Usability and learning potential of virtual learning environments which applies spaced repetition

A case study on sharplet.com

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ABSTRACT
The increasing amount of learning tools developed in the virtual room enables more flexible learning; it can be personalized and reduce distance barriers. But researchers search to find design guidelines and user needs that relates to these learning tools. This thesis follows that path and researches the usability and learning potential of virtual learning environments (VLEs) which applies spaced repetition. A case study was performed in order to implement the extensive theoretical research regarding usability, e-learning and learning. The results generated improvement recommendations to the company of the case studied VLE. This thesis contributes to the research field by using usability aspects and learning perspectives as tools to analyze VLEs in general, as well as on a specific VLE.

1. INTRODUCTION
Plato raised a problem that many after him have tried to answer: How is it that a learner is able to understand something new? (1) A long line of educational scientists like John B. Watson, John Dewey, Jean Piaget and Lev Vygotsky have tackled this question and extended it in many ways. There is no standardized definition of learning, although attempts are being made from several sources. We can only make assumptions about a person’s learning. The process happens internally in the learner and can be difficult, if not impossible, to see from an outside perspective (2). The digital revolution has sharply changed the conditions of teaching. A whole new room of education has appeared, namely “the virtual room” (3). An umbrella term for different learning related activities in a computer-based manner is e-learning, a rapidly expanding key component in education and distance learning (4). Virtual learning environments (VLEs) may be viewed as an example of an e-learning activity and also VLEs that uses spaced repetition. In this thesis different perspectives on learning, e-learning the blend of e-learning and traditional teaching will be considered.

Sharplet.com is an online learning environment (5). There, users are able to start an account and attend courses. The courses can be in various fields such as language, medicine, science and standardized tests. In the course the user does study sessions based on a flash card system, see figure 1. The system asks a question, the user thinks and when ready reveals the answer by clicking on a button. The user grades how well he/she knew the answer with options “known”, “familiar” or “unknown”. The system is dynamic, so depending on what is selected the question will appear sooner or later in upcoming sessions. The motivation to use the system is to remember more in less time. The courses are delivered by means of a method called spaced repetition, which will be described further in the literature review.

Figure 1: Study session during course on sharplet.com (5)
The target group of users for Sharplet is mainly students. It can be used as a tool along side of their studies. Aside from that there are other users that can benefit from this tool, perhaps to develop new skills on their free time. Another probable user group is teachers, who can use a course in their education and also view statistics on which part the students seem to struggle with. The development has so far been lacking user feedback and how well it actually is received and perceived by the users is somewhat unknown.

In this thesis sharplet.com will be analyzed as a case study of VLEs that apply spaced repetition.
1.1 Aim and problem statement
The aim for this thesis is to assess the usability and analyze the learning potential of using virtual learning environments (VLEs) that applies spaced repetition. To analyze the learning potential of these VLEs is to discuss if/how the interface has the potential to support the user’s learning. A case study on sharplet.com will be performed, which is in this thesis considered to be a spaced repetition VLE. This process aims to result in improvement recommendations to the company. The thesis takes on a user-centered design (UCD) perspective. The discussion of the research question will be based on theoretical aspects and qualitative and quantitative data.

The question that outlines the thesis is the following:

- Does using virtual learning environments (VLEs) which applies spaced repetition support learning from a usability perspective?

Sub-questions:
- In which context of use can VLEs be beneficial/not beneficial for learning?

Specific to the case of sharplet.com:
- What does students and teachers think of the system? Are they happy with what the system supplies in terms of effectiveness, efficiency, satisfaction and potential for learning?

1.2 Delimitations
The thesis is limited to the user-groups students and teachers. Since Sharplet’s courses not all correspond with the Swedish school-system the ones that are likely to be used in a Swedish school are selected. Courses in introduction to java are appropriate.

Sharplet will be available on several platforms such as tablet and phone, but this research is limited to the web-application.

There is a “create” feature and also a “classroom” feature on the website. In the gathering of data the study mode feature will be in focus partly because the assignment to the participant will not be big and partly because some of the other features are under development. Theoretically all features will be considered.

2. LITERATURE REVIEW
This review initially takes on an interaction design perspective where usability and cognitive psychology is considered. Thereafter several perspectives on learning are presented followed by a review focused on e-learning and VLE’s.

2.1 Usability and cognitive psychology
There is a verity of terms related to interaction design and evaluation that can give some confusion or misunderstanding. There are also several definitions of these terms, therefore, it is of importance to define the terms and specify which is relevant in this thesis. Rogers, Sharp and Preece (6) state that user experience is central to interaction design and that it is about how people feel about a product and their pleasure and satisfaction when using it. It involves both overall impression and reaction to smaller details. But since the experience starts from first impression, perhaps in a store, an important part of designing for user experience becomes marketing and branding which involves an excessive focus on the surface. Gulliksen and Göransson (7) emphasize on this point, which result in that the central focus is selling rather than developing effective tools. Usability on the other hand according to ISO 9241-11 is defined 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)

This definition has several benefits. It is concrete and enables discussions with consensus of its ingredients. It also has measureable characteristics (7). The parameter effectiveness refers to how good a product is at doing what it is supposed to do and the parameter efficiency refers to the way a product supports users in carrying out their tasks (6). The previous can be interpreted as if the product is capable of allowing people to carry out their goal and the latter as if there are any supporting features helping the user to carry out their goal. It is notable that one of the parameters in the usability definition is satisfaction, so how people feel about the product is incorporated in the definition. There are several definitions and descriptions of usability were some involve parameters such as memorability and learnability. But this research will be restricted to the ISO definition since it captures the core elements of a product’s usability, the most fundamental aspects. If other parameters where to be used the research would have to be extended with several data gathering techniques that measures these parameters, which would be too big research for the scope of this thesis.

Usability of a product cannot be examined disengaged from the context of use; the product itself does not have its own usability, only a capacity to be used by specified users for specified tasks in a specified environment (7). One big part of the context of use is the user’s cognitive abilities. Cognition can be described in terms of several processes. Some of these processes are attention, perception, memory and learning (6). These processes can be translated into design choices that can help users understand the system in the way developers intend.

Attention is focusing on relevant information from a range of possibilities, visual, auditory and/or haptic. The level of difficulty regarding attention depends on whether we have clear goals and if the information needed is salient in the environment (6).
Perception is acquiring information from the environment via the sense organs and transforming them into experiences. It is a complex process, which involves other processes like memory and attention. Presentation of information can affect the perception, grouping items together with spaces between aids attention and helps the user to perceive and locate items (6).

