This thesis studies learning at the boundary between university, society and other academic institutions in food science, food quality, and animal welfare. Two specific practices are explored, work-based learning (WBL) and the use of open educational resources (OER). The aim is both analytical – to understand WBL and the use of OER as boundary activities in these domains – and design oriented – to develop models and methods for working with and enhancing open learning practices.

The studies are concerned with a local WBL practice, a global community using OER and quality assessment of OER. The participants are higher education researchers, teachers, students, and actors in industry.

The main contribution of this thesis is that WBL supports boundary crossing activities between academia and industry and carry a learning potential. Furthermore, the use of OER supports boundary activities between academic institutions. Both these practices also challenge established structures and involve tensions that are subject of negotiations. In WBL student projects as boundary crossing activities must fulfil demands from both higher education and industry where individual student agency becomes important. In working with OER there is a tension between institutional quality concerns on one hand and participatory approaches and a sharing culture on the other. The studies also indicate that individual teacher agency is most vigorous when situated in small and subject specific communities using OER. Finally, the research indicates that open learning can be an instrument for higher education to be in dialogue with society and ultimately contribute to sustainable development and more democratic food systems.

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Open Learning in Life Sciences

UNIVERSITY OF GOTHENBURG

Open Learning in Life Sciences

Studies of open educational resources in animal welfare and work-based learning in food science

Anne Algers

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To my surprise!

Nelson Mandela: "Education is the most powerful weapon which you can use to change the world". ("Lighting your way to a better future": Speech delivered by Mr N. R. Mandela at launch of Mindset Network, July 16, 2003).

ABSTRACT

The aim of this thesis is to explore ways of organising and supporting open learning in food science, food quality and animal welfare at the boundary between society, the university and other academic institutions. Two specific practices are explored, work-based learning (WBL) and the use of open educational resources (OER). The aim is both analytical - to understand boundary activities in these domains - and design oriented - to develop models and methods for working with and enhancing open learning practices. The thesis also attempts to make a contribution to sustainable development and a system of food production that is in compliance with the views of society.

The theoretical approach is cultural historical activity theory, and more specifically theories on boundary crossing and learning at the boundary between activity systems.

The empirical research the thesis build on is presented in five articles focusing on questions about boundary activities of students, teachers and actors in industry, concerned with a local WBL practice, a global community using OER and quality assessment of OER. The empirical material was collected through surveys, video recordings and interviews, and analysed with qualitative as well as statistical methods.

A main contribution of this thesis is that it demonstrates how WBL can support boundary crossing activities between academia and industry and carry a potential for learning at the boundary. Furthermore, the use of OER supports boundary activities between academic institutions.

Both these practices challenge established structures and involve tensions that are subject of negotiations. In WBL student projects as boundary crossing activities must fulfill demands from both higher education and industry, where students have a mediating function and individual student agency becomes important. In working with OER there is a tension between institutional quality concerns on one hand and participatory approaches and a sharing culture on the other.

Furthermore, the study indicates that open learning approaches are most vigorous when situated in content-driven, subject specific and rather small and open communities. A local community of higher education

teachers in food science is one example and the global community of animal welfare teachers another.

This thesis does not aim at generalising to higher education in other scientific fields than food science, food quality and animal welfare. However, some of the results could be generally applicable to learning at the boundary such as WBL carrying a learning potential and OER carrying a potential for a sharing culture. WBL and OER as approaches to open learning can be instruments for higher education to be in dialogue with society.

Finally, the thesis points at the complexity of our relationship to food and suggests that more inclusive learning approaches could contribute to sustainable development and more democratic food systems.

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Keywords: open educational resources, work-based learning, sustainable development, animal welfare, food quality, food science, cultural historical activity theory, design

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Björkö, September 2015
Anne Algers

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PART I

CHAPTER 1
INTRODUCTION

This thesis explores how to open up higher education in food science, food quality and particularly animal welfare, and how activities at the boundary to the society, industry and other academic institutions may evolve. Open learning is a broad term, referring to activities that either enhance learning opportunities within formal education systems or broaden learning beyond formal education systems (D'Antoni, 2009).

There are various reasons for choosing this interdisciplinary theme. First, open learning is a rather new phenomenon with significant potential for the democratic dimension of higher education (Hylén, 2006; Iiyoshi & Kumar, 2008). Second, open learning reinforces the collective and collaborative aspects of teachers and students practices, but is also challenging both at individual and systemic levels (McGreal, Kinuthia & Marshall, 2013). Third, food science and food quality are scientific disciplines that concern us all and embrace normative and value-laden aspects of sustainability and food security (Wright & Middendorf, 2008). Fourth, animal welfare is included in the concept of food quality (Broom, 2010) and is a global and separate research and teaching discipline which is relatively

young (Broom, 2005). The fifth and final reason for choosing this interdisciplinary theme is the potential and concerns of applying open learning to the subjects of food science, food quality and animal welfare. In terms of research relevance, few studies seem to have addressed our understanding of open learning for a specific subject area in one and the same work.

In this thesis, I have studied aspects of open learning and the activities of higher education teachers, students and other learners when engaged in open learning within the specific subject areas of food science, food quality and animal welfare[1].

GLOBAL CHANGES

During the last decades, societal changes have transformed the premises for knowledge and learning and Castell (2010) has written a comprehensive overview of the development of the network society. It describes the social dynamics in the information age that contributes to the multidimensional complexity of the concerns in society but also affects how we collaborate and learn.

Universities and researchers are increasingly connected, making universities more global with all that implies in terms of cultural differences, new contexts, and changes in the way knowledge is produced. However, higher education has adapted very little in response to these changes and is still associated with face-to-face interaction (Castell, 2010) and with solitary work being the norm (Burke, 2012).

Hence, a university's strategy for internationalisation and communication with society has to take into consideration our global network society with its Internet-enabled communication processes and knowledge sharing based on the social knowledge networks that make it up. This transformative view on learning and knowing has great implications at systemic and individual levels (Säljö, 2010; Thomas & Brown, 2011). Distance education seemed like a reasonable response to this development, however distance courses generally require tuition and password, provide socially isolated participants with generic material that can be downloaded and

1 The thesis is based on a theoretical framework (Cultural Historical Activity Theory and the idea of boundary objects) (Engeström, 1987), described in the theory section.

consumed and does not necessarily contribute to making higher education connected, participatory, personal and open (Wiley, 2006).

Open education is related to how scientific knowledge is produced, presented, taken up and utilized. Some authors even claim that new models of production of scientific knowledge are developing as a response to societal demands. Gibbons, Limoges, Nowotny, Schwartzman, Scott & Trow (1994) argued for a new paradigm of knowledge production that would supersede the old paradigm with a hegemony of autonomous scientists and academic institutions. In this new paradigm – ´Mode 2´ – knowledge production is "socially distributed, application-oriented, transdisciplinary, and subject to multiple accountabilities" (Nowotny, Scott & Gibbons, 2003, p. 179).

This alleged paradigm shift parallels a change in the realm of education that has taken place during the last couple of decades. Here, at least four examples of this paradigm shift were identified, namely (1) learning as acquisition or participation, (2) computer-supported collaborative learning, (3) cultures of learning, and (4) open learning approaches.

Learning as acquisition or participation are two metaphors described by Sfard (1998). Although the two distinct concepts could be identified, Sfard found that they were interrelated and interacted with each other in the learning situation and therefore we cannot neglect any of them. However, the debate on the different perspectives on learning questioned the prevailing belief, that knowledge is transmitted from one individual mind to the other.

That knowledge can be seen as the result of learners interacting with each other, sharing knowledge, and producing knowledge as a group got a new dimension with the arrival of the Internet. In the 1970s computer supported collaborative learning (CSCL) emerged as a new paradigm of learning (Koschmann, 1996). This was an approach using the Internet for learning through social interaction, sharing and construction of knowledge and was mirroring the emerging perception of cognitive and social activities being intertwined (Koschmann, Hall & Miyake, 2002).

The power of digital technologies for reframing learning was also critical to Thomas and Brown's (2011) proposal of "a new culture of learning". This is a description of a change from higher education producing, offering and examining knowledge based on a push approach in which

knowledge is "transmitted" to the learners to taking more of a "pull" approach, where higher education is demand driven, and looking at a broad range of methods to make knowledge in tune with and available to the society. The institutional argument against this is that by having a demand driven approach you put too high expectations on the society and that the universities should "show the way", but it could also be argued that the society is very well equipped to at least take part in the debate about the educational needs. This is not an argument for demand driven knowledge at the expense of basic research and education in basic subjects, but for demand driven knowledge as a complement to basic research and education in basic subjects.

The new culture of learning, is also described by Thomas and Brown (2011, p. 35) as an ecology "where the context in which learning happens, the boundaries that define it, and the students, teachers and information within it all coexist and shape each other in a mutually reinforcing way". They suggest that the new culture not only focuses on explicit knowledge but also on the reinforcement of tacit knowledge, because this knowledge evolves from personal experience and experimentation and becomes personal and non-transferable, meaning that "you can't teach it to me, though I can still learn it" (Thomas and Brown, 2011, p. 77).

As Thomas and Brown (2011) pointed out, digital technologies are no longer just a fast way to transmit information; instead understanding is socially constructed through this digital medium, which is constantly being changed by the participants themselves. This is the background for the fourth example of the identified paradigm shift, which is the development of more open learning approaches, such as massive open online courses (MOOCs) and open educational resources (OER).

OPEN LEARNING THROUGH OER

Two international initiatives encourage changes in the direction of open learning in higher education; The article 13 in the UN declaration argues that "higher education shall be made equally accessible to all, on the basis of capacity, by every appropriate means, and in particular by the progressive introduction of free education" (UN, 1966) and a recent initiative from the European Commission (EC, 2013, p. 10) states that "Member

states and educational institutions should encourage formal education and training institutions to include digital content, including OERs, among the recommended educational materials for learners at all educational levels and encourage the production, including through public procurement, of high-quality educational materials whose copyrights would belong to public authorities".

OER is a rather new phenomenon. Those who support OER argue for a culture of participation, which is building on the Web 2.0 and collaborative learning theories, which is called open educational practices (OEP). However, some authors claim that we still only see a culture of sharing (Iiyoshi & Kumar, 2008). OER *per se* do not constitute a new kind of learning, unless they are used within a practice that is intended to realise a new learning approach. This social learning approach can be collegial between peers, include students and/or even be inclusive to citizens in society.

This social dimension implies a shift of attention from access to information (what we learn) to access to other people (how we learn). This shift has consequences for the role of teachers, as expressed by Iiyoshi and Kumar (2008, p. 101) "Faculty members have served for centuries as a knowledge filter, providing interpretations of disciplinary knowledge, guiding students toward important ideas and methods of enquiry so that they themselves can get expertise. Rather than defining a rigid course, are academics ready to become more like facilitators, guiding students through the raw disciplinary remixing?". Thus, what is suggested is to open up education through giving access to an unfiltered knowledge bank, in which students' critical thinking and teachers' guidance is crucial.

By giving teachers and students agency the boundaries between teachers and students are blurred resulting in transformation of higher education institutions at both the systemic and the individual level. The three fundamental design features of open education include the combination of learning and research, communication and collaboration, and the ability to share findings within networks argued for by a EU recent strategic document (EC, 2013) seem to go in the direction of blurring those boundaries.

Another contemporary approach to open learning is MOOCs. However, MOOCs are not always open, since the incentives for openness in

most cases are limited to open enrolment in contrary to the OER movement where openness is related to openly licenses and free and sharable resources (Atenas & Havemann, 2013). MOOCs have also been criticised for neo-colonialism and low retention rates and that the learning situation sometimes is instructivistic (Daniel, 2012), but it is a new business model for universities that has triggered a debate and taken the issue of open education from being a concern between single enthusiasts to the management level in most higher education institutions. MOOCs are nevertheless out of scope of this thesis.

HIGHER EDUCATION OF SOCIETAL RELEVANCE

The rationale for open learning is that, in addition to the participatory advantages, it highlights societal relevance (Coffey, 1988). Some knowledge domains are more vibrant and of general interest than others, and knowledge about food inevitably concerns us all on an everyday basis. Two interrelated aspects of food quality are sustainable production methods and the welfare of our food production animals. They are international and interdisciplinary concerns related to natural and social sciences as well as ethics.

Education for sustainable development is characterised by social cohesion, equity, justice and well-being and is a plan of action to reduce the human impact on the environment (UNESCO, 2009). Lundholm (2011) also suggested that learning about sustainable development serves purposes of awareness raising, promoting moral understanding and developing metacognitive skills in order to enable the learners to participate and take action in society.

Humans are dependent on nature for the production of food; hence a non-sustainable food production is a real threat to society (Rockström, et al., 2009). Since we are dependent on farming products in order to meet our basic needs, it is in the interest of the selfish human being to continue to eat food that is produced in a sustainable way. Accordingly, the quality of food today must be defined not only by food safety, aesthetics and health but also by means of how ecological, economic and social sustainable it is (Verbeke & Viaene, 2000; Maloni & Brown, 2006; Miele, 2011).

A holistic view on food quality was put forward already in 1993, when it was defined as the sum off all properties and assessable attributes of a food item, acknowledging that the assessments have a subjective component (Leitzman, 1993). Ethical issues arise in any food chain and the depth and range of ethical aspects of the "history" of foods are often hidden, but the potential for opening up this information is considerable (Wright & Middendorf, 2008). However, there does not seem to be much research published on open learning in the field of food science and animal welfare.

Animal welfare is an aspect of sustainability and food quality (Broom, 2010) and a subject of increasing concern in society (Verbeke & Viaene, 2000; Bayvel, Rahman & Gavinelli, 2005). Thus, the societal needs of knowledge in animal welfare are extensive (Special Eurobarometer, 2007) and may go beyond what can be accomplished within formal educational structures. Animal welfare is a rather new domain in higher education, and is taught in many veterinary faculties worldwide (Broom, 2005). In primary and secondary education however, animal welfare is not an established domain but recent development at EU-level is expected to have a strong influence on the national laws regulating education at all levels and on implementation of the teaching of animal welfare in schools and universities (EC, 2012a).

Three decisions at the European policy level place animal welfare high on the agenda; The Amsterdam Treaty (EC, 1997) stated that animals can feel pain and suffer and the Lisbon Treaty (EC, 2007) stated that since animals can suffer we need to pay full regard to their welfare. Consequently, the Animal Welfare Strategy argued that "This puts animal welfare on equal footing with other key principles mentioned in the same title i.e. promote gender equality, guarantee social protection, protect human health, combat discrimination, promote sustainable development, ensure consumer protection, protect personal data" (EC, 2012b). An action plan (EC, 2006) describes the challenges of raising awareness about animal welfare in all members of society as a means to achieve the same vision for what is good animal welfare.

OPEN LEARNING THROUGH WORK-BASED LEARNING

By transforming the education system and its instructional practices in accordance with social needs, higher education becomes aligned with education for sustainable development. At the systemic level, open learning can refer to activities that either enhance learning opportunities within formal education systems, by eliminating barriers and giving opportunities and recognition for participation in formal learning, or broaden learning opportunities beyond formal education systems (D'Antoni, 2009).

This view of learning echoes some of the arguments made, and epistemological positions held, by pragmatists such as John Dewey. As a radical educationalist Dewey stated already in the beginning of the 20th century that "What nutrition and reproduction is to physiological life, education is to social life" (Dewey, 1916, p. 9). Thus, Dewey conceptualised education as a process of sharing experiences and argued for a society connecting education and life and for openness as a way of thinking and relating to the world (ibid.). Dewey discussed the relation between education and work, arguing that "the only adequate training *for* occupations is training *through* occupation. The educative process is its own end, and the only sufficient preparation for later responsibilities comes by making the most of immediately present life, applies in full force to the vocational phases of education" (Dewey, 1916, p. 310).

Work-based learning (WBL) is striving to use the workplace as a vehicle for learning in line with the early ideas of Dewey (1916) on purpose, experience and reflection in relation to learning. In WBL the learner is involved in the co-construction of knowledge and thus in making higher education responsive to or relevant for the society (Billett, 2001b). In many areas of higher education there is an ongoing discussion on the relation between theory and practice. This discussion is not only rooted in the early ideas of Dewey, but also to the ideas of Schön (1987) on constructionism, where knowing and doing are co-acting like a spiral where the one informs the other, which in turn feeds back and generates further knowledge, and so on. In many profession-oriented fields such as teacher and nursing education there are long traditions of involving practice-based elements into the curriculum (Walsh, 2007; Webster-Wright, 2009).

A wide variety of models have been testified for organising collaboration between academic institutions and actors in industry and public sector aiming at using the workplace as a vehicle for subject-specific learning (Betts, Lewis, Dressler & Svensson, 2009; Walsh, 2007) and a rich body of literature explores the potential of WBL. Several benefits have been documented, such as enhanced student motivation (Nixon, Smith, Stafford & Camm, 2006; Lester & Costley, 2010) and students' employability, and the development of generic skills (Yorke & Knight, 2006; Alpert, Heaney & Kuhn, 2009).

Generic skills are often referred to as non-discipline-specific competences, which make it possible for the learner to navigate in and between different cultures. Tacit knowledge is difficult to report but deeply rooted in involvement in a specific context, which help to perceive and define the context (Raelin, 2007) but make it difficult for new members to understand. Higher education has an obligation to contribute to the development of flexible and critical citizens and WBL has been highlighted to support the development of generic and tacit skills (Raelin, 2007).

However, WBL has also been criticised for some of the learning that takes place being at low academic level and for being commercially-driven (Lester & Costley, 2010). This criticism reflects the boundary nature of WBL, which at the systemic level has been explained by academia and industry having different premises, expectations and goals (Elmuti et al., 2005; Lester & Costley, 2010), and at the local level is related to the three stakeholders (university, industry and students) having diverse but overlapping needs (Alpert et al., 2009).

As argued above, OER and WBL are approaches in higher education that can break up the boundaries between university and society. The adoption of OER based on Web 2.0 not only can break up the boundaries but is also an approach that increases learner agency and has a disruptive character (McAndrew & Farrow, 2013a). WBL is a boundary practice where the students are crossing the boundaries between different contexts carrying a learning potential (Akkerman & Bakker, 2011). The approaches are based on an assumption that there is both a desire and an ability to share and apply knowledge, but may also involve tensions that are challenging the individuals, since they are breaking boundaries.

Hence, open learning can take place through different models of WBL (Bowen, 1987) and open educational practices (McAndrew, 2011), but is not limited to these models since it is defined by the teachers and learners motivation and context and teachers' pedagogical skills and support, and the interpretation has changed and is changing further (Lane, 2009). Lane argues that "openness can be equated with freedoms, but the degrees of freedom available within a particular openness can vary and can be influenced by many other factors beyond the license and particularly how potential users perceive their openness" (Lane, 2009, p. 3).

In summary, higher education needs to act strategically with new and open learning approaches based on research in educational sciences, to align with the needs and interests of society, teachers and individual learners.

1.1 AIM AND RESEARCH QUESTIONS

The general aim of this work is to contribute to the knowledge about activities in higher education organising and supporting open education and learning in food science, food quality and animal welfare at the boundary between society, the university and other academic institutions. An important perspective is to make a contribution to sustainable development and a system of food production that is in compliance with the views of society.

The aim is both analytical - to understand boundary activities in these domains - and design oriented - to develop models and methods for working with and enhancing open educational practices. The aim is realised by studying two formats of opening up higher education: use of work-based learning in food science; and design, creation, use and sharing of open educational resources in food science and animal welfare.

The overall research questions are:

1. How can one understand work-based learning in food science as a boundary activity?
2. Which are the institutional and individual incentives for adopting open educational resources in food science and animal welfare?
3. Which are the institutional and individual concerns for adopting open educational resources in food science and animal welfare?

