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Teaching Universal Design – Key content and course design

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Abstract

There is not much written about how to teach universal design (UD) in design educations. This article aims to present the didactic experiences from teaching three courses in universal design at Mid Sweden University and Lund University: the courses Design for freedom, Universal Design Theory and Universal design of digital accessibility. By comparing and contrasting our experiences in a qualitative content analysis we end up with a model with three overall learning goal themes: to understand, create and reflect. The main insights in this article are these common three themes that constitute the key content and the base in the course design in courses teaching universal design. The structure in the courses is similar, but the content is implemented in slightly different ways. For example, achieving understanding and the practical exercises are different in the different courses. The theoretical basis lays the foundations for the students to create practical prototypes and further a possibility to reflect upon what they have done iteratively in the design process.

Keywords: *Universal Design, Accessibility, Teaching, Didactics, Design for learning*

Introduction

There is much written about what Universal Design is, but significantly less about how to teach the subject (Hernandez-Torrano et al., 2020). Furthermore, design is one of the least explored areas

of education (Björklund Boistrup & Selander, 2022). More than 20 years ago, Christophersen (2002) described the interest in how UD is being taught in various places. In this article, we describe how we teach UD in three courses at Mid Sweden University and Lund University in Sweden. As part of this, we outline the design and key components of the courses. We also discuss our experiences from teaching UD, focusing on three learning goal themes: to understand, create and reflect.

At both universities we have a student-centered learning and teaching approach so that every student is given good conditions to complete the education on equal terms. An openness in how to communicate in teaching and an inclusive and positive atmosphere where different opinions and cultures are accepted, has shown that the commitment of the students increases (Dewey, 2015). This in turn enables students to advance in the learning process. It is important to create an inclusive context for the students, where everyone's value is clear. In this way, the students are appreciated for their experience where everyone can develop on the same terms in their learning.

Learning to “think like” a designer and have a design-oriented perspective is about finding new angles of incidence and getting tools to understand how different problems can be described and framed (Selander, 2022). The overall approach to design knowledge at the two universities originates in the concept Designer as Author, a constructive critical approach to the artistic work. A critical discourse has also become a starting point for a theoretical and pedagogical approach to universal design (Christophersen, 2002). The didactic prerequisites are that it is required that the designer is both creative and critically reflective to identify problems in society and solve real problems in society through design (Noble & Bestley, 2016).

According to Sandhu (in Christophersen, 2002) designers can bring about far greater change in society through universal design know-how than politics or legislation. The principles of universal design offer designers a way to better integrate features that meet the needs of as many users as possible. According to Christophersen (2002), designers have managed to achieve a certain amount of tradition when it comes to the universal design concept. This universal design tradition wants to make people rethink their way of life, but above all see how people are affected by norms in design (Bardzell & Bardzell, 2013).

Learning about UD is essential for the students and their future professional practice. Both at Mid Sweden University and Lund University, UD is a mandatory feature for our design students and a common key component in courses.

Aim and Research Questions

The aim of this article is to share and reflect about teaching Universal Design in higher education. The research questions are:

- How is theoretical content regarding UD taught in three courses?
- How is UD applied practically in the courses?

This article seeks to contribute new insights, from a Swedish context, regarding how we teach Universal Design at Mid Sweden University and Lund University. These insights are hopefully of use to teachers of UD world-wide.

Teaching Universal design

To give an insight into how universal design is being taught in three courses, we discuss and compare the different key components and

learning objectives. Figure 1 below shows the content and arrangement of three courses at Mid Sweden and Lund Universities. In the first example, Design for freedom, the students get a progression in design methodology, universal design, design for all and ergonomics. The second example is an introductory course in UD called Universal Design Theory. The purpose of the course is to create a foundation for a second, larger, course, Universal Design Project. These two courses, i.e., Universal Design Theory and Universal Design, are part of the curriculum for the second year of the industrial design program at Lund University. The third example is the course Universal design of digital accessibility where anyone that has the pre-requisites for university studies can apply. The course had its premiere in 2020 (but started in a different form in 2004) and runs both spring and autumn semesters.

	ECTS	Students	Teaching	Type	Focus on understanding				Focus on prototyping					
Universal design of digital accessibility Mid Sweden University	15	50	E-learning, stand alone	Stand alone										
Universal Design Theory Lund University	2	30	Campus, programme	First course, project course to follow										
Design for freedom Mid Sweden University	4,5	24	Campus, programme, year 3	Last course in a series of universal design, methods and ergonomics										

Figure 1. Three examples of courses including universal design. The last two columns, i.e., focus on understanding and focus on prototyping, show where the focus on content is in the courses.