Memory can be defined as learning that has persisted over time, information that has been stored and can be retrieved. A classic model of information processing compares the human memory with a computer. According to that analogy, remembering an event consists of encoding, storing and retrieving. Encoding is to get information into the brain, storing is to retain that information and retrieving is to later regain the information (8). A well-known phenomenon is that people are much better at recognizing things than recalling things. GUIs often provide visually based options that allow the user to recognize rather than remember (6).

Learning from the perspective of an interaction designer can be viewed in two ways, in terms of how to use a computer-based application or using a computer-based application to understand a given topic (6). Carroll (9) found that when learning to use a computer system people experience difficulty when following instruction manuals, they prefer learning by doing. The users want to figure things out themselves and not just read about them, they want to navigate on their own in a training sequence. He portrays an active learner that likes to test hypotheses and prior knowledge, while working in a meaningful context towards meaningful goals. For learners, web-based learning makes it possible to present and interact with information in more creative ways than traditional channels like books for example. In an interactive environment a student can explore abstract concepts that can be hard to understand, a process can be represented in several ways (6).

2.1 Learning and memory: Spaced repetition

The psychologist Hermann Ebbinghaus studied the human memory by experimenting with the memorization of non-sense syllables. He found that as time passed, the memory of the syllable faded accordingly, referred to as the forgetting curve (10, 11). The spacing effect states that repetitions of a learning content, after a given amount of time, flats out the forgetting curve and thus improve retention of the content. Repeating learning content improve long time memorization (11, 12). The approach spaced repetition embraces this concept. A core aspect of spaced repetition is to find the ideal interval time between the repetitions, which in practice is done in various ways. The length of the intervals between repetitions should be as long as possible but short enough to ensure the content is remembered. They increase the closer the learner comes to the learning goal. A common area in use of this approach is vocabulary training often with flashcards as a method (12).

2.2 Perspectives on learning

2.2.1 Behaviorism

Behaviorism grew out of experimental psychology that became a science in the 1800th. After the publication of Darwin’s theory of evolution, great similarities between humans and animals were seen. Behaviorism developed from psychology researchers’ interest in animals’ way of solving problem and learning. Direct links to human behavior were drawn (1). Early behaviorist John B. Watson (13) describes behaviorism as prediction and control of behavior. He saw problems with the psychologists focus on the consciousness because of the subjective interpretations. It is an advantage that animals could not describe what they were thinking and their experiences like humans can, because there is no way of validating the introspective response people gave (1). “To the behaviorists learning was a process of expanding the behavioral repertoire, not a matter of expanding the ideas in the learner’s mind” (1).

In this perspective to trigger learning is to change behavior, and how to do that is by conditioning, that is stimuli that creates a response (1). E. L. Thorndike formulated the “law of effect” which stated that any response to any stimuli can be conditioned (changed) by immediately reward or reinforce it (14). The results were extended by B.F. Skinner, who states that the reward does not have to follow every time a wanted response occurs. Skinner also introduced a teaching machine, which regulated reward according to the users input(1). This exemplifies, both figuratively and literally, how mechanically learning was viewed. Behaviorists’ view of learning has been a dominating tradition in education but their way of viewing learning is built on simplifications. Further examples of this is that to them knowledge consists of separate pieces that can be put together and learning is nothing other than memorizing (15). However they clearly stand for a perspective that the environment is crucial when it comes to learning due to the concept of conditioning.

2.2.2 Psychological constructivism and problem solving

In constructivism there is an interest in what goes on in the learner’s mind and learning is viewed as more than something that happens to a student, it is an activity (16). This perspective is rather different than behaviorism where learning is portrayed as rather passive (1). Jean Piaget is one of the front figures in constructivism since he formed a theory about the mental construction of knowledge and a child’s mental development. The child transition from one stage to another is possible by interaction with the child’s surroundings. He took an interest in the construction of new cognitive structures. It involves two processes, assimilation and accommodation. Assimilation means to confirm the existing cognitive structures whereas accommodation means to change existing structures (17). The construction of new cognitive structures can be interpreted as the learning, the creation of
new knowledge. Important to point out is that the student, according to Piaget’s theory of development, is at birth provided with certain biological potential which is expanded by each stage in the development (2).

Phillips and Solitis (1) describe how John Dewey saw learning as a practical capacity, an exercise where we actively interact with our surrounding. He believed that educational environments have to trigger the learner’s search for solutions to problems. Unless the learners personally have struggled with an issue, information given from a teacher could only be memorized in a lifeless mechanical way. Dewey describes the learning process to begin with a person feeling a problem arise then the mind struggle to find a clear formulation of the problem. After that the plan of action is formulated and tested. If the problem by then is solved the person have learnt something (1). In Dewey’s description of the learning process it is apparent that it involves action from the learner.

In earlier educational theory, such as behaviorism, the student was seen as a passive recipient and information was sent one-way perhaps from teacher to student. In the one-way model the demands on the sender’s skills in delivery becomes very high, for example reflecting upon the situation from the sender’s point of view. Constructivism refers to the student being the active constructor in the process of learning. In this model the student is the center where the student actively gathers information from different sources in order to solve a problem. By understanding a problem and managing to make use of the surroundings, the student constructs meaning (15). Figure 2, illustrates the two models of teaching.

**Figure 2: translated illustration from Bron and Wilhelmsen (15)**

2.2.3 Social aspect of learning: Interactionism and social constructivism

Several of the previous educational theorists (except Dewey) are missing one aspect in their work, the social aspect of learning. Piaget for example is depicting the learner as a lone investigator (1). Säljö (2) promotes a sociocultural perspective on learning. Then learning is viewed not only on an individual level but also on a sociocultural level. The individual is considered navigating in a sociocultural context. Learning is a flexible capacity that is used to engage in and evolve the cultural we live in. So how knowledge is passed on and used is not a static concept and it differs between cultures. Säljö describes that Lev Vygotsky turned against the basic response-stimuli model and suggested that people interact via external tools when acting in and understanding the environment, something Vygotsky calls mediation. All tools are cultural tools and can be divided into linguistic and physical tools. The linguistic tools are speech and symbols, which are shaped by cultural and historical influences. In a sociocultural perspective communication and speech are vital to learning, since even if we use physical tools they inherit symbolical meaning that we have to understand to use them. An example can be to use a physical tool, like a yardstick, one has to understand the measurement symbols, units and conventions. All of which are symbolical and linguistic in nature. Inscriptions are a type of cultural tool where intellectual or discursive tools are preserved in a physical tool used for communicational purposes. Words and linguistic makes it possible to interact and transfer knowledge, therefore according to Säljö conversation has been, is and will always be the most important arena for learning (2).