4. How can one understand peer reviewing as a quality assessment method of open educational resources in animal welfare?
5. How can a productive method and an infrastructure for sharing and using open educational resources be designed?

1.2 OUTLINE OF THE THESIS

The present study is divided into two parts. Part I consists, besides the introduction of

2) background including a review of related research
3) theory framing the research interest
4) description of the research design and methods
5) summary of the empirical studies
6) concluding discussion
7) Swedish summary.

Part II includes five studies as reported in the following five articles. My contribution to each part in the articles is indicated as a percentage of the total effort in Table 1.

Article I Algers, A., Svensson, L. and Lindström, B. (2015). Work-based learning through negotiated projects – Exploring learning at the boundary. Forthcoming in *Higher Education, Skills and Work-based Learning*.

Article II Algers, A., Lindström, B. and Pajor, E.A. (2011). A new format for learning about farm animal welfare. *Journal of Agricultural and Environmental Ethics*, 24(4), 367-379.

Article III Algers, A., Silva-Fletcher, A., Gregory, N. and Hunt, M. (2013). The development of a new methodology for knowledge sharing in the interface between university and society - an example from the meat sector. *Journal of Meat Science,* 95, 672-678.

Article IV Algers, A. and Silva-Fletcher, A. (2015). Teachers' perceived value, motivations for and adoption of open educational resources in animal and food sciences. *International Journal of Emerging Technologies in Learning*, 10(2), 35-45.

Article V Algers, A. and Ljung, M. (under review). Peer reviewing of OER in a contested domain – an activity theoretical analysis. Submitted to *Journal of Interactive Online Learning*.

Table 1. Contribution of thesis author to the articles (%)

	Article I	**Article II**	**Article III**	**Article IV**	**Article V**
Idea and hypothesis	50	50	80	70	80
Planning of work	90	80	90	90	90
Performance of work	95	90	80	95	95
Analysis and summary of results	50	80	80	70	80
Writing of manuscript	50	95	90	80	80
Corresponding with scientific journals	80	100	100	100	100

CHAPTER 2

BACKGROUND

This section describes trends in higher education in the Western world. However, it should also be pointed out that the situation is not homogeneous; rather there is a large variation in traditions and trends between diverse cultures and countries and even between universities in the same country.

2.1 HIGHER EDUCATION IN RELATION TO SOCIETY

Universities are unique in the sense that they both produce new knowledge and train future knowledge producers. The latter is a task that no other institution is equipped to undertake and therefore it is more a core activity than the research itself (Nowotny, Scott and Gibbons, 2001). However, the trend in western societies is that universities focus more on research than teaching, which has to do with increased societal emphasis on international university ranking, excellence centres and global competition for acknowledgement (Daniel, 2012). Furthermore, the governmental balance

in economical investment between research and education has in recent years changed in favour of research (Daniel, 2012; The Swedish Higher Education Authority, 2014).

Besides teaching and research many universities have a third task, known as public outreach. In Sweden it is specified as a responsibility to share research findings and make them valuable for society, but the fulfilment of this so called third task has been questioned, which has been explained by lack of solid theories of knowledge transfer between research and practice and low merit value for engagement in the interplay between universities and society (Tydén, 2003). An international study of public engagement activities has shown that senior scientists are more active than their less experienced colleagues, that public engagement is not equally distributed between scientific disciplines, and that there is a positive correlation between academic publishing and public engagement (Bauer & Jensen, 2011).

The term knowledge production was coined by Gibbons and colleagues (1994) who argued for a context-driven, problem-focused and transdisciplinary knowledge production. Gibbons and his colleagues labelled this "mode 2" knowledge production, distinguished from how it is traditionally done, which they labelled "mode 1" and described as academic, investigator-initiated and discipline-based. This argumentation has been criticised for being more of a political ideology than a descriptive theory and for being normative (Godin, 1998). But later Nowotny, Scott and Gibbons (2001) responded to the criticism by arguing that societal problems are getting more and more complex, that the belief in simple cause-effect relationship is naive and that interdisciplinary research has advantages.

Today, science and technology policies seek to strengthen the relationship between university, industry and government on the grounds that basic science is a common resource which must make its own economical contribution and be of relevance for the society. There is even a tendency to erode the demarcation between traditional knowledge institutions, such as universities, and other entities for instance research institutes, high technology SME's, think-tank's and NGO's, as the collaboration between these institutions increases and as the power relations changes because

status, power and knowledge is not only concentrated to the universities anymore (Nowotny et al., 2001).

Furthermore, the knowledge-based economy requires learners to act as professionals, to be able to construct new knowledge and ideas and to take responsibility for their own continual learning during their lifetime (Sharples, 2000; Kirkwood & Price, 2014). Thus, to involve the learners in approaches that combine research, education and societal interaction is reflecting that universities are not the sole owners of learning and that learners can have a role of contributing rather than consuming knowledge (Araya, 2008).

RELEVANCE AS MEANS OF SOCIALLY ROBUST KNOWLEDGE

Some complex issues such as sustainable development, health and ethics, are particularly in need of a collective and participatory angle of entry (Wals, 2007). One reason is the unpredictability and uncertainty in how these subjects will develop because of increased globalisation and normative changes, another is increased scientific evidence about the impact of societal changes on the vulnerability of the earth and human living.

Strong contextualisation occurs when researchers have the opportunity and are willing to respond to signals received from society and not only change research agendas and priorities but also research topics and methods. Strong contextualisation not only results in social robust knowledge, because social robustness can only be judged in a specific context, but is also capable of dealing with unknown and unforeseen contexts, thus socially robust knowledge has a strong empirical dimension and is subject to frequent testing, feedback and improvement because it is open-ended (Nowotny et al., 2001).

With strong contextualisation new ethical issues and dilemmas arise as a result of the growing power of society. One could argue that it builds on a bottom up perspective in contrast to a top-down and under certain circumstances results in no right or wrong answers but a need of open and transparent models for communication, critical reflection and further development.

The acknowledgement of that there may not be only one truth has in some ways undermined notions of scientific objectivity (Thomas &

Brown, 2011) and has increased the need of highly educated voices in the debate. It can be seen as a power struggle of importance for democracy and for leverage the level of debate and contribute to knowledge development. A public space where science and society co-mingle requires a well-educated population, which is critical, reasonable, and can express their views and voice their demands, often based on a combination of their roles as citizens and consumers (ibid.).

The increasing demand for participation in the societal debate is not only a result of democratisation; it is also evidence of universities being more and more successful in contextualisation; that they address the problems which are the concerns of the public. Thus, legitimate knowledge is defined in this thesis as socially robust knowledge that is not only assessed by individuals or limited scientific communities, but rather by wider communities of knowledge producers, disseminators, traders and users (Nowotny et al., 2003). That said; the importance of conducting basic research and educating students in basic subjects in order to meet long term societal expectations cannot be overemphasised.

The domains of food quality and animal welfare are here viewed as examples of subject areas in needs of strong contextualisation and spaces for collective processes, since they are areas of concern that are of relevance to every citizen and at the same time at risk of being more opinion based than evidence based.

COLLECTIVE PROCESSES THAT CAUSE OF TENSION

Thus, higher education plays a significant role in society through the education of competent citizens and through participation in the societal debate. Some claim that mode 2 knowledge production in comparison to mode 1 is more reflective, eclective and contextualised, which also has the effect that the distinction between research and teaching tends to break down (Nowotny et al., 2001). However, there are some fundamental differences.

Research is generally accepted as a community-oriented collective enterprise, where researchers build on each other's research results and where the results are quality checked through peer review (Albert, Laberge & McGuire, 2012; Smith, 2006). On the other hand, education is still

considered an individual enterprise, and teachers are often described as rather lonely in their solitary roles (Engeström, 1994; Iiyoshi & Kumar, 2008; Frydenberg, 2009), and teachers' career paths prioritise individual processes of collective. Since teaching is increasingly specialised it also becomes more and more vulnerable because specialised and distributed knowledge is heavily person bound. Thus, specialisation and globalisation can bring about an increase in multiplicity and diversity on the one hand and increased connection between social and cultural practices on the other (Hermans & Hermans-Konopka, 2010).

The adoption of OER and WBL can be seen as collective processes between teachers. In the case of OER, sometimes the process is only collective in the sense that one teacher uses a resource developed by a peer (Clements & Pawlowski, 2011) but collaboration between peers when creating OER occurs and WBL have also been found to benefit from having a team of teachers (Nixon et al., 2006).

Collective processes for students are highly positive for motivation (Petraglia, 1998), and computer supported collaborative learning can be seen as a meaning making process (Koschmann et al., 2002). Since interaction through computer networks remove time and space constraints they may help students sharing their ideas and expertise (Lipponen, 2002). An OER can function as a collective memory and make thinking visible through the storing of the history of the knowledge production process for subsequent revision and use (ibid.), and OER might not only be beneficial for the expansion of formal education but also for the support of informal learning (McAndrew & Farrow, 2013a).

Approaches like WBL and OER can also be seen as ways to give students some responsibility and control in relation to knowledge production. The pedagogical value of giving student agency is related to student motivation, and courses with high student achievement and retention are often the result of participatory processes (Martinez & Maynard, 2002).

The interest to conduct projects within industries or to engage in OER development can also be seen as students wanting to be engaged in their own professional development, and it has been shown that when students are constructing their own learning they personalise their learning process (McGreal et al., 2013).

To give students more agency and involve them in the production of knowledge does of course also involve risks. According to McGreal, Kinuthia and Marshall some institutions have due to quality reasons restricted the submissions of OER to educators only (McGreal et al., 2013), and many academics see WBL as threatening the emblematic features of higher education (Symes, 2001).

DIGITAL TECHNOLOGIES AS DISRUPTIVE OR SUPPORTIVE TOOLS

Digital technologies have been a major reason for the paradigm shift in higher education. Thus, it has not only made it possible to study at a distance, to use digital applications in the classroom and for teachers and students to communicate online, but also to collaborate on teaching activities, or from the institutional point of view on scaffolding (such as selection and sequencing into an educational process) to support student learning (Frydenberg, 2009). ICT has, however, also been a general threat to higher education, because it has disrupted traditional boundaries in education (Blin & Munro, 2008; Dirckinck-Holmfeld, Jones & Lindström, 2009). The switch has also been described as a shift from small scale, and highly personalised craft of teaching to a scalable higher education that is standardised, and thus not personalised (Katz, 2008).

Digital technologies have created new opportunities for higher education such as networked learning (Dirckinck-Holmfeld et al., 2009) and different modes for teaching. In networked learning "ICT is used to promote connections: between one learner and other learners, between learners and tutors, between a learning community and its learning resources" (Goodyear, Banks, Hodgson & McConnell, 2004. p. 5), leading to knowledge being created and discussed in complex networks. Dual-mode universities offer higher education, in contrast to traditional campus-based universities and complete distance teaching universities or open universities, as a combination of on-campus meetings and distance teaching. The early adaptors of dual-mode universities were found in large countries with scattered population (Daniel, 2012), such as Australia and Sweden.

It has been shown that integration of ICT in teaching depends on the compatibility of new technology with existing teaching methodologies

(Karasavvidis, 2009). If the technology has low transformative impact it is likely to be adapted but if it has higher transformative impact teachers might face the technology as a barrier. Karasavvidis (2009) took the example of the easily adaptable OH projector, which can be used in the same way as the chalkboard. Accordingly, the integration of OER depends on if the resource is compatible with existing teaching in higher education, e.g. if it is stand-alone and include own scaffolding. It can be expected that OER with high transformative impact (neither being neutral nor with scaffolding) will take more effort and time to integrate, but examples from and contact with institutions and individual teachers within own subject area can enable adoption of OER (Conole, 2010).

Apparently, higher education is moving in the direction of open education (Peters & Britez, 2008), but open education based on OER is not standard in higher education and there are even trends in the reverse direction. OECD (2012) found that 6 countries had national OER policies, 7 countries were developing OER policies, 11 countries discussed national policies, but four countries (including Sweden) had not started any preparations at national levels nor mentioned OER in any official documents (ibid.).

Taking in consideration that the future concerns and developments are based on which approach of open education we focus on, there is a need for a more critical understanding of how this new higher education paradigm based on open and collective learning actually gets taken up and used by people and what the reasons are to why it does not take off. Three key conditions for the uptake of OER and WBL in higher education are changing target groups, changing conditions for teachers and changing political and strategic structures.

CHANGING TARGET GROUPS

An increasing demand of access to higher education is created primary due to a growing global population, an increasing middle class, and an increasing life expectancy (Iiyoshi & Kumar, 2008). Kumar (2009) added to this list an accelerated participation in the global knowledge economy, caused by a rapid development agenda (especially in the developing coun-

tries) leading to learners with highly differenced levels of preparation (Kumar, 2012).

Therefore, politicians in some countries argue not only for a need of mass education but also for an egalitarian model (Iiyoshi & Kumar, 2008). Equity has to do with widening participation to groups of learners' with other backgrounds than the ordinary higher education learner, and access to higher education is partly related to increasing access to Internet and use of mobile learning techniques (Blessinger & Anchan, 2015). The need for educational reconstruction mainly has its reason in increased internationalisation and the development of democracy, which brings up the issue of new target groups.

Given the global job market, students are likely to switch jobs, even entire careers, several times during their professional lives (Iiyoshi & Kumar, 2008). Thus, students have to be more receptive to changes in society and therefore they have to acquire "portable skills", allowing them to see patterns where others only see chaos and to distinguish between reliable and unreliable sources (ibid.). These portable skills are often named generic competences, generic attributes or gradual employability skills as they prepare the student for flexibility.

Hence, some students want to get their education from the best universities and experts, irrespective of their location (Frydenberg, 2009). Another segment of students do not want to move geographically in order to study (Cavanaugh, 2005), which can be a consequence of students sometimes starting to build families during university studies or that they work besides study. This can also explain that a growing number of students take part in off campus learning activities offering more flexibility. Therefore, universities have started to adjust to these new trends and to transform their teaching and adapt ICT to give students more freedom in time and space.

Open learning approaches like WBL attracts non-traditional target groups because it includes periods of more practical related studies (Lester & Costley, 2010), and it has also been documented that when using OER universities reach new target groups compared to the traditional (Schuwer & Mulder, 2009).

Changes in target groups, learning objectives, and increased mobility and use of technologies place greater demands on teachers' ability to adapt

and to their digital competences. Furthermore, a characteristic of open learning is that the users themselves are involved in setting up the target for their studies, which is clear in the case of negotiated WBL, whereas creators of OER to different degree have succeeded in taking the users' perspective and to involve them in knowledge development (Camilleri, Ehlers & Pawlowski, 2014).

TEACHERS' CHANGING CONDITIONS

Social constructivism emphasises that learning is a result of a social activity, which is in contrast to the standard way of conducting higher education that focus on the transmission of knowledge from the teacher to the learners and on reproduction of knowledge at the examination (see e.g. Säljö, 2010).

Moreover, pedagogical consciousness and competences are generally low in higher education (Burke, 2012), where academics' in many countries can conduct their teaching duties with only a couple of days of professional teacher training. There is also no reason to expect that higher education teachers differ from teachers at school level, where limited ICT use is explained by lack of confidence in the use of ICT, combined with low access to resources and time constrains (Karasavvidis, 2009).

Professional development regarding ICT in higher education institutions is problematic because technology changes quickly and educational institutions slowly (Burke, 2012). Other barriers are teacher motivation and that higher education teachers are also researchers aggravates these built-in dilemmas. It has been found that because of the strong emphasis on the new public management in universities, successful employees in universities focus on research and publishing (Blessinger & Anchan, 2015), but leaves teaching and routine work to the less successful researchers. Thus, in order to increase the incentives for teachers to engage in open approaches, educational qualifications need to be recognised in the same way as academic publication (Kanwar, Balasubramanian & Umar, 2010).

As technology advanced and constructivist theory gained popularity in higher education, technology's use in such education increased, especially for administrative and communication purposes, and instructional design was introduced in order to make acquisition of knowledge more efficient

and appealing (Svensson, 2002). In distance education the design should provide certain flexibility for the course participants, however the balance between how much scaffolding that should be given in relation to student flexibility in a given context is not evident, which make it difficult to discuss generic quality aspects of any design (ibid.).

The transfer from a constructivistic view on learning where the learning outcomes are understood as predictable and where instruction controls the learning process (Petraglia, 1998) to a socio-constructivistic view on learning needs approaches that emphasise both the individual learner and the social collaboration. One could argue that a philosophy underpinning the use of WBL and OER in teaching is based on the ideas of Dewey's on that learners conduct inquiries about what they want to learn. He argued for education as a democratic project offering personal choices and encouraging reflective practices and for teachers facilitating learning by guiding the learning path (Dewey, 1916).

It has been suggested that in order to make teachers adopt OER in their teaching, the OER itself should include a navigation structure supporting the learning process and provide a "teacher page" suggesting a learning path for the users (Wiley, 2007). However, in open educational approaches, students are given agency, which also mean that teachers need to take a step back and involve the learner in the knowledge production. This places special demands on the OER, but also on the teacher.

Some researchers claim, that the traditional teaching culture has left teachers to practice as they chose and impeded teachers' professional development, but collaboration between teachers and in particular through the use of online communities for teachers is suggested to enable their professional development (Liu, 2012). Furthermore, teachers in higher education traditionally have had a certain status but through the adoption of more horizontal learning approaches, they need to give up some of the control, leading to lack of academic confidence that has been documented in the case of both WBL (Walsh, 2007) and OER (McAndrew & Farrow, 2013a).

CHANGING POLITICAL STRUCTURES

Several initiatives have been announced at global, European and EU level in order to encourage open higher education. Open education is motivated by a belief that learners desire to exercise agency in their studies and "open" refers to the elimination of barriers that can impede both opportunities and recognition for participation in institution-based learning (Wikipedia, 2015).

The UN International Covenant on Economic, Social and Cultural Rights of 1966 declared, in Article 13, that "higher education shall be made equally accessible to all, on the basis of capacity, by every appropriate means, and in particular by the progressive introduction of free education" (UN, 1966).

At the European level, the European Convention on Human Rights adopted in 1950, an article which obliged all "signatory parties" to guarantee the right to education in Europe. In November 2013 the European Commission launched a communication on "Opening up Education". It included an action plan and an encouragement to member states and higher education institutions to stimulate open access policies for higher education publicly funded educational materials. It also encouraged the inclusion of digital content and OER for learners and the production, including through public procurement, of high-quality educational materials whose copyrights would belong to public authorities (EC, 2013).

These international initiatives are expressions of concerns related to slow adoption of an open and collective model for higher education, which also are dependent on systemic circumstances in society. The universities are undertaking the challenge of increasing quantities of students but the qualitative challenges, and in particular teachers' professional development need more attention. However, in many countries the financial burden related to pedagogical development is placed on the universities, and a lack of support and time for pedagogical development are barriers for further progress, which means that improvement of quality is an individual and institutional incentive.

Another circumstance hampering the development of open and collective initiatives in higher education is the absence of a central quality assurance systems and infrastructures for sharing of higher education.

One reason is the rise of autonomous institutions as a complement to governmental governance of higher education (Katz, 2008).

Local active leadership of higher education is also required in order to provide a strategic vision; and transforming siloed institutions into connected learning communities and rewarding professionals for innovative teaching approaches are other initiatives (EC, 2013). Furthermore, leadership has to be accompanied by organisational change and institutional development plans (ibid.).

Openness refers to a kind of transparency (Peters & Britez, 2008) and opens up for the recognition of achievements by the participants (Gourley & Lane, 2009). Informal learning is also seen as a way to open up the traditional structures and processes in education and has strong links with both adult learning and lifelong learning (Peters & Britez, 2008).

