Usability evaluation of two virtual learning environments used in Qatar-Finland International School

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The amount of digital educational resources has grown dramatically over the past two decades. Also, the fast development and growth in the number of mobile devices at home and schools has created new possibilities for learning. Thousands of online sites and applications are offering educational resources in different formats and interfaces. In order to make these resources as efficient and useful as possible, developers should gather more information about usability and user experience to build better interfaces.

In this research, I will evaluate the usability of the two, modern virtual learning environments (VLEs) used in Qatar–Finland International School. The VLEs are Sanoma Pro and Microsoft Office 365. These particular learning environments were selected by interviewing the users at school.

This thesis in a qualitative study and the research methods are semi-structured interviews and a thinking aloud- method. The informants are from three different categories: users (students), super-users (teachers and administration) and experts (usability professionals). The research was carried out in the academic year 2016-2017 and finalised during 2018.

As a result, a conclusion can be drawn that especially in Office 365 more emphasis should be put on usability from the student’s and teacher’s point of view. Overall, the complexity of the learning environment makes it relatively hard to use for many inexperienced users. Sanoma Pro material, on the other hand, has taken the users well into consideration but is lacking the possibilities of editing the materials according to the needs of the end-user. It is important to make a careful usability testing before the launching of the material, and take all possible stakeholders in to consideration. According to this research the recommendation is to use three groups in the usability testing of the learning materials: teachers, students and usability experts.

In general, developers of the learning resources should take the questions of usability in to careful consideration in order to produce compatible quality materials for effective and long-time use in growing international markets.

**Keywords** usability, virtual learning environment, thinking aloud, heuristic evaluation
Educational resources have changed considerably during the 21\textsuperscript{st} century. These changes have altered media and access to digital resources. At the same time those changes have altered how, when and for what purposes educational resources are created and used. All these changes are the result of the growth of information systems such as the Internet and the World Wide Web. With the current gadgets (phones, tablets etc.) we can use the new technologies in classrooms, libraries, homes and business. (Hill & Hannafin 2001, 37)

Nowadays, with our mobile devices, we have access to more information than a person could gather during his lifetime a hundred years ago. Obviously, this affects the role of education materials in teaching and learning, but also the whole concept of learning.

Current technology gives us new possibilities for teaching and learning, but do the users have enough education and the right practices to optimise the information? Digital resources can be generated to correspond to the needs of teachers and students. The companies producing Resource Based Learning Environments should use more effort to evaluate the usability of their products because of the diversity of their users. After interviewing teachers and monitoring students it has been stated that RBLEs are expanding the use of resources and providing new ways to use them in learning and teaching. (ibid.)

In this research, I will evaluate the usability of two, modern resource-based learning environments (RBLEs) used in Qatar- Finland International School, in Doha. These RBLEs are Sanoma Pro and Microsoft Office 365. Although Microsoft Office is not a virtual learning environment but a productive / office software and service originally designed for corporate users, its use in a school environment can be studied as a virtual learning environment, because that is how teachers and students see it. From this point forward, we will call these two RBLEs services as virtual learning environments (VLEs).
The exponential growth of information and new technologies creates challenges for designers of the VLEs. We need to keep VLEs simple, clear, easy to use and interesting to promote learning. This is the reason to promote usability by studying how users think and act.

1.1 MOTIVATION
I have studied computing at Jyväskylä Polytechnic. My major was user interface design and programming. This thesis is part of my MA in New Media design and production studies at Aalto University. I have 15 years of experience in designing and implementing web and desktop interfaces for commercial use in the fields of internet banking, ATM services, financing, government services, commercial web pages and marketing. I am currently working as a usability expert at Oy Samlink Ab. Samlink is developing and updating internet banking software for Finnish banks (SP, OmaSP, POP, Handelsbank and Hypo).

Good usability and minimalistic interfaces have always been important to me as well as keeping up with the evolution of user interfaces. User interface designers and developers need to learn and communicate on how to keep up with new trends and techniques because designs, devices, standards and expectations for how software should look, think and act change constantly.

1.2 INTERNATIONAL SCHOOL AS A LEARNING ENVIRONMENT
This research was carried out in Qatar-Finland International School, which is the first of its kind in the world. There are many different types of international schools in the world that are part of different school systems and follow a variety of curricula. According to the International Educator online publication a school has to follow a national or international curriculum that is different from the host country to be considered an international school. (Nagrath, 2011)

Qatar-Finland International School is located in Doha, Qatar but follows the Finnish National Curriculum and is the first of its kind in the whole of the Finnish history of schooling. The reason, why an international school falls very well into the category where different VLE’s can be evaluated, is the hypothesis that in such an institution, a variety of educational practices and traditions as well as expertise from all over the world are present. Also, teachers
in international schools have experimental mind-sets and therefore are more willing to try new methods and ways of teaching.

![Assembly Hall of Qatar-Finland International School](image)

**Figure 1. Assembly Hall of Qatar-Finland International School**

According to its webpage, Qatar-Finland International School is providing education, following the Finnish National Curriculum and based on the Finnish style of learning. Finnish education has been many times reported by many global studies to be one of the best in the world. That is one reason that Q.F.I School was established in Doha. The school is run by a Finnish company called Educluster Finland ltd. The Qatar-Finland International School is a co-ed school for students aged 5-13 (grades 0-8). The intention of the school is to continue to grow until at least Grade 9. Almost all the teachers are from Finland and have Master’s Degree in Education.

The main language inside the school is English but language support is given for English as a second language- students. Arabic language studies are obligatory because the goal is to educate functional bilingual students. (Qatar-Finland International School 2017)

"For us the child comes always first. We will provide your child a solid foundation for lifelong learning, promoting holistic well-being and social confidence.” (ibid 2017)
1.3 \textbf{VIRTUAL LEARNING ENVIRONMENT}

A virtual learning environment (VLE) is a web-based application for teaching and learning. The basic components of a VLE include searching, processing, manipulation and communication tools (Hill & Hannafin 2001, 44). Normally, every VLE user has a logging information with certain rights for using the environment. Usual user groups are admins, teachers or students. The teacher/admin user group has additional rights to create and modify content, track student performance and sometimes modify the interface of the VLE.

In a survey, conducted in the UK in 2009, teachers listed the materials they have found in VLE’s they had used. The most common element was notes linked with specific lesson. Then, schemes of work, course handbooks and course planning material. The third most common elements were assignments and assessments, due dates, submissions and feedback. The fourth most common items were practice test which mostly were multi-choice tasks with automatic marking. The fifth most common element was student produced materials which were mainly art or media presentations. After these came commercial materials, power point presentations, links and staff resources. (House 2009, 17)
We can divide VLEs into two groups by their contents. Some VLEs include prepared learning material for example Sanoma Pro which can be used as a normal school book. Other VLEs offer just a presentation service for material created by teachers or students. The Microsoft Office 365 is a good example of a presentation service. This affects greatly how they are used in teaching. (Nokelainen 2006, 179).

According to Dillenbourg et al. a virtual learning environment is a designed information space and social space that is explicitly represented, so that students are active actors constructing the space (Dillenbourg, Schneider & Paraskevi 2002, 2). It can be stated, that every website is an information space but the structure of the information, the design of the visual components and the usability of the user interface varies depending on the designer. VLE should be a customised environment for teaching and learning. This separates the VLE from a basic information-rich web site. Dillenbourg et al. emphasise the social aspects of the VLE: Inside the VLE users can comment, chat, create and share documents, share calendar, make groups, play puzzles, view learning materials etc. VLE should be a social place where students interact and learn together. (Munro, Höök & Benyon, 1999, in Dillenbourg, 2002, 4). These social places can vary from text to 3D worlds.