Interaction is also a key element in learning in symbolical interactionism. Learning is achieved by interacting and thus, is a social process. The operators in this interaction can, for example, be between teacher and student, a book writer and a student or the student alone. Learning happens in this interaction, intersubjectively. Intersubjection is communication that leads to meaning, which means that knowledge contains something and is not hollow memorization. Meaning is an active and, sometimes, complicated process for the learner that happens in two steps: interpretation and negotiation. First the learner attempts to interpret information that is presented then a negotiation follows where the learner in communication with teacher, other people or just by herself reason back and forth to come to an understanding of the meaning. Since learning happens in this intersubjective context the communication aspect is a key in this process of building meaning of information (15).

Above is hinted that the interaction does not always have to include other people then the learner. Mead developed an interesting idea about the “self” (18). To him our “self” is a social object that evolves in social interaction so we can reflect upon ourselves as other people may see us. So even when reflecting by our self we are social in the way that we reflect
about other people in an abstract way, we are able take other people’s perspective. Smagorinsky (19) explains how teachers often misunderstand Vygotsky’s emphasis on speech and just implements social forums like discussions in their teaching. He explains how Vygotsky’s work do not necessary imply that social forums in school must be set up, it explains the context of thinking as an inner dialogue. According to Vygotsky we first use language in communication with others, then language is used when thinking by our self. He is known for formulating that communication and thinking first appear between people then individually. One capability in learning can be described as running an inner conversation that increase in complexity (2).

2.2.4 Current attempts to define learning
Today several pedagogues have concatenated historically developed learning theories into definitions on learning. Bron and Wilhelmson define learning as a “qualitative difference or change in the way to perceive or relate to the social or material reality and the previous knowledge of it” (15). Selander and Kress (3) formulate the contents of several terms like representation and meaning. Then they explain how learning concatenates these terms. Representation is the expression that shows how one interprets the world, not the exact copy of the world. Meaning is a “creative action in which one re-design already made representations” (3). Learning can then be described as “the difference between the representation of meaning at two points in time” (3). Learning is not something directly visible, only signs of learning through the expressed representations from the learner (3).

2.3 E-learning and virtual learning environments
Personal computer use have grown in a high pace so some argue that educational institutions must address that the students will use technology with or without a teachers’ instruction to do so since students nowadays are so used to using computational tools in their everyday life (4). Learners today can be considered digital natives, that is, people who have grown up with digital technology (12). The reaction to the learners’ frequent use of computers has resulted in virtual learning solutions. Littlejohn and Pelger (4) describe that in the context of teaching the meaning of e-learning is using computers and the Internet for learning purposes. According to them e-learning is an umbrella term used to describe, for example, online learning, computer-assisted learning, networked learning and computer-mediated learning. Benefits of using e-learning systems are several, among them it enables personalization and participation without hinders such as distance or time. Virtual learning environments (VLEs), also known as web-based learning environments, are examples of e-learning applications. Dillenbourg, Schneider and Synteta (20) formulated some features that identify a VLE.

- Designed information space, by analyzing functional educational requirements.
- Social space. What characterizes virtual environments is that they are populated, where users are inside the information space and there see representations of them.
- The representation of the environment varies from text-based to 3D. It is not about the look but the functionality.
- Students are not only active, but also actors. They are members but also contributors.
- Not restricted to distance education.
- Integrate heterogeneous technologies and multiple pedagogical approaches. The idea of environment includes integration.
- Most virtual environments overlap with physical environments. For example bringing classroom elements online.

VLEs that apply spaced repetition should still confirm these criteria with the spaced repetition mechanism as an add-on.

There has been some questioning towards e-learning mostly regarding quality, control and change (4). E-learning can increase access, is flexible, eliminate geographical barriers, improve convenience and is effective for individualized and collaborative work. But even if it can lead to those benefits it can lead to lack of social interaction, high costs of maintenance and technical support. Students working in these environments may feel isolated, confused, frustrated or reduced interest in the field of study (21). There are solutions that aim to reduce some of these risks, like using blended e-learning in the education for example. Blended e-learning systems (BELS) describe a hybrid model of e-learning that combines traditional face-to-face teaching and e-learning (4).

Paechter and Maier (22) did an extensive research were a survey was carried out to 3729 students in different universities in Austria. In these universities different varieties of blended e-learning were performed and the researches wanted to find out for which purposes students prefer online components and for which they prefer face-to-face components in a blended learning setting. Their findings were that the advantages of e-learning were that it enables clarity and a coherent structure of the learning contents. When it comes to interaction students advocated to use different communication scenarios for different objectives. They appreciated the fast exchange of information online and to monitor one’s learning progress. However they preferred face-to-face contact with either students or the teacher in situations where ideas are exchanged and the discourse serves to develop knowledge. The students also valued a positive interpersonal relation with the teacher, an aspect in learning which is important for the maintenance of learning motivation. When learning certain concepts text based information can become too abstract and hence more difficult to understand. Face-to-face
communication can in that case be beneficial since it offer several channels of feedback (2).

Schimanke, Mertens and Vornberger (12) studied design consideration in the case of spaced repetition used in mobile game devices. They describe how motivation can be categorized in three types: intrinsic motivation, extrinsic motivation and absence of motivation. Extrinsic motivation is that external factors pushes a person to act while intrinsic motivation pushes the person to act on their own, from the inside. In some cases, such as learning games, these two types seem to coexist. Extrinsic motivation can also over time lead to intrinsic motivation. One of the aspects to promote motivation in the case of learning games is “well implemented interaction concept and therefore a system of rules, feedback and goals” (12). One model to achieve this is by using spaced repetition. The spaced repetition model is in their work combined with another model, the Input-Process-Outcome Game Model, an iterative process that involves user judgment, user behavior and system feedback. After the system presented the user with instructional content and game characteristics the user makes a judgment. This judgment can for example be enjoyment that leads to frequent use of the system. That use will then lead to user behavior in the form of improved skill in the environment. Depending on the behavior the system gives feedback accordingly. The authors argue that with a well-designed game, the cycle will lead to self-motivated learning (12).