In conclusion, an increasing number of people in society are qualified to take part in a scientific debate and therefore there is an increased likelihood of future public negotiations, calling for an open agenda and an open model for knowledge production, research and particularly for higher education. Thus, it is important to better understand how infrastructures and resources impact the actual learning activities, since learning is closely tied to the mastery of artefacts and the appropriation of tools (Säljö, 2010).

2.2 WORK-BASED LEARNING

WBL is a phenomenological concept that captures a wide array of practices and has been developed in diverse directions (Tynjälä, 2013). The origin of WBL can possibly be argued to be the model of apprenticeship as coined by Lave & Wenger (1991) as a critique of institutionalised theoretical learning; however WBL is influenced by a variety of theories (Tynjälä, 2013). Various models have been testified for organising collaboration on WBL for subject-specific learning (Walsh, 2007; Betts et al., 2009). In profession-oriented educational programmes such as teacher and nursing education there are long traditions of involving this approach in the curriculum, based on students crossing boundaries (Walsh, 2007; Webster-Wright, 2009).

The incentives to engage in WBL are to make teaching more relevant, enhance student motivation, and reach new target groups and not least to develop self-managing professionals (Lester & Costley, 2010). However, WBL has also been criticised for bringing in practice (Symes, 2001), for having mercantile and pragmatic goals (Coady, 2000), for increasing student number at the expense of quality (Lester & Costley, 2010), and for being practical and therefore seen as belonging to vocational oriented institutions (Walsh, 2007).

Contemporary WBL models often have arguments from Dewey's model on experiential learning, which focuses on action as essential for purpose (Dewey, 1916) and to learning as situated action and cognition (Suchman, 1987, Brown et al., 1989). Kolb's argumentation on cognitive development, describes the basic learning process of adults as developing from active to reflective and concrete to abstract, leading to a higher degree of cognitive functioning (Kolb, 1984). He emphasises this iterative process, including stages of incubation, insight, verification (through actual practices) and incorporation and argues: "If the education process begins by bringing out the learner's beliefs and theories, examining and testing them, and then integrating the new, more refined ideas into the person's belief systems, the learning process will be facilitated" (Kolb, 1984, p. 28). Beyond that, WBL can also be seen as the way workplaces afford opportunities for individual engagement, collaboration and interaction (Billett, 2001a), and it is this way of looking at WBL that turns it into an open learning approach.

Students engagement is dependent on teachers support for autonomy, but also on scaffolding and how challenging the learning activities are, and on students' own motivational states (Reeve & Tseng, 2011). Their motivational states are in turn considered to be dependent on cognitive, emotional, behavioural, and even agentic aspects. The latter can simply be described as students having a say in their learning opportunities (ibid.), which is an important characteristic of WBL.

The issue of power relations in WBL has been a focus of interest in several studies. Fuller & Unwin (2002) criticised lack of equality, and Alpert et al. (2009) found that projects not always were meaningful and fulfilling the needs of all three actors. However, Lester & Costley (2010, p. 563)

found negotiated WBL to help students to be "self-managing practitioners who are committed to their own development".

This also implies that students develop their identity through WBL, since the relation between learning and identity development is intertwined (see e.g. Salling Olesen, 2001; Illeris, 2003). Engeström (2007) refers to Gee who pointed out that "All deep learning—that is, active, critical learning—is inextricably caught up with identity in a variety of different ways. People cannot learn in a deep way within a semiotic domain if they are not willing to commit themselves fully to the learning in terms of time, effort and active engagement. Such a commitment requires that they are willing to see themselves in terms of a new identity, that is, to see themselves as the *kind of a person* who can learn, use, and value the new semiotic domain. In turn, they need to believe that they will be valued and accepted by others committed to that domain—that is, by people in the affinity group associated with the domain" (Gee, 2003, p. 59).

Hence, the knowledge produced at the boundary can be both transdisciplinary and related to general competences (Walsh, 2007). The individual teachers and researchers involved in WBL challenge the distinction between both theory and practice and between expert and novice (ibid.). WBL is in this way disruptive and challenges the academic community; it has in particular low acceptance in research-led institutions, and is therefore often dependent on enthusiasts (Walsh, 2007; Lester & Costley, 2010). As a response, Lester and Costley (2010) have suggested more sophisticated partnerships with appropriate infrastructures.

Walsh (2007) describes the negotiated WBL as an approach to institutionalise WBL. She characterises this partnership with academic credits, individualised learning experiences and the involvement of an academic advisor that can negotiate and design individualised learning activities. Elmuti et al. (2005) describe this as joint venture corporations, which are a sort of strategic alliances that both gives practical learning activities and real-world experiences for higher education and low cost R&D for companies. However, they also points at risk of difficulties when different cultures and values meet (ibid.).

This is where the students enter at the boundary. Their incentives for working at the boundary have been found to be career advantages and less time to get a job after graduation and improved self-confidence and gen-

eral competences (Gault et al., 2000; Alpert et al., 2009) such as the ability to adapt to changes (Akkerman et al., 2011).

Engeström (2001) has asked the question "Why do they learn – what make them make the effort?" and answers the question by focusing on the sense making of the object of activity, which is triggered by the contradicting demands imposed on the participants by the context. In this thesis, WBL is therefore analysed from the point of view of students as boundary agents and the learning mechanisms associated with boundary crossing. The term 'work-based learning' refers to all and any learning that is situated in the workplace or arises directly out of workplace concerns (Lester & Costley, 2010), but in this thesis it means an institutionalised and accredited project at an industry within a bachelor program.

2.3 OPEN EDUCATIONAL RESOURCES

A great amount of the studies conducted on OER has hitherto tended to focus on technical, logistical and legal issues (Ferreira & Wilson, 2012) but the intention with this work is to analyse incentives and concerns related to the development and use of OER in higher education. Massachusetts Institute of Technology (MIT) unpredictably announced in 2001 the release of the majority of its courses on the Internet for free access. This was the first known organisation for higher education implementing a strategic investment in OER. Although higher education started and is till dominating the OER movement (D'Antoni, 2013), many different stakeholders are involved and OER are used both for formal and informal learning (Camilleri et al., 2014).

In the early years of the movement terminological differences related to OER were reported (Hylén, 2006) and the concept went through an evolution from open access to a product in the direction of greater openness and a shift in focus to the process or Open Educational Practices (OEP), see Table 2.

Table 2. Definitions of open educational resources and open educational practices

	Definitions	Year	Open license required
UNESCO	"A universal educational resource available for the whole of humanity, to be referred to henceforth as Open Educational Resources"	UNESCO (2002)	No
OECD	"Open Educational Resources (OER) are digitized materials offered freely and openly for educators, students and self-learners to use and re-use for teaching, learning and research"	OECD (2007)	No
Cape Town Open Education Declaration	"Open Educational Resources are teaching, learning or research materials that are in the public domain or released with an intellectual property license that allows for free use, adaptation, and distribution"	CTOED (2007)	No
Commonwealth of Learning and UNESCO	"The phenomenon of OER is an empowerment process, driven by technology in which various types of stakeholders are able to interact, collaborate, create, and use materials and pedagogical practices, that are freely available, for enhancing access, reducing costs, and improving the quality of education and learning at all levels"	(Kanwar et al., 2010)	No
UNESCO	".. Practices which support the (re)use and production of OER through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning path. OEP address the whole OER governance community: policy makers, managers and administrators of organisations, educational professionals and learners"	(UNESCO, 2011)	Yes
Wikipedia	"OER are freely accessible, openly licensed documents and media that are useful for teaching, learning, and assessing as well as for research purposes. Although some people consider the use of an open file format to be an essential characteristic of OER, this is not a universally acknowledged requirement"	(Wikipedia, 2015)	No

At the time of writing the definition is still contested and research on OER and OEP is rapid and vibrant. In this thesis, if not anything else mentioned, OER is defined according to the Cape Town open education declaration.

The diverse definitions mirror a changing understanding of the specific term *openness*. Downes (2007) defined open as opposed to commercial but pointed at the difficulties of this interpretation by giving two examples: non-commercial enterprises such as academic publishers that are not openly accessible and Google search, which is a commercial enterprise that is open. He finally defined open as "open for exchange" rather than "open for share", the possibility (and maybe the duty) of sharing back refined versions of the original OER. Some prefer to use the term "libre" which denotes "the state of being free", as in "having freedom" or "liberty". Stallman (2004, p. 45) stated that "to understand the concept, you should think of free as in free speech, not as in free beer".

The biggest growth area in quantity and use of OER was in video lectures or podcasting by academics, which is mimicking the traditional mode of teaching in higher education (Lane, 2013). Yet, there has been a transition from sharing *teaching* (e.g. lecture notes online for free use) to sharing digital *learning resources* (e.g. self-instructional resources, designed for structured learning for free use) that were put together into a logical structure by a course developer in higher education who attached an open license to it (McAndrew et al., 2009).

However, the evolution of the term openness rather reflects a change in paradigm from Web 1.0 and the individual content provider producing a product, an OER, that can be used by others and needs some kind of quality assurance; to Web 2.0 (O'Reilly, 2007) and a community of content providers and the process of their efforts to develop, use and reuse in an iterative process an OER. Thus, increased focus on OEP is expected to promote pedagogical practices and re-use of OER (McGreal et al., 2013).

Hence, the debates now often focuses on the practices, OEP, and based on a study of 58 case studies on open education (OPAL, 2011) it has been argued that OEP is an incremental rather than a radical practice, suggesting a gradual development of staff knowledge, and of adoption and institutional sustainability (McAndrew & Farrow, 2013a).

According to Geser (2012) the incremental move into an open practice can be understood as supporting both learner-centred and collaborative forms of learning, in which learners engage constructively with OER to address and solve problems and not for reproducing content. Thus, OER based on new technologies such as Web 2.0 offer collaborative practices, where teachers and learners together develop the learning resources (Kanwar et al., 2010).

This view on open learning is closely related to the development in open source, open access, open archiving and open publishing (Peters & Britez, 2008) and follow the development from technology based distance education, learning objects and open courseware. The term "learning object" has been subject of debate since it was first used in 1994 (Wiley, 2001; Conole, 2002). None has a clear definition; but generally objects are defined as subordinate to a resource. This view generated criticism because of the problem with the picture received, that symbolise learning objects as Lego pieces that could be assembled to easily generated courses. As Friesen (2004) noted, the term was not presented in a manner that was familiar or meaningful to educators, and therefore the term was negative between educators. Later, he claimed that an OER can be regarded as a subset of a learning object that is openly licensed (Friesen, 2009).

However, the view on learning where the learners autonomy and self-direction is acknowledged is fundamentally different than when knowledge is seen as an abstract object and learning as a transmission of knowledge to the learner who receive and store the knowledge (Brown & Adler, 2008), which also dominated the view on OER in the beginning. This also explains that the first years of the OER movement was dealing with research on technology regarding repositories and standardisation in relation to metadata for the facilitation of searching and administration of OER (Friesen, 2004).

The emerging open educational movement based on participation has some similarities with research when researchers are building upon each other's work and discuss their findings with fellow researchers in order to get a shared understanding and where they use peer review for quality assessment (Iiyoshi & Kumar, 2008). Thus open education has the potential to enhance "the virtues of openness such as the ethics of participa-

tion, collaboration and co-production, co-design and co-evaluation of all aspects of education" (Peters & Britez, 2008, p. xix).

Authors, users, re-users and organisations have different incentives for being engaged with OER. At an institutional level the incentives can be 1) free education for everybody according to the UN declaration, 2) effective use of taxpayers´ money, 3) promotion of lifelong learning, 4) showwindow for the attraction of new students, and 5) stimulation of internal improvement and re-use (OECD, 2007).

At an individual level it is related to 1) the pleasure of sharing, 2) the importance of recognition, and 3) the enhancement of student motivation (OECD, 2007). The speed of knowledge sharing has also been mentioned as an incentive as well as improved achievement when supplementary OER are used in teaching (Wilson & Ferreira, 2010).

Early research on OER communities focused on individual incentives for participation and subsequent empiric studies suggest that intrinsic benefits, such as joy and identification may be of the highest importance (West & O'Mahony, 2008). However, only few research studies on OER as a participatory learning resource have hitherto been conducted. But learning and epistemology have been increasingly more central when the attention has changed to OEP and the role of technology in social learning (Peters & Britez, 2008).

OPEN EDUCATIONAL PRACTICES FOR DEVELOPMENT

The collective aggregation of knowledge that is going on in OEP can be seen as mutual shaping of meaningful action, which can be argued to require participants with similar epistemological point of departure or interests that can be found in participatory cultures. Participatory cultures are according to Jenkins, Clinton, Purushotma, Robinson & Weigel (2009) cultures with low barriers to civic engagement and with informal mentorship giving members a feeling of being socially connected. Participation is "a term that cuts across educational practices, creative processes, community life, and democratic citizenship" (Jenkins et al., 2009, p. 8).

It has some similarities with what has been conceptualised as communities of practice, which are "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge

and expertise in this area by interacting on an ongoing basis" (Wenger, McDermott & Snyder, 2002, p. 4). When the concept of communities of practice was coined it changed the understanding of learning processes, from acquisition of knowledge to active participation in activities that generate identities and meaning (Jewson, 2007). However, the concept has been so widely applied that it is losing specificity and is sliding into a general descriptive term (Hudges, Jewson & Unwin, 2007). Furthermore, it has been accused of being normative (Hughes, 2007) and for failing to explain processes of disagreement and exclusion and power structures etc. In this thesis "community" is used as a concept for a group of people who are gathering because they want to participate in a culture of sharing OER; in open educational practices.

Communities are considered important not only in the process of development of OER but also for OER to become widely adopted (Atkins, Brown & Hammond, 2007; Fetter, Berlanga & Sloep, 2012). The phases in the formation of communities are described as establishment, belonging, and provision of mutual support. Fetter et al. (2012) point at the importance of peer support defined as people in the same community helping each other rather than receiving help from an official source. They also argue that a community not necessarily form around a repository of OER but rather is related to trust (ibid.).

CONTENT DRIVEN AND VALUE BASED DEVELOPMENT

It is suggested that the process of collaborative construction of knowledge is most vigorous when situated in a content-driven community that collaboratively develops goals, rules and a clear sense of overall mission (Petrides & Jimes, 2008). Similarly, Shirky (2008) suggests that trust and transparency of motive is fundamental for the success of any social media start-up. In a study on online game theory by Chen (2008) he argues that a bottom-up approach and collaboratively set up of rules through communication results in trust based on shared goals and well-established relationships and roles, which is stronger than trust based on individual motivations.

A successful community for OER adoption will most likely be a community of interest gathering around a topic, discipline or issue (Lane,

2013), or niche communities within specific disciplines in highly motivated networks (Petrides & Jimes, 2008) or because it supports "passion-based learning" (Brown & Adler, 2008). Gee (2004) uses the concept of "affinity space" to describe a space organised around an interest which people have an affinity for. Contributing to the collective knowledge through interactions among participants in such a space is found to be more important than the knowledge of individual participants *per se* (Gee & Hayes, 2011; Ponti, 2014).

In affinity spaces the idea of sharing OER can be suggested to create value because of three reasons. First of all, it is a way to be in dialogue in the open, which has particular importance for institutional representatives in contested areas of societal relevance. Secondly, sharing and collaborating on the creation of OER is a social culture creating satisfaction for teaching staff in the otherwise solitary profession (Iiyoshi & Kumar, 2008). Thirdly, it can be argued both from a non-academic and from an academic point of view, that the power of participation in an affinity space can be harnessed and give a sense of equality (Brown & Adler, 2008).

QUALITY ISSUES

It has been reported that some academics believe that when a resource is free of charge it is likely to be of poor quality (Wiley & Gurrell, 2009). Wikipedia, which is globally used as a scientific reference point, is in need of a constantly critical user, but has also balanced this view. This is related to the transparency of both the content and the process by which it is created. Clicking on the tabs that appear on every page, allows us to read across time, which make critical reflection possible (Brown & Adler, 2008).

When Wiley and Gurrell (2009) discussed the quality of OER they claimed that it had two dimensions; one that is context free and has to do with the accuracy of the information communicated by the resource, and one that has to be assessed in the context between a specific user and a specific resource. One could argue that the first dimension is about the accuracy of the OER *per se* and the second dimension about the contextual values or the legitimacy. Thus, it is argued that learning is most powerful when it is shared, tested, examined, and challenged in public and least useful when it is private and hidden (Schulman, 1999).

The use of OER is thus related to the requirement of a certain literacy of critical thinking and evaluation because "many of the places we now look for information do not carry the institutional warrants that have traditionally been used as markers for accuracy and truth" (Thomas & Brown, 2011, p. 96). Instead it shifts the responsibility of assessing creditability of content onto the user, with the risk of confronting the user with an anxiety of choice and with the risk that the user is not able to judge the academic or educational quality for themselves and whether it fits their needs. Rating schemes like that on the Amazon website for books can, when it involves large numbers of people, be a good quality criterion (Lane, 2013), but it would be unrealistic to expect most individual learners to assess correctly the quality and relevancy of any learning content for themselves (ibid.).

Peer review has already been suggested as a coordinating mechanism in social production but there are several concerns related to the peer review process such as "who's agenda is followed, how should it be conducted, and how should it be communicated?" (Kelty, 2008). Much of the concern related to peer review of OER is related to 1) the general critique to peer review, 2) that OER based on Web 2.0 are constantly in flux, 3) that the context is not known to the reviewers, and 4) that the reviewers knowledge and values will affect the outcome.

Benchmarking is defined as a comparison between the current and the desirable states and affairs, which contributes to the transformation process that realise these improvements. But as e.g. Iiyoshi & Kumar (2008, p. 14) write, "benchmarking comparisons cannot tell the full story". Studies on benchmarking have described the challenges to integrate external quality audits and internally driven benchmarking, but studies of benchmarking seem to be instrumental and focus on the management perspectives rather than on the students' perspectives (Ossiannilsson & Landgren, 2012).

Generally, the OER movement can be criticised because of various reasons. First of all, the flow of OER is in one direction only, from the Northern to the Southern hemisphere (Kanwar et al., 2010) or from the developed to the developing countries (Mulder, 2008). Furthermore, it has been found that the rate of adoption of OER in educational practices is low (Ochoa & Duval, 2009, Atenas & Havemann, 2013), which has been

explained by lack of clear implementation strategies and agreed-upon quality standards, and because a demand driven and bottom-up participatory approach is time consuming and that funders tend to be product-oriented rather than process-oriented because a process is more difficult to capture as a result (Kanwar et al., 2010).

In practice, most educational resources can be more or less easy to re-use depending on the context, and not necessarily on the feature of the resource itself (McAndrew & Farrow, 2013a). Petrides, Nguyen, Jimes & Karaglani (2008) studied different reasons for reuse behaviour. The reuse depended on the ability to contextualise OER across various teaching and learning situations; highly de-contextualised OER were reusable in the greatest number of learning situations but could also be the most difficult to reuse, localise and personalise (ibid.).

Clements & Pawlowski (2011) have elaborated on the concept of trust as a barrier or facilitator for re-use of OER, especially in the initial phases of the re-use process. They pointed out that trust is very important and that some users trust organisations with good reputation; others trust technologies or their personal friends, which calls for different approaches. However, very few users contribute with adapted resources back to the community (ibid.).

Creative commons was founded by the law professor Lawrence Lessing, with the ambitious mission to realise "the full potential of Internet – universal access to research and education, [and] full participation to culture" (Creative Commons, 2013). The creative common licence was released in 2002 and included three elective clauses. Today it encompasses six different creative commons licenses, all of them requiring that the original creator should be attributed or acknowledged (Friesen, 2013).

