Report about a menu

In reporting mode, one cannot add products. Reports can only be viewed or printed.

In general, the more skilled the student is, he/she has a tendency to find it boring to write the elements on paper first, especially longer elements. These skilled students wanted to be able to copy and paste the elements, and only change the text between the tags. However, the other students did not raise this as an issue, and wanted to practice first on paper and write the elements themselves without using copy and paste.

4.4 Lesson 4 – Web Page Usability

The topic of this lesson is usability. Steve Krug has written the book “Don’t Make Me Think” which contains simple rules for enhancing usability on your web page. The most important are his **three laws of usability**.

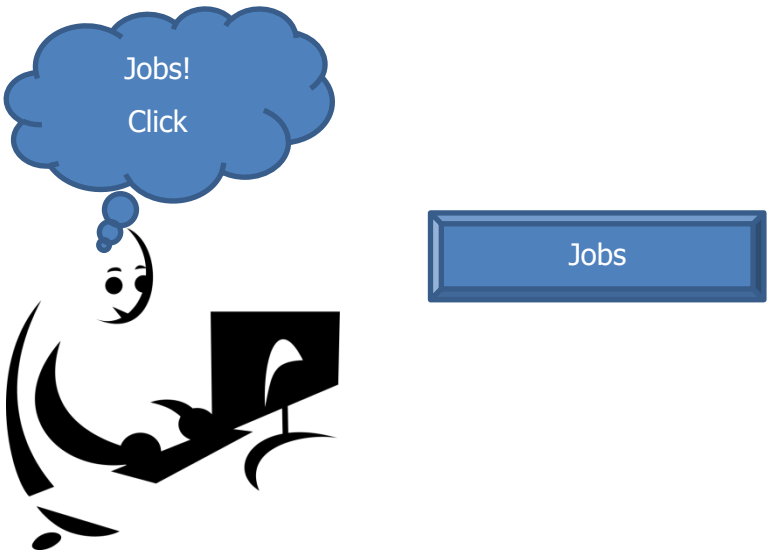
It is surprising how many homepages there are on the internet that are difficult to use and hard to grasp as a whole. One reason Krug's rules are so famous is that they are easy to understand and are clear and concise. After learning Krug's rules, we don't have to repeat the same mistakes again and again.

Krug's first law of usability - Don't make me think

If possible, everything on a homepage should be so obvious that the users do not have to hesitate about what something means. In Figure 17 there are three buttons that do the same task, which is showing the jobs available. The first one is the easiest to understand and the last one is the most difficult to understand.

Figure 17. Buttons for searching jobs. Data collected from Krug 2006 [15]

It is easy to guess what happens when a user presses the button that says “Jobs” in Picture 18.



Picture 18. Obvious button, data gathered from Krug 2006 [15], Figure from [21]

In Figure 18 we see an example of the thinking process. The user sees a button with the text “Jobs” so he clicks the button without hesitation.

In Figure 19, the user sees a button with the text “Employment Opportunities”. He hesitates a moment and thinks it is probably the same as “Jobs” so he clicks the button.

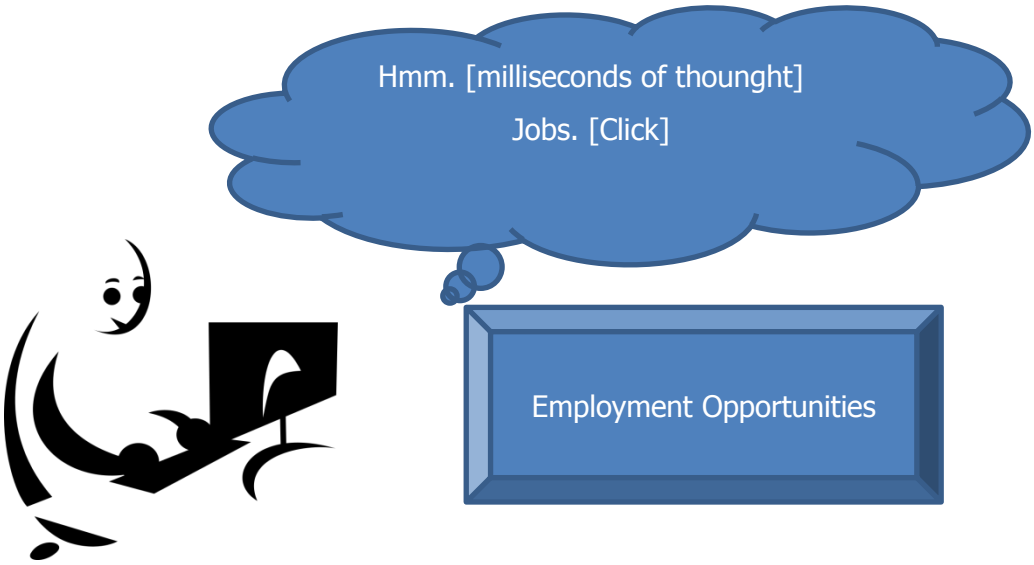


Figure 19. Not so obvious button. Data gathered from Krug 2006 [15], figure from http://openclipart.org [21]