3. METHOD

3.1 User-centered design

This thesis is carried out from a user-centered design (UCD) perspective where the user viewed as a student had a central role. This is because UCD represents the process and methods for designing usable systems and UCD seek to support how users actually work, rather than change their behavior to use something (23). The process of user-centered development is iterative in nature and consists of four stages: Analysis, design proposal, evaluation and feedback (7). Since the development of the case-studied environment sharplet.com has been lacking user-centeration in their development, this thesis starts from the UCD process. This means that this research is centered on the analysis stage, and the recommendations it resulted in can be regarded as part of the next stage, the design proposal. Due to time limitations a complete design proposal, evaluation of the design and feedback of that was not part of this research. The focus in the analysis was to understand the needs, goals and the context in which the system is beneficial to be used. The result from the analysis was used in the recommendations of improvements to the company. The analysis consisted of a theoretical research (literature review), interview sessions regarding Sharplet and demonstration of the website followed by a questionnaire.

3.2 Theoretical research

A thorough theoretical research was prioritized in this thesis because from experience, learning is a complex field with several interpretations about the nature of learning and how learning is acquired. Therefore it was important to map out the different main perspectives of learning in order to proceed with the analysis and answer the problem statement. There are several perspectives on learning and also blended perspectives in between them. In this thesis a selection among the existing perspectives was made, presenting three of the most distinctive perspectives which core features will be used in the analysis. The selected perspectives offer different views that all were considered valuable when addressing the research question. When it comes to web-based learning tools the goal of use is learning and the context of use is a learning environment. So, also from a usability perspective the theoretical research concerning learning is of great value. Beyond that it also served as part of the preparation for the interview sessions.

In this thesis the results from the theoretical research are shown in the literature review section. The references for the theoretical research consisted of books and articles. Books were selected to find relevant content like, usability, cognitive psychology, perspectives on learning and e-learning. To find articles the search engine KTH Primo (24) were used. The aim of the search was mainly to find studies that are contemporary concerning e-learning, cognitive psychology, spaced repetition or pedagogic. Keywords: Spaced repetition, e-learning, blended e-learning, names such as Mead, and Thorndike. Some articles were mentioned in the literature and then searched in KTH Primo that was for example work from earlier researchers that added to the learning section.

3.3 Interviews and questionnaire

Data of both qualitative and quantitative nature were gathered from the user groups students and teachers in the form of interviews and a questionnaire. This data addresses learning potential of Sharplet from a usability perspective. A partition of three groups were made in this research:

- Group A, expert group. Students that got the chance to test sharplet.com for about four weeks followed by an interview session.
- Group B. Students that were presented with sharplet.com and then submitted a questionnaire.
- Group C. Teachers that got the chance to in forehand look at the website on their own followed by an interview session.

The interviews were semi-structured. There were preplanned questions but further questions could be asked to get the most relevant and exhaustive information possible. In the interview manuscript compound questions were avoided since it can confuse the interviewee (6). The questions also started with a warm-up question and there were limited closed questions. Beside the theoretical
research, in preparation for the data gathering a pilot interview session was performed. One person, unfamiliar with Sharplet, got a week to familiarize and test any course. The pilot interview was done where the test-interviewee simulated the participants in group A. The pilot test enabled improvements to be made in design. See the interview manuscript and questionnaire in appendix A, appendix B and appendix C. Language was adapted to the participants so the material were given in Swedish, with one exception from an English speaking interviewee.

There were three participants in group A where one of them studied at a technology institute and two at municipal adult education school. All participants in this group were beginners in Java programming, partaking in beginner courses in Java at their school. Java was chosen partly because Sharplet offers several courses in that area and partly because the material is compatible as a resource in Swedish programming education. After the four test-weeks they where called to an individual interview. In the interview they were asked about their frequency of use, selection of course on the webpage and about their overall experience of the system. The overall experience hints about their satisfaction of the system. The next questions aimed to capture the effectiveness and the efficiency of the system so the students were asked if they believe that the system contributes to the learning goal and also in what way the system contributes or not contributes to that goal. With those questions the umbrella definition of usability with effectiveness, efficiency and effectiveness was covered. The finishing question was if they think this tool will benefit to use in a blended e-learning setting, full e-learning setting or other. The interviews were held in silent rooms such as a seminar room and a group room at the library. The duration was approximately 15 minutes.

Participation in group B demanded less commitment than in group A so the number of participants found was higher. In this group 13 participated, all students of a technology institute with various years of study experience. Prior to the questionnaire, Sharplet was shown and described to the participants. Then individually they submitted a questionnaire. In this questionnaire they rated their initial impression and how likely it is that they now will use it, this addresses the initial motivation aspect of using this type of systems. They were in the questionnaire also asked how they would use the system given some suggestions followed by a general question of current use of other web-based learning platforms.

Three teachers participated in Group C, two from a technology institute and one teaching at municipal adult education school. They were asked about their general opinion of the system and if they think they would use Sharplet in their education, with motivation. As in the interviews in group A their opinion on the use regarding full e-learning versus blended e-learning were asked. The interviews of the teachers where held in their own working environment, such as their office. The length of the interviews were approximately 15 minutes.

3.4 Analyzing data
After books and articles on relevant topics were reviewed they were sorted in different categories. The categories were: usability and cognitive aspects, classic learning theories and e-learning, modern learning tools using web. After the theoretical material was gathered and sorted it was used to discuss the research question. The perspectives on learning served as different angels of approach in which VLE and Sharplet was discussed.

The interviews were transcribed based on the audio recordings. In the transcription the person speaking was clearly marked and some repetitions in the sentences were removed. Also humming during the dialogue was often removed. If there was a need for a contextual comment this was marked by “[“]. From the transcription the answers from the participants were coded, as participant a, b or c combined with the group, for example participant 1a is the first participant in group A. Then the data was summarized and presented as results.

4. RESULTS
4.1 Group A
Students in this section will be coded by 1a, 2a and 3a. 1a attended a technical institute and 2a, 3a attended a municipal adult education school. 1a first looked at java courses but decided to try the course “introduction to software testing – terms and definitions”. Both 2a and 3a tried “Java for beginners- basic concepts and definitions”. 2a also tested a course in HTML.