Wiley (2010) argued that OER need to be openly licensed in order to be OER; otherwise they are only linkable and viewable resources that cannot be touched. He used the metaphor of "window shopping" when talking about unlicensed resources and claimed that if you cannot make and distribute your own copies, you are in the hands of the creators.

Metadata are descriptors to give context (Burgos & Ramíres, 2013). To ease the diffusion and dissemination of OER it is important to describe and document each OER with well-defined metadata (Hodgkinson-Williams, Paskevicius, Cox, Shaikh, Czerniewicz & Lee-Pa, 2013). Thus for

sustainability issues, there is a need to create OER that are flexible and easy to remix and repurpose (Conole, 2010; McGreal et al., 2013) and at the same time provided with metadata such as SCORM. The Shareable Courseware Object Reference Model framework (SCORM) is "a collection of technical standards and specifications for web-based electronic educational technology" (SCORM, 2004).

Traditional models for sustainability within higher education do not employ on the OER movement; such as enrolment fees, tuition, book sales (Baraniuk, 2008). Wiley (2007, p. 5) has defined sustainability in relation to OER "as an open educational resource project´s ongoing ability to meet its goals". Long term viability is also central for sustainability according to Downes (2007). He focused on the provider perspective and more precisely on scale, quality, production costs, margins and return of investment, and identified nine different funding models of OER projects (ibid.).

McGreal, Kinuthia & Marshall (2013, p. 238) argue that "in order for OER to be sustainable requires a transition from OER being a social behaviour to OER becoming institutionalised as a social practice". Thus it needs to become a teaching and learning practice norm within the university, and therefore it is of interest to better understand institutional incentives and barriers.

West and O'Mahony (2008) studied the difference between open source software communities that were sponsored by an organisation and grow with strategic direction, they named them "synthetic communities"; and communities that were autonomous and were individually founded and grow through grass roots communication, they named them "organic communities". They found that a synthetic community did not attract new participants in the same way as organic communities.

Therefore, the sustainability of an OER project may depend on whether it is developed in a content-centred community or an affinity space, which is built on trust, and it is suggested that it will be most successful when sited in an area of societal interest and with a value-based component (Algers & Lindström, 2010); food quality and animal welfare are such areas of concern.

2.4 TEACHING FOOD QUALITY

Food is a concern for every human being. The production, processing and market of food are increasingly interlinked and global phenomenon (Murdoch & Miele, 1999). It is rather common that food is produced in one country, transported to another for processing and thereafter transported to new geographical regions for market and sale. This new global food scenario gives rise to complex concerns for sustainability, fair trade and ethics which calls for education, not only for the consumer but also for employees in the food sector and the society as a whole.

In parallel to this global trend, a trend towards a systemic view on food quality has become increasingly central (Peri, 2006), acknowledging that food quality is the sum of all properties and assessable attributes of a food item, even those having a subjective component (Leitzman, 1993). Food quality can be defined in different ways but one of the more general definitions is that food quality is "the requirements necessary to satisfy the needs and expectations of the consumer" (Peri, 2006, p. 4). The consumer requirements must be satisfied by the *performances* of the product and the performances derive from the *characteristics* of the product, which finally are obtained through the control of the production process (ibid). The characteristics are measurable and objective data (e.g. shape, weight, composition), also called intrinsic quality (Callon, Méadel & Rabeharisoa, 2002), and performances are functional and subjective data, that only exist between the consumer and the product (e.g. sensory, nutritional, aesthetic, ethical and convenience performances), referred to as extrinsic quality (ibid.).

Peri (2006, p. 7) suggests that we should focus on how to minimise rejection of a certain food item instead of maximising the preferences. Thus he suggests us to adapt a system based on "the borders within which it is possible to move without generating a rejection for the lack of specific requirements" as a contrast to the usual way in which we maximise the desirability or acceptability of one of many quality requirements. This could be exemplified with setting lowest levels of accepted animal welfare for food producing animals such as no antibiotics, no cages and no mutilations (Algers, 2015). This would lead to that experts climb down from their perceived specialist pedestal and open up for a more reasonable and

comprehensive quality discussion (Peri, 2006) at the same time as consumers and citizens do not need to inform themselves about every detail of the production methods.

Murdoch & Miele (2004, p. 163) also discuss food quality as a disruptive interaction between biological, ecological and social mechanisms that breaks down disciplinary boundaries; "because it asks us to look at the whole *process* of qualification, and hence the changing relationships between market and non-market spheres, the breakages, the linkages and the shifting boundaries between production and consumption. It involves the rhetoric and the social worlds of amateurs, intermediaries and experts of all sorts".

Generally, food choices have a strong impact on the ecologic footprint (FAO, 2006), and when the level of impact from farm animal production on sustainability became evident in the beginning of this century when FAO published the report 'Livestock's long shadow' it evoked global awareness and discussion (ibid.).

A system or procedure is only sustainable if it is acceptable now and in the future generations of the society (UN, 1987), thus if a system or procedure is considered morally unacceptable by a substantial proportion of citizens the system or the procedure is not social sustainable, and the people referred to may be in a local community, in a nation, or in a global community (Broom, 2010). The perceived welfare status of the animals from which the food is produced is one of those attributes that are of considerable importance to European consumers (Blokhuis, Keeling, Gavinelli & Serratosa, 2008). Furthermore, it has been shown that improving the welfare of the living animal can increase disease resistance, reduce the use of antibiotics and thus enhance product quality which has a direct bearing on food quality and safety.

It could be expected that moral concerns for farm animals would only be prevalent in developed countries but people in all parts of the world are insisting on transparency in commercial and governmental activities and on changes in production methods of various animal products (Broom, Galindo & Murgueitio, 2013), not least because of the linkage between human and animal health, which is conceptualised as One Health (OIE, 2010a).

In a similar way as for education, a shift is observed from a push-approach driven by the producers of animals to a pull-approach driven by consumers and citizens, facilitated by governments and retail companies (Broom et al., 2013) and sometimes industries. Animal welfare is part of both product quality and of food safety, which again are part of sustainability, since it is intertwined with what kinds of food that are socially accepted (ibid.).

The consumption of food nowadays depends on consumers trusting food products. However, there are now reasons for believing that this trust has begun to break down, and recent trends suggest that many consumers are engaged in a requalifying of foodstuffs (Murdoch and Miele, 2004), one that embraces 'embedded relations'. Murdoch and Miele (2004) argue that the concern for embeddedness brings 'relational reflexivity' to the fore among consumers, and it is evident that most of the European consumers have concerns related to their choice of food (Special Eurobarometer 294, 2008; Flash Eurobarometer 256, 2009).

These issues are examples of new trends in the food consumer market which increase the demand of knowledge and labelling besides the more traditional characteristics. Vivid debates on biotechnology, stem cell research and cloning have shown that there is a need for open public dialogue on the ethical implications of scientific advances (EurActive Network, 2010). Middendorf and Wright (2008, p. 14) argue that "the examination of agency and structure in agrifood-systems is an important sociological inquiry, because it sheds light on how humans shape something as essential for life as food and so how the existing food system shapes human action". They also point at localised changes in consumer views being unlikely to bring about "wider transformative change unless diffused to a broader audience that has the power to effect change through the power of numbers".

In conclusion, the literature points to the need of increased academic knowledge building and dialogue in the fields of food quality, food ethics and animal welfare. The target group comprises students, employees, consumers and citizens. I have chosen to study open educational approaches within both intrinsic and extrinsic attributes in this thesis. The studies on WBL are most often focusing on intrinsic attributes and the studies on OER on animal welfare as an extrinsic attribute of food quality.

2.5 TEACHING ANIMAL WELFARE

Animal welfare is a rather new domain in higher education. It became a scientific discipline in the 1980s and the first professor in animal welfare was appointed at Cambridge University in 1986 (Broom, 2005). The development of animal welfare as a subject taught to university students, such as veterinary, agriculture, and biology students, was slow in the beginning and globally 10 professors were appointed in the subject before 1995 (ibid.). Today animal welfare is taught in veterinary faculties worldwide, although the subject has its own curriculum in a limited number of veterinary schools and only occasionally is taught in other faculties (Broom, 2005; Lord & Walker, 2009).

In primary and secondary education, animal welfare is not an established domain but recent development at EU-level is expected to have a strong influence on the national laws regulating education at all levels and on implementation of the teaching of animal welfare in schools and universities (EC, 2012a). The societal needs of knowledge in animal welfare are extensive (Butterworth, 2009; Algers, 2011) and go beyond what can be accomplished within formal educational structures because of the following circumstances that will be further elaborated in this section.

The global production and consumption of animal products have increased during the last decades and animal production practices have become increasingly intensified (Fraser 2008) with the major focus being on improving economic efficiency. In 2012 around two billion birds and three hundred million mammals were used for farming purposes in the EU. Livestock farming in the EU represented an annual value of 149 billion euros (EC, 2012b).

Intensive rearing is the norm for most of the farm animal species, not only within EU. Figures from USA. show that 95 % of hens are housed in conventional cages and 84 % of the sows are bred in total confinement facilities (Mench, 2008) and it is common in the western world to keep broiler chickens in darkness, and pigs in barren environments. As a consequence of intensive, barren husbandry systems and their effects on animal behaviour, in most countries different kinds of surgery are executed, usually without any pain relief; pigs tails are cut, cows are dehorned, and hens are beak-trimmed, however in Sweden and Norway tail docking,

teeth clipping and beak trimming are prohibited (Veissier, Butterworth, Bock & Roe, 2008).

Urbanisation is a global trend that is contributing to inaccurate perceptions and low awareness about farm animals. For example about 2 % of the Swedish population is engaged with animal husbandry and the number is decreasing. Before Sweden was urbanised, 90 % of the population was living in the countryside and had daily contact with animals (Israelsson, 2005). Knowledge about farm animals and how they are handled on the farm and at the day of slaughter has been lost over the generations and knowledge among urban citizens in handling of farm animals can be expected to be low. More people are close to companion animals than to farm animals, which may have changed our relationship to animals and thus our general attitudes to them (Nordstrom, Richards, Wilson, Coe, Fivek & Brown, 2000). The welfare of animals other than farm animals is, however, out of the scope of this thesis.

There is an increasing concern in society for animal welfare (Bayvel et al., 2005), and a strong desire to be better informed at least within the European society (Special Eurobarometer, 2007). There is also a need for introducing an education policy that aims at increasing human awareness of animal welfare problems and promote action to reduce the suffering of animals (Webster, 2006). In the EU animal welfare action plan (EC, 2012b) a road map is presented that applies to these problems and help meet these goals. The EU animal welfare strategy for the period 2012-2015 explains the driving forces affecting the welfare status of animals within the Union and includes a rather detailed action plan based on these driving forces (ibid.).

In a global perspective, the level of concern varies between continents such as Europe, Asia and Africa and obviously between countries and within countries, depending on urban area or countryside and rich or poor (Bracke, 2009). Brazil has e.g. a strong interest and works hard to reach the level of European standards in animal welfare mainly because of its export of meat to European countries. Furthermore, the concern for animal welfare is under intensive development in the third world because of economic issues related to export to Europe and because of a more general concern that is articulated in consumer demands and societal pressure (ibid.).

As a response to the societal developments mentioned above, control instruments have been amended. In Europe animal welfare legislations are developed both at EU-level and national levels but the legislation related to animal welfare is weak in USA compared to Europe and the major trend on the USA market is that private initiatives by food retailers along with some of the food producer groups and organisations are improving animal welfare standards (Mench, 2008). The purpose of private initiatives, which is a global trend but most prominent in USA, is diverse from being an alternative to legislation to develop audits, niche markets, product differentiation, and labelling and branding for the consumer market.

In summary, it is my hypothesis that the following factual changes have developed a knowledge gap in the domain of animal welfare: 1) the global production of meat has increased and production methods been intensified, 2) a reduced number of people are involved in animal husbandry and an increased number of people are keeping companion animals, 3) animal welfare has become a knowledge domain of increasing concern in contemporary society, 4) legislation and standards have been developed as a response, and finally 5) our scientific understanding of animal communication, perception and suffering has increased substantially, which will be further elaborated in the next section.

SCIENTIFIC UNDERSTANDING OF ANIMAL WELFARE

Animal welfare research started in the early 1960-ies and, inspired by the book 'Animal machines' by Ruth Harrison (1964), became an expansive research field, including research on animal behaviour and physiology related to production systems, research animals and companion animals. Historically, animal welfare was equated with physical health and functioning of the body (Hewson, 2003; de Boo & Knight, 2005) and it was not before it was evident that seemingly healthy and productive animals are able to suffer and are having needs that it became a scientific knowledge domain of its own.

A scientific definition of animal welfare has developed over time and is nowadays mostly related to how an animal is coping with the conditions in which it lives. However, as we will see later in this text, different beliefs about what constitutes a good animal life has led to disagreements

between researcher groups and contrasting views on how animals should be housed and managed (Fraser, 2008).

Different beliefs and interests have also led to that animal welfare has been assessed in different ways and by the use of different indicators including measurements of behaviour, physiology, health, longevity and reproduction. The global organisation for animal health (OIE) has defined animal welfare accordingly:

> An animal is in a good state of welfare if (as indicated by scientific evidence) it is healthy, comfortable, well nourished, safe, able to express innate behaviour and if it is not suffering from unpleasant states such as pain, fear and distress. Good animal welfare requires disease prevention and veterinary treatment, appropriate shelter, management, nutrition, humane handling and humane slaughter/killing. Animal welfare refers to the state of the animal; the treatment that an animal receives is covered by other terms such as animal care, animal husbandry and humane treatment (OIE, 2010b).

The nature of animal sentience was developed from the theories of Dawkins (1988) on behavioural deprivation, and since then animal cognition and affective states in animals (such as grief in elephants and happiness in dogs) have had an increasing importance in animal welfare science. This has also changed the research from being focused on the measurement of welfare problems by the observation of unnatural behaviour or measurement of stress reactions to considering animal welfare on a scale from very bad to very good. Different scientists have in their choice of research questions and consequently in their choice of measurements in their studies of animal welfare taken a value-based stance (Fraser, 2008), which makes it important for the reader to understand and critically reflect upon.

The attitudes to animal welfare can roughly be categorised in three approaches; the basic health and functioning of animals, the affective states of animals and the ability for animals to live a natural life (Fraser, 2008). The measurements used in the first approach are typically reduction in growth, reproduction and survival, disease, and injury. Measurements of acute and chronic stress became an extensive scientific field often in

combination with studies of abnormal behaviour. The affective states of animals such as pain, distress and suffering are measured by behaviour observations, but some of these states cannot be observed directly and therefore physiological measurements are often combined with behaviour observations. The study of animal welfare, as a reaction to more or less of "natural living", started by studies of poultry and pigs in semi-natural conditions (Wood-Gush, Duncan & Savoury, 1978; Stolba & Wood-Gush, 1984).

The historical development of fundamental knowledge in the domain of animal welfare has over a short period of time resulted in a substantial body of knowledge. One example is that it recently became evident that fish most likely also can feel pain and suffer (EFSA, 2009) and therefore we have to handle fish with respect to fish welfare; formulated as "fish have become part of our moral circle", even called our moral realm (Lund, Mejdell, Röcklinsberg, Anthony & Håstein, 2007). This knowledge has resulted in the development of new legislation on fish welfare at the EU-level (EFSA, 2009) and is an example of the need of education to all levels in contemporary society.

SOCIETAL INITIATIVES FOR ANIMAL WELFARE

According to the European Commission, animal welfare has become part of a "cultural attitude" for the European society (EC, 2006). The Council of Europe had already in the 1970s initiated a harmonization of national animal welfare regulations, but it was the Amsterdam Treaty (EC, 1997), which recognised that animals are sentient beings and therefore should be protected, that made a big change for animal welfare in Europe.

The EU Commission launched the Lisbon treaty in 2007, which constituted Article 13 stating that the Union and its member States shall

> since animals are sentient beings, pay full regard to the welfare requirements of animals, while respecting the legislative or administrative provisions and customs of the Member States relating in particular to religious rites, cultural traditions and regional heritage (EC, 2007).

Legislation has been the main policy approach for protecting the welfare of farm animals in Europe and therefore Europe has by far the most elaborate animal welfare legislation in the world (Bracke, 2009). The protection of animals has been a stepwise development starting with attention to (stray) dogs and cat, and issues related to animal welfare at transport and slaughter tend to precede the concerns about the way farm animals are housed.

In this way most European countries regulated the handling at slaughter by the 1930s, whereas the first federal Humane Methods of Slaughter Act (HMSA) in USA went into effect in 1960 (Friend, 1990). The very first federal law in the USA was the Twenty-Eight Hour Law, which was already passed in 1873 to protect farm animals during transport to slaughter. This law required that animals could be transported for 28 hours but not more before they should be unloaded and provided with feed, water and a resting area for at least 5 consecutive hours before transport could be undertaken again. However, the law did not regulate truck transport of animals (which has been the most common way to transport animals) and it was not before 2006 that this was included in the legislation, after protests on this loophole from animal protection groups (Mench, 2008).

Mench (2008) pointed out that there has been almost no change in federal legislation of animal welfare in USA in the last 40 years apart from a law on the use of mammals in biomedical research; which is in deep contrast to the legislative climate surrounding animal welfare in Europe. This has not only to do with the fact that the states in USA have a high degree of autonomy but merely that private stakeholders take the role of primary driving forces of improved animal welfare (ibid.). Some states have laws on companion animals and wildlife and a few have specific regulations; e.g. the ban of foie gras in California (Mench, 2008).

The approach in USA is to develop standards which started in 1998 with standards on laying hens initiated by the United Egg Producers and in 1999 with McDonald's standards on handling and slaughter of cattle (Grandin, 2000. The standards were assisted with auditing guidelines that could be used by retailers to check compliance and to incorporate into buying specifications resulting in strong economic incentives. When animal welfare was interconnected to economic motivations, significant changes occurred in farm animal welfare in the USA (Mench, 2008).

The legislation on animal welfare in Europe was inspired by Ruth Harrison's book in 1964, and the Brambell Committee was appointed in 1965 in UK as a direct result of the outcry and the general concerns related to intensively farmed animals. The Brambell Report stated that animals should have the freedom to stand up, lie down, turn around, groom themselves and stretch their limbs (Brambell, 1965); known as Brambell's Five Freedoms. These freedoms were further developed into the Five Freedoms by the farm animal welfare council in UK; Freedom for hunger and thirst, freedom for discomfort, freedom for pain, injury or disease, freedom to express normal behaviour, and freedom for fear and distress.

It was not until 1976 that a convention for the Protection of Animals Kept for Farming Purposes was prepared, providing general principles for the keeping of animals in intensive housing systems. A Standing Committee to the European Commission was established, which since then has produced recommendations for cattle (1988), poultry (1986, 1995), pigs (1986, 2005), sheep and goats (1992), calves (1993), ratites (1997), duck, geese and fur animals (1999), turkeys (2001) and fish (2006). The European Union constitutionally recognised through the Lisbon Treaty (2007) that animals are sentient beings and their welfare must be taken into account in law and policy making.

At a global level OIE, which is the World Organisation for Animal Health (originally Office International des Epizooties, OIE) is setting standards to improve animal health worldwide since it is representing 180 member countries and territories. OIE is increasingly engaged in animal welfare and has since 2005 adopted eleven animal welfare standards.

SUSTAINABILITY AND ANIMAL WELFARE

Webster (2006) suggests that any enquiry into animal welfare must start from the fact that we as human beings share the globe together with animals and that the quality of their lives are governed by the way we treat these animals.

Intensive farming and animal production inclusive mechanisation, barren animal environments and the use of preventive antibiotics, was driven by economic interests but resulted to different degrees in problems related to animal welfare, animal diseases and humane resistance to antibiotics.