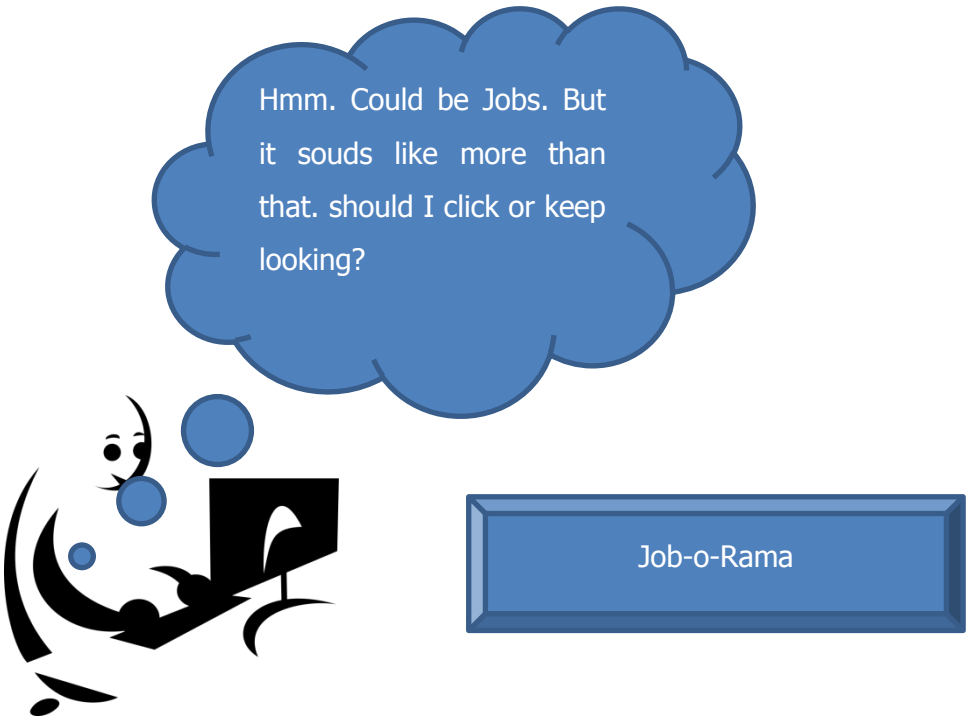


Figure 20. Requires thought button. Data gathered from Krug 2006 [15], figure from http://openclipart.org [21]

In Figure 20 a user sees the text “Job-o-Rama”. He hesitates and thinks it might be the same as “jobs” or it could be something more.

In Figure 21 below, does “quick search” mean the same as search? The user has to click the combo box in order to see what else than “Keyword” can be chosen.