Users co-construct the virtual space by creating content, customizing the outlook, sharing information and adding comments (ibid, 6). VLEs are student centered and that clearly encourages them to take responsibility for their own learning. Materials for learning, such as computer programs, lecture notes, special assignments, exams etc. are available in the VLE and students can contact the teachers without face-to-face contact. Students can discuss about exams, reports, lectures and get technical help using the VLE. All the learning material and tools are usable 24 hours a day. (Peat 2000, 203).

Inside a VLE tutors should be allowed to create assignment for student to complete as they work through the material of the course. Students should be able to return completed assignments for a grading and feedback. (Britain & Liber 1999, 6) This feature come in handy for example students working at daytime, living abroad or with special needs.

VLEs are providing the technology for students for easier collaboration and resource sharing. Working with online cloud resources allows users to collaborate around the globe. VLEs should
not be seen only as a single tool to use for learning but as an online resource used with classroom activities.
2. Usability and evaluation

2.1 Usability

Before moving towards evaluating the usability of two selected VLEs, we should first define what usability is. Usability is the ease of use and learnability of any item that we use. Generally, items or tools that are easy to use are more usable than those which are difficult to use. The International Standard ISO 9241-11 (1998) defines usability as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO 9241-11 (1998). According to Bevan et al, effectiveness is compared to scoring goals, efficiency is compared to wasted time and satisfaction can be compared to willingness to use the system. (Bevan, Carter, Harker 2015, 2).

In this study, I will define technical and pedagogical usability by using the model presented by Jacob Nielsen (1993, 25). The top level of the model is system acceptability (Figure 3). Acceptability is divided into social and practical acceptability. An example of social acceptability is a curriculum where only the teachers can make changes on the studied subject. This can be seen as accenting the teacher’s authority and restricting the students’ independent discovery. Social acceptability can be also seen as ethical and moral choices of the software developers. For example, the application can ask the user to answer questions and then search the same information from database and check if the user is trying to cheat. (ibid. 24)

Practical acceptability means usefulness, cost, compatibility and reliability of the system. The main idea of usefulness is naturally that the system can be used to achieve a goal. The usefulness can be divided into two types of usefulness: utility and usability. Utility means that the system can do what it is designed for and usability is a matter of how effortlessly users can use the functionality of the system. (Nielsen 1993, 24-25).

Nielsen (ibid. 26) lists 5 usability attributes, which are learnability, efficiency, memorability,
errors and satisfaction. **Learnability** means how long it takes for a beginner to learn essential skills needed to perform their tasks. **Efficiency** refers to how well users who have learned the design of the application can operate it. **Memorability** means how well the returning user remembers the operational principles of the software. **Errors** can be divided into less serious errors that only disturb the user and serious errors that endangers the material or will crash the application. **Satisfaction** is a subjective judgement by the user. (ibid.)

![Nielsen's framework for usability (Nielsen 1993, 25)](image)

**Figure 3: Nielsen's framework for usability (Nielsen 1993, 25)**

### 2.2 Usability evaluation

There are several methods for evaluating and measuring usability. These techniques can be roughly divided into empirical user testing and usability inspections. Empirical user testing is all the methods that involve tests with users. Usability inspection is done by usability expert. (Riihiaho, 2000, 1)

Empirical user testing is often considered to be the most reliable way to find problems related to usability and user experience. Empirical user testing, however, is more time consuming and requires more resources than inspection done by usability experts. Time tables of users, setting up the place to meet and gathering the gadgets needed for testing can be challenging. Usability experts, instead, can conduct the inspection at home or office with a list of questions at hand when evaluating the usability of application or a web site. (Riihiaho 2000, 8). Another
important issue to consider when planning a usability testing is the reliability and validity of the test.

According to Nielsen: “Reliability is the question of whether one would get the same result if the test were to be repeated, and validity is the question of whether the result actually reflects the usability issues one wants to test” (Nielsen, 1993, 165).

In this study, I am using three different methods to evaluate the usability of two virtual learning environments, Sanoma Pro and Microsoft Office 365. The first part of the usability evaluation consists of interviews with the admin users and teachers who use the application. This is to get the overall view of the usability of the application, from the viewpoint of an adult and a superuser. The second part of the evaluation is a compilation of heuristic evaluations made by usability professionals. The third part is a compilation of thinking aloud tests done with the students. By combining these three methods I will get a good understanding of the usability of the application from different viewpoints.

2.3 **Interviews**

Interviewing is the most common method used to generate data in qualitative research. It is a data collection method where the researcher is asking questions from an interviewee. An interview may be structured, semi-structured or unstructured. (Edwards & Holland 2013, 1-2)

According to Edwards & Holland 2013: structured interview provides less flexibility available to the researcher, because it is based on the same sequence of questions always asked in the same order. (ibid, 3)

In a semi-structural interview, on the contrary, the researcher only has a list of topics or an interview guide. This is how they get the information needed to cover their needs. Thus, in addition to the flexibility, a semi-structured interview allows more individual approach towards the interviewee. The interviewer can probe answers which might open discussions with the interviewee. These interviews allow interviewees to speak more freely about their personal point of view than structured interviews. Still these interviews will provide the material for comparison across interviewees. (ibid, 29)
In the third interview type, unstructured interview, the researcher often has a clearer aim for the research and a well-defined framework and topic of a study. In an unstructured interview, the researcher allows the interviewee to present her own point of view, to use references they are familiar with and language they are familiar with. (ibid)

In this study, I am using semi-structured interviews because the main goal of the research is to find out the positive and negative usability issues of the software our interviewees are familiar with. The semi-structured interview provides the necessary information but allows the interviewees to add their personal opinions to the matter.

2.4 Heuristic evaluation
According to Mack and Nielsen heuristic evaluation is a systematic study of a user interface, focusing on the usability design of the interface [Mack and Nielsen 1993; Nielsen and Mack 1994]. In a heuristic evaluation the goal is precisely to find the usability problems. The findings can then be used in a next iteration of the design process aiming to improve the usability. (Nielsen 1993, 155)

Heuristic evaluation can be conducted by one evaluator, but the experience from several projects has indicated that a single evaluator will find about 35 percent of the usability problems in an interface. Figure 4 shows the amount of usability problems found compared to how many evaluators are used. The figure shows that it is reasonable to use at least three evaluators and recommended to use at least five evaluators to get the best results. (Nielsen 1993, 156)
In this study I am using six usability professionals to do the heuristic evaluation. With six evaluators, we may assume that approximately 90% of the usability issues will be covered. Combined with the interviews and thinking aloud testing, I believe I will find a very good amount of usability issues to evaluate the usability of the Sanoma Pro and Office 365. Nielsen describes the heuristic evaluation with several evaluators, as follows: “Heuristic evaluation is accomplished alone by each evaluator. They will inspect the interface of the system and report the findings to the researcher. Evaluators are not allowed to communicate with each other before the evaluation is complete. To ensure independent and neutral evaluations this procedure is very important.” (Nielsen, 1993, 157)

Usually heuristic evaluation is done with a set of certain rules. In this research, we are using Jacob Nielsen’s ten usability heuristics. These heuristics are attached to annexes (annex 2). The “heuristics” are not usability guidelines, as such, but more like rules of thumb that can be used to design and to evaluate usability.

2.5 THINKING ALOUD METHOD
Another method often used in usability research is called thinking aloud. With this method the researcher can gain information about the user’s thoughts. The method can be used in various kind of research studying humans and their behaviour. Before being applied to
usability research, the method has been used, for a long time, to study the cognitive processes in a problem solving. (Riihiaho 2015, 43).