A sustainability movement developed in the 1970es based on alternative production systems adapted to the animal needs. Sustainability is defined in different ways; The World Conservation Union, for example, defines sustainable development as "improving the quality of human life while living within the carrying capacity of supportive ecosystems" (World Conservation Union, 1991).

It can be concluded that there is consensus in the scientific community today that animals are sentient beings with the ability to suffer and that the society has a duty to end cruel farming systems and other trades and practices which inflict suffering in animals (Webster, 2006); which can be interpreted as one of our carrying duties and thus part of a sustainable development.

Mahatma Gandhi (1869 – 1948) has noted that animal welfare reflects our degree of civilisation by saying that "The greatness of a nation and its moral progress can be judged by the way its animals are treated". OIE has recently together with WHO and FAO started to coordinate medical and veterinary health policies, although people imprecisely claim that developing countries are not ready for the discussion on animal welfare pointing at the necessity of emphasising human welfare. One of the conclusions from the 3rd OIE conference on animal welfare held in Kuala Lumpur, Malaysia, was that animal welfare continues to increase in importance and has a significant bearing on trade in animals and their products (OIE, 2012).

After all, the welfare of humans and the welfare of animals are closely linked (FAO, 2009). The term `One Health´ is recently adopted, although the link between animal and human health has been known since ancient times. One Health is an initiative addressing health risks at the interface between animals, humans, and their environments, and is a shared initiative between FAO, OIE and WHO (OIE, 2010a). Animals and humans are increasingly sharing the same diseases (zoonosis and lifestyle diseases) and the supply of food for people is depending on healthy and productive animals, whereas animals depend on the care and nutrition that they receive from people. Thus, animal production has raised a wide range of ethical issues, including concern for animal welfare, which has to be considered alongside environmental sustainability, food security, -safety and -quality.

If consumer and industry expectations on good animal welfare differ, this may lead to increasing conflicts between consumers and the food industry, which in the long run is not sustainable (Algers, 2011). Different views on animal welfare has polarized society and resulted in arson of laboratories (Friend, 1990) and arson of animal transport vehicles for slaughter in Sweden, and the issue is therefore important for society representatives to tackle. The current challenge is to raise awareness about animal welfare throughout society as a means to achieve the same view on what is good animal welfare as a basis for industry to develop its production schemes and for consumers to guide their habits for purchasing food (EC, 20012b).

As discussed above, animal welfare can be measured scientifically, independently of any moral considerations (Broom, 1991; Duncan, 1996; Fraser, 2008). However, Fraser (2008) suggests that animal welfare should be discussed in terms of values, and he advocates for a closer association between animal welfare and animal ethics, which can be defined as the human concern for animal welfare measured by attitudes to different types of animal uses (Fraser, 1999).

Anthony (2003) stated that we have for centuries excluded animals from our moral realm and created boundaries to shut them out, based for instance on the perception that they lack intellect, rationality or a language similar to ours. The first aspect of animal welfare that was addressed by ethicists' was if the animals could suffer (Algers, 2011). Jeremy Bentham stated already in 1789 that "The question is not can they reason?, nor, can they talk? But, can they suffer?" (Bentham, 1789). As discussed above there is scientific evidence that animals can suffer and therefore all animal creatures are included in our moral circle. Some scientists pointed out that because animals can have greater or lesser degree of welfare it implies something better or worse for the animals and therefore it is value based and cannot solely be studied objectively with quantitative measurements (Tannenbaum, 1991; Fraser, 1999).

Fraser (1999) explains this by a comparison with quality of bread. By assessing the composition and freshness of the bread we get some information, but underlying empirical studies are normative preference values about what makes bread better or worse for the quality of bread. In the same way animal welfare studies are undertaken based on objective meas-

urements of how the animal perceive its quality of life but the decisions on which variable to study and how they are interpreted involve normative judgement.

In order to address ethical concerns about the treatment of animals empirical studies in animal welfare need some ethical reflection. When handling groups of animals, humans can choose to focus morally on the individual animal or the herd causing various philosophical views in play. Utilitarian's e.g. base their views on that "morality is about maximising human and animal well-being" (which means that animal welfare problems for a single animal is less important than the welfare of the population or the herd), whereas the animal rights view is that "good results cannot justify evil means" (which means that there are limits to what we are permitted to do with an animal but the limits are not defined which means that the animal rights view comes in more or less radical forms). There are also other ethical views on animals (Lund et al., 2007).

The ethical concerns of the treatment of animals are becoming even more complex when we consider other constraints relating to the production of food such as traditional sustainability issues for example climate change and use of natural resources, health and safety, food security and economy. There are e.g. problems related to intensive farming that are not affecting the farmers' economy enough to induce a change to more animal welfare-friendly production methods (e.g. high prevalence of pneumonia in pigs) and there are dilemmas in choosing housing and management systems when the effect on animal welfare and the environment are negatively correlated (e.g. grazing versus intensive housing).

In the text above, I have chosen not to go in depth about theories in animal ethics; rather I focus on the importance of teaching and training in ethical argumentation and ethical decision making. Individuals need to be assisted to become more aware of the complexities surrounding ethical decision making and more conscious of their own ethical orientation (Crane, 2004; Giacalone, 2007; Algers, Kaiser, Loor, Wahlgreen & Welin, 2010).

KNOWLEDGE ABOUT ANIMAL WELFARE

As already mentioned knowledge about animal welfare is limited and only few people gain their knowledge about animals and animal welfare through life experiences and therefore animal welfare needs to be included in formal education at school and university level and vocational teaching programmes as well as in informal lifelong learning initiatives in society (Algers, 2011).

As Ruth Harrison (1964, p. 144-145) pointed out in her book Animal Machines "if one person is unkind to an animal, it is considered to be cruelty, but where a lot of people are unkind to animals, especially in the name of commerce, the cruelty is condoned and, once large sums of money are at stake, will be defended to the last by otherwise intelligent people".

Webster (2006) claims that the first step to improve animal welfare is to increase their value to us which is a responsibility of us all. He continues that when society gives added value to animal welfare and can trust those who work with animals to put this into effect, then those who work with the animals can feel a sense of pride.

The concern for and opinion on farm animal welfare is of increasing significance to European citizens and consumers and animal welfare is becoming recognised as an important attribute of food quality (Blokhuis et al., 2008). Similarly, in USA the public opinion on animal welfare is changing rapidly with increased concern for animal welfare (Siegford, Bernardo, Malinowski, Laughlin & Zanella, 2005) and the increasing concern in America and Asia can at least partly be explained by trade with Europe (Algers, 2011). The diverse and changing public opinion creates a growing demand for science based education in the subject.

In order to meet public expectations producers need further knowledge to reform animal practices (Rollin, 2000) and as Algers (2011) pointed out it is not a sustainable situation if there is a discrepancy between consumers (who benefit from animals but do not work with them) and industries expectations on animal welfare. The goal should be to harmonise producer and consumer expectations on animal welfare in order to avoid conflicts and this can be done by teaching and training programmes for the food industry and all citizens (Algers, 2011).

The body of research within the area of animal welfare education is limited because teaching of animal welfare has a relatively short history. Animal welfare education is also a new topic for conferences, and journals focusing on education in animal welfare have still not been developed; however articles on animal welfare teaching are published in journals in adjacent topics.

Until the late 80es vet students were taught that healthy and productive animals had a good welfare and therefore animal welfare was not an own issue until the science of animal welfare took on board research in ethology including natural behaviour and behaviour changes, cognitive ability and suffering as well as physiology (Pepperberg, Gardiner & Luttrell, 1999). With this approach teaching in animal welfare concentrated on conceptual understanding and the measurement of the reaction of the animals to different situations by using ethograms (catalogue of behaviours exhibited by an animal) and blood parameters and looking for e.g. stereotypies like tongue rolling in cows, cannibalism in poultry and stress hormones in pigs. Recently, the science about animal cognition including positive and negative emotions became an issue in animal welfare curricula (e.g. play behaviour in dogs and grief in elephants).

Animal welfare education had in the beginning an instrumental foundation and teaching animal welfare was often a combination of practical experience with animals and theoretical lectures. The definition of animal welfare used at the time was based in veterinary medicine: "The welfare of an animal is its state as regards its attempts to cope with its environment" (Broom, 1991, p. 4168). Teaching in animal welfare was constructivistic; practical training and site visits should enable students to identify situations where welfare is reduced and to use animal welfare indicators for disease prevention (Hewson et al., 2005).

Until the late 90es scientists in animal welfare were focused on the measurement of animal welfare as if it was purely an empiric property such as viscosity or metabolisable energy (Tannenbaum, 1991) and therefore the teaching of animal welfare was solely about quantitative studies. The definition of animal welfare was further developed and psychological aspects were included. Animal welfare is all to do with "the absence of states of suffering and (probably) with the presence of states of pleasure" (Duncan, 1996, p. 31).

At this time animal ethics was becoming an established domain, but although the disciplines of animal ethics and animal welfare had a common goal of understanding and articulating our relationship to animals they were two different cultures (Fraser, 1999). Ethicists pointed out that animal welfare is inherently a normative concept and that any assessment of animal welfare is based on value notions of what is better or worse for an animal (Fraser, 1999) which changed the scientific field and the teaching approach to a more value based foundation. Thus, the two disciplines; Animal welfare and animal ethics were approaching each other. Today a social constructivist perspective is prevailing based on a holistic approach to animal welfare including knowledge in ethology, physiology and philosophy in order to measure behavioural adaptation, physiological responses and to value the pros and cons with the production of food and other reasons for keeping animals. Because there are complex links between animal husbandry and animal welfare and complex conflicts of interest (Hewson et al., 2005; Main, Appleby, Wilkins & Paul, 2009) teaching in animal welfare needs to be placed in a sociocultural context.

By the integration of visits to farms, slaughter houses and other clinical practices in the education and by the encouragement to reflect and express and defend viewpoints on animal welfare and ethics (Main et al., 2009), students get the opportunity to voice their opinion on animal use in food production, as companion animals, in entertainment and for science or biomedical research. Today it is rather common to teach animal welfare and ethics based on discussions of current case-studies and sometimes formal debates and role-playing is used (Hewson et al., 2005) that can give students the feeling of authenticity which has been shown to be positive for learning (Herrington, 2006).

Preconception in animal welfare is about how close the subject is the students' awareness. In the case of veterinary students and students in animal science, animal welfare is a domain gaining high awareness among students and every single student has private thoughts about animal welfare related to how animals are used and treated in the society but also related to the career and the personal beliefs. The preconception among other students in higher education and among school children are more difficult to predict.

Culture is known to have strong influence on early child development (Vygotsky, 1967) and therefore one has to start early to educate children. Cultural traditions like bullfighting, rodeos and cockfighting are entertainment that inflicts on animal welfare (Tadich, Molento & Gallo, 2010) and may have an influence on the general attitudes to the welfare of other animals. Teaching animal welfare to children is central to the new EU strategy (EC, 2012b), with the ambition to teach children how to operate in a democracy, and influence the way we treat animals in society.

Little is written about teaching animal welfare at school level but studies have been carried out in order to find the most suitable age for teaching animal welfare according to Piaget's theories on human intellectual development in terms of stages (Inhelder & Piaget, 1958). Kellert (1985) suggested that children aged 13-16 years are at most responsive to education in animal welfare, however, a study on children in Mexico showed that children already at the age of six were receptive to education in animal welfare (Aguirre & Orihuela, 2010).

Webster (2005) wrote that increased awareness of the nature of animal sentience is the single most effective step to better animal welfare and advocates that this should be taught early in life. In order to get a rapid impact in the EU countries, it has been suggested to adopt animal welfare in the national frameworks for teaching at school level. The most prominent EU-initiative in the teaching of animal welfare for children is the launch of the OER "Farmland" (Farmland, 2015), which is studied within this dissertation.

2.6 EMPIRICAL STUDIES ON WBL AND OER IN FOOD SCIENCE AND ANIMAL WELFARE

A literature search in Scopus, Science Direct and Google Scholar on the combination of "open educational resources" and "animal welfare" or "food science" respectively "work-based learning" and "food science" or "animal welfare" gave only few results, although "all sources" and "all years" were enabled. In Scopus and Science Direct only two articles were identified per search when using the combination of "open educational resource" and "animal welfare" or "open educational resource" and "food science", respectively. The combination of "work-based learning" and

"food science" only resulted in six articles in Scopus and one hit in Science Direct; the combination of "work-based learning" and "animal welfare" gave zero results. The search in Google Scholar for the combination of "open educational resources" and "animal welfare" gave 191 hits; and 420 hits for the combination of "work-based learning" and "food science", however only eight scientific articles were relevant for the first combination and eleven for the latter combination. The combination of "open educational resources" and "food science" gave 165 hits, however only one scientific article was relevant, and the combination of "work-based learning" and "animal welfare" gave 73 hits, where only three articles were relevant.

The literature search resulted in three reviews of trends in food science education. Trends in both Europe and USA have indicated a change towards student centred approaches and emphasised collaboration between both students and teachers (Dumoulin, 2004; Iwaoka, Britten, & Dong, 1996) and inquiry-based learning (Iwaoka et al., 1996; Shewfelt, 2012). Brew (2013) has published an article on how the intension to engage students in research and inquiry strengthens the link between research and teaching and shifts the view on students from consumers to active producers of knowledge. However, she pointed at the problem that teachers with practical experience of engaging students in research do not have the authority to make decisions about curricula and that those making the decisions do not have the authority to implement them (ibid.).

Continuing education in food science is found to be widespread and numerous examples of distance education to employees in the food sector have been documented (e.g. Shanley, Thompson, Leuchner & Zhao, 2004), but not much research has been published about the use of OER or WBL in this subject area. A few articles focus on OER as an artefact with the aim to facilitate access to knowledge in food science for employees in third world countries (Geith, Vignare, Thiagarajan & Bourquin, 2010; Kaneene, Kisaka, Ssajjakambwe, Miller & Kabasa, 2013). Lindshield argues for the use of OER in the field of food science but his searches in two OER repositories on "open educational resource and food science" or "open educational resource and nutrition" resulted only in one OER, which was an open textbook for teaching about food at school level, thus

he concluded that the food science community still do not value openness (Lindshield, 2013).

Billett (2001b) analysed the use of WBL for continuing education at five different work places, of which one was a large food company, with the intention of identifying the kinds of measures that need to be in place at the industries in order to give opportunities for learning. He pointed at direct and indirect support from the management team as part of everyday practice as important for quality of learning (ibid.). Also, a recent study on WBL as an approach to develop generic competences needed in the food industry was published as a conference paper (Komariah, 2015).

It has further been argued that there is a potential for OER in veterinary medicine (Frydenberg, 2009). Since the discipline of animal welfare nowadays combines natural sciences and normative considerations, the teaching is most commonly grounded in discussions of current case-studies and sometimes in formal debates and role-play (Hewson et al., 2005). Thus, teachers need to be able to articulate ethical negotiations on how science fits into the social debate (Fraser, 1999), but not all animal scientists feel confident in conducting such ethical discussions. Therefore, there seem to be a need for case studies in the subject area of animal welfare and of learning resources that can be shared to scaffold ethical discussions.

One such example is a learning resource about animal welfare in kennels and catteries developed in the UK (Denwood, Dale & Yam, 2008). This learning resource was authored by a student which "brought to the project not only computing expertise, enthusiasm, and motivation but, perhaps most importantly, his perspective as a fellow undergraduate student who had very recently had to assimilate information about small-animal housing within his overall understanding of veterinary medicine" (Denwood et al., 2008, p. 323). Thus, this study supported the involvement of students; however the resource was not an OER but only accessible to a selected audience, confirming that access to knowledge about animal welfare is restricted and most often found in formal structures such as classrooms and libraries.

CHAPTER 3

THEORY

This thesis aligns with a sociocultural perspective, where learning happens in a social and cultural context (Vygotsky, 1978) and where "the elaboration of concepts, methods, and theories takes place within the science itself during the whole course of scientific knowledge acquisition" (Rieber & Robinson, 2004, p. 248).

The learning philosophy underpinning open learning can be seen as resonant with the work of Dewey (1916) on enquiry based learning in which he emphasised the importance of the learners being active explorers of their environment. Dewey pointed at the importance of institutionalising education and that teachers facilitate learning by providing materials and guiding the learning path. He also argued in what has been conceptualised as Dewey's progressivism, that knowledge is best viewed in terms of their practical uses and successes rather than in terms of representative accuracy (ibid.). Dewey´s educational project was built on the idea that an educational system within a democracy stimulates learners' power, since it "gives individuals a personal interest in social relationships and control,

and the habits of mind which secure social changes without introducing disorder" (Dewey, 1916, p. 99).

Hence, his way of thinking was not only the foundation for the concept of situated learning but also for social production of knowledge, and Dewey shares the same epistemological approach with the Cultural Historical Activity Theory (CHAT). At its simplest, situated learning is when learning takes place in the same context in which it is applied (Lave & Wenger, 1991). The concept of situated learning was coined as a reaction to an authoritarian educational practice, and situated learning tackles questions of participatory learning as a sociocultural process. Dewey's project on progressive education has been an inspiration in educational science, e.g. is computer supported collaborative learning (CSCL) an umbrella term and an established research field that focuses on collaboration and is inspired by enquiry based learning (Koschmann et al., 2002). Iiyoshi and Kumar (2008) argue that the viewpoints underpinning open learning are the situated learning theory and CHAT, and that both offer ways of examining learning in social situated practices and their systemic structures, whether they are technologically mediated or not.

Thus, a fundamental premise of the thesis is the involvement of the users and the understanding of the users' needs as well as to take into account all possible factors that can influence the process of iterative design and the development of new practices. It is characteristic of action based research that you do not distinguish between knowledge creation and developing practice. The two approaches explored in this thesis, OER and WBL can be regarded as carriers of new knowledge and collaboration at the same time.

Activity theory is drawing on the socio-cultural theory and Vygotsky's ideas on mediated action (Engeström, 1987). Cultural historical activity theory is "unique for its practical, political, and civic engagement" committed "to ideals of social justice, equality, and social change" (Stetsenko & Arievitch, 2004, p. 58). CHAT focuses on practice, understanding that everyday practice in the real world is the very objective of scientific practice (Nardi, 1996) and CHAT is the analytic tool in this thesis.

3.1 CULTURAL HISTORICAL ACTIVITY THEORY

In this chapter I will initially describe CHAT and explain its development, main concepts, and components and why this analytical framework is of special interest to this thesis. After this introduction, I will go deeper into some of the characteristics and concentrate on the features having direct significance for my studies.

The cultural historical activity theory (CHAT), as conceptualised by Engeström (1987) studies different forms of human practices in change, with both the individual and the social levels interlinked. These two characteristics, that man and society are not separated entities and that focus is on changes and unstable entities over time, are shared with three other historical break-troughs; in philosophy (Hegel), biology (Darwin), and social science (Marx) (ibid.).

CHAT builds on the Russian school of activity theory (AT), which originally constituted three entities; the individual, the object and their mediating instruments. This is illustrated by the upper triangle in the activity system (see Figure 1), and is called "the tip of the iceberg" as they represent the "visible instrumental actions of teachers and students" (Engeström, 1998, p. 79). AT is descriptive and emphasises mediation by tools, rather than being a predictive tool emphasising language as a tool, which is the characteristics of CHAT (Nardi, 1996).

AT is also narrower than CHAT, in that AT has been oriented to practical needs of society and always tends to take examples from natural sciences (Kaptelinin, 1996b). This difference is related to the focus on culture in CHAT. Cultural differences and social discontinuity give rise to inner tensions and contradictions, which are argued to be a potential for change (Engeström, 1987). Two examples of activity systems with cultural differences are higher education and food industries that use different tools to mediate the activities and generally have different objects of activity.