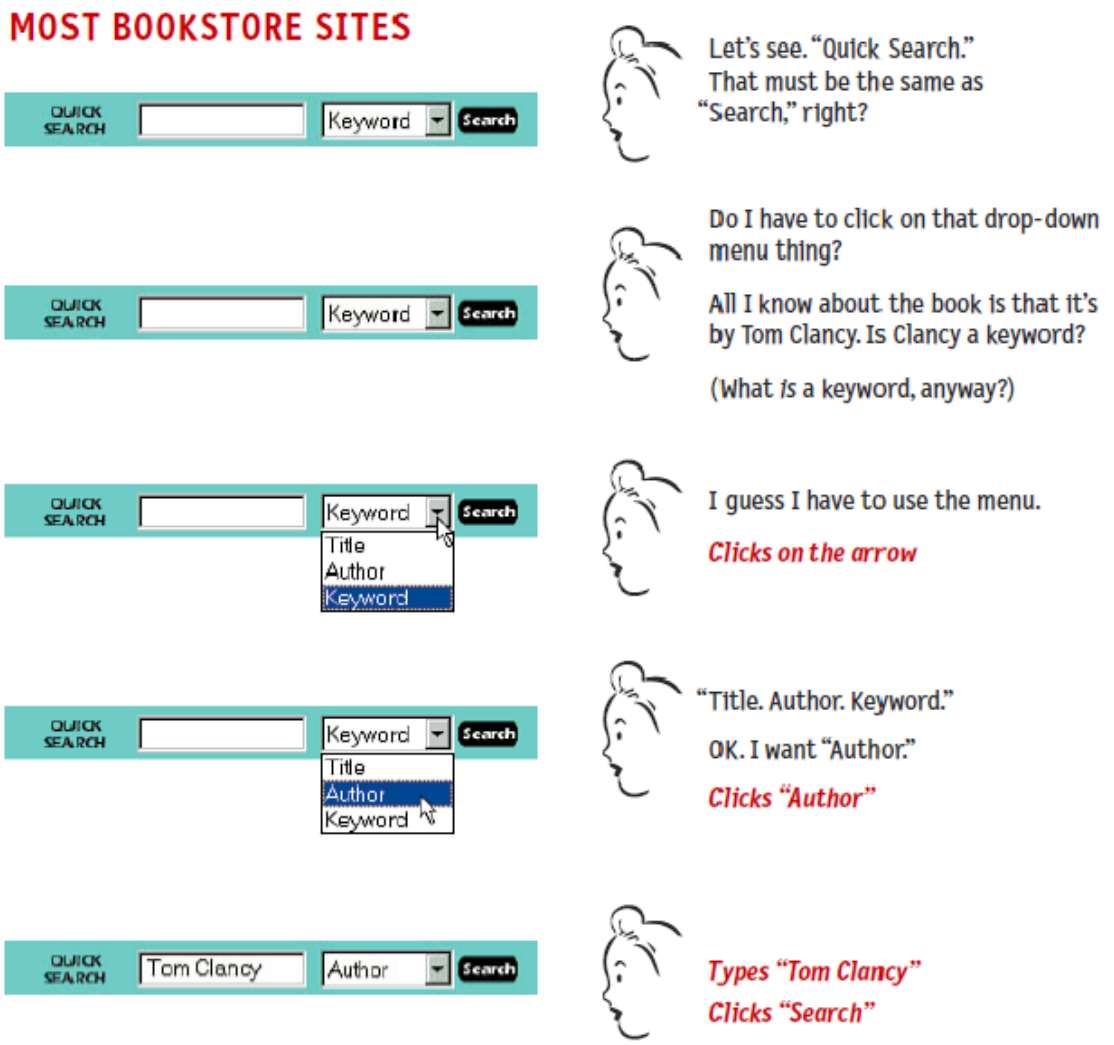


Figure 21. Thinking process, copied from Krug (2006) [15]

The Figure 21 violates Krug’s first law of usability. It is too complicated. The customer does not quickly enough realize what to write or click. The user does not know what “quick search” means. He/she wonders if it the same as regular search? The order of the textbox and the combo box is wrong. The order should be from left to right. In this case the user would first have to choose Title, Author or Keyword and then go back left to enter the words for the search, and finally to the far right to click on “Search”.

A better design is in Figure 22 which is done with the following HTML5 tags:
<input type="text" placeholder="Type Author, Title or Keyword of Book" size="42" />
<input type="submit" value="Search" />

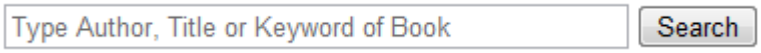


Figure 22. A better design

In the textbox we write the author, title or keyword for books we search. When the user types the first letter in this box, the placeholder text from the textbox disappears automatically. To the right we have the button labeled “Search” that everybody understands. The user moves in the logical direction: from left to right. This design is much easier to understand than the original complex example.

Krug’s second law of usability - It doesn’t matter how many times I have to click, as long as each click is a mindless, unambiguous choice. Usually, users do not get frustrated by having to click many times to reach their goal if they easily understand what each mouse-click means. [15.]

Krug’s third law of usability - Get rid of half the words on each page, then get rid of half of what’s left. Do not add words to your homepage that no one is going to read. Get rid of them. It makes the pages shorter allowing the users to see more of each page without scrolling. It allows users to concentrate on the most important issues. [15.] Users do not usually like to read lots of text. Therefore minimize the amount of text on your homepage. Keep your paragraphs short and concise.

Create a clear visual hierarchy. If something is important, it should stand out. For instance, headings are usually in a larger font as seen in Figure 23. [15.]