Figure 2 below explains what the process looks like in the various courses. It can be seen that there are some common components and learning goal themes in all three course examples. The following three components are used in education when teaching universal design:

- 1) The theoretical basis (to understand),
- 2) practical prototypes (to create) and
- 3) thinking about what has been done (to reflect).

The learning objectives linked to all three components in the figure are examined in the courses to see whether the students have met the various learning objectives or not.

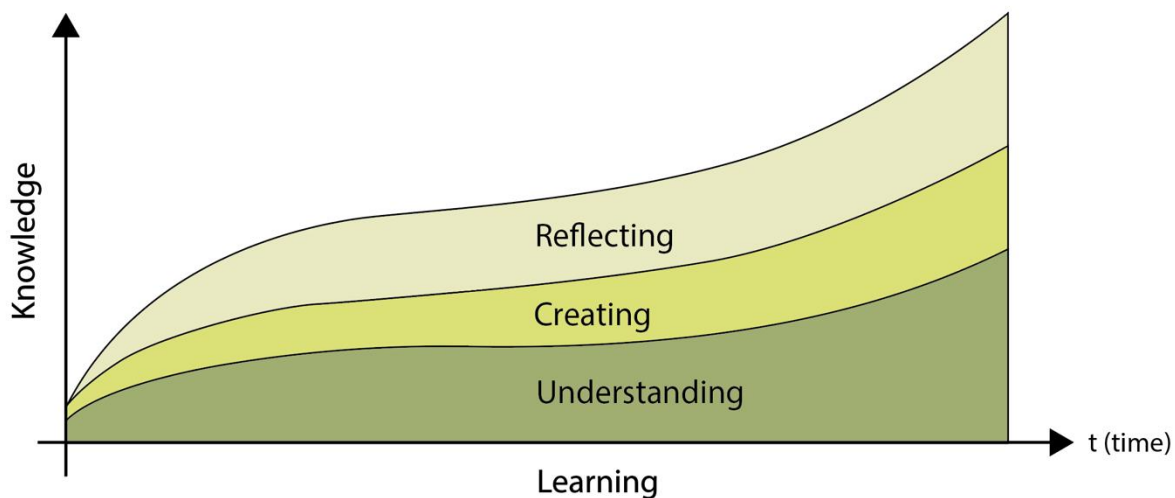


Figure 2. Model of students' learning in example courses that teach universal design.

Understanding – insights about norms, diversity and design

The common view on knowledge and pedagogy in the courses is to combine several pedagogical approaches. Our hope is to provide multiple ways to engage with the material and in the learning activities, and also multiple ways to show one's competencies and progression. This loosely follows the three principles of Universal Design for Learning (UDL) which is a framework to improve and optimize teaching and learning for all people. When developing courses, we draw on constructive alignment (Biggs, 1996; Biggs &

Tang, 2011) as a general framework. This means that we see it as important that all parts of a course are connected. The primary approach guiding the teaching is that of a constructivist perspective. Lev Vygotsky has been a key inspiration influencing teaching, regarding learning as an active process, where students actively construct their own meaning and learning which in turn increases learning. It also means that learning is a joint process.

The course structure and core components of the three example courses are similar but teachers' favorite exercises differ. The theoretical mindset is understanding, empathy, reflections and the importance of reaching understanding through, for example, expert users who are professional persons that help out with usability testing. The expert users are strict demanders and professionals in their role (Lorentzen & Hedvall, 2018). The foundations for the courses usually start with understanding which in turn is about theory and empathy. What we bring from UD into everything that we do is the notion of "flexibility", which can be seen in the examples. This way of thinking and combining different approaches inspire the way we lead as well, how we provide materials, et cetera. Combining several modes and modalities is one such example, for instance not only relying on text but also on bringing in photos and illustrations as much as possible.

The Industrial design program at Mid Sweden University focuses on product design and therefore on physical products. In the first example, the course Design for freedom, students need to understand that user involvement needs to be integrated early in the design process. To include as many users as possible in their design, and become aware of who is not included, in the end means increased freedom for more users in society. The idea for the course is to give

the students both theoretical and practical knowledge in design for all and norm creative design processes which involves testing new design solutions, or using new methods. Part one of the course content starts with theoretical perspectives where the students get an introduction lecture to gain an understanding of diversity on different levels. The methods used are user testing, creating physical prototypes, form studies, semiotics and ergonomics.