4.1.1 Experience of using sharplet.com
The students described the frequency of use as maximum of one use per week (1a), once every two weeks (2a) and a few times during the four-week period, unregularly (3a). Two students (1a, 2a) reacted positively to the design and presentation of the website, their impressions were that it has a good thought behind it and looks well made. However none of the students felt like the system contributed to their goal of learning the main theme of the course. Their motivations for this and their general satisfaction are as follows:

- Sharplet promotes that a wide range of categories can be learnt by this system. There is however a difference in building knowledge and building vocabulary. Sharplet’s system does not work for all knowledge building only as a vocabulary builder. So to claim that all can be learnt is misleading. Also learning covers the whole process from discovery to testing and implementing the knowledge. This system only covers the first part and especially in programming that feels redundant. There is no practical use of knowing the theory behind concepts as the main goal for a
programmer is to get at program to work which requires a more “hands on”- method. When extra support is needed to fix a problem Google is preferred as a tool and other more specialized supporting websites for programming. (1a)

- The system seems more like a quiz that would be more appropriate for someone that is not a beginner. As a beginner, doing the course did not improve coding skills and therefore is an unnecessary workload. (2a)
- Too abstract and not so concrete knowledge is presented. It can be exemplified with learning everything about equations but not how to use them. Not suitable for someone that hasn’t seen code before. (3a)

So when it comes to what purpose this system seem to serve there were basically to themes, one was that it is a vocabulary builder (1a) that has a right or wrong answer (2a). The other was that it seems to work better for complex theory but only for experienced people, not beginners (3a).

They were asked about the factors that contribute to learning versus the factors that could make learning more difficult. Among the contributing factors are the way the cards are repeated (1a), graphical elements like “expected finish dates” (1a), the variety of courses (1a) and easy to navigate on the website (3a). When it comes to the downside, apart from the factors mentioned above that there is a lack of implementation and testing, one student (2a) mentioned that the system is not organized by the learning curve. Since the cards are mixed there cannot be build up, beginning with basic knowledge and advancing on that.

Two students (1a, 2a) raised a concern for the reliability. If anyone can create sharplets that means that there is no way to know if the information is reliable. It is an effect of the Swedish school system where we are taught to review information critically (1a). Besides the reliability part it makes the use of the website more fuzzy and raises questions about who the target group is (2a).

One student (1a) would not use Sharplet again and another student (2a) would use it but probably more for hobbies. The third (3a) might use it in a later part of studies in a course.

4.1.2 Context of use and ideas for Improvements
There were some creative ideas on context of use and how it may be improved. One student (3a) felt that it would benefit to get an extra step in between question and answer, for example given three answer options. The system could be used as tool for someone that already have good knowledge about something and need to review it. It could work as a quiz to help the student see how well they know something (2a). It would be good to have a way to test the knowledge of implement something (1a). Teachers can create their own sharplets that gives the students the chance to review the concepts from the lecture (1a).

4.1.3 Use of VLE
When it comes to using VLE, learning environment such as Sharplet, the students felt that it works well to use in individual studies (1a, 2a, 3a). The graphical environments often give a good overview of the progress, in Sharplet for example there is a bar with “expected finish date” (1a). One student (2a) said that the community aspect is important, since learning is giving and taking. The social aspect does not necessarily have to be in person but in that case it has to be well functioning in the learning environment. Another student requested that there should be a way to correct or somehow being able to comment if they did not think that the answer in the flashcard is right (1a).

4.2 Group B
Here are the significant results from the questionnaire translated to English. The results where mixed, but mostly positive in nature. Here follows the students’ comments regarding the design and learning concepts.

Design
“Easy to understand and have a good design.”

“User friendly website that gives a clear view! Easy to understand how it is built and where/how you can find a course!”

“Seems good that the behavior of the course [sessions] can be managed. Nice looking website but the interface of the start page can be made clearer”

Learning concept
"Feels well thought out and have a wide range of courses, I like this kind of learning! However I wish that you did not have to use it without being a member. So all can use courses but be a member to have access to tracking the course and such”

“Very good idea, something I have been looking for”

“Good functionality but I don’t know if I would use the program over and over even if it works well”

“Generally I find learning appealing. […] I do not believe in rehearsed learning. I am also hesitant to studying without setting clear goals. Without goals I tend to study less time and then getting tired of it”

“I like to learn but I have no need for this now, but really good concept”

“Good way to learn new things”

“Seems like a good tool to use in studies, would like to discover more”

"Like the idea of the website. However I think I would be more appealed if I had a specific subject to search for. When just clicking around it can easily get messy with too many alternatives. I would have liked some type of filtration, if you search for say, language, there can be several sub-categories that can be important. Another fun thing could be to be able to randomize course selection to learn something new”
In figure 3 and in table 1 data is presented on the likelihood on future use, and in what way they might use it for. Mixed results are seen on likelihood, but for intention of use, most relates to studies.

Figure 3: Answers to the question “How likely is it that you would use Sharplet now that you have seen it? (1-Not likely at all 5-Very likely)

<table>
<thead>
<tr>
<th>Options</th>
<th>Likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>As a complement to ongoing course</td>
<td>7 53.8%</td>
</tr>
<tr>
<td>Outside of courses but for studies</td>
<td>5 38.5%</td>
</tr>
<tr>
<td>Learning on free time</td>
<td>5 38.5%</td>
</tr>
<tr>
<td>Not at all</td>
<td>1 7.7%</td>
</tr>
<tr>
<td>Other</td>
<td>1 7.7%</td>
</tr>
</tbody>
</table>

Table 1: Answers to the question “In what way would you use the website?”

4.3 Group C

Teachers will in this section be coded by 1c, 2c, and 3c. 1c and 2c are teachers at a technical institute; 1c works in the field of computer science and 2c in the department of speech, music and hearing. 3c works as a teacher at a municipal adult education school in computer science.

4.3.1 Opinions of the system

When asked of their opinion of the concept and the learning style, that is spaced repetition by flashcards, two teachers (2c, 3c) were positive to the concept with reservation that it is suitable in certain situations and to be used as a compliment to additional education. They both had the intention of using this website in their education going forward. One (2c) was not clear on how, only that it would be used at an early stage and the other (3c) would add it to a selection of educational services they link to on their VLE. The situations that the two teachers found suitable are learning of terminology and basic concepts but not suitable for complex concepts. One of them (2c) explained that it works every time there is a one-to-one mapping, like word and translation in language or like term and only one definition of the term. If there are more complex mappings it will not work because of the graphics of the shifting flashcards. If one concept is built on other concepts they have to be presented first and in this graphics they might be mixed. The third teacher (1c) agreed in that the system should be used to learn vocabulary or simple terminology but was more hesitant to the overall idea of the system and saw problems with the self-assessment part. A student may fool herself/himself. Think, “I know what this is”, look at the answer and then think, “well that was kind of what I was thinking”. An example of a related situation was given, that is, when students study for a test and keep the answers sheet close all the time to check and fails when they get to the test and no longer have the answers sheet close. If the user is good at self-assessment the situation might be different.