According to Ericsson and Simon 1980, verbal reports can be categorised by time of verbal reporting, level of thinking aloud and form of probing. Verbal reporting can be done concurrently where information is verbalized at the same time when concluding the tasks or retrospectively where information is verbalized afterwards. Retrospective reports tend to be less useful and less reliable because they rely on of the memory of participants. (K. Anders Ericsson and Herbert A. Simon 1980,218)

According to Jacob Nielsen, thinking aloud testing is inexpensive to organize because there is no need for special equipment. It is a robust way to get good findings even without good facilitator skills or proper methodologies. It is flexible to use in any development lifecycle and the results are convincing when coming from the customer’s mouth. In addition to these, the thinking aloud testing method is easy to learn. (Jacob Nielsen, 2012)

In this study, I will ask the students to verbalise the information at the same time as they complete the tasks, in order to minimise the memory load. The researcher and the recording device (iPad) will be close to the student but only the screen of the student’s computer will be recorded.
3. Virtual Learning Environment usability evaluation

3.1 Why is VLE usability evaluation needed?
In their paper: “Teaching and learning in digital environments: The resurgence of resource-based learning.” Janette R. Hill and Michael J. Hannafin are observing the challenges and possibilities of digital resources in education. The digital age has changed the nature and form of resources and information. These changes have transformed new social and economic enterprises. Several issues about how to use this information has to be addressed to maximize the benefits for educational use. (Hill and Hannafin 2001, 37)

Firstly, that new software has changed the skillset that students have to possess. Users have to be trained before using new applications. Another issue is, that the developers must analyse the usability of learning material so that the interface is easy and effective to use for the students. (ibid 2001, 38)

According to Storey at al, there have been several studies for analysing web-based learning tools from pedagogical and institutional perspectives. These studies will guide us on how to build better software to correspond the needs of educators and administrators. However, it will not provide any information about the usability of the software. Usability is a well-known concept in software development, but when developing software for educational use additional issues raise. These are for example, how to design the learning activity, what are the learner’s abilities, how to match the difficulty and how to pace the practises. (Storey, Phillips, Maczewski & Wang 2002, 1-2)

To conclude, it seems that more usability research is needed to better understand educational software. In this study, I am comparing two commercial learning tools Sanoma Pro and Microsoft Office 365.
In this thesis I want to discover:

- How the students rate the overall usability of the applications
- If the tools are usable from the teacher’s perspective
- How usability professionals see the usability of the applications

My hypothesis for this research is that there are many usability problems in VLE’s used in schools. These problems prevent students and teachers getting the full benefits of the VLE’s. By combining the expertise of many different stakeholders, these issues can be discovered and dealt with. This would also help the developers to build more usable VLE’s in the future.

3.2 **Contexts and contents of the VLE’s**

Virtual learning environments come in many shapes and forms. Before it is possible to study the VLE’s used in a school we need to understand the similarities and differences of these two learning environments.

Context are the settings, in which learners develop understanding. This means that in different VLE’s the information is organised and produced in different ways. Furthermore, contexts can be externally directed, or learner generated. In externally directed context an external facilitator sets up the venue (virtual or physical), organises the tasks and goals, and facilitates the learning activities. In learner-generated context, it is the individual who defines his/her goals and seeks resources that are needed and might be useful. It is possible to seek assistance and it is provided when the learner needs it. (Hill & Hannafin, 2001, 43)

According to the above definition about externally or learner generated environments, Sanoma Pro is an external directed environment where the learning material is produced by the designers of the application. Furthermore, Microsoft Office 365 can be seen both as an externally directed environment and as a learner-generated application since it allows both teachers to create materials for the students but also the students to make their own productions in forms of texts, presentations, drawings or audio/video material.
4. Usability evaluation of Sanoma Pro

Sanoma Pro is a learning environment owned by the Finnish Sanoma Media Corporation. After a long history in print and television media the Sanoma Corporation has extended its products to printed learning materials as well as digital learning environments. (Sanoma Corporation 2018)

According to the website of Sanoma Pro, the software is developed by a team of 170 professionals that include editors, software specialists, customer experts, project leaders, graphic designers, programmers and marketing and sales experts. Development is also carried out by experts, teachers and students. Usability is improved by constant user feedback. (Sanoma Corporation 2018)

In this evaluation I am using Sanoma Pro Kymppi which is a series of Math books as well as digital material for elementary school Grades 1-6. The content of the materials follows the Finnish National Core Curriculum (Perusopetuksen opetussuunnitelmakokous 2014). Q.F.I. School has bought licenses to use the digital material as well as the books for all elementary grade levels.

4.1 Interviews

For the first part of the usability evaluation I interviewed five Qatar-Finland international school teachers. The method of the interview was semi-structured questions about the usability of the Sanoma Pro website. These interviews provided me with the opinions of the admin users of the application.

Teacher A has used Sanoma Pro Kymppi for two years with grades 1-4. Teacher B has used it for three years with grades 3-6. Teacher C has used the application for three years in elementary school. Teachers D and E have used the application for one year in grade 3.
Teacher A feels that the usability of the software is excellent. "I can find everything I need easily and navigate easily." She also says that she hasn't found any errors and that the application is working if your internet is working. The application guides the user from one task to another.

The Sanoma Pro application helps the teacher to guide the student to be more independent and self-coordinated, says Teacher A. In her opinion, the visual look of Sanoma Pro is good. Pictures are working nicely with the content and the layout is clear and the navigation is easy to use. It is easy to move between the content and even between the content of different teachers. Overall usability and service reliability are the stand out features of Sanoma Pro.

Teacher B comments: "I love the fact it looks clear and simple. It represents well the Finnish approach to learning, which means less visual stimulus. Less is more. I like the repetition of the topics. I like that the material is very interactive and the same kinds of content are repeated in every topic, it makes planning easy."

There are some areas for improvement. The application should guide the student better. Teacher A says they have one license for a teacher and one for the whole class. There can be different levels of knowledge between the pupils and it is challenging to guide the pupils to their level of tasks. "Every pupil should have their own login information to get to their level
of tasks easily." According to Teacher C, the biggest problem is the navigation back and forth: "Sometimes it is hard to move back. I get mixed up with arrows that are moving pages or exercises. Signing in takes quite many phases which is boring and time consuming. Automatic sign out is too quick and useless."

Teacher A states: "It could help younger users and users with special needs if the user interface were editable or if there were themes. This would help the teacher to create more simple environments." Also, teachers C, D and E pointed out the possibility to create their own content or at least edit the existing contents according to the learners’ abilities. This seemed to be the most common issue (3 mentions) that the teachers were missing.

4.2 **Heuristic Evaluation**
The heuristic evaluation of Sanoma Pro was made with six usability professionals. These people are designers, usability experts, coders and team leaders. Four of them have over ten years of experience in planning, building and testing various ICT projects in the field of banking, government, insurance, health care and media.

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*Figure 6: Usability experts*

The evaluation was done by sending a word document with Nielsen's 10 heuristics (annex 2), instructions and login information to Sanoma Pro to the evaluators. In a week (21.5.-27.5.2017) I received completed documents from the participants. The results of the evaluations are combined together.
1. Visibility of System Status (Feedback)

The visibility of the system status was given positive feedback. All header links have clear and informative icons and a tooltip which helps the user to understand what the link does. The user needs a little patience to wait for 2 seconds for the tooltip to appear. Selecting a course icon on the header can be misleading for those who have used office products (application navigation) but tooltip helps user to understand the meaning of the link.

![Figure 7: Sanoma Pro Main page of the Qatar Finland international school](image)

The main navigation links have clear and simple titles: Support, Tools, Cooperation, Own files and Help. The links on sub navigation are named clearly.

The workspaces section on the left part of the content area lists active workspaces. The list has sorting tools for active workspaces, classes, subjects and a series of materials. The Show all -link is too big and always visible. This can distract the user while using the sorting feature.
The list items have pictures and headings of the book. When the user clicks a link menu the item opens and the user can choose a shortcut to the *Workspace, Teacher's presentation material* or *Test for the pupils*. This is very good for usability because the user can navigate straight to the material page without going first to the workspace page.