In CHAT there is also an element of history because the historical aspects of the institution and the individual activities co-construct each other (Engeström, Engeström & Kerosuo, 2003) and that the task is to get an understanding of the developmental germ cell, which is expressing the inner contradictions of the system under scrutiny (Engeström, 1987). Higher education is strongly influenced by historical aspects and the system is stabilised by mediating conditions such as rules in the form of curricula.

The lower part of the triangle, symbolises the mediating conditions of an activity, which illustrates that the activities are carried out within a social context, and that the relationship between subject and the community is mediated by rules and the relationship between object and the community by the division of labour; similar to the mediation between subject and object by the means of the instruments in the upper triangle (Engeström, 1987).

Thus, the rules, the community and the division of labour give structure to the activities at the systemic level (Engeström, 1987). However, these components in the activity system are not always visible at a systemic level but more tangible at a local level (Engeström, 1998). Rules are formal or informal regulations that constrain (e.g. group thinking, overconfidence in regulations and fragmentation) or deliberate the activities (e.g. structure that increases students' freedom). The division of activities among social actors in the system and the hierarchical structure of activities and actors are of importance for the social activities.

The components and the relationships between components within an activity system need to be analysed individually but an analysis always needs to include the whole activity system, since the essential task is always to grasp the systemic whole, not just separate relations. An example is the inclusion of all entities in the analysis of an activity system of a particular peer review process in order to make more extensive declarations. The ability to use CHAT for analysing diverse kinds of human activities and at the same time to be able to generalise the results makes CHAT rather unique (Kaptelinin & Nardi, 2006).

Activity systems do not exist in isolation; they are only possible to understand with their context and are imbedded in networks that constantly change (Daniels, Edwards, Engeström, Gallagher & Ludvigsen, 2010). The third generation of the activity theory includes at least two interacting activity systems (Engeström, 2008), and the shared object is what brings them together as exemplified by bringing together higher education and industry through the student projects in WBL.

CHAT is a theory of object-driven activities (Engeström, 2008). The object of activity is the reason why groups of individuals choose to participate in an activity, thus the term activity addresses the relationship between the actors and their motives and concerns, and gives the activities a special direction (Kaptelinin, 2005).

An outcome of activities is considered to be the result of the driving force of change and development related to social tension, contradictions and instability (Daniels et al., 2010). Sometimes the outcome identifies a knowledge gap or a result, but it is not a stable and finalised solution to a problem (Nummijoki & Engeström, 2010).

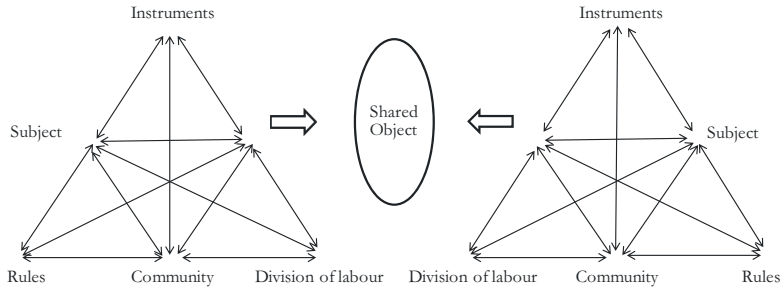

Figure 1. Interacting activity systems and shared object. Adapted from Engeström (2009).

In summary and of particularly interest for this thesis, CHAT:

- is useful for critical analysis, when trying to understand difficulties and dynamics in human activities from the users' point of view (Nardi, 1996);
- helps to understand and analyse the relationship between the human mind (what people think and perceive) and activity (what people do) (Daniels et al., 2010);
- is rich enough to capture the most important aspects and generalisable enough to be useful (Kaptelinin & Nardi, 2006);
- instructs us to treat people as sentient moral beings and emphasises the behaviour or activities of the same people (Nardi, 1996);
- needs to include the motives, goals and conditions of activities in the analysis since activities are oriented towards motives (Kaptelinin & Nardi, 2006);
- has activity as a unit of analysis, which is including a complex system of individuals, artefacts, traditions and interests, in contrast to proceed from the individual (Vygotsky, 1978) or the community (Lave & Wenger, 1991).

LEVELS AND PLANES OF ACTIVITY

Kaptelinin and Nardi connect to the earlier development of activity theory in Russia through their focus on the levels and planes of an activity (Kaptelinin & Nardi, 2006). Kaptelinin emphasises the levels through the identification and understanding of what goal-oriented and object-oriented activities are in order to understand human activities and advocates three levels of activity. He describes activities as oriented to collective meaning making and driven by motives – *why* something takes place; whereas actions are subordinated activities - *what* takes place, which has a temporary and often individually focused goal. The activities are realised through operations - *how* the activity is carried out, which becomes routinised and unconscious with practice (Kaptelinin & Nardi, 2006).

Nardi points at the problem for the observer to understand human motives, and suggests that when the motive for activity and the object of activity are separated it makes it easier to understand why people engage in activities and also to recognise the object motives of others (Nardi, 1996). Kaptelinin and Nardi also emphasise that when conditions for operations are frustrated, humans most often do not notice; however when the goals for actions are frustrated, humans change to new goals, but then again when motives for activities are frustrated people get emotional and their behaviour become unpredictable (Kaptelinin & Nardi, 2006).

While Kaptelinin recognises three levels of activity, activity theory traditionally identify two planes of analysis; the internal and the external planes. The internal plane of actions refers "[...] to the human ability to perform manipulations with an internal representation of external objects before starting actions with these objects in reality" (Kaptelinin & Nardi, 2006, p. 51). Some researchers divide the analysis in three planes without focusing on the intra human plane. They consider variously the personal, the interpersonal and the community aspects of the activities since they are inseparable but need to be analysed at different times (Rogoff, 1995; Yamagata-Lynch, 2010). Rogoff (1995) also suggested zooming into one plane at a time during analysis and claims that any event in the present is an extension of previous events and is directed to goals that will be accomplished in future.

Kaptelinin's view on levels and planes of activity differs from Rogoff's and is connected to how Leontiev distinguished the object of activities in two different meanings, described as *predmet* (Russian), as a special status acquired by things that opposes *object*, which is a physical thing (Kaptelinin, 2005). The special status was exemplified by Leontiev as "the object of labour" or "the object of contemplation" (Leontiev, 1981), and in the context of animal welfare this could be "the object of protecting a vulnerable creature". The predmet of activities are according to Leontiev the motivations or "the true motive", thus a motivation is a drive behind an act and a goal is a more shallow reason for the activity (Kaptelinin, 2005). This way of thinking can inform how we can analyse teachers' motivations for using different approaches in their teaching.

AGENCY

In activity theory the core mechanism implies that the individuals gain agency and take charge of the process (Engeström & Sannino, 2010), in other words that they realise intentions based on motivations and perform directed activities. CHAT has been criticised for having the main focus on collaborative processes on the systemic level at the expense of the individual agency, but recent studies have indicated how agency emerges in interactions or in the collective relationship between individuals rather than within the individual (Engeström & Sannino, 2010; Edwards & Kinti, 2010).

Thus, it refers to the capacity of individual agents to act independently and to make their own free choices within a "structure" which refers to those factors that seem to constrain or influence the opportunities that individuals have, such as social class, religion, gender, and ethnicity. In the context of higher education this can be seen as a dynamic interaction between on the one hand the solid structure, which manages the academic integrity and is rigid in relation to changes and gives little room for interpretation for the individual teacher, and on the other hand the teachers' and students' individual agency. Thus, the notion of structure is here placing emphasis on the interconnectedness and relational view and can be seen as an ecology of tools and action (Star & Griesemer, 1989). However, the rules can also to various degrees deliberate activities and provide

the subject guidance in the interaction with other community members (Engeström, 1994), and it will as an example be considered whether the initial negotiations in the WBL approach play that role.

Agency is connected to intentional physical movement of the body (Nummijoki & Engeström, 2010). However, embodiment is not enough, there should also be a will or a need to act related to cultural and/or biological needs, and sometimes agency also relates to emotions and moral concerns. Engeström & Sannino (2010, p. 1) describe expansive learning as an integration of two directions, "The theory of expansive learning currently expands its analyses both up and down, outward and inward. Moving up and outward, it tackles learning in fields or networks of interconnected activity systems with their partially shared and often contested objects. Moving down and inward, it tackles issues of subjectivity, experiencing, personal sense, emotion, embodiment, identity, and moral commitment". This integrative approach is used in this thesis to analyse the motivations of teachers to change their teaching practices.

To see activities like object-oriented leaves the motives positioned outside the individual, which stands in contrast to that they are mental and individual processes that should be taken into account. Anna Stetsenko has contributed with a discussion of the individual agency in relation to CHAT (Stetsenko & Arievitch, 2004; Stetsenko, 2005; Vianna & Stetsenko, 2006). She argues that the individual through activities is affected by a social discourse and by the activities in the communities the individual is belonging to. These activities are "creating an integrated view on the self" (Stetsenko & Arievitch, 2004, p. 447) and people are "simultaneously molded by society and also mold society; that they are created by history but also create their own history" (Stetsenko & Arievitch, 2004, p. 492). Hence, she points at when focusing solely on the importance of the social or the individual in the sense of the biological, one misses what is driving the development of personality. She has also criticised Leontievs' conceptualisation of personality as a participant in collaborative activities rather than a driving force that enacts and contributes to life (ibid.).

The driving force is also embedded in the notion of relational agency, which is a capacity related to social activities with others and to strengthen purposeful responses to complex problems (Edwards & Kinti, 2010). Edwards & Kinti suggest that relational agency can be learned and explain

that it has two sides 1) that one recognises the motives and the resources of others and expand the object of activity and 2) that one align one's own responses to the newly enhanced interpretation.

Internalisation has been defined as a process of "using explicit knowledge to extend one's own tacit knowledge base" (Nonaka, 1991, p. 99). Internalisation has also been described by Engeström as the "key psychological mechanism" discovered by Vygotsky and is associated with learning (for example, learning ideas or skills) and making use of what has been learned from then on. Internalisation is the process of consolidating and embedding one's own beliefs, attitudes, and values when it comes to moral behaviour, in the whole, which will be studied in the case of student projects in industries, but may also be related to tensions and contradictions.

TENSIONS, CONTRADICTIONS AND POWER STRUCTURES

Contradictions are historical accumulated tensions within and between activity systems that are creating the motive and thus are creating the driving forces for the activities leading to change and development (Engeström, 1987). However, contradictions that relate to systemic tensions are most often subtle and do not develop into open conflicts; conflicts rather relate to individuals and their short-term actions (Sannino, 2008).

Inner or primary contradictions can arise within the components of an activity system (Engeström, 1987). Contradictions between components within the activity system are the most common. They may have different reasons of which influence from intersecting activities is one reason, and they are considered as secondary contradictions (ibid.). Contradictions at the tertiary level, are leading to the introduction of more advanced objects of activity and contradictions at the fourth level. Finally, the contradiction between the object of activity at the boundary to other activity systems are at the quarterly level (ibid.). The division of contradictions in different levels is helping to analyse and interpret the contradictions and is also of importance to understand the power relations in CHAT (Daniels et al., 2010).

Since a peer review process can be seen as an activity system acting at the boundary to other activity systems and may also be influenced by tensions between the reviewers, an analysis of contradictions within and

between activity systems in peer review can contribute to the understanding of the process and its inherent power structures.

The division of labour in CHAT is related to both the vertical division of power and the horizontal division of tasks. The notions of horizontal and vertical movements of learning are of importance for the understanding of social learning. Vertical learning can be both top-down and bottom-up learning, but the traditional view on learning is the top-down vertical movement, when the expert teaches the novice and where horizontal learning is largely ignored (Engeström, Engeström & Kärkkäinen, 1995).

Engeström argues for a broad and complex view on expertise and experts. Engeström and Middleton (1996, p. 4) describe expertise as the "collaborative and discursive construction of tasks, solutions, visions, breakdowns and innovations" rather than the individual mastery of specific subject areas. Thus, experts face the challenge of negotiating and combining ingredients from different contexts to achieve hybrid solutions, and they are also increasingly involved in multiple communities of practice (Daniels et al., 2010). The vertical master-novice relationship, and with it the professional monopoly on expertise, is problematised as demands for dialogical problem solving increase (Engeström et al., 1995).

Hence, the capacity to recognise and collaborate on the resources other can offer is a bearing capacity in activity theory and a reaction to experts' groupthink and fragmentation that may make it impossible for experts from different contexts to "speak the same language" and exchange ideas about a problem (Daniels et al., 2010). Also, there is a point in focusing on the differences since what chafes can lead to something new and enhanced. This way of thinking is of particular interest in the context of food quality and animal welfare being in need of the involvement of citizens from different cultures.

BOUNDARIES, BOUNDARY CROSSING AND BOUNDARY OBJECTS

Boundaries are social constructions that define who are included and excluded from interactions (Edwards & Kinti, 2010). Boundaries between two worlds that are of relevance for each other are particularly important. Interdisciplinary collaboration involves boundary practices and collabora-

tion between animal scientists and ethicists in the field of animal welfare is one example of such practices and work-based learning another.

When practitioners interact at the boundaries of their institutional practices, their social and professional identities are challenged, and articulating new practices is particularly challenging (ibid.). When learning is defined in terms of identity development the argumentation of Akkerman and Bakker (2011, p. 132) becomes central "a key question is the distinction between what is part of me versus what is not (yet) part of me". Thus, boundaries both connect and divide the activity systems involved (Akkerman & Bakker, 2011).

Engeström refers to boundary crossing as horizontal movements of knowledge between multiple parallel activity contexts (Engeström et al., 1995). In the academy, boundary crossing is not only of importance for researchers when making their results relevant to society but also for teachers using OER to cross boundaries to other academic institutions and for those using WBL, because this approach is based on students crossing boundaries between two separate worlds (Webster-Wright, 2009).

Akkerman and Bakker (2011) have reviewed the literature on boundary crossing and identified four learning mechanisms, which can be used for a more detailed analysis of learning at the boundary. They are in short; 1) the identification process that occurs by defining one practice in light of another; 2) the coordination process which is the first attempt to get a common understanding, 3) the reflection process that develops the different parties' view so that they can understand the perspectives of the other party; and finally 4) the transformation process that involves confrontation and continuous work, which leads to changes in practice.

Individuals acting at the boundary between two activity systems may be relatively isolated within each but develop skills in mediating between diverse groups and generating partnerships, acting as diplomats, or negotiators. Such individuals may also be important sources of innovation, since their structural position enables them to transmit and translate ideas from one context to another (Jewson, 2007).

A boundary object between activity systems is an analytic concept which has received special attention (Star & Griesemer, 1989; Engeström et al., 1995). Star & Griesemer (1989) emphasise the introduction of an object to achieve boundary activities and to connect actors from differ-

ent social worlds with different agendas to create common meanings. Engeström, however, seems more focused on the process when generating boundary objects through boundary activities. His view is more in compliance with open learning theories, where actors create the boundary objects that invites to use and further development, but can also have an advantage in being preserving boundaries.

Thus boundary objects can be abstract or concrete but are always related to action (Star and Griesemer, 1989). The three examples of boundary objects within this thesis are: work-based learning projects, OER and peer reviewing. Star and Griesemer (1989, p. 393) describe such objects as "objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites".

There are different views on how adaptable actors need to be in boundary practices (Guile, 2011). Star and Griesemer´s definition has been criticised for being restrictive, not taking into account individual agency and relying on the introduction of an extant object to coordinate actions (ibid.). However, boundary objects allow coordination without consensus as they can tolerate an actor's local understanding to be reframed in the context of a wider collective activity and therefore are the identification of frictions/tensions/contradictions so important to identify the "rhythms of activity" that needs to occur to overcome those frictions (Guile, 2011).

EXPANSIVE LEARNING AND RUNAWAY OBJECTS

Expansive learning is characterised by being a horizontal movement of knowledge, which is crossing boundaries and tying knots between activity systems (Engeström et al., 1995), and at the same time initiated by a critical view and a will to revise accepted practices and the tacit rules and procedures that regulate the setting (Daniels et al., 2010). Negotiated knot working is required when collaboration between actors takes place without predetermined rules or a fixed central authority and when the object of the activity is unstable, resists attempts at control and standardisation, and requires rapid integration of expertise from various locations and traditions (Engeström, 2007).

Both acquisition based and participation based approaches to learning (Sfard, 1998) look at learning as a one way movement from incompetent to competent, whereas expansive learning is about learning something that is not yet there (Engeström & Sannino, 2010). Thus, in expansive learning the actors construct new objects which are intertwined with the acquisition of knowledge this requires. In expansive learning the object is pervasive and its boundaries are hard to draw (Engeström, 2008) and most often it involves numerous activity systems and sometimes the object of activity begin as marginal problems, which make them difficult to predict and utilise. These kinds of objects are called runaway objects, and they have the potential to escalate without anybody's control and expand up to global scale of influence (ibid.).

In expansive learning the object is not only broadened but also implemented in practice, and studies on expansive learning are based on thick descriptions of participants in real situations. Furthermore, expansive learning is a process leading to formation of new theoretical knowledge and concepts and thus new cognitive trails as a result of people moving between multiple parallel contexts, demanding complementary but also conflicting tools, rules, and cultures and combining ingredients from different contexts to achieve hybrid solutions (Engeström et al., 1995).

In summary, expansive learning is characterised by four features:

1. Horizontal – crossing boundary and tying knots between activity systems
2. Transformative – broadening the shared object
3. Experiencing – placing participants into real situations
4. Subterranean – involving new cognitive trails

In this thesis several interrelated activity systems and objects of activity are researched. Engeström (2008) argues that expansive learning is a stepwise expansion of the object, and that the potential for such expansion is best discovered by means of interventions which open up the zone of proximal development of the activity system. Engeström et al. (2003) suggest three methodological rules for interventional research, that will inform the methodologies in this thesis: (1) Follow the objects of activity in their temporal and socio-spatial trajectories; (2) give the objects a voice by involving the clients or users in dialogues where the object is made visible, articulated and negotiated; and (3) expand the objects by organising

intervention sessions and assignments where the producers and clients construct new shared models, concepts and tools to master their objects.

FORMATIVE INTERVENTIONS

Formative interventions are in contrast to linear interventions, situations in which the researcher aims at provoking and sustaining an expansive transformation process owned by the participants (Engeström, 2011). In linear interventions goals are known ahead, the process is executed by the researcher without resistance, and the researcher aims at controlling all variables.

Hence, in formative interventions the key outcome is agency among the participants that takes charge of the process, and the intervention need to be embedded and contextualised in the participants' life (ibid.). However, "Much of the literature on design experiments seems to take for granted the traditional designer-led model of innovation and ignores the recent turn toward user-led or `democratic´ innovations" (von Hippel, 2005; Engeström, 2011, p. 4).

Hybrid solutions are made by experts, who operate in and move between multiple activity contexts. This requires an expertise, which is a capacity to recognise and work with the resources that others can offer (Edwards & Kinti, 2010). Peer review is an activity which is bridging the gap between developers and the users (Engeström & Sannino, 2010) and "software agents must operate as boundary crossing agents that facilitate interaction and mutual intelligibility between the perspectives" (Hasu & Engeström, 2000, p. 86).

Knot working is a specific mode of collaboration that moves towards co-configuration (Engeström, 2007), however this does not capture the phenomenon of peer production of knowledge which has been described by Engeström (2007) as *mycorrhizae*, which is a metaphor for the symbiotic association between a fungus and the roots of a plant, in which fungi grow through and within the environment around them, that it has a large surface area but no centre, that it is hard to kill but still vulnerable, and that it in return provides nutrition to the environment (ibid.). A global discussion of the concept of animal welfare on the Internet between participants with diverse perspectives can be regarded as peer production.