4.3.2 The context using the system

Even though the system seemed to be designed for individual work an alternative way of use was proposed by a teacher (1c), which would be the method of choice if the system would be used in teaching. That is to work with the system in pairs. That two people, for example prior to a computer lab, studied some terminology together. The benefit of this is that they can discuss the answer in mind before reveling it which both makes it possible to check how well their respective answers in mind added up to the right one and also that it is spoken out loud. The teacher stressed, “There is a difference in thinking how something works and to say it”. If the user is by themself however, the teachers proposed that they might benefit from writing the answer in mind down before revealing the answer.

4.3.3 Use of VLE in teaching

When asked about their current use of VLEs and e-learning tools one (2c) could not think of any at the moment and stressed that more of that should be used. Another teacher (1c) first did not remember much but as the conversation went on several were mentioned; a VLE and some helping resources to aid in learning programming. The third one (3c) used VLE and other components attached to that a lot. The reason for that was that courses were short and online communication and recourses was crucial in order for students to keep up even if they could not attend class. When we discussed the importance of VLE this teacher stated, “in the past they were less important but the less time given to teaching the more important it gets”.

5. DISCUSSION

Both the concept usability and learning are widely discussed and required clarification and definitions, if there were any. The central definition of usability was found to be:

“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)

It is a rich definition in that it contains all elements that need to be discussed to assess the usability of a system. Regarding the subject of this research the specified goal can be regarded as learning, the other concept in need of clarification. It will now be discussed from different angles.
One might say that learning cannot be observed, only signs on learning (3). But there are currently attempts to define learning or at least describe its core features. The current definitions of learning (15, 3) are humble in their perspective on learning; they are both describing learning as a qualitative difference in representations of something. The representation is the expression that shows how one interprets the world. The definition seem trivial, something that all learners can relate to. For example prior to learning about computers you might know how to use computers and vaguely something about the system, after a course in computer science you might know much more about the systems under the surface. The representation of the understanding on computers has made a qualitative difference to the learner. The explanation to how the qualitative difference of representation has been achieved is not that trivial. Behaviorists will say that it is all about the external factors and that attention to stimuli can acquire the desired response. The idea is to change the learner’s behavior (1). Piaget along other psychological constructivists will say that learning is all about the genetics. So one would first be aware of the learner’s current developmental state, and then present things that trigger the learner’s own problem solving spirit (17). Vygotsky with the sociocultural perspective would focus on the interaction and to improve the interactive climate for the student (2).

The research question will now be further discussed in detail, with the theoretical results such as the ones discussed above used as analysis tools. Other analysis tools are the results from the interviews and the questionnaire. First a discussion on spaced repetition VLEs in general followed by a discussion on the results regarding Sharplet, last a method discussion.

5.1 Usability and learning potential of spaced repetition VLE’s

In order for a VLE applying spaced repetition to be useful it should follow the central definition given above. If we view the specified users as the learners their main goal by using the VLE is to learn. Hence to assess the usability the learning potential has to be analyzed.

Following the definition that learning is a qualitative difference in representations, these VLEs can theoretically support learning if they offer a system that helps the user achieve this difference. When it comes to how depending on perspective the answer divide. To the behaviorists learning is a process of expanding the behavioral repertoire. This is done by stimulus that can trigger a wanted response with the use of reward when the wanted behaviors occur. Behaviorists would most certainly like the idea of a virtual environment sending these stimuli. The system can be carefully designed with rewards placed when the wanted behavior presents itself, the wanted behavior then comes in the form of right input to the system. The idea that the system can be preplanned and programmed to give certain feedback when certain input is given in the same manner to all students is very compatible with the behavioristic perspective. Skinner used this idea early, with the teaching machine he invented (1).

The constructivists would be more hesitant towards the VLE or at least demand more from the system, since they promoted the learner’s activity in the learning process. Dewey found learning to be a practical capacity and believed that the learning environment should trigger the learner’s own problem solving (1). So the VLE somehow have to support and trigger the learner’s own activity. So, the learner feels a problem arise and then formulate a plan of action in their mind, which they then can test. As figure 2 on page 5, show, the interaction in the VLE cannot be too one-way; it has to encourage the learner’s gathering of recourses to solve something.

Several perspectives like symbolical interactionism, social constructivism and the sociocultural perspective promote the social aspects of learning. Learning happens in interaction and as based on the ideas of Mead and Vygotsky that does not always refer to interaction that involves more people than oneself (2, 18). More precise, Vygotsky means that communication and thinking first appear between people and then individually (2). Learning is acquired by mediation, where we use cultural tools, both linguistic and physical. The VLE can be viewed as an inscription, that is an intellectual or discursive tool preserved in a physical tool that is used for communicational purposes (2). The VLE is a tool used to communicate material that can lead to learning. The communication aspect according to Säljö, is vital to learning (2). But the context of the communication can vary in this case, for example system to user or in classroom teaching that involves the VLE.

There has been research done on the context suitable for VLEs, that is, full e-learning versus blended e-learning. Paechter and Maier’s (22) findings indicate that students appreciate the clear and coherent structure that is possible to create in a VLE. When it comes to interaction they found face-to-face interaction crucial when ideas are exchanged and new knowledge is developed. VLEs works well for fast information exchange and tracking learning progress. So, a blended setting would be beneficial when using the VLE or that the benefits of face-to-face interaction is reflected in the online interaction. This answers the sub-question to this research regarding beneficial context of using VLEs.

The parameters efficiency, effectiveness and satisfaction would also have to be achieved in order for the spaced repetition VLE to be useful. These have been regarded in the case study. Also the part stating specified context have to be achieved. When it comes to VLEs the context of use can be varied so the system has to be designed accordingly.
5.2 Usability and learning potential of Sharplet

Sharplet can with the defining factors given by Dillenbourg, Schneider and Synteta (20) be labeled as a VLE, and carry the potential to be a well functioning VLE. Some features are not yet fully developed or currently used to its potential. Below characteristics of Sharplet is compared to the defining factors of a well functioning VLE.