The *Join a workspace* quick link on the right side of the page looks like a search feature. The user has to know the key to join a workspace. An experienced user might enjoy this feature but a new user would not understand what it means. There should be an info text under the heading *Join a workspace* (työtilaan liittyminen) to help the user understand the meaning of this element.

*Figure 8: Sanoma Pro workspace section*

The calendar feature is not showing the upcoming calendar items correctly. There is not enough space for the name of the month and it ruins the calendar design.
The teacher's presentation material main page is a simple page with listed links arranged by category suitable for each class. The header of the page has the main navigation links: Previous, Next and Content. The Previous and Next links will move the user between the workspace links. This feature is very misleading because the user might expect the links to navigate between the tasks on the page (see workspace page).

The sub-navigation on the header of the page has the Front page, Index, Tools and Instruction links. The Frontpage link moves the user to the Teacher's presentation page. The Index link reveals a dropdown to navigate between the tasks. This is a very efficient way to navigate without returning back to the main page and it saves space, if there is a lot of tasks on the main page. The Tools link opens a popup for writing and simple drawing on the task page and the instructions link opens a popup for navigation help and browser support.

The Visual aids link at the centre of the header is confusing because it opens a popup activity to learn numbers by using pictures. The User has to click the X mark on the top right of the popup to return back to previous page.
The footer has next and previous buttons on the left and right side of the page. There is no visual indicator (aid) where those buttons will navigate.

On the task page the user can view one section at a time (zoom) by clicking the mouse button. To return to the full page view you need to click the 2\textsuperscript{nd} mouse button and then find and click a return button from the bottom right corner. This is a bit confusing as the return button is difficult to locate.

In the centre of the footer there are the links \textit{Let's learn, Let's practise, Brain teasers and Mental calculations}. These links are well-placed on the footer because they offer additional tasks but do not distract from the main material.
Figure 11: Task page

Figure 12: Task page (one section).
Figure 13: Visual aids popup.

The test page shows the user a quick flash animation on how to modify the test. This quickly teaches the user to use the tool effectively. The Easier version, Basic version and Advanced version headings on the top left of the test page are similar to the links on the right side of the page and there is an icon which is very commonly used as a sort icon. This may result in some of the users clicking these headings incorrectly.
2. **Match between System and the Real World (Metaphor)**

Overall, there is a strong connection between the system and the real world within the Sanoma Pro. The examples given are close to the world of a primary-school aged child, at least one who lives in Finland and understands the Finnish culture. Utilising the application in another country, especially a culture as different as Qatar, might cause a number of misunderstandings. For example, the use of Euros as the sole monetary unit, the measurement of distances using “Finnish” cities and the comparison of the weight of “Finnish” bird species. If the product had been designed to be used in a “Finnish” context these examples would not have been so problematic.

The evaluators found a couple of unconventional words. “Luokka-aste” (Class level) would be easier to understand as “Luokka” (Class). There was also “tulevat kalenterimerkinnät” inside the calendar which is typically called “Tulevat (kalenteri)tapahtumat”. The sorting dropdown has a value called “Tyhjennä valitut” (Clear selected) which should be “Tyhjennä valinta” (Clear selection).
3. **User Control and Freedom (Navigation)**

The main navigation opens a page in the same browser tab and the header is always on the top of the page. Navigation is made simple and clear. The user can navigate to the main page using the home link or to another page using the main navigation. The home link serves as an emergency exit.

The *Teaching material* pages open in a new browser tab. Some users who are not used to browser tabs (minority) may find this complicated when going back to the frontpage. The sub-navigation on the header of the page has a frontpage link which takes the user to the teacher's material page. The index links navigate between the tasks. The user can close the browser tab as an emergency exit.

The Sanoma Pro website has very good navigation and freedom of movement. Navigation is simple and the structure of the web page is easy to handle. The user cannot get lost inside the pages. The red colouring of the cancel button supports the user in both finding it and not accidentally clicking it. Creating a new workspace is accomplished using a flexible wizard, that guides the user in the task. Being able to return to the previous step is a plus. However, the evaluators could not find a way to delete or archive a workspace. This can cause serious problems in the long run, if the system is full of workspaces that are no longer in use or have never been used.

4. **Consistency and Standards (Consistency)**

Overall, the layout of the Sanoma Pro website remains consistent and follows standards and conventions. The placement of each function and feature on the main page stays the same as the user navigates from page to page, although the presentation material and the test pages have different user interfaces which can make the user feel he or she opened a new application. The design of these pages is very clean and informative except for the previous, next and content links which are difficult to comprehend. After more vigourous investigation I discovered that the previous and next links actually navigate through the material pages and that the content link is a dropdown where the user can select a different material page from
the workspace. The previous and next links on the footer bar move through the task pages. Understanding these links takes time to learn and is not an efficient use of the time and effort of the user.

The evaluators discovered a couple of inconsistent words and situations that need to be fixed. There is a contradiction of wording with the “Työtilaan liittyminen” (Join workspace) function. The hover text behind the question mark says "napauta Liity" (click Join), but the text in the button says "Lisää" (more/add). Since the function is called “Työtilaan liittyminen” (Join workspace), the button should say “Liity” (Join) as well.

The user should be able to edit the main framework at “Työtilan hallinta” (Manage workspace) page but there were only links to calendar and posts. This feature is blocked from the users or not finished yet. There is no standard icon for “Valitse työtila” (Choose workspace). The selected icon is usually used for selecting a layout. However, since there is a tooltip indicating the icon’s meaning, this is not a big usability issue. The navigation should always stay in the same place and be consistent. However, when selecting a link under the username dropdown, the navigation disappears. Users can find the link back to the workspaces under the username dropdown, but it is not a consistent solution.

On the 404 error page the navigation lacks 3 links. The user must know or find out that clicking on the logo will return the user to the workspace. If there is no technical reasoning for this, the navigation should stay the same on the error pages as well. “Edellinen” (Previous) and “Seuraava” (Next) links work differently depending on which page the user is on. The users end up not using those links. In general the links and texts were confusing. Most of the evaluators tried to click something which was only a text.

5. **Error Prevention (Prevention)**

The system gives an error when the user attempts to add an attachment to a calendar item and subsequently clicks save without adding the attachment. This error could easily be avoided if the Ok button remained disabled until the user had chosen an attachment.
Obligatory information fields on forms should always be marked, for example, in the Create new wizard dialogue. The user interface should have short informative texts explaining what should be done in this view. The info texts are usually hidden behind the question marks, which is unnecessary because they are very short, typically just one sentence long.

The system does accept special characters in text fields. These should be restricted at the front end and again in the backend of the system. This is because a single "<" can break a page if not handled correctly in the background.

When the user enters the support request form the system analyses the user’s settings (OS, Browser, required extensions etc) and prompts the user, if there is something that they can fix themselves. This is a very good functionality, but in the wrong place – an error has already occurred. This analysis should be done right after the login and the system should prompt the user to fix these issues.

These are some minor issues the evaluators found that could improve the usability of the system. Basic Error prevention works well on the Sanoma Pro website. The evaluators did not experience any critical errors while using the system.

6. Recognition rather than Recall (Memory)

The workspaces section and calendar section work together to ease the memory load of the users. Workspaces section offers short cuts to the learning material and is showing user’s most
used material at the top. Calendar and news can be seen on the righthand side of the page.

The design of Sanoma Pro is made simple and clear enough to help the user navigate through the material without needing to remember information from earlier content. Only on the presentation material page and the task page are the header and footer links hard to understand.

Instructions are available, but the links could take the user straight to the topic, not to the root of the instruction pages. This, however would require replacing the link away from the navigation to the content. The instructions behind the question marks are too short and quite unimportant.