Figure 23. Visual hierarchy, Copied from [15]

An important word in a paragraph might be of a bold typeface, See Figure 23. Important text can also be in a different color. [15.] The logical relation between elements should also be visually related. For example in a heading hierarchy, the most important headings are of a larger font. Or in a multi-layer menu the hierarchy should be logical. See Figure . [15.]

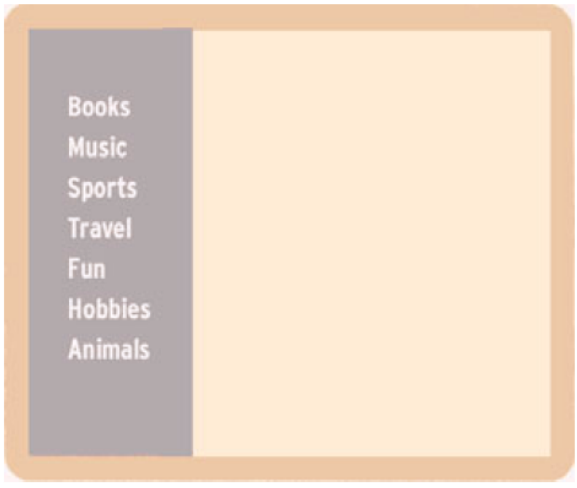


Figure 24. Logically Related Things, Copied from [15]

Elements are organized in a way which shows their hierarchy. For example the heading “Computer Books” in Figure 25 appears above the title of “One Particular Book”. [15.]

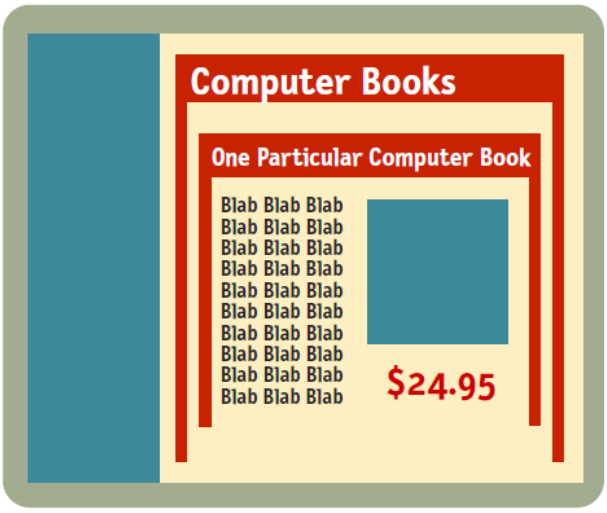


Figure 25. Hierarchy, Copied from [15]

There are several of examples where the concept of hierarchy is used, for example magazines, newspapers and websites. [15.]

4.5 Lesson 5 - Color Theory

A color gets its essence according to the perceptions of the eyes and the brain. When people talk about color harmony, they estimate the total effect of two or more colors. Combinations deemed harmonic in everyday speech are made with very similar colors or using colors that do not contrast each other so much.

Color Harmony

Harmony is important in many arts. On a piano, pressing more than one key simultaneously can sound harmonic, if the keys are chosen appropriately. The same principle is true for colors. Understanding color theory helps in choosing harmonious colors for a webpage. In order to avoid picking disharmonious colors and thereby creating more esthetically pleasing webpages, different color theory concepts will be taught in this part of the course.

In many companies, the same person is often in charge of both the technical and graphical implementation of a homepage. The aim of this chapter is to provide guidance on how to choose a harmonic color palette for a homepage, even without having any artistic talent. One important and simple rule is to not use many different colors, in order to keep the page from becoming confusing. It is better to choose less colors, ones that are harmonic to each other.

In this lesson, we create a HTML page that uses several CSS files - on the HTML page there are links pointing to the CSS files. Each file has a different color scheme, for example complementary color scheme, triad color scheme, analogic color scheme or split complementary color scheme.

Primary Colors

There are three primary colors in a color wheel: red, green and blue. All colors can be created by mixing the primary colors. [16.]