- This research along with other measures taken by the company to better understand the functional educational requirements makes it a designed information space.
- Users populate Sharplet and there are comment-possibilities in the courses that make it a social space. More interactive features can enhance this aspect in order for the populated users to be more expressive.
- The environment does not have to look in a certain way as long as it is functioning. The functionality will later be discussed with the results from the participants.
- Users are actors and can contribute to the space since they can create sharplets.
- It is not restricted to distance education, since it can be used in a blended e-learning manner.
- It has potential to incorporate heterogeneous technologies and multiple pedagogical approaches, both in the way of using the system in education but also the flashcards are developing for example with video-features.
- It has the potential to bring even more classroom inspired elements online, although some of the elements on the website can already be considered as classroom elements.

When assessing the usability of Sharplet, the parameters effectiveness, efficiency and satisfaction were addressed in the interviews and the questionnaire. Effectiveness describes how good a product is at doing what it is supposed to do. In this case by using the system the goal is to learn, so the level of learning potential that comes from using the system can be regarded as effectiveness. Efficiency refers to the way a product supports users in reaching their goal. This is reflected in some areas such as design and interaction. Satisfaction is connected to everything that relates to the user’s experience when using it. The nature of the comments, positive or negative, and the intention of future use indicate their satisfaction of the system.

From the results, the students seem to appreciate the design on the website. That is indicated in the reactions from the students participating in group A as well as in group B. Some examples of the comments on the graphical elements are that it was easy to understand, good design, clear view and nice looking website. In the interviews there also was a positive reaction to the progress bar showing the “expected finish date”. This confirms results from the research done by Paechner and Maier that one of the appreciated aspects of using VLE that is the graphical possibilities showing learning progress (22). No trace of cognitive over-load was seen in the results that related to design and navigation. The positive reactions and absence of such complains indicate that there was not an unnecessary cognitive load due to design and functionality issues. Also the spaced repetition seemed to work well, according to a student in group A.

The students’ overall need for this tool can be found from the results of both group A and group B. In group B, the students rated the likelihood that they would use the website after they have seen it (Figure 3, page 9). The results show a span of rating from 1-5 with majority given on 3 and 4. That indicates that there are with various intentions of use. The majority seems positive but somewhat unsure that they will try it in the future. Also some of the comments given by group B hints on the reasons behind their rating. Some liked the idea, some did not and it seems that for some participants motivation to use is low, even if they liked the idea. The low motivation can be due to not needing it at the moment, not believing in the learning concept of memorization or not wanting to create a membership in order to use it. In group A one student would not use it again and another student would not use it for the area that has been tested during the weeks, programming, but would probably try it for hobbies. Another student might use it later on in a course, but not as a beginner. Two of the three students in group A were concerned with the reliability aspect, especially when there is a create feature open for everybody. This could then be a reason for not using this as a tool in the future.

To address the learning potential some of the problems that were found based on the test users in group A and the teachers in group C, need to be discussed. Some problems arose when it came to which areas works in this system. It seems that complex areas that have a more complex mapping than one-to-one between word and meaning becomes problematic, both for the system functionality and learning potential. One student clearly explained that this seem to work only for expanding vocabulary and not to build knowledge in its full form, and for that there are other tools that work better. This can potentially explain that the system did not seem to work for courses in programming, at least as the only source. From a perspective as a programmer the main goal is to learn coding, so a vocabulary-training tool might in that particular area be redundant. However teachers reacted positively to using the system on more complex areas but to be used as a tool along with other measures, such as combined with lab sessions in school. One student found the problem to be that it is directed to beginners, but as a beginner felt lacking too much knowledge to use the system. It would work better as a quiz tool, to be used as a reviewing tool for people with more knowledge of something.
There were some results found regarding interaction. The students in this research were positive to studying individually although functioning interactive features were requested such as a functioning discussion forum or ways to correct or discuss or question the answers in the flashcards. It seems like that the system lack two-way communication, there is no way to implement or test the knowledge. Based on constructivist ideas, if teaching interaction is one-way as in figure 2, page 5, this demands much of the sender’s communicative skills. One example is the ability to take the student’s perspective, which in the case of a VLE becomes to demanding. Therefore it should be more similar to the other model in the same figure where it enables the learner’s activity to have a central role. One teacher also raised a concern that the self-assessment part might be a problem that could be solved with how the system is used, like writing down the answer before reviewing or work with the system in pairs. Another teacher figured that it can be used in connection to lectures, with flashcards on the themes of the day.

Sharplet has the potential to be a useful VLE. But according to the students in group A, some comments from the students in group B and results from the theoretical research the students need to be triggered in their problem solving skills that relates to the relevant application of that knowledge. The social and interactive aspect is also important to consider, both in an individual learning setting and combined with classroom teaching. That the design of the website and the spaced repetition functionality trigger positive reactions is beneficial, since it can be regarded as extrinsic motivation factors. And if the experience of use is positive, that might trigger intrinsic motivation and therefore motivate the user to keep learning.

5.3 Method discussion
The variety of target groups addressed in this research is positive, since it captures several perspectives. That can be considered as a triangulation technique, from different angles narrowing down to an answer to the research question that satisfies the different target groups. The two different groups with students for example gave interesting angles from students both with more insight and with a fresh view of the system. The teachers as educators could both reflect upon the system from a student’s perspective and as a teacher, since they are trained to do so in teaching. However if there was more time and recourses in this thesis the groups could contain more participants to ensure validity of the results. In this thesis the way to find out the learning potential of the VLEs was to ask the participants if they felt that it helped them achieve their goal of learning Java. This could have been done by doing a before and after test with test questions that could indicate learning potential. In this research that solution felt to extensive of the scope of the thesis but it would have been interesting to see the results from such a comparative study in addition too these gathered results.

The majority of the data was gathered personally, for example by taking the role as interviewer or demonstrating the website to participants in the questionnaire. When the same person is responsible for the entire research it can influence the results. When demonstrating the website to participants personal opinions can leak through, positive or negative. A reflection when transcribing was that it is difficult to be neutral and at the same time act nice to the participants.

Some minor errors occurred during the process that needs to be brought up. In the questionnaire the two ratios unfortunately got different sizes, 0-5 and 1-5. The ratios 1-5 were the one that it was supposed to be, so only that one is used as a result. Comments that are connected to the question with ratio 0-5 are used, so some data relating to that measure is preserved even if this error occurred. Due to changing the questionnaire from English to Swedish accidentally the Swedish word for “other” did not get translated. None of these errors were mentioned by the participants during the process, which indicates that it was not a source that damaged the results.