7. **Flexibility and Efficiency of Use (Efficiency)**

The main page of the system is quite a simple so accelerators would not add much value. There is a possibility to copy a workspace which may speed up the work of an experienced user. The links to the *Presentation material* and *Tests* in the workspace list work as accelerators as well. The presentation material pages have links to extra tasks for example *Let’s learn, Let’s practise* etc.

The sub-navigation on the header of the presentation page has an index link which helps the user to change a subject easily. This is a very efficient way to navigate without returning back to the main page. It also saves space if there are a lot of tasks on the main page.

8. **Aesthetic and Minimalist Design (Design)**

The Sanoma Pro main page has very light, aesthetic and minimalist design. There is a lot of white space in the centre of the page where the workspaces section is located. White space helps guide the user’s eyes around the page more quickly with minimal confusion. The main page is not too text heavy which as well helps the user navigating thru the content. Minimalistic design should be considered for the pages that have lot of navigation elements.
Generally, destination pages, pages that users want to end up, can be filled up with text and media because users are looking for that content. Navigation pages like in Figure 7 should be highly visible, easy to use and contain not too much text to read so users can navigate to the destination pages effectively.

The presentation material page is a very simple page with a collection of links. As mentioned in section 4, the only usability issues on this page are the next and previous links on the header and footer which are hard to understand.

The Design on the task page is very light and clear. There are large and clear images and the navigation is very simple and easy to learn.

9. **Help users recognize, diagnose, and recover from errors (Recovery)**

Overall the Sanoma Pro system operates smoothly and there are not any errors the user cannot resolve without support. There is still a possibility to make it more usable, however. The application could tell the user what information is required to achieve the desired results. For example, when the user is trying to join a workspace without a key and he or she gets an error message saying it was unsuccessful. In this instance the system should also inform the user what went wrong and why.

![Figure 16: Error message when no key inserted.](image)
10. Help and Documentation (Help)

The Sanoma Pro website has an excellent help and support page. The help page is easy to find because it is on the main navigation bar. The main help page has instructions for teachers and students, in addition to technical instructions. There are short and long versions of help documents and even YouTube videos for the user. Sanoma Pro uses question mark tooltips to guide the user. The user can click on the question mark and get more information about the feature. This is good for usability, but in some cases the help or info texts could be visible all the time.

The instructions are easily accessible from the navigation bar, but it takes the user to the instructions' table of content. A more efficient way of providing support would be through context-based links that take the user straight to the exact topic. Also, there should be the possibility to search directly from the documentation, especially when the user has a specific problem. After all it seems that Sanoma Pro has put quite a lot of effort into the help section.

Conclusion
After completing the heuristic evaluation for the Sanoma Pro website, several usability strengths were found in reference to Nielsen’s ten usability heuristics. There were also some weaknesses or areas to consider for improvement. The strengths of the Sanoma Pro website are: navigation, prevention, efficiency, design and help.

Navigation on the Sanoma Pro main page is very clear and easy to use. The content works very well with different screen sizes (responsive design). I would recommend using at least a tablet computer because there is lot of information on the task pages, which may be too small for mobile screens to show clearly. Sanoma Pro should make the site more usable for mobile users.

Error prevention
Error prevention is extremely effective. The evaluators were not able to cause any critical errors during the heuristic evaluation. There was an error (Figure 16) when joining a workspace which needed a better error text. The evaluators discovered a couple of minor
usability issues. The obligatory fields should be better marked, the special characters should be taken care of more professionally and the web page should have more information texts to guide the user.

**Efficiency**
The clear design of the user interface and intelligent naming of the elements ease the memory load of the user. The navigation and short cuts are very efficient, and the user does not need to remember where he or she was about to navigate. It is enough to remember which grade you are working with.

**Design**
The design of the Sanoma Pro website is aesthetic and minimalistic. It has a lot of white space between the elements which makes the page clear and effective. White space also helps guide the user’s eyes down and across the page more quickly and easily with minimal confusion for the user. Also, another good design aspect of the Sanoma Pro website is that it is not too text heavy which, in my opinion, is important when being used by younger children. The colours are also light which has a calming effect on the user.

**Help**
The link to the help page is in the main navigation which makes it easy to find. The help documents are sorted by grades and roles, which makes it easy to navigate to the right help document. The help documents are also simple and easy to understand. Some of the most important features even have a video to guide the user.

The Error messages should be more informative and guide the user to not make the same mistake again in the future.

Sanoma Pro has a language selection under the user account settings. Changing the language could be more straightforward. For example, a clickable flag or a dropdown on the main navigation. In addition, when I changed the language to English I noticed that the navigation and most of the headings did not change to English.
4.3 **THINKING ALOUD TESTING OF SANOMA PRO**

The thinking aloud testing of Sanoma Pro was completed in two different sessions at Qatar-Finland International School. We had the first workshop on 2\textsuperscript{nd} of April with Teacher A, a 4\textsuperscript{th} grade teacher, where we discussed the tasks and the students we should invite to the test.

We decided to use the demo math tasks from the Sanoma Pro Kymppi because of license issues, and, more importantly, because maths is a universal language and there are less barriers with language or region. We decided to invite three 4\textsuperscript{th} grade students to the test. This is because of diminishing results of adding testers (Figure 4 on page 12) and the timetables of the teachers and the students. With three testers, we could cover approximately 70\% of the usability issues. We also chose students whose mother tongue is Finnish, because the Kymppi Students’ material is not available in English.

The thinking aloud test was held in a classroom between the lessons. There were two major reasons for it. The first reason was the timetables of the students and their school transportation. The second reason was that we wanted to use a familiar and safe environment for the children, so they could concentrate on the tasks without any distractions.

We chose four demo tasks which tested the Mathematical skills of the students. They had 5 minutes to complete each task. Teacher A was the facilitator of the workshop and I was the scribe with an iPad to record a video of each participant.

Tasks of the Sanoma Pro thinking aloud workshop:

Task one:

- Find category: Maths
- Choose: Kymppi 4 Digital additional tasks
- Choose task 36 1\textsuperscript{st} quarter of the coordinate system
- Open dartboard with one dart
- Read the instructions and start the game
- When the task is finished close the tab
- Go back to the first tab
Task two:
- Choose: Kymppi 4 Digital additional tasks
- Choose task 36, 1st quarter of the coordinate system (Koordinaatiston 1.neljännes)
- Open dartboard with two darts
- Read the instructions and start the game
- When the task is finished close the tab
- Go back to the first tab

Task three:
- Choose: Kymppi 4 Digital additional tasks
- Choose task 39, Test and act (testataan ja toimitaan)
- Open dartboard with one dart and 2 coins – The game of coins
- Read the instructions and start the game
- When the task is finished close the tab
- Go back to the first tab

Task four:
- Choose: Kymppi 4 Digital additional tasks
- Choose task 39, Test and act (testataan ja toimitaan)
- Open Balls in the row game (Picture with Dice and the tokens)
- Read the instructions and start the game
- Close the tab

The students seemed to be very familiar with its operations. They listened actively and started to work immediately after the teacher's instructions. Their concentration and focus remained high during the workshop.

After the workshop I discussed with teacher A about the findings. The tasks we selected were at the right level and took the right amount of time. The students were fully engaged in the process and they found it quite natural to talk at the same time when doing the tasks. All of the participants had experience of talking with friends live or online when playing a computer or game console.
**Conclusion**

The biggest issue was the language barrier. I thought that it would be wise to use the students’ strongest language with thinking aloud testing to make the speaking while doing the tasks easier. It turned out that a native Finn who had used English 6 to 8 months daily in school couldn't remember the terms in Finnish like Origo or Koordinaatisto. We mitigated this issue by having a Finnish and English-speaking teacher with us to explain if difficulties like this occurred.