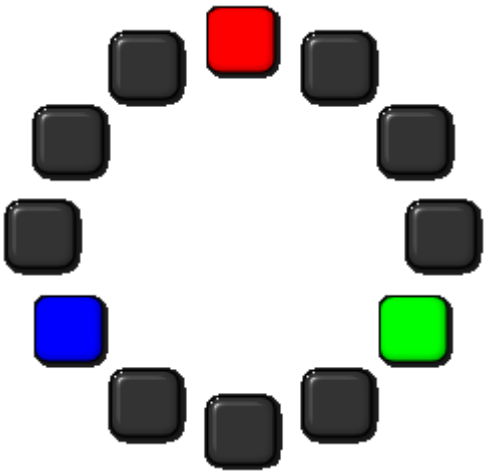


Figure 26. Primary Colors, Modified from [16]

By using triad colors we mean that we take three colors equidistant on the color wheel. For example red, green and blue are triad colors [16]. “When you want a design that is colorful and yet balanced a triad color scheme might be the way to go. [16]"

Analogous Colors

If three colors are close to each other, like in Figure 27, they are called analogous colors. Analogous colors are common in nature, which might be one reason why analogous colors feel so harmonious. [17]

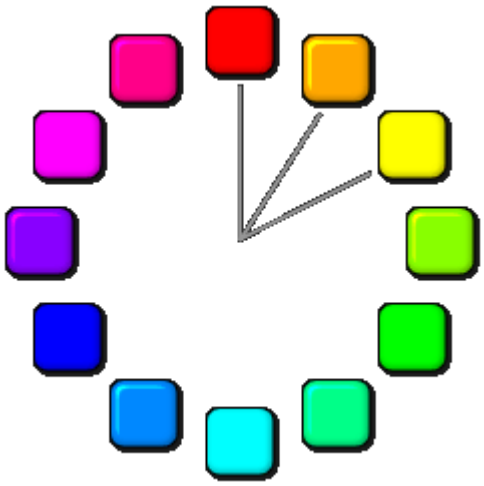


Figure 27. Analogous, Colors Modified from [16]

An easy way to get harmonious looking homepages is by applying analogous colors.

Complementary colors are opposite from each other on the color wheel as in Figure 28. Complementary colors stand out against each other because of the high contrast. [17.]

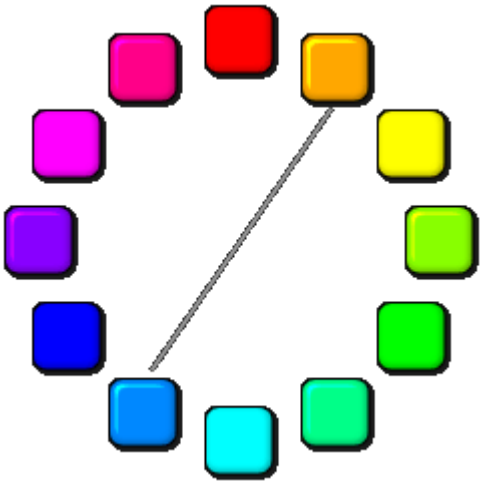


Figure 28. Complementary Colors, Modified from [16]

In many cases it is a good idea to user complementary colors to highlight the text from the background. [17.]

Split complementary

A split complementary color scheme consists of three colors. It is built by one main color and two colors that are on each side of the imagined complementary color (see Figure 29) of the main color.

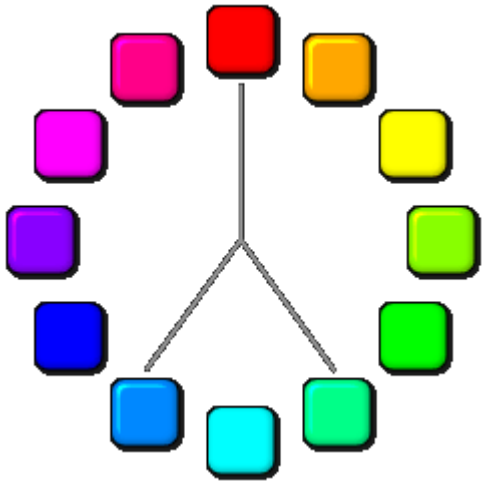


Figure 29. Split Complementary Colors, Modified from [16]

Split complementary color is usually more harmonious than complementary colors, why it is used quite frequently in homepages.

4.6 Lesson 6 – Gestalt Theory

According to the law of similarity, our minds have a tendency to group together shapes of similar **size**, **form** or **color**. The more things resemble each other, the easier it is to see them belonging together. In the same way, less similar objects are seen as separate from each other. [18.]

Understanding the law of similarity is very useful when designing homepages, especially when creating pages with many controls, such as text boxes, buttons and labels.