CHAT FOR ANALYSING PEER PRODUCTION

CHAT can be used for design work research but is more often used for the analysis of human interactions (Yamagata-Lynch, 2010), and the object of activity is the reason why groups of individuals choose to participate in an activity (Kaptelinin, 2005). In this thesis CHAT is use in different ways to understand design-oriented research, to analyse cross boundary collaboration, and to understand human motivations and interactions for systemic change in peer production.

In peer production, the process can be simultaneous and multi-directional in sideways transitions (Engeström, 2008). The distinction between structure, or system for learning and process is obsolete but 1) the actors are in there to achieve something, their object is open-ended but it has motivational force; 2) the swarming movement is collective and 3) new patterns seek symbiosis with vertical and linear structures of mass production and 4) actors are seeking models of activity that enable "innovation and expansion, yet be sustainable and not burn out their own energy and environment" (Engeström, 2009, p. 5).

Wikis and other Web 2.0 artefacts are characterised as "a hybrid of tool and community" (Shirky, 2008, p. 136; Engeström, 2009, p. 11). They have severe constraints: They give little monetary rewards, are time and energy consuming, and carry a high risk of failure and have little centrally organised efforts. Thus, in peer production actors are highly motivated, "have strong object and use-value orientation and resistance to thorough commercialisation" (Engeström, 2009, p. 5).

Engeström (2008) suggests that in order to give an object drawing power it needs to have intrinsic properties. The object also has to yield useful intermediate products, and the object must be visible, accessible and cumulable and there must be effective feedback from and exchange among the participants acting on the object.

In research peer production and peer-review are well-established processes but in education collegial activities are not that recognised, and the engagement of the students or the learners in knowledge production is still a new trend, but when the "scripts" of the educator and the "scripts" of the learner engage in dialogue the potential of learning is strong (Engeström, 2009).

In summary, peer production is suggested to be one of the biggest challenges for future studies of expansive learning alongside the serious theoretical and empirical efforts that are needed in order to understand and integrate the two directions "up and outward and down and inward" (Engeström & Sannino, 2010, p. 21). This thesis will address both these challenges.

CHAPTER 4

RESEARCH DESIGN AND METHODS

The five studies in this thesis have been designed to explore open learning activities in higher education with the aim to understand them as boundary activities and develop models and methods for working with and enhancing open educational practices. The unit of analysis in all studies is the activities that teachers and students perform (or report they perform) in their social setting or context. To be able to expand our understanding on negotiated WBL and OER within this context, it is valuable to investigate their use and development from several interrelated and complementary levels of perspectives. One cannot understand an individual's activities if one do not understand the structures and vice versa (Mcgill et al., 2005), and therefore the research is conducted at different system levels and with different methods.

In study I student activities at the boundary between academia and industry are analysed in detail based on results from survey and interview data. In study II, which is more of a concept article, the activities are only superficially assessed based on the properties of the infrastructures and the resources. In study III the activities of teachers in a design-oriented

setup are described and analysed. Study IV analyses self-reported activities and the motives for activities of teachers in a global network, and finally study V focuses on activities conducted by peer reviewers when assessing the quality of an artefact.

A literature review was initially conducted to investigate what is known about WBL and OER as open learning approaches in the field of food science and animal welfare. The review resulted in remarkable few publications although positive expectations on the approaches are documented (Komariah, 2015; Lindshield, 2013). Thus, it emphasised the importance of a deeper investigation of various aspects of these approaches in order to get an enhanced understanding of the complex processes in open learning.

This thesis is based on a multi methodological approach (Brewer & Hunter, 2006), since the integration of qualitative and quantitative research has been considered necessary in order to provide a comprehensive analysis of open learning methodologies both within and between the articles, and because CHAT implies that a varied set of data collection techniques are used (Nardi, 1996). Structure and process are of equal importance in open learning activities, which is also a reason for combining methods. Quantitative research provides an account of structures in social life, exemplified by the factor analysis of underlying motivations in study IV, and qualitative research provides a sense of process or action (Bryman, 2012), exemplified by the video analysis of the peer review process in study V.

The two research methods can also be fruitfully combined, when one is used to explain findings generated by the other (Bryman, 2012), which can be exemplified by study IV and V; in Study IV quantitative methods resulted in findings about quality assessment and peer review of OER, which was followed up by qualitative research in study V. Finally, a multi methodological approach was used to allow for methodological triangulation, exemplified by the results from the interview of students confirming what they have already stated in the survey in study I.

4.1 POSITIONING A RESEARCHER IN A CONTESTED AREA

Researching controversial and contested fields involves a number of ideological positions and open learning, animal welfare and food quality are examples of such contested fields. I have an ideological belief that openness and transparency in higher education can strengthen democratic societies, that sustainable development is necessary and that we should take account of the welfare of those animals we have in our care for food production and that the quality of food is dependent on issues such as both sustainability and animal welfare.

These standpoints have predominantly influenced me in the choice of research questions. However, it has also required high standards of consciousness in the analyses of the collected empirical materials to reduce the occurrence of bias in the interpretation of the results, and thus the validity and reliability of the research. Säljö (2015) stresses that when teachers select a pedagogical approach, it is not ideologically neutral. It is linked to ideological values. Furthermore, research and education need to be socially accepted in order to be socially robust as described by Nowotny et al. (2001) and this is the context of this thesis.

4.2 METHODOLOGICAL CONSIDERATIONS

The research is using a broad approach that also involves methodological challenges, such as the issue of interpreting, designing and conducting interventions in the same study as described by Braa and Vidgen (1999) in their article on `in-context information system research´. Although the optimal research design should be defined depending on the research question, applied research is not always as straight forward and combining intervention and interpretation activities mirrors that they also presuppose each other (Mathiassen, 2002) albeit the emphasis differs (Braa & Vidgen, 1999).

This is related to the researcher's role, having been involved in the development of designing structures for learning, such as the bachelor program in study I and the infrastructure and resources in study III, and researching the same structures and their impact for learning. However,

the insider role in the process of the development of infrastructures for OER can be argued to be a prerequisite for the level of details and thus for the quality of this research, but there is also a risk for not keeping necessary distance.

Therefore, in study I and V where methods other than surveys were used some special considerations were taken. In study I the researcher met the students for the first time in the interview situation and had not been involved in the educational program for more than 5 years. Furthermore, the researcher had never been a colleague to several of the surveyed teachers and had only had personal contact with few of the surveyed host workplace supervisors (referred to as supervisors).

The researcher's previous experience in animal welfare had resulted in a large global network of higher education teachers, which even implies personal connections to colleagues and students. Such relationships could be a bias, in particular in person-to-person inquiry such as interviews and focus groups (Bryman, 2012). For that reason, the strategy has been to conduct surveys rather than interviews and focus groups, and likewise not to be present during the peer review meetings in study V.

The domain of animal welfare is compared to e.g. food science rather small but global. Having previous experiences from research and teaching in this domain in which some of the empirical material has been collected can be regarded as both an asset and an obstacle. The benefits are again related to that previous experiences can inform the research and the obstacles are related to the difficulties of keeping distance to the findings.

Self-completions questionnaires have drawbacks such as the risk of low response rates and respondent fatigue (Bryman, 2012). Since they rely on self-reporting, responders do not have anybody to clarify if the wording is unclear which increase the risk of misinterpretation or unanswered questions (ibid.). Therefore the questionnaires used in this thesis were all tested for content validity by small test groups. The response rates were higher in the study on WBL than in the studies about the adoption of OER. This can be explained by the latter studies being addressed to geographically dispersed teachers that were not necessarily directly involved in the EU-project. Finally, the use of surveys does risk appealing to respondents already interested and therefore may not be representative.

4.3 DESIGN ORIENTED RESEARCH

There are a number of approaches to design oriented research. Design research and design experiments are aiming at developing and refining theories about how people learn (Brown, 1992). Design-based research (DBR) has a similar objective. DBR is a series of approaches with a theoretical anchoring with the intent to design artefacts and practices in naturalistic settings and advance our understanding of learning-related educational phenomenon simultaneously (Barab & Squire, 2004). Design science research (DSR), on the contrary, is not grounded in educational sciences but is rather an established tradition in informatics or engineering in that it generally aims at producing or evaluating design guidelines and frameworks that inform the design of artefacts addressing a certain class of problems (Hevner, March, Park & Ram, 2004). These approaches are related and it is partly a question of use of terminologies.

This work is discussed in terms of DSR since the methodology used for knowledge sharing via OER has similarities with design science research (Simon, 1996). Both are characterised by relevance and novelty and require a systematic research structure: 1) defining the problem, 2) demonstrating that no adequate solution exists, 3) developing and presenting a novel ICT artefact (construction of models and methods) that addresses the problem, 4) evaluating the IT artefact enabling the assessment of its utility, 5) articulating the value added to the IT knowledge-base and to practice, and 6) explaining the implications for IT management and practice (March & Storey, 2008). In other words, design science research focuses on the construction of situated artefacts and the evaluation of artefact performance following construction (Vaishnavi & Kuechler, 2008), which is also the case here.

Study III can be regarded as an intervention conducted in collaboration with higher education teachers. It is based on a systematic research process having the goal to change activities and the research is highlighting both the process and the product. Within study III the teachers and users were directly involved to confirm the validity of the design goals, iron out technical issues, and get feedback about the design. This way of collaboration has been described by Bellamy (1996). The willingness to involve users in the design process has been growing, leading to a change from user-centred design to user-involved design in iterative design processes (Nardi, 1996). Bellamy (1996) has also highlighted the need to design for

the education community as a whole, and not just for learners for whom the technology is being designed in the design process, since learners are just one set of participants in the activity of education.

Thus, the methodology of DBR shares with the theoretical framework of CHAT that they both have an underlying motive to develop the phenomenon that is being studied, and given the bidirectional nature of activity systems the mental process of the individual will change when the design is changed. Bellamy (1996, p. 128) has expressed that "only by understanding and designing for the complete situation of education (every issue in the activity-triangle) it will be possible for technology to bring about pervasive educational reforms".

In study III, the research was conducted in an iterative process, and as most often only with one cycle. It was used to facilitate our understanding of what the activities of the creation of OER for research dissemination in an EU-project entail and was also used to develop research questions for further studies.

4.4 PARTICIPANTS, CASE STUDIES AND EMPIRICAL MATERIAL

The participants in the studies in this thesis are higher education teachers, bachelor and PhD students as well as supervisors in industry, trainers and users of OER (see Table 3 for an overview of the time, participants, the case studies and the empirical material). The participants in study I were either teaching or studying at the Swedish University of Agricultural Sciences or employees and at the same time supervisors at the Swedish food industries. Study II did not have any participants but resulted in a conceptual article on the incentives for and empiric data on the incidences of OER in animal welfare. The participants in study III and IV were teachers and users of OER at university level in a global network related to animal and food sciences and animal welfare. The network was identified within an EU-project and it was five years between the surveys. However, since only 11 respondents answered both surveys the investigations did not include whether there were any correlations. The participants in study V were PhD students and a process leader in a doctoral course at Swedish University of Agricultural Sciences. The PhD students were recruited on a voluntary basis from both Sweden and Finland.

Table 3. Overview of time for collection of empirical material, participants, case studies and data

	Time	Participants	Case study	Data
Study I	June-October 2009	100 students, 31 supervisors and 8 teachers responded to surveys and 11 students were interviewed in a locally developed bachelor program.	Educational program with negotiated WBL-model.	Survey results from surveys to three different target groups and interviews of students before and after their project.
Study II	April 2010	-	-	Search results from an inventory on electronic teaching resources in animal welfare from three different Internet search engines.
Study III	April-November 2007	99 teachers, 70 trainers and users of OER in a global network of individuals from industry and academia	EU-project.	Survey results from surveys to two different target groups.
Study IV	June-September 2012	101 researchers and teachers from the same global network as in study III.	EU-project.	Survey results from survey to teachers.
Study V	October-December 2012	6 PhD-students and a process leader involved in animal welfare.	Peer review-setting.	Videos from four meetings and produced documents.

The incentive for performing case-studies is to provide detailed and intensive analysis of single cases, such as a community or an organisation (Bryman, 2012). The emphasis tends to be an analysis of a real life event in their natural setting, which is defined as "a relation between acting individuals and the arenas in relation with which they act" (Lave, 1988, p. 150). In this thesis multiple cases are studied, which has the potential of improving an emerging theory and strengthens the findings, since it is providing different angles on the same inquiry (Bryman, 2012).

4.5 METHODS

The specific material collection methods used in this thesis are described in this section.

INTERNET INVENTORY

Article II is primary a concept paper but it does also include a description and discussion of the results from an Internet inventory of the availability of OER in animal welfare. The Internet provides a rich and varied source of information; however the sources need critical evaluation and this study only included resources of which the provider, the level of openness and the target group could be assessed. Search engines are software systems designed to search for information on the Internet, and the three search engines, Google, Alta Vista and Yahoo were frequently used at the time of the inventory, although Google was the most popular.

The systematic inventory of OER in animal welfare was conducted using "animal welfare" and "farm animal welfare" to constrain the search for relevant content. In order to search for type of educational material we have used the encompassing terms "e-learning" and "learning resources" to give a broad coverage and the term "open educational resources" to target the specific type of educational material of focus in this thesis. The same set of search terms was used in advanced searches by the three search engines. Finally, the first 30 Google-hits on the different combinations were analysed in order to identify the resources produced by higher education institutions. Any relevant OER not included were an oversight and not intended as a critique of their usefulness. A search in Google

Scholar on the same combination of search terms gave zero results in April 2010 when the inventory was conducted.

SURVEYS

Web surveys have been used since the goal has been to study relatively large groups of geographically dispersed on-line users (Bryman, 2012). E-mail lists have initially been composed and used for inviting prospective respondents to visit a website at which the questionnaires were found and could be completed online. The software package "Free Online Surveys" has been used in all three studies (I, III, IV), enabling the researcher to download the responses into databases that could be used directly in SPSS.

All the surveys were distributed electronically together with a covering letter giving information about the research and stating the names of the researcher(s). Two-three reminders were send as emails, and the responders were guaranteed anonymity but could provide their name if wanted. In study I surveys were used in combination with interviews in order to understand learning mechanisms at the boundary. In study III survey data was used in the design process together with other measures such as workshops. Survey data from teachers in higher education and researchers constitute the empirical material in study IV.

In study I surveys were sent to all students (190 individuals) that had completed a bachelor program within the last 15 years, to all host workplace supervisors (56 individuals) in the industries that had been involved in the bachelor program over 15 years, and to the 8 teachers that had been active in the program during this period. The response rates were 78, 63 and 100%, respectively. The surveys to students, supervisors and teachers included 20-24 questions of which 8-10 were essay questions, focusing on difficulties, dilemmas and problems and the development of general competences.

In study III one survey was sent to over 250 teachers and trainers identified in the EU-project, soliciting details of currently used teaching and training methodology and about their interests and needs of various educational approaches and resources. Two surveys including 18 questions detailing training needs in industry were sent to trainers and other users in industry. The responders were placed in 21 different countries and the

response rate on the survey of the educators was 40% (99 responses out of 250) whereas 70 responses came from trainers and other users. However, the actual response rate was undeterminable because this survey was forwarded using the snow ball method. Web surveys generally have the disadvantages of low response rates and the requirements of high motivation (Bryman, 2012), which is expected to be more problematic between users than teachers. The surveys were followed up with workshop sessions, in which more detailed discussions based on the survey results were implemented.

In study IV a survey including 23 statements and 6 essay questions was sent to the 218 higher education teachers, having a response rate on 46%. This survey focused on the value and adoption of OER; demographic information was also included. The study was not based on an established questionnaire but the battery of statements was inspired by the twelve key challenges identified in the open learning network (OLnet), referred to as: The *sticking points* (quality, sustainability, re-use), the *emerging challenges* (advocacy, culture, and open assessment), the *persistent challenges* (copyright, technology, access) and the *underlying challenges* (cost/benefit, impact, policy) (McAndrew & Farrow, 2013b, p. 69).

The battery of statements was later validated through the use of exploratory factor analysis, in which the relationships between different variables discern the underlying factors, and each factor was given a contextualised and theoretical explanation. For analytical purposes respondents were divided in two groups, teachers of animal welfare and others, which were teachers in other subjects of animal science and in food science and related areas.

Statements on value of OER were separated as general benefits and problems at institutional level and personal incentives and barriers. Statements on adoption of OER were separated as use, sharing and creation. Teachers' values were measured based on previous work by (Clements & Pawlowski, 2011); their agreements on statements about the value of OER were given at a Likert scale.

INTERVIEWS

In study I, the students were individually interviewed before and after they conducted their final project. The interviews were aimed at getting a deeper understanding of students' attitudes than what was possible in the survey. They displayed the students' expectations and reflections on their projects and development of general competences, and on their own efforts and the support they got from the different actors. They were also aimed at grasping what kind of tensions, problems and contradictions the students expected and how they undertook these difficulties.

The semi-structured interviews were performed as an interactive dialogue based on 10 open-ended questions. The questions were kept short but allowing for the responders to elaborate, which is also recommended by Kvale (1996). Three of the questions were posed both in the first and the second interview. In the second interview the students were reminded of their answers in the first interview and thus given the opportunity to reflect on their previous answers.

The interviews were conducted in the same setting, except one interview that had to be conducted over the phone because the first attempt to do the interview was not recorded due to technical problems. Every interview was audio-recorded. The first round of interviews lasted for approximately 20 minutes in comparison with the second round of interviews, which lasted approximately 12 minutes.

VIDEO AND TEXT

Video recordings of the peer review process and text analysis of a report to EU formed the empirical basis for the analysis and the discussion in article V.

The data consisted of videos of the four meetings between the reviewers and the different parts of the final report in order to 1) provide a complete view on the negotiations that were going on in a peer review process, and 2) understand the values and power structures of such a process.

The peer-review process was conducted in the autumn of 2012 by six PhD-students and a process leader; together they were regarded as a group of experts. The reviewers were recruited on a voluntary basis,

after open advertisement to participate in the process, and all applicants were accepted. It was a heterogeneous group of mature PhD students with respect to location, gender, age, affiliation, and PhD subject and each reviewer was knowledgeable about the animal species they were responsible for in the assessment. The reviewers signed an informed consent.

Since the PhD students were placed in two different geographically locations the meetings were held every third week as video conference meetings and recordings were done by using the Cisco Jabber Video system (Cisco Headquarters, 2013). One camera in each location was used to record the participants and in addition participants could use screen and document sharing during the meetings. All the participants were accustomed to use this system as a regular means for work collaboration. Thus the recordings included at the same time video from two locations and the shared screen/documents and a notebook provided possibilities for the researcher to index the captured meetings.

Before they started the assessment the reviewers studied a selection of scientific papers and guidelines using systematic methods to evaluate digital resources. At the first meeting, the reviewers discussed the literature on the assessment of digital resources and decided jointly to use the quality evaluation tool developed by Hays, Stout & Ryan-Jones (2005), and the reviewers who wanted to combine this tool with other review protocols or standardisation media were encouraged to do so. Before the second meeting, they either individually or in pairs reviewed the OER named Farmland (Farmland, 2015) by using the quality evaluations tool. The evaluation scale for each of the criteria ranged from 1 to 5, and each of the scores were described in detail for each criterion. The reviewers wrote their part of the report (two worked together, four worked individually) on the different topics based on the scores and their experiences from their PhD studies and background.

Then the reviewers had two meetings in which they discussed the quality of Farmland and how the individual part of the report should be changed and combined into the final report to the EU. Each individual report was scrutinised by a fellow peer within the group of reviewers and the process leader. Their comments were presented and negotiated at the fourth meeting. After the individual reports were amended, they were combined into the final report. This report was communicated to the EU.

The four meetings between the reviewers, lasting 2, 3, 2, and 2 hours, were video-recorded.