The second example course, Universal Design Theory, consists of three initial assignments followed by a series of guest lectures. The students start with photo exercises where they go out and take photographs of products and environments in their own lives that they consider to be inclusive or exclusive. They are also given the seven principles of UD as a guide for what to look for. When they come back to class, they each bring 14 examples (i.e., interpretations) of what could be inclusive or exclusive. During a full day, they all talk about their 14 examples. In a class of 30 students this means 420 examples during one day. We only discuss a few of the examples, the main pedagogical idea is for the students to see a large number of examples. After about 100 examples, patterns start to appear. This is an example of an exercise inspired by a phenomenological approach. In a parallel assignment, the students try to do their morning routines with just one hand or blind-folded. This is a way to “make the familiar strange”. As part of this exercise, they also go to the supermarket or join a student activity using a wheelchair or trying a white cane together with simulation glasses.

The third and last example, the course Universal design of digital accessibility, has a focus on doing but starts with understanding the basics but then quickly moves into applying the knowledge. In some parts of the course we are a bit high on the learning goal scale in

Bloom's taxonomy for being a basic course (Bloom & Krathwohl (1956). This is in line with Dewey (2005), arguing that knowledge is relative and must be used to become meaningful. In other words, without practice the theory becomes incomprehensible and without theory the student does not get a deeper understanding of the practical aspects.

The course is based on content, presentation and technique. All three are necessary, since if one of them is missing the content is not accessible or cannot be understood. To be able to have a more human approach we are teaching the principles of Universal Design and other user-centered design methods like Innovationsguiden ('The Innovation Guide') which is a method and toolkit developed by the Swedish Regions and Local Governments. As we also want to do right from the start, we use the standard SS-EN 17161:2019 ("Design for All - Accessibility following a Design for All approach in products, goods and services - Extending the range of users") as a foundation.

The course starts with an introduction to universal design, accessibility and usability. In the course context, accessibility also includes usability. There is a focus on empathy and learning about different types of disabilities. We try to involve people with high demands on design solutions. For example, how can we design an app to make it possible for a person with rheumatism to handle the app in the smartphone? How can the content work and be understandable for people with dyslexia or Swedish as second language and so on. We don't try to cover every aspect of disabilities, but instead we teach how to involve the needs of the users and to get the information or skills needed for the design solutions.

Finally, after this first phase of the course – understanding – the students have gained knowledge and insights including empathy, norms and human diversity to better understand the users when they move on to the next phase in the design process to create solutions.

Creating – how to apply universal design

In the second phase, create, the students learn how to implement and apply what they have learned about UD in the first phase understand. The practical parts in the courses include creative exercises alternating theory and practice to improve learning from practice, where creativity contributes to innovation. The aim is innovation, based on theories of pedagogical research, for example learning by doing Dewey, 2008 and experiential learning Kolb, 1986. Part two of the course Design for freedom is the design project where the students work together with expert users to challenge and question today's products (see figure 3). In this part the students get an introduction lecture about the design process in the field of design for all. The guidelines for the project are that the product should be handheld and should preferably have a typical standard within its context.

In order to create innovations that are of a standard level, the students formulate a challenge linked to understanding what the real need is. For example, the purpose of a shaver is to trim beards or trim body hair. Students themselves choose a product and they are encouraged to choose a product that can be sorted in a typical normative category, e.g. hair trimmer. Once the challenge is formulated, the students start immediately with a workshop together with our expert users who are invited. They are represented as “users with high demands” which for this project means that they have

disabilities in their hands and have high demands on ergonomics. Very often they use different grips and maybe use products in completely different ways. Students often have preconceived opinions and quickly get a picture of what a product should look like, how it should be used and in what context it should work. The commercial aspect also means that financial profit is rewarded, as products that are created are also expected to be sold for profit. Students often realize how difficult it is to go from theory to practice and that universal design is extremely difficult, as the expert users have different perceptions of what is good or less good, and as one millimeter more or less material can be decisive for whether something is ergonomic or not. However, students also learn that it is important to test your ideas early, with different people, and that innovation can be created if you are open to it and that knowledge and curiosity play a big role.



Figure 3. Design solutions created in the course Design for all.