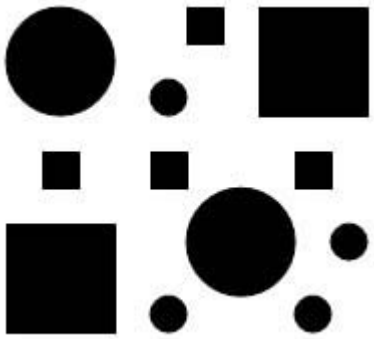


Figure 30. Similar Sizes. Copied from [18]

In Figure one can automatically notice the distinction between small and large forms.

The objects are of different shapes and sizes. The differences in size seem to be more notable than the differences in shape. [18.]

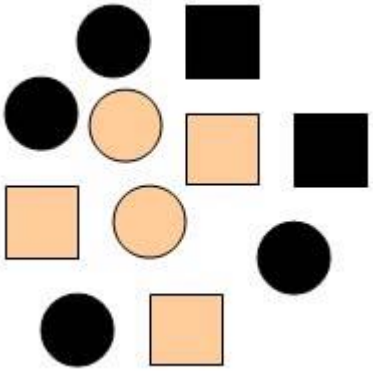


Figure 31. Similar colors. Copied from [18]

Color is another type of perceived similarity as seen in Figure 31. The shades of gray in a black and white Figure have to contrast notably. It is easy to separate objects from each other using color and saturation, making it easier for the mind to group objects together. [18.]

Similar Forms

Form and form elements, such as direction and structure, can also be used to group things together. If grouping using size and color is not feasible, form is a good alternative to consider. The squares and circles below are simple forms. [18.]

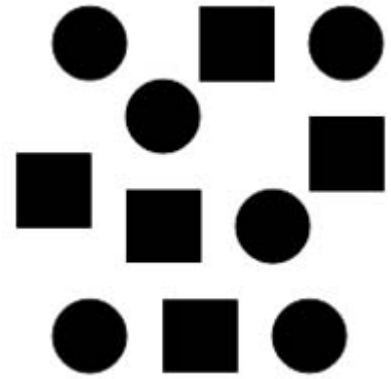


Figure 32. Similar Forms. Copied from [18]

As seen in Figure , Complex and surprising forms stand out more easily, but simple forms are often stronger, because they appeal to our need for natural order. [18.]

Law of proximity

The law of proximity states that objects close together are seen as belonging together. Proximity is usually even more effective than similarity as seen in Figure [18.]

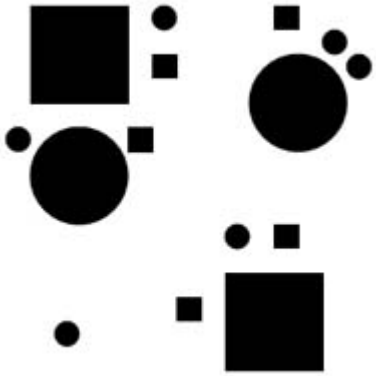


Figure 33. Law of Proximity. Copied from [18]

We get the strongest impressions when both similarity and proximity are used. See Figure [18.]

4.7 Lesson 7 – Testing

It is advisable to use a small number of test persons and to let them test many phases of the project, rather than only test a few times with lots of persons. [15.]

Think Aloud Tests: A test person gets a number of tasks to perform. During the test-phase he/she talks aloud about what he/she is doing. An example of a task in an e-bank is to find the phone number and opening hours for ones nearest bank office. [15.] Some questions to ask your test persons: is it clear what we're trying to sell? Did you have any trouble navigating the site? What is the worst or most confusing part of the site? [19.] Suitable times for testing: at the web site's conception (start by testing a printed mockup of the home page), before planning a redevelopment and repeatedly during (re)development, as critical pages or sections are prepared. [15.]

"Some people think that usability is very costly and complex and that user tests should be reserved for the rare web design project with a huge budget and a lavish time schedule. Not true. Elaborate usability tests are a waste of resources. The best results come from testing no more than 5 users and running as many small tests as you can afford." [20.]

Think about what and why you are testing. Know what you hope to discover each time you test. With all tests, you want to discover whether the user gets the point of the pages, whether he/she understands the navigation system and can guess where to find things. [15.]

In a general test, you want to know how users interact with the web site you are testing. What is difficult for people to do and where do they get lost? [15.] Tests range from five minutes (for a single page design) to one hour (for a general response to the whole site or new design). Most people (including you) will be tired after one hour of testing. [15.] Users should be outsiders, so they should not be involved in the web site in any way. They should be completely new to the web site and be somewhat familiar with the Web in general. [15.] Ideally, run in tests the user's home or work place so the user feels more relaxed. [15.]