We found a couple of usability issues which need to be resolved. The designers of the tasks should be very careful with how they use the elements of the interface. For example, *The Game of Coins* uses button like images for a text and text like images for the drag and drop elements. This is very misleading, but the students learnt quickly through trial and error.

![Figure 17: The Game of Coins](image)

There were also some difficulties with the instructions of the games, for example the *Balls in a row* game instructed users to use one dice to move horizontally and another dice to move vertically. We found that the student became confused on which die to use to move horizontally and which one to move vertical.
Two of the three students used the instructions button while playing to see which dice should move X and which Y. After they noticed that the instructions did not help, they used their own logic: When moving, if the position was taken, they changed the place of the dice in their mind to get an available position. This was very refreshing to notice. In contrast, when an adult user rolls the dice they would, most likely, use the first dice for the x axis and the second dice for the y axis.

The designer of the dice game should have spent more time and effort on the instructions. There should be no doubt how to play the game. In this case, the dice should be clearly marked with numbers or the letters X and Y.
Figure 19: Balls in a row game: The game

The interface and navigation are simple and easy enough for the students to move around the application. The games are not fully responsive on a smaller screen size (an Ipad for example), the user have to scroll through the game area to view the whole content. This could be fixed using a CSS style that adjusts the size of the graphics when the screen size changes. One identified minor design issue concerned the back button located at the bottom left corner (on the footer). The Footer is not the standard position for the back button so the users may not find it when needed. This could easily be fixed by moving the back button to the top left corner of the task area or adding a close link to the right corner of the task area header.

The students enjoyed the games once they fully understood how to play them. These puzzle like games are very good for learning maths. Most of the games were easy to learn after a couple tries. Although as mentioned earlier the usability and logic of some of the games needs to be better. The user should be able to successfully play the games after a quick look around.
5. Usability Evaluation Microsoft Office 365

Microsoft Office 365 is an online tool that combines Microsoft Office applications and cloud storage for one subscription. According to the Q.F.I School vice-principal, it is widely used in schools and educational institutions in addition to commercial and other public use. Schools often get the licenses for educational use together with their corporate contracts and Microsoft is constantly developing its software to meet better the needs of the field of education.

Office 365 is developed and maintained by Microsoft Office applications Engineering team. This team consist of hundreds of professionals that include editors, software specialists, customer experts, project leaders, graphic designers, programmers, marketing and sales experts. (Windows Central 2017)

The team is actively developing the usability of Office 365 and the software attached to it. For example, they published an Accessibility checker in year 2016. This is how they explained what accessibility check does: “The Accessibility Checker tool finds accessibility issues in your Word documents, Excel spreadsheets, and PowerPoint presentations. The tool generates a report of issues that could make your content difficult for people with disabilities to understand. Accessibility Checker also explains why you should fix these issues and how to fix them.” (Microsoft Office 2016)

5.1 Interviews
For the first part of the usability evaluation of Microsoft Office 365 I conducted interviews with four teachers and the vice principal of the Qatar- Finland International School. The interviews were carried out between January – May 2017. The method of the interview was semi-structured questions about the usability of the Microsoft Office website. These interviews provided me with the point of view of the admin users of the application.

The admin users had used Office 365 for approximately 2 to 4 years with students from 1st grade to college. 100% of the interviewed admin users feel like it is easy to create new content
in Office 365. They also think that saving the content and reusing it later is easy. This is a very important feature because Office 365 does not come with ready-made content for students.

### Informants in Q. F. I. School

<table>
<thead>
<tr>
<th>Microsoft Office 365</th>
<th>Teacher F</th>
<th>Teacher B</th>
<th>Teacher C</th>
<th>Teacher D</th>
<th>Teacher E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>53</td>
<td>39</td>
<td>32</td>
<td>52</td>
<td>32</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td>Female</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td><strong>Years of teaching</strong></td>
<td>28</td>
<td>7</td>
<td>8</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td><strong>Current position</strong></td>
<td>Vice-principal</td>
<td>Class teacher</td>
<td>Class teacher</td>
<td>Class teacher</td>
<td>Class teacher</td>
</tr>
</tbody>
</table>

*Figure 20: Admin users of the Office 365 in QFIS.*

Teacher F has used Office 365 for five years in teaching. Teacher B has used Office 365 for 3 years, teachers C and D for one year, and teacher E for more than three years. All of them had years of experience using Microsoft Office tools in work life and at home.

All the interviewed admin users e.g. teachers also think that Office 365 works fluently with different platforms and devices (PC, Mac, Ipad, Android). Only 1 of 5 admin users had problems using it with a smart board.

I approached the teachers by email and booked times for the interviews. The interviews were carried out between October 2016 and May 2017. When asked what they would like to add to or change in the Office 365 I received the following answers.

Teacher F wanted to have return links and the possibility to backup content. Also, teacher F wanted the possibility to move files inside the software more smoothly. Furthermore, teacher F thought, that the navigation between organisations, accounts and separate applications should be easier.
Teachers F and E would like to add a section for tests. This section would have timed forms for students to test their knowledge. These tasks could be done even after school because of the timed forms.

Teachers B and E would like to have less buttons and more possibilities for younger users. The interface should also be less cluttered and easier to comprehend by lower grade students.

Every interviewed admin user felt that the basic usability and the navigation of the application is excellent inside the school organisation. Teacher E stated: “Inside the organisation you can easily find the content needed and it feels easy to navigate between content. Users can share and edit the same document. This is very good for group tasks.”

Most of the admin users feel that navigation between organisations is problematic and should be easier. According to the teacher B: “It is possible to share a link to your content, but it is too difficult for the average user, especially for a young child.”

Teacher F complained about the Office 365 requirement to sign in to separate applications constantly. This makes school work more difficult and causes unnecessary delays in lesson work. Teacher F compared Office 365 to another similar education tool, Google Apps for Education or nowadays G-Suite, and found G-suite much more suitable for school use especially in this context.

Furthermore, according to teacher E, it seems that the basic features of Office 365 are easy to use but more advanced features seem to be a little too difficult to use for the average user (in this case a student or a beginner staff member). For example, sharing the Outlook Web calendar to other members of the group is very complicated.

All admin users felt that Office 365 is more of an application meant for a business world than a digital learning environment used in a school.

5.2 **HEURISTIC EVALUATION**

The heuristic evaluation of Office 365 was completed with the same group of usability professionals who evaluated Sanoma Pro (See Figure 6: Usability experts). The evaluation was
done same way as with the SanomaPro: sending a word document with Nielsen’s 10 heuristics (annex 2), instructions and Office 365 login information to the evaluators. In week 22 (28.5.-1.6.2017) I received completed documents from the participants.

1. **Visibility of System Status (Feedback)**

The system clearly indicates that the user has logged in and which credentials he or she is using. The alarm clock icon with a notification shows if the user has something to pay attention to. The header has a Menu link, an Office 365 Home link, a School home link (which navigates to office 365 home as well), an Announcements link, a Settings link, a Help link and a User settings link. The links have very clear icons but only Email and School link has a tooltip. Tooltip would give the user more information where the link is navigating and would make navigation more effective.

The main navigation has very clear icons with a text underneath. The search field has a magnifying glass icon and a text: *Search from online documents*. When the user navigates to the mailbox or uses the search feature the system shows a loading progress icon with an informative text. These small hints help the user to understand the reason for the feature and that there is an action in progress.

The evaluators found a couple of things to improve usability. First the system is lacking information on which programs the user has rights to. Many of these programs require separate licenses, but access denial is not indicated anywhere. This is only a minor issue but disabling or removing the buttons would be a more practical way to handle this.