In groups of 4–5 students per expert user, they shape and create different ideas together. The students work quickly with test models linked to their challenges. They use clay, straws and metal wire and other leftover materials are used to quickly build and test models together with the expert users. The observations of grip, body movement and functions together with the students' ideas start to form an idea with new functions. During short sessions, they test different grips, angles and concepts to meet the set challenge. After the test the students analyze their observations, models and ideas and iterate their findings for the next test where they have three ideas to test and shape. These concepts are tested again with the testers providing new feedback on the models. For the third and final test, the students work iteratively to refine the models. They connect coloring and form that challenge or neutralize the identification related to different norms, such as gender, ethnicity, etc. The result they get to share is an oral presentation that shows the design process, with parts from observations, compilations and a design proposal in clay that is colored in the way the student wishes.

How create is being taught can also be seen in the course Universal design of digital accessibility. There is a focus on doing, and it is the text that the students create that we focus on. The second part of this course consists of writing, with a focus on both Plain Language and Easy to Read content. In Plain Language the sentences are shorter, the text is divided into more paragraphs, and abbreviations and extra long or unusual words are avoided. This gives the students a foundation but they need a great deal more practice to master writing. The third part of the course is about accessible documents (presentation and technique). Here, content, presentation and technique come together for the first time. The students put content,

text and images together in a nice presentation (layout, structure, typography, colors et cetera) and use the proper technique to turn it into an accessible document.

The fourth part is to develop and test digital prototypes. That is the part where we spend most of the time. In the last step, the student's personal project is about widening or deepening their knowledge. The students learn the software needed to build prototypes in a day or two. The rest of the time is spent on learning how to test and how to involve real people.

By doing many tests and involving many users in the process students get people who are tired, have a hangover, stressed, have a cold et cetera, which is an advantage. The students test with few persons at a time, to be able to do many iterations. The students have to make sure that the prototype works and is understood before they do any coding. The aim for the prototype is not to make it fully functional, just good enough for testing and demonstration. It is important to try new things when it is not going as you have expected (Schön 1987). We believe that this way will give us a better product in a shorter amount of time.

In conclusion, in this phase it is the responsibility of the students to include the most demanding users in the design process. By including as many users as possible there could also be economical and environmental profits but, most of all, it could lead to innovation for a diversity of people.

Reflecting – a method for learning

The last phase in the courses consists of reflections. Reflections can be used as a pedagogical tool for learning (Bie, 2014; Schön, 1987)

and according to Boud (2000) this is also a way to raise the quality in order to achieve continuous quality improvements. Evaluation methodology is also central in the teaching of Universal Design (Christophersen, 2002).

In the example courses we use evaluation and reflection as tools for continuous improvement in how learning is stimulated in the progression and how we get continuous student reflections in the courses. The three course examples all follow a similar cycle with different steps which include students' reflective observations with analyses and drawing conclusions from an experience with an aim to take the learning into new stage. This is in line with models by Gibbs and Kolb, describing a process from a description of the experience to conclusions and an action plan of what to do next at the end of the cycle (Gibbs, 1988; Kolb, 1984).

The students write self-reflections which are integrated throughout all three courses and take place continuously in the process with the purpose to stimulate learning. They reflect with the focus on why, together with the tasks that they hand in. This is in line with researchers who claim that progression over time with systematic support in a framework for reflection is important in the learning process (Kolb 1984, Gibbs 1988, Schön 1987). Based on students' self-reflections, we see that they believe that design for all and universal design are very important for inclusion. What we hear is that the students' first thoughts were that design for all is easy. However, when they are in the process of working together with expert users with decreased hand functions, they get frustrated about not finding one shape that fits all. They find out that there is not one design solution when creating innovation. This is one component in how learning is stimulated in the progression. We can see what the student

has done, it is the “why” that is more interesting and that shows if the student has understood. Co-creation has been difficult with the digital prototypes. We have been able to reach two tests and iterations in one day but it’s difficult to keep that momentum. It’s not as direct as working in clay with a physical handle. We can involve users in many other ways as well, from traditional interviews and observations to card creation and sorting.

One example of how to use student reflections in courses is in the first example course, Design for freedom, where the students write an informal text reflecting on the content in different articles within the area of norm critical and norm creative design. At the end of the first week students gather at a seminar to discuss and reflect on the articles. Then the students go off to find examples of one normatively good and one normatively bad product. We then discuss their findings together. Next, the students get a couple of articles within the area to read. Meanwhile, they write a text individually with reflections on the articles. The last day of the week we gather for a seminar where the students first discuss in groups and finally summarize for everyone.