5.4 Future work
This thesis has only touched upon usability and learning potential assessment in the VLE context. Further work can be done to expand the knowledge of the users need’s, goals and context regarding VLEs. The research on VLE can have a range of focuses for example regarding design, interaction and user context. A more narrow selection on focus as well as a larger participant number would generate useful results to the development of new VLEs in the future. Since this thesis only started the UCD iteration, more steps can be taken in the future, such as developing a new design based on the recommendations. Sharplet will continuously be improved to reach optimal functionality and design. Therefor further improvement of Sharplet can be done, for example by having user tests or analysis of user needs with larger participation number. Also it would be interesting to analyze usability in more target groups, such as free time learners that are not students.

6. DESIGN RECOMMENDATIONS FOR SPACED REPLICATION VLEs
From the discussion regarding both spaced repetition VLEs in general and Sharplet as a case, some design recommendation can be proposed. Even if the recommendations below address the case studied platform, they can be regarded as general criteria in development of all VLEs which applies spaced repetition, since they are built from results of the entire research.

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Sharplet can be commended for the design that in this thesis was appreciated by the students. It managed to give the users a good impression and made navigation unproblematic. Also the spaced repetition mechanism seems to work well. However when it comes to some other aspects recommendations of improvements can be made based on the above discussion:

- **Be clear on target group and intention of use.** When participants in this research tried the system and reflected upon the using experience they speculated on how different user groups can use the system best. For example, students can use it as a quiz to rehearse something, only as vocabulary builder or to build more complex knowledge as well as vocabulary. Interactively it can be used as a collaborative tool, individually with option to write the answers in mind down. Teachers could use existing sharplets in teaching or create own and use as study material for the students. It seems that the intended use of the system is somewhat unclear to the user both regarding who is the target group and in what way/ways the system should be used. Therefor it is recommended to find a more narrow focus and communicate it more clearly, both regarding the intended user group (students/teacher) and the intended way of use (for example as a vocabulary builder only with one-to-one mapping or rehearsal quizzes also in more complex areas). Another more precise point from the users about unclear intention is the sharplets named “beginner” since it did not seem to work for the beginners. The naming or the content of these courses is therefore recommended to be reviewed.

- **Expand the social space.** The social aspect of learning needs to shine through in the VLE so improvements to expand the social space is recommended.

- **Ensure reliability.** Since everyone can become a user and create sharplets it becomes a reliability issue according to the participants in this study. This could for example be improved by giving the sharplets some sort of quality marking so the user knows it is from a trusted source. Another way is to in some degree mimic Wikipedia. Since all users can help to correct information there is a lot of peer review going on, so if users had access to correct errors in created sharplet cards it could improve the reliability. This solution would also contribute to expand the social space.

- **Trigger the user’s problem solving skills.** It is recommended, based on learning theory and the users reactions, to support some kind of implementation space in the system. This is to trigger the user’s problem solving skills. For example by setting up an extra step before the answer is revealed where the student can implement something, perhaps their answer in mind to then compare to the correct answer. This would also improve the interactive aspect.

### 7. CONCLUSION

When reviewing the core theoretical concepts in this thesis, usability and learning, an interesting connection was found in the definition of usability. The concepts usability and learning potential could not be regarded as two separate aspects of VLEs, since the specified goal for the user is to learn. The learning potential then became the vital concept to continuously review in the theoretical research. The perspective on learning did not give a unison answer to the research question, however it did offer several answers depending on perspective. Each perspective generated interesting inputs when used to analyze spaced repetition VLEs in general and the case studied VLE. It has been rewarding to analyze Sharplet as a case since it enabled the theory regarding useful VLEs to be directly implemented. The guidelines served to check which features Sharplet currently carry and which could be expanded to become a well functioning VLE. Several features that needed expansion or improvements were confirmed by learning theory, for example the importance of social interaction and the user’s activity in the environment.

### 8. REFERENCES


Appendix 1: Interview manuscript for group A
Frågor till studenter grupp 1 (Swedish version)

1. Vilken kurs testade du på hemsidan?

2. Hur ser dina tidigare erfarenheter av Programmering ut?

3. Hur frekvent använde du Sharplet?
   • Aldrig
   • Fåtal gånger
   • Någon dag per vecka
   • Varje dag

4. Vad tycker du generellt om systemet?

5. Anser du att Sharplet hjälper dig nå målet att lära dig Java?
   • Ja
   • Nej

Frågor om hemsidans design och funktionalitet:

6. Vilka faktorer på hemsidan anser du bidrar till lärande?

7. Vilka faktorer på hemsidan anser du försvårar till lärande?


Appendix 2: Questionnaire for group B

Studenter om Sharpet.com

Hur är ditt intryck av Sharplet?

0 1 2 3 4 5

Inte lockande alls ○ ○ ○ ○ ○ Väldigt lockande

Motivera gärna ovanstående val

Hur troligt det är att du kommer att använda Sharplet efter att du nu sett hemsidan?

1 2 3 4 5

Inte troligt alls ○ ○ ○ ○ ○ Väldigt troligt

På vilket sätt skulle du använda hemsidan?

☐ Som komplement till pågående kurs
☐ Utanför kurser men som stöd till studier
☐ Lärande på fritiden
☐ Inte alls
☐ Other: ______________________________________

Använder du andra web-baserade lärplattformar eller hemsidor arpassad för läran? 

☐ Ja
☐ Nej

Ge ett exempel på en sådan plattform/hemsida

Submit

Never submit passwords through Google Forms.
Appendix 3: Interview manuscript for group C

Intervjumanus: lärare

Innan intervjun startar bekräfta att läraren förstår systemet:

- Flashcard-sessioner
- Flera ämnesområden
- Dynamiskt system-självskattning
- Inloggning pågående kurser i "my area"
- Kommunikativa features kommer såsom kommentarer mellan kursdeltagare
- Lärare kommer att kunna skapa ett klassrum med deltagare i klassen, där kan de se elevernas framgång

1. Hemsidan bygger alltså på ett flashcardsystem som repeterar material efter användarens självskattning. Vad tycker du om det här upplägget?

2. Vilka ämnesområden eller specifika ämnesmoment tycker du lämpar sig att användas enligt den här inlärningsmetoden?

3. Tycker du sidan lämpar sig att användas i eget bruk eller i kombination med undervisning?

   • Varför?

4. Skulle du kunna tänka dig använda Sharplet i din undervisning?

   • Ja
     o Hur?

     o Varför?

   • Nej
     o Varför inte?

5. Hur använder du i dagsläget web-baserade lärplattformar/e-learning verktyg i din undervisning?