Many users do not know or understand the colour codes of the Microsoft applications. The mouse over effect of these different colours can be confusing. Another minor correction for a search feature could be changing the text to: *Find an online document*. 
The language in Office 365 is clearly far from one of a primary school student’s. Students can get easily lost with the number of options, applications and buttons from just the start menu. Visually Office 365 is not appealing to a child, with again too many options available. Concepts such as download, add-ons, hyperlink etc. are clearly designed to serve adults and professional users and can be overwhelming and difficult to understand for a child. Also, there should be more information about the links to the applications because most of the users are not familiar with all of them.
3. **User Control and Freedom (Navigation)**

There is a dropdown menu in the left corner of the header section where the user can choose where to navigate. The header is on every application of Office 365. This makes it very easy to navigate. The navigation opens the application in a new browser tab and the main page stays in its own tab. The user can close the application tab when it is not needed, and the main page works as an emergency exit. Some of the users like this feature but some would like to use the browse back button which does not work within the applications.

Office 365 has excellent navigation and freedom of a movement. Navigation is simple, and the structure of the application is kept easy to handle. The evaluators noticed a good feature in settings where the user has to save the settings by pressing the save button or revert to earlier by pressing cancel. After the button is pressed the application navigates to the setting’s main page. If the application saved the new settings automatically the user would have to press back or the close button to return to the setting’s main page.

The user is not allowed to remove programs from the list. This can only be done by the system administrator. The user should be able to modify the programs list to make the main page more effective.

4. **Consistency and Standards (Consistency)**

The office 365 website has a clean layout and clear navigation. It consistently follows common web standards and conventions. The layout does not change much when navigating from one application to another.

A couple of evaluators discovered that if another user shared a file with you, it didn’t show under files but under the *Shared with me* folder. This can be hard to understand for a new user. A better solution might be to have the shared files under the same folder as other files but with a different icon.

There is a naming issue where the *Groups* and *People* text seem to mean the same thing in different applications. Also, some of the evaluators felt that the *Contacts* text in previous MS
Office versions would have been better than the People text used in Office 365.

Some of the icons are in Finnish (Tehtävät, Kalenteri) and some in English (Forms, Planner). It makes it harder to find the correct functionality. Also, there are a couple of links on the header that have dropdown menus under them but there is no icon to indicate it. The user should notice and understand the dropdowns on the page without clicking them with mouse.

5. Error Prevention (Prevention)

Error prevention works very well on the Office 365 webpage. The evaluators were not able to cause any errors while testing the software. Information about the links, proper translation of the application names and dropdown icons would significantly decrease the number of potential mistakes the user could make when navigating around the page. All evaluators thought that the page was easy enough to use after a quick view of the elements.

6. Recognition rather than Recall (Memory)

Office 365 has a header dropdown menu and main navigation which both have clear icons and text under them. The user can see easily where to navigate. The main page shows the last edited documents and used folders in the middle of the page. The help feature is easy to find when needed. The community link at the help section navigates the user to the Microsoft community. This is good place to get extra information about the application.

Office 365 only has a search function for the help feature but the user cannot browse the help topics. This is very complicated if the user is unsure about the search words needed. Also, the options are visible, though there are just a few of them. There should be Hover explanations on program icons, since some of these are new to MS Office and their names are not intuitive (Delve, Yammer, Flow etc).
7. **Flexibility and Efficiency of Use (Efficiency)**

The Office 365 header has a dropdown menu which is always at hand. The user can change the application very easily and there is no need to return to the main page. Navigation is one of the strongest points of Office 365. One improvement the evaluators would like to see in Office 365 is the ability to modify the list of applications on the main page. Most of the users need only 5-10 applications for daily use. There is no need to show all 20+ application links on the main page. It would be useful, if the admin user could do basic customisations for all the students.

The main page has a list of recently used documents and recently used folders. These links are good accelerators to speed up your daily routines. I think there should be a possibility to modify what documents are shown on the list.

The office applications work smoothly together. User can create and edit documents and save them to a local machine or to the OneDrive. These documents are easy to share with other users.

8. **Aesthetic and Minimalist Design (Design)**

The office 365 main page has a very clean and minimalistic design. It has a lot of space between the elements which helps the user to concentrate on the content. The page does not have too much text, so the interface feels light and friendly. The use of colours and lines of the main page are clear and calming.

The office 365 applications have almost identical designs. Consisting of an Office 365 header, with navigation on the left and content in the middle. This kind of a design has been used for years and is recognisable for most users. Simple design is important for users to easily find and edit their documents.
9. **Help users recognize, diagnose, and recover from errors**  
*(Recovery)*

It is not easy to find errors with modern applications as everything is tested to such a high standard. One interesting point is the search feature of Office 365. If the user does not enter any search word and presses enter or the search button the search function does not do anything and there is not any error message showing. The search function works better in Sanoma Pro where the application gives a common error message if the search did not find any results. The error messages in Sanoma Pro had a clear message to help the user complete the task (e.g. File search).

10. **Help and Documentation (Help)**

The office 365 help page can be difficult to see due to the combination light colours. One major problem of the help feature is that the user has to know what to search for. The search function is automated so that when the user starts writing a word into the field the application shows the help documents related to that word. There should be an info text on how to use the help feature and a help index where the user can find the most important topics without doing a search. The community link takes the user to the Microsoft Community pages. The user will find a lot of questions and answers from that web page, but frequently asked questions should be on top of that list.

**Conclusion**

After completing the Heuristic Evaluation of the Office 365 website, I found a couple of usability strengths and areas to consider for improvement in reference to Jacob Nielsen’s ten usability heuristics. The strengths of the Office 365 website are: navigation, prevention and efficiency.

**Navigation**

Office 365 has excellent navigation and freedom of a movement. Navigation is simple, and the structure of the application is kept simple and easy to handle. The main page works very well with different screen sizes (responsive design). The email application even works with a
mobile phone, but most of the applications like PowerPoint need at least a tablet computer because of the amount of information on the screen.

*Error prevention*

Error prevention works exceptionally well. The evaluators could not cause any errors while navigating and doing basic tasks on the Office 365 website.

*Efficiency*

Efficiency is a strength and a weakness of the Office 365 application. The main page works nicely as a palette of applications, but the user has to remember which application to use. For example, Sway, Flow or Dynamic 365 are not intuitive to a new or young user. The user should be able to customise which application links are shown on the main navigation. The recently used documents are good accelerators for daily routines. Other areas of improvement are support for online forms and user guidance.

5.3 Thinking aloud method for Office 365

Thinking aloud testing of Office 365 was completed in two different sessions in Qatar- Finland International School. After the very good results with 4th grade students evaluating the Sanoma Pro, I decided to use the same method to evaluate Office 365. We had the first workshop on 16th of April with Teacher A, a 4th grade teacher, where we discussed about the tasks and the students we should invite to the test.

I decided to invite three 4th grade students to the test because of diminishing results of adding testers and the timetables of the teachers and the students. As mentioned before, with three testers we could cover approximately 70 percent of the usability issues (Jacob Nielsen and Thomas Landauer, 1993).

In this case, the thinking aloud test was conducted in an empty classroom during lesson time. The task took longer than the Sanoma Pro tasks as the students had to write texts and add pictures found on the net. It was not possible to arrange the workshop after school because of the school transportation of the students and the timetables of the researchers.

We chose one demo task where the student makes a travel brochure of the country he or she
has been visiting or would like to visit. This kind of task provides freedom to think and play while collecting the data for usability. The students had 45 minutes to complete this task. Teacher A was the facilitator of the workshop and I was the scribe with an iPad to record a video of each participant.

Task for the Office 365 Thinking aloud workshop:

- Login to Office 365
- Open PowerPoint
- Make a travel brochure (minimum 4 pages) of the country you have visited, or you want to travel to.
- Attach pictures and videos to the brochure you find from the internet
- Write information on the country, capital, people, livelihood and sights on the brochure.
- Share the brochure with your teacher.