Another example is in the course Universal Design Theory, where the last step in the course is to write about one page describing what they have done, their experiences, and ideas for improvements. After that, the class meet in small groups to discuss their experiences and thoughts after doing the assignment. This is a great opportunity to, for instance, discuss other people’s gaze, a sense of belonging or not belonging, or the shift in perspectives trying to reach something from a wheelchair at the supermarket. This is an example of an exercise inspired by constructivism. The course always ends with 20-30 minutes of live evaluation. During one of these sessions, a student brought up a need to discuss their experiences more in depth. The

next year we added such a discussion slot, which has proven very valuable both as a chance for a debriefing session and as a learning opportunity, hearing about and discussing each other's experiences in small groups in order to increase the understanding.

The purpose of this last phase of reflection is to evaluate design solutions, but it is also a great method and an opportunity for the students to reflect upon their own learning and insights in the design process.

Concluding discussion

In summary, the aim of this paper was to contribute and give insights into how we teach universal design regarding what characterizes the course design and key components. It is the holistic perspective of how we teach that is interesting even though all three courses have similar content, layout and progression, but there are some differences in the course phases.

The courses in this article have in common how learning is stimulated in the progression. As teachers, we have an active student perspective. We start off by laying a theoretical ground before moving on with the practical parts. The students begin at a lower level by learning and understanding, and then the knowledge increases. The understanding is important initially but will also recur several times in different ways and at different places in the courses. The process and level of knowledge takes a different amount of time for each student and student group. Understanding is also created in the process with co-creation in different ways at different phases with expert users and guest lecturers who give their perspective on universal design. The students implement in creative environments

what they have learned including the users in the process. Furthermore, the iterative process of knowledge is increased by using constant student reflections in the progression. Reflection is about creating an awareness of one's own practice linked to theoretical frameworks and being able to describe it. The learning objectives are also connected to this.

By exploring the practice, we hope to spread the understanding and practical examples for further development in more learning environment and hope to get feedback from readers about what they can take with them to their own teaching regardless of where in the world it takes place.

References

Bardzell, J., & Bardzell, S. (2013). What is critical about critical design? Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. 3297-3306. <https://dl.acm.org/doi/10.1145/2470654.2466451>

Biggs, J. B. (1996). Enhancing teaching through constructive alignment. Higher Education, 32(3), 347–364.

Biggs, J. B., & Tang, C. (2011). Teaching for quality learning at university: What the student does. Open University Press.

Bie, K. (2014). Reflektionsboken för pedagoger. Malmö: Gleerups.

Björklund Boistrup, L. & Selander, S. (red.) (2022). Designs for research, teaching and learning. A framework for future education. Routledge. (Open access)

Bloom B., S. & Krathwohl, D., R. (1956). Taxonomy of Educational Objectives: The Classification of Educational Goals, by a committee of college and university examiners. Handbook I: Cognitive Domain. New York, Longmans, Green.

Boud, D. (2000) Sustainable Assessment: Rethinking assessment for the learning society. Studies in Continuing Education 22(2), s.151-167.

Christophersen - 2002 - Universal Design - 17 Ways of Thinking and Teachin.pdf

Dewey, J (2005) Individ, skola och samhälle, Hartman, Sven G. (Redaktör/utgivare), Hartman, Ros Mari (Översättare), Förlag: Natur & Kultur.

Dewey J. 2015. *Experience and education*. Andrauppl. Free press, New York.

Gibbs, G. (1988). *Learning by doing: A guide to teaching and learning methods*. Furthe rEducation Unit, Oxford Polytechnic, Oxford.

Innovationsguiden. <https://innovationsguiden.se>

Kolb, D., A. (1984) *Experiential learning: experience as the source of learning and development*. Prentice Hall. <http://www.learningfromexperience.com/images/uploads/process-of-experiential-learning.pdf>. date of download: 31.05.2006

Lorentzen, L., & Hedvall, P-O. (2018) *Bringing Human Diversity into Design Processes Through Empathic Modelling*. *Studies in health technology and informatics*. 256. 128-136.

Noble, I. & Bestley, R. (2016) *Visual Research An Introduction to Research Methods in Graphic Design*. Fairchild Books.

Schön, D. (1987). *Educating the reflective practitioner. Toward a new design for teaching and learning in the professions*. San Fransisco, US: Jossey Bass.

Selander, S. (2022). *Design för undervisning och lärande i en tid av förändring*: 174–178.

Svenska institutet för standarder. <https://www.sis.se/produkter/miljo-och-halsoskydd-sakerhet/ergonomi/ss-en-171612019/>