5 Results and Discussion

5.1 The Four Learning Packages

For the homepage creation course I created four learning packages. The **1st package**, which is the one you are reading just now, is meant for teachers. This is the thesis it-self. It gives a teacher the necessary tools for teaching a homepage creation course. It also includes pedagogic suggestions. In the writing process of the thesis, I have found many useful ideas about how to improve my teaching skills. I would like to share these with other colleagues.

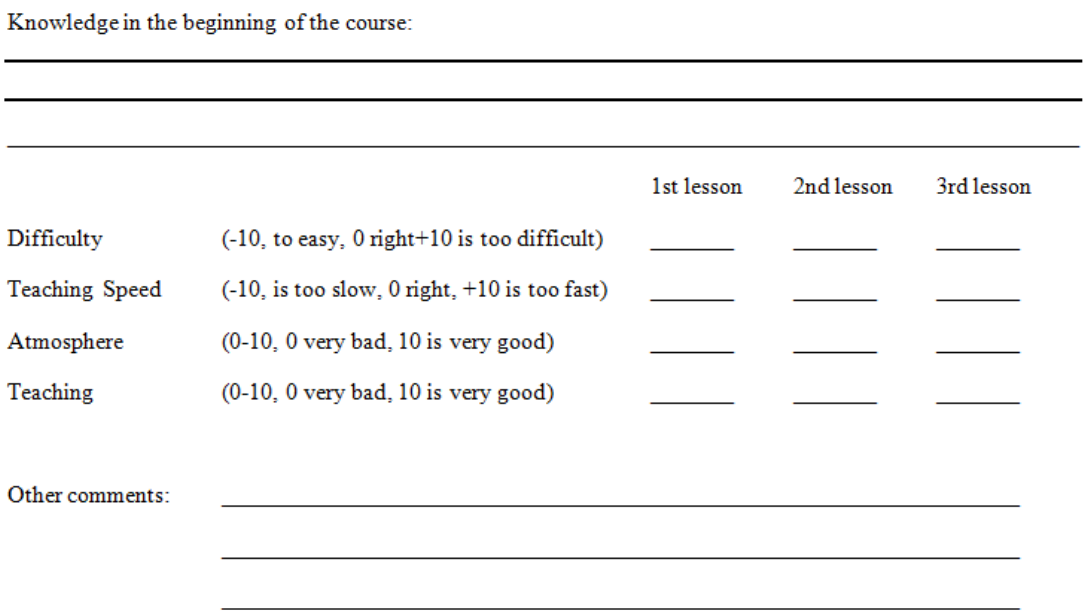
The **2nd package** is a PowerPoint presentation. During the process of creating the PowerPoint presentation I learned much about how to summarize complex concepts with just a couple of key words. The students do have access to the PowerPoint presentation on the course homepage. If a student cannot participate in a lesson, he/she can check the main points from the PowerPoint presentation at home.

The **3rd** package is a **homepage.** This is a reference for HTML5 and CSS3. Here one can find the compact version of the whole course. On the homepage one can also find and download the 2nd package (the PowerPoint presentation) and the 4th package (all exercises).

The **4th package** is the **exercises**. The exercises are essential to the learning process. During the course the students spends more than 50% of the time on exercises. This ensures that the students are really able to create homepages when they have finished the course.

5.2 Course Evaluation

An evaluation form is given to the students at some lessons as seen in Figure 34. This helps the teacher to keep track of how satisfied the students are with the course.



Knowledge in the beginning of the course:

		1st lesson	2nd lesson	3rd lesson
Difficulty	(-10, to easy, 0 right+10 is too difficult)	_____	_____	_____
Teaching Speed	(-10, is too slow, 0 right, +10 is too fast)	_____	_____	_____
Atmosphere	(0-10, 0 very bad, 10 is very good)	_____	_____	_____
Teaching	(0-10, 0 very bad, 10 is very good)	_____	_____	_____

Other comments: _____

_____

_____

Figure 34. Questionnaire for students

The form asks the students to rate how easy or difficult they find the subject matter, if the general atmosphere is good or not, if the teaching speed is appropriate, and how they would rate the teaching in general. See Figure 34.

Difficulty Level

In the beginning of the course, the majority of the students found the course to be too easy. One found it too difficult and two found it just right. See Table Table 1.