**Conclusion**

Office 365 is a different kind of a tool compared to Sanoma Pro. In Office 365 the main idea is that the users produce the materials themselves instead of learning from ready-made contents. That was the reason we had to change the practises we used to test the students and make our own task for the test.

The students were able to easily login to Office 365. After logging in the user is taken to the home page of Office 365. The home page is clear and easy to use. The main page is too cluttered with application buttons in the middle of the screen. Every student had to search for a while to find PowerPoint. There should be a possibility to edit which buttons are visible when logging in. This would make Office 365 much more usable for younger users.

After the students located and opened PowerPoint they easily created a new presentation. They could easily add the text they had searched from the internet. Adding online images would have been quite an easy task as well but we encountered problems with the Bing search engine which did not let us use the searched images. We decided to search for pictures with
Google. Most of the students needed help with saving the images and locating them from the hard disk.

One advanced student started to add styles to the presentation which made it look great. Sharing the document is part of the grade 4 curriculum in Q.F.I.School, but all the students needed help with saving and sharing the project.

I learned that the task description should be as clear and concise as possible to help students to get started faster. Also, the task was too broad for Grade 4 students to complete during one lesson, more time was needed to finish the assignment. In some cases we decided to let the student quit earlier.

In conclusion, I believe that Office 365 is too complicated application for primary school students to use. This is because Office 365 has so many applications to handle for younger students. It would help if admin user could customise the application links. The teacher should be able to remove all the application buttons and add them one by one when the student is able/allowed to use the application. Office 365 does not have any content for learning, so teachers have to make the content themselves. This could result in the content being very different for each grade, especially if the teachers do not cooperate on the content creation.
6. Conclusion

After concluding the evaluation of these VLE’s, it is relevant to go back to my hypothesis. In the beginning, I predicted that the virtual learning environments that are widely used in schools have many usability problems and that these problems prevent effective use of the applications.

In general, it can be concluded that the VLEs I was evaluating had considerably fewer usability challenges than expected. One reason could be that both VLEs (Sanoma Pro and Office 365) have obviously been widely tested in the development cycle.

Nevertheless, there is still some room for improvement. Office 365 has been clearly designed for adult users and the interface is too complicated for primary school students (or even teachers) to use the applications to their full potential. Within the interviews, it was found that many of the programs were not used because of too complicated usability.

The admin users and teachers expected fully customisable contents so that they could cater for all kinds of learners. The students enjoyed the materials that were simple to use and easy to find. The professional evaluators pointed out the importance of consistency and flawless logic in navigation, in order to create as enjoyable a user experience as possible.

The Sanoma Pro materials are clearly more suitable for primary school use because the content has been made by professionals of education and the material and the usability of the content has been tested by developers and users. As a result of the thinking aloud test there is a need for wider usability evaluation by the developers.

In my opinion, the usability flaws have been a direct result of the usability not being evaluated widely enough by different user groups and/or professionals. Clearly one group that has been forgotten in many cases are the actual end users, in this case the students.
Naturally, it is important to test the material with teachers as well, since they are the ones who make the decisions about choosing and purchasing the actual product. Usability professionals can give input about technical issues that are easily overlooked by pedagogical staff. We should combine the results of evaluations made by teachers, students and usability professionals to get the most out of the usability.
In addition to comparing the usability of the Sanoma Pro and Office 365 this study also identified critical areas to improve with the educational materials. It also resulted in finding recommendations for improving the usability evaluation of the Virtual Learning Environments.

In his article to Educational Technology and Society, Nokelainen (2006, 178) presents a model of PMLQ (Pedagogically Meaningful Learning Questionnaire) to cover the usability criteria for digital learning materials. He points out the importance of researching the technical usability as well as pedagogical usability of VLEs (ibid). In building up the questionnaire, both opinions of teachers and students were taken into consideration as well as evaluation of technical usability. (ibid, 186)

This study strengthens the same premise. Technical experts, teachers and students all provide valuable information in studying the usability of virtual learning environments.

This information is helpful for designers of the VLEs and companies who would like to improve their evaluation of their products for the educational market. This model is one suggestion for this procedure.

As a recommendation for evaluation of the VLE’s I have used the methods that were used in this study:

1. Interview (admin and teachers, super users)
2. Heuristic evaluation (usability professionals)
3. Thinking aloud testing (learners, end users)
By using this model VLE producers can get information from many different points of view that are valuable in designing the usability of the software. The usability should not be undermined when designing a VLE and all different stakeholders should be taken into consideration. The product will not be used at all, or to its full potential, if the experience about using the product is that it is too hard, too complicated, too messy or it does not look nice. Usually the first encounter with the product is the most important one. Usability experience is a key issue also when purchasing decision is made.

Nokelainen (2006, 189) points out also, that it is crucial how the system and material it contains help the student and the teacher achieve their goals. From the viewpoint of usability, the most important thing is how easy and effective the software is to use. Student should be able to use the software without any external help. (ibid)

This statement is something that needs to be considered every time when choosing and using virtual learning environments and materials for any pedagogical use. Is this the best possible tool to achieve desired goals in this context and in this case? For this important decision,
usability evaluation is a crucial element, in order to make a right choice.

For example, it is important to understand that also very young children are using these applications nowadays too. It is not only the adults or high school students who use the VLEs and digital materials for studying. Furthermore, teachers need to cater for an increasing variety of students and their different learning styles in the classroom. Expectations and curricula change often. Need for differentiation is huge. Keeping this in mind, teachers or admin users should be able to modify the user interface for different age groups and for variety of learning needs.

Taking these ideas into consideration, in the future, there could be even more effective, simple to use, easy to modify, appealing to the eye and flawlessly usable VLEs in the market.
8. Annexes

1. Interview questions

1. What is the name / brand of your digital learning environment?

2. How long have you been using your learning environment?

3. How would you describe the usability of the application? (bad, ok, good, excellent)

4. Does the application have different age groups for the users?

5. Does the user interface change when changing grade / age group?

6. Can you create your own interface for students with special needs?

7. Can you change / create themes (colours, button models, placing of the objects)?

8. Is it possible to easily produce new content?

9. Is it possible to save the old content and reuse it later?

10. How does the application work with different platforms? (windows, mac, linux)

11. How does the application work with different devices? (pc, mac, ipad, android)

12. How well does the application interact with other programs? (excel, word, paint etc)
13. How well does the application interact with other devices? (printer, scanner, drawing board, wallboard etc)

14. What kind of features would you like to add to your app? (undo, redo, shortcuts, return links etc.)

15. How satisfied are you of the application, overall?

16. What kind of a license system application has (single user, class, whole school)?

17. Have you noticed any usability issues?

18. Have you noticed any usability issues between different the age / sex / religion of users of the application?

19. Do you think there is a need for better usability on current Digital Learning Environments?

20. Feel free to add your own comments about usability and the outlook of the application you are using.
2. Jacob Nielsen’s ten usability heuristics:

1. Visibility of system status: The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

2. Match between system and the real world: The system should speak the users' language, with words, phrases, and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

3. User control and freedom: Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

4. Consistency and standards: Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

5. Error prevention: Even better than good error messages is a careful design which prevents a problem from occurring in the first place.

6. Recognition rather than recall: Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

7. Flexibility and efficiency of use: Accelerators-unseen by the novice user may often speed up the interaction for the expert user to such an extent that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

8. Aesthetic and minimalist design: Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

9. Help users recognize, diagnose, and recover from errors: Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

10. Help and documentation: Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such
information should be easy to search, focused on the user’s task, list concrete steps to be carried out, and not be too large (Jacob Nielsen 1995a)
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