Table 1. Difficulty level of the course

-10 is too easy, 0 is optimal, +10 is too difficult

	1st	2nd	3rd	4th	5th	6th	7th
Student1	-10	-10		-10			
Student2	0	0	0		0	0	0
Student3	-10		-5		-1	-1	-1
Student4	-5	-5	-5	0	3		
Student5	0	0	0		0	3	1
Student6	-5	-5	-5	-5	-4	0	0
Student7	5	5	5				

At the end of the course, the ones who finished the course, found the difficulty level to be just right. The ones who did not finish the course found the course either too difficult or too easy. This is shown in Table 1.

Teaching Speed

There is a strong correlation when comparing the teaching speed with the difficulty level. The ones that thought the difficulty level was too easy found the teaching speed too slow. The one who found the course to be too difficult found also the teaching speed to be too fast.

Table 2. Teaching Speed of the course

-10 is too slow, 0 is optimal, +10 is too fast

	1st	2nd	3rd	4th	5th	6th	7th
Student1	-10	-10		-10			
Student2	0	0	0		0	0	0
Student3	-5		0		-1	-1	-1
Student4	-5	-5	-5	0	5		
Student5	0	0	0		0	2	2
Student6	0	0	0	0	0	0	0
Student7	5	5	5				

Three of seven students found the teaching speed to be optimal from the beginning. At the end of the course, all students that finished the course found the teaching speed to be almost optimal as shown on Table 2.

Atmosphere

The atmosphere was good throughout the whole course as seen in Table 3. One reason for this was that I encouraged students to communicate with each other during the lessons.

Table 3. The atmosphere of the Course

0 is very bad, 10 is very good

	1st	2nd	3rd	4th	5th	6th	7th
Student1	10	10		10			
Student2	7	7	7		8	8	8
Student3	5		7		7	7	7
Student4	7	7	7	5	5		
Student5	8	8	8		8	8	8
Student6	10	10	10	10	10	9	9
Student7	7	7	7				

The students were keen to share about their computer related work. They were also able to establish contacts with other students. This contact network will probably help them in their career later on.

Teaching Quality

The teaching quality did not change much during the course. It was considered to be on a rather high level as seen in Table 4.

Table 4. Teaching quality

0 is very bad, 10 is very good

	1st	2nd	3rd	4th	5th	6th	7th
Student1	10	10		10			
Student2	7	7	7		8	8	8
Student3	7		7		7	7	8
Student4	7	7	7	5	8		
Student5	8	8	8		8	8	8
Student6	10	10	10	10	10	9	9
Student7	5	5	5				

The one who felt that the difficulty level was too high gave the teaching quality the lowest score. The answers to the four questionnaires mentioned above also support this assumption as shown in Table 4.

Discussion

Two themes of the seven lessons do not directly support the theory of homepage creation. These two themes were the second lesson which was “Computer Malware” and the third lesson which had the theme: “Databases”**.** These two themes should be substituted with two other themes, which support better the topic of homepage creation. Perhaps uploading web pages to the web server could be covered in the future. The other themes such as “Color Theory”, “Gestalt Theory” and “Testing” do support perfectly the homepage creation procedure.

Prior and during the work with this thesis I studied various theories of pedagogy. It was quite difficult to apply directly one or two theories. I have some nine years of experience of teaching at community college without formal competence in pedagogy. In practice I do use mainly constructivism and behaviorism without knowing it. During this work it was nice to realize that I have been on the right track. The answers to the four above mentioned questionnaires also support this assumption.

6 Conclusions

The goal of the project was to create a learning package for a homepage creation course. In the autumn of 2012 I created the package and held the course at Kirkkonummi community college. This enabled me to find out how the package was actually working, both the advantages and the disadvantages. I received real feedback from the students at the course which is part of this thesis. Some students found it difficult to understand the learning packages written in English. For the next course I will therefore translate the homepages and exercises into Finnish.

The biggest challenge with the course was the wide experience gap between the students. It would make sense to have two courses next year; one for beginners and another for advanced students. The courses should be following each other, so that beginners could take both courses, first the beginners’ course and then the advanced course.

One of the key tasks was that all students would design a homepage of their own. They were advised to choose a real homepage that they needed to create. The idea was that this homepage would also be in use. Because many students chose too large homepages to be designed and we did not have enough time, many of the homepages were not finished. For the next course I will have to advise students to choose simpler homepages or if they need a larger one, we will only create the front page of the site.

The end result of the thesis was four learning packages: the thesis itself, a course reference home page, printed student exercises, and a set of PowerPoint presentations for the lessons. All in all, the course was found to be useful and fulfilled most of the goals set in the introduction. With slight adjustments this course can be improved further. The next course has already been planned and booked for the autumn of 2013.

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