4.6 ANALYSING THE EMPIRICAL MATERIAL

Quantitative data in study I, III and IV were analysed using simple statistical tests such as mean, median, standard deviation, frequency, t-test and chi-square-test in SPSS. Furthermore, internal consistency of data in study I were analysed using inter-rating-reliability measured by Cronbach's alpha.

Study IV was complemented with exploratory factor-analysis in order to determine whether groups of indicators, here identified as underlying dimensions for the motives, tend to bunch together to form distinct clusters, known as factors, and thus to reduce the number of variables (Bryman, 2012).

Agreements on statements about the value of OER were given at a scale. A few missing values were substituted with the mean value of the scores of the specific answers. In order to achieve a robust structure, different component solutions were assessed, using Varimax-rotated principal component analysis, based on the eigenvalues being larger than 1 and the scree plot. A few items were excluded because of low technical quality, e.g. that the respondents had difficulties understanding the question or because they were not discriminating, e.g. that almost everybody totally agreed. After applying these guidelines, the best solution for a factor structure model, based on the remaining items, were identified.

Qualitative data in study I and V were after recording transcribed and empirical material from study I was analysed in NVivo. The data in study V was less extensive and complex and therefore the coding of data, the writing of memos, and categorising and theorising were conducted by hand and integrated into the iterative process of writing the article.

The 22 interviews in study I were transcribed. After transcription, the 22 interviews were analysed using the NVivo software. The analysis was inspired by a study by Dahlgren (2009) on inter-professional learning, leading to the three codes; learning from others, learning together with others, and learning about others. Firstly, the interviews were coded with the five codes: 1) Learning from, 2) Learning with, 3) Learning about, 4)

Expectation and criticism of supervision, and 5) Expectation and criticism of own performance. Secondly, the coded excerpts were analysed together with the learning mechanisms defined by Akkerman and Bakker (2011). The results were the quotations included in article I.

In study V, twelve excerpts from the four video clips were identified as sequences where Farmland was discussed. The twelve excerpts were analysed, drawing on CHAT as a conceptual framework (Engeström et al., 2002). Six of these excerpts were illustrating contradictions and were further analysed.

Moreover, the final report to EU was investigated in study V by the use of content analysis. Eight quotations of relevance for the identified excerpts from the negotiations were identified. Each separate excerpt and quotation from the report was treated as a natural unit of analysis. A code was assigned to each excerpt depending on the connection between components in the activity system. Finally, after all excerpts were identified and coded, the initial codes were merged into two new themes, 1) Negotiations on content, and 2) Negotiations on context of use. To illustrate the findings, we have included excerpts from the interactions during the meetings and quotations from the report.

4.7 ETHICAL CONSIDERATIONS

When conducting research in issues of high societal relevance, and especially in ethical issues, the credibility of the studies is of particular importance and therefore honesty and transparency are essential. The voices that become apparent in the studies in this thesis do not necessarily reflect the citizen opinions. This is problematic and therefore it is also suggested to include the citizens in further studies.

The individuals involved in the research of this thesis were more than 18 years old and could choose whether they wanted to take part or not, which is in accordance with the Swedish Research Council's ethical guidelines (Codex, 2010).

Furthermore, the participants that were interviewed or video recorded got an initial explanation by the researcher about the studies and were given the information that they at any time could withdraw from partici-

pating in the studies. They also signed an informed consent before they were interviewed respectively video recorded (Bryman, 2012).

When surveys were used, brief information about the research and the researchers, that the participation was voluntary and contact details for more information were given (ibid.).

Every participant in the studies in this thesis were also informed that their identity would be kept confidential, to prevent identification of participants. Every effort was moreover made to maintain the anonymity of the excerpts. These ethical clearances were considered sufficient in this thesis.

CHAPTER 5

SUMMARY OF THE ARTICLES

The studies reported below contribute to an understanding of the two ways of organising open learning: WBL in the teaching of food science and OER in the teaching of animal welfare. One of the articles focuses on WBL and four of the articles on OER.

The first article is targeting WBL as an open learning approach and builds on a case study of a WBL model that has been in use since 1994; it does not address IT. The second article is surveying OER and arguing for OEP and the third article focuses on an intervention in OEP. The first and the last two articles are using activity theory to analyse and describe human activities related to open learning in higher education. These papers are generally also more advanced both theoretically and analytically.

The first paper on OER (article II) emphasises access to artefacts on the Internet, but the research in this thesis has a progression from seeing OER as an artefact to conceptualising OER as a collaborative tool for social construction of knowledge. The thesis takes a stepwise stance in the analysis of using OER in the knowledge domain of animal welfare. Article II argues for a mutual view on animal welfare through the use of

OER and try to give a temporal overview of the use of OER within this domain. In article III a specific community of actors are organising an intervention in order to develop infrastructures and resources for this specific community. In article IV the actors are given a voice and the underlying motives for using OER and their concerns are explored. Finally, in article V a peer review process for quality assessment of OER is studied in detail.

In the following, the specific aims, the methods and the main results of these five studies will be summarised.

5.1 WORK-BASED LEARNING THROUGH NEGOTIATED PROJECTS – EXPLORING LEARNING AT THE BOUNDARY

The first article aims at an analysis of a WBL-model in which students in food science conducted project work at the boundary between a Swedish university and the food industry. The two activity systems are separate and different activity systems, with different cultural traditions and interests and students work at the boundary and their projects are boundary objects. The more precise objectives are to investigate how the actors' appreciated the WBL activity as a boundary activity, and to enhance the understanding of the learning potential at the boundary.

Boundary crossing is associated with both challenges and a learning potential. This potential has previously been identified as four learning mechanisms (Akkerman & Bakker, 2011); Identification coordination, reflection and transformation, and these mechanisms are used in this paper to explore learning at the boundary. This process was characterised by an unspecificity at the boundaries, which triggered dialogue and negotiations of meaning.

The work-based learning model is based on initial systemic negotiations between actors from all the three parties: Academia, the industry and the students. The negotiations between actors were central in the process leading to the project description, which was framing the project. Students most often had to handle the local negotiations themselves. The boundary object had different meanings in the different activity systems and at the

same time a potential to bring together the resources from the different practices and facilitate connection and boundary crossing between activity systems.

Engeström has described boundary crossing with reference to Tyre and von Hippel's statement that "problem solvers may need to move in an iterative fashion between settings because, as they gain knowledge in (and about) one setting, they become better able to recognise and use the knowledge in (and about) another setting or location" (Tyre and von Hippel, 1997; Engeström, 2009, p. 13).

The article is based on a combination of 139 survey responses from the three stakeholder groups and interviews of 11 students before and after their last project. The interviews were transcribed and analysed in NVivo. These empirical findings were used both for the analysis on how the actors appreciated the model as for the analysis of learning mechanisms.

The results showed that negotiated WBL challenges all actors' flexibility, and that students were more critical to the collaboration between academia and industry than the representatives from the two institutions. This can be a direct result of that it was the students who had to handle the local negotiations in case of conflicts and when the systemic negotiations did not translate into precise manual tasks. It also turned out that students developed strong agency at the boundary between the activity systems, but did not seem to prioritise both systems equally. This is related to that students' wanted to live up to industry expectations more than to the educational requirements, that they gradually became participants in the activity system of the industry and that they to a certain degree already saw themselves as employees. It also seemed like the industry saw the students as if they were part of their activity system.

The first mechanism, identification, was according to Akkerman and Bakker (2011) divided in two processes, "othering" and "legitimate coexistence". "Othering" was exemplified by a student making it clear that she had identified different expectation in the two activity systems and that she hoped to live up to both. "Legitimate coexistence" was expressed by a teacher as important to make clear from the beginning that the project is part of an education and not an internship.

The second mechanism, coordination, was divided in four processes. One host workplace supervisor expressed "communicative connection" as the importance of student and the company having a shared goal and articulating that. The second and third processes were "efforts of translation" and "enhancing boundary permeability" and one teacher exemplified these mechanisms with the industry having to appoint the right supervisor in order to get the activities to run smoothly. The fourth process was "routinisation", which is exemplified by the instructions for how to write the project report, which was following the same procedure in each of the three consecutive years, and thus facilitated movement between different sites.

The third mechanism, transformation, was divided in two processes "perspective making" and "perspective taking". One student showed that she had learned that process, since she described that one have to present what they are interested in hearing and in a way not to offend anyone or get resistance. Another student describe perspective taking as one have to analyse the reactions of the receivers to be sure that you made yourself understood.

Finally the fourth mechanism, transformation, was divided in six processes, of which the first was "confrontation". This was exemplified by the first year of the negotiated WBL-model that at that time was set-up as coop, which resulted in exploitation of students. The process of "recognising a shared problem" was pinpointed by a supervisor as the problem related to diversity in how independent sudents were and thus sometimes leading to students' not getting enough supervision. One supervisor mention that one of his ideas sometimes is getting further developed by a student in a much better way as he could have imagined, which can be an example of "maintaining uniqueness". The process of "continuous joint work at the boundary" was mentioned both by teachers and students as a potential. "Hybridisation" is the process of new cultural forms such as the suggested on-line feature for student collaboration, and finally "crystallisation" which is the process of new activities becoming embedded in the initial activities.

5.2 A NEW FORMAT FOR LEARNING ABOUT FARM ANIMAL WELFARE

The second article aims at describing the incentives for using OER and provides an argumentation for the adoption of OER in animal welfare being a global concern in need of new learning approaches. It also explores the availability of OER in animal welfare and farm animal welfare. The method is an inventory based on search in three different Internet search engines, Google, Alta Vista and Yahoo on different combinations of "e-learning", "learning resource(s)", "open educational resource(s)", "animal welfare" and "farm animal welfare". The combination of "farm animal welfare" and "open educational resource(s)" gave 3-6 hits. The first 30 Google-hits on the different combinations were analysed in order to identify the resources produced by higher education institutions; the number added up to 14 resources.

The inventory was intended to be comprehensive at the time (April 2010) which, despite its imperfection, has given us a snapshot of the availability of information, learning resources and OER in animal welfare. The argumentation is an intertwined historical and global outline of the development of the subject, and the supply and demand of knowledge and new kinds of learning in the subject area. It describes a global landscape of multiple voices within animal welfare having their own agendas and generating conflicting and confusing messages.

It argues that higher education has high responsibility to create and share new knowledge. However, traditional educational structures do not meet the demands of knowledge by the global, extensive and heterogeneous group of potential learners. Therefore, new technologies can facilitate access to knowledge and provide new learning opportunities within this domain, which are based on a pull approach rather than the traditional push approach.

The incentives for using OER are discussed such as 1) informal learning by society, 2) collaborating with peers, 3) including learners in knowledge creation, and 4) making teaching more research-based. Furthermore, animal welfare is argued to be a subject area that is well suited to the Internet, since video, audio, and photo are media carrying a great amount

of information that contextualise animal welfare and therefore facilitate understanding.

Animal welfare is described as a global issue with pronounced societal concerns. It started out being a purely veterinarian subject with focus on physiological measurements but has developed into a multi-disciplinary issue combining natural sciences and ethics. The conceptual understanding of animal welfare is in continuously change as the scientific understanding increases on animals being able to feel pain and suffer from stress. Farm animal welfare is moreover considered to be linked to human health and to be an integrated part of food quality.

An inventory of existing OER illuminates that only a few universities create and share OER within the subject of animal welfare and in particular farm animal welfare. On the contrary, both universities and other organisations provide knowledge within this subject on the Internet but locked in behind passwords in traditional course contexts. It is suggested that universities collaborate both on the creation and sharing of OER in animal welfare but also get involved in the quality assessment of OER, for the benefit of teachers, students, society, and, indirectly, animal welfare.

5.3 THE DEVELOPMENT OF A NEW METHODOLOGY FOR KNOWLEDGE SHARING IN THE INTERFACE BETWEEN UNIVERSITY AND SOCIETY — AN EXAMPLE FROM THE MEAT SECTOR

The third article aims at describing the creation of an infrastructure for OER including OER in animal welfare, animal science and food science. It is targeting knowledge sharing in the interface between academia and society and is contrasting the traditional one-way dissemination from academia to selected participants. The design-experiment was based on a multi-disciplinary EU-project with 62 partners from 23 countries and with the goal of improving meat quality for the European consumer. The methods were surveys, workshops and negotiations between actors in both academia and society, which in this situation was industry and organisations.

Firstly, the article described the identification of the design problem, the community, the motivations and the prerequisites for the novel solution, which comprises a structured collaborative space for sharing experiences and resources between teachers, trainers and learners. The identification process was facilitated by the use of surveys and workshops. One survey had 99 responses from higher education teachers and another survey had 70 responses from other users. The surveys were followed up by two half-day workshops, with invited participants. They addressed industry demands for knowledge transfer and teaching methodologies, respectively.

Secondly, it formulated the development and the empowerment process. This process was also based on surveys and workshops and the subject areas of interest were negotiated with industry partners and training professionals. The surveys gave sufficient foundation about format, content, and pedagogical structure of the OER in order to create them. The surveys also indicated that teachers were willing to share their existing OER, although only few had anything to share and that the users pointed at the importance of having well-defined needs and that a repository for OER should be developed as well as a wiki and a discussion forum.

Thirdly, the article documented the creation of a virtual community, an infrastructure for knowledge creation, sharing and use, and of ten OER and a wiki in a customised UNESCO-based open learning platform. The design process was targeting knowledge sharing and emphasising societal needs, collaboration and open dialogue between institutions and between academia, industry and society. The OER were created collectively between the researchers, with knowledge in OER and scientists in the specific subject areas and based on the demand (both regarding content and pedagogies) formulated from the results from surveys and workshops. Each of the OER developed in the project were also uploaded to the UNESCO Open Training Platform.

The article highlighted the design process based on a participatory design. It also suggested that a peer review process may be needed to provide trust and validation of the accuracy of the OER in order to increase re-use of OER.

5.4 TEACHERS' PERCEIVED VALUE, MOTIVATIONS FOR AND ADOPTION OF OPEN EDUCATIONAL RESOURCES IN ANIMAL AND FOOD SCIENCES

The fourth article analyses a study based on survey data about the adoption of OER and the perceived value and motivations for the adoption within the field of animal and food sciences and in particular animal welfare. The aims are to analyse teachers´ values and motivations for OER and how they are related to the actual adoption of OER. A third aim is to investigate how and why adoption of OER differs between animal welfare teachers and other teachers.

This study is conducted within a network of higher education teachers identified in an EU project on the development of innovative, integrated, and sustainable food production. For analystical purposes there were only two groups, teachers of animal welfare and others, which were teachers in other subjects of animal science and in the food science domain.

In this study the activity theory is used to interpret data on the activities taking place at both the personal plane and the external plane in the activity system of higher education teachers. Engeström and Sannino (2009. p. 21) have described this as "moving up and outward, it tackles learning in fields or networks of interconnected activity systems with their partially shared and often contested objects. Moving down and inward, it tackles issues of subjectivity, experiencing, personal sense, emotion, embodiment, identity, and moral commitment".

Survey data constituted 101 responses from the identified global community, however only 86 respondents commented on statements about the value of OER and only 28 about the statements on creation of OER. A factor analysis was used to better understand the underlying motivations for benefits, personal incentives, problems, and personal barriers for adoption of OER and for incentives for creating OER.

The results showed that OER challenge the individual teacher and the boundaries of higher education by changing the demands on teaching practices and quality assessment. Both the personal and the general concerns had three underlying explanations of which the first two were the same, namely related to quality assessment of OER and how to adapt the OER to the pedagogies. The third underlying motivation was at a

general level related to OER being deviant in academia and at a personal level articulating low confidence in relation to own competence in how to handle OER.

The results on positive value of OER had at the general level a strong underlying dimension about outreach and at the same time a democratic dimension related to giving society free access to education and scientific knowledge. Two underlying factors at the general and personal level had similar explanations, namely the factors related to the collective and expansive properties of OER. The loadings on the collective and collaborative factor were generally strong and are expressing the importance of collaboration in order to utilise the expertise in the research community so that it improves teaching and makes it more research based. The loadings on the expansive dimension of OER was at a personal level related to the internal and external expectations coming with new digital teaching approaches and at a general level it expressed an attractiveness of OER to students, and that it therefore can expand education.

The results on teachers underlying motivations for creating OER indicated that they are related to a systemic academic agency dimension, which can be understood as an expression of a combination of individual positioning in academia and social activities dealing with the development of institutional operations. Factor two was related to societal benefits of knowledge sharing outside academia and had "I want to share this for the benefit of others" as the strongest loading.

The study also supports the importance of affinity spaces and content-based practices and passions for trust and willingness to share and collaborate, since collaboration with peers is generally an important incentive for teachers, and since teachers in animal welfare have different adoption patterns and also different values and underlying motivations. One such example is the altruistic incentive of sharing for the benefit of others which is more pronounced among animal welfare teachers. Furthermore, it is suggested that the subject area of animal welfare is a small enough community of teachers in order to form an affinity space with the prerequisites for enacted agency and breaching boundaries.

Finally, the respondents trusted peer review as an instrument for quality assessment, and allowing students to undertake changes were associated with some risk for half of the respondents. However, the teachers in

animal welfare did not perceive it to be such a significant question, and the survey suggests that these teachers valued increased student motivation and the benefits of social knowledge creation at the expense of accuracy. The higher acceptance for student involvement in affinity spaces was pointed out as an area for further research.

5.5 PEER REVIEW OF OER IN A CONTESTED DOMAIN – AN ACTIVITY THEORETICAL ANALYSIS

This final article aims at presenting an analysis of the quality assessment through peer review of an OER in animal welfare. It tackles multiple activity systems and the different view on the concept of animal welfare and the quality of OER in these interconnected activity systems. The focus is on the negotiations and the contradictions within the core activity system. Engeström (2001, p. 134) has described a contradiction as "characterised by ambiguity, surprise, interpretation, sense-making, and potential for change", and has proposed four levels of contradictions; primary (within the nodes), secondary (between the nodes), tertiary (when a more advanced object of activity is introduced), and quaternary level (between the core activity system and outside activity systems).

The case is an OER named Farmland (Farmland, 2015), which is created by the Directorate General for Health & Consumers (DG-SANCO) in the European Commission, referred to as the EU. This OER is part of the action plan for awareness rising within the subject of animal welfare for all citizens in the EU and is targeting children in the age of 8-12 years and their teachers.

The peer review is conducted by six PhD-students and their process leader in the subject of animal welfare at the Swedish University of Agricultural Sciences, following discussions with the EU about its quality. Before they started the assessment the reviewers studied a set of scientific papers and guidelines describing systematic methods for evaluating digital resources. At the first meeting, the reviewers discussed the texts on the assessment of digital resources and decided jointly to use the quality evaluations tool developed by Hays et al. (2005), but the reviewers could also combine this tool with other review instruments. Before the second meeting they either individually or in pairs reviewed Farmland by using

the quality evaluations tool. At the following meetings the reviewers discussed the results of the individual reviews and the report to the EU. The video recordings from the four meetings between the reviewers and the report to the EU constitute the empirical findings for this article. Twelve excerpts from the four video clips were transcribed, and analysed, drawing on CHAT as a conceptual framework (Engeström, Engeström & Suntio, 2002). We have chosen to highlight six excerpts from the videos and 8 quotations from the report that illustrate contradictions.

The article emphasises what was negotiated, identified as: a) the OER content and b) the context of use. A closer look at these negotiations identified one contradiction at the primary level (within the object of activity), one at the secondary level (between the object of activity and the rules) and one at the quarterly level, which is at the boundary to other activity systems.

The first contradiction focused on the object of activity itself; that the reviewers needed to put themselves into the children's and the teachers' situation which is difficult because they could not conduct any usability tests or impact studies, but only could assess the OER separated from its intended use. This contradiction is discussed in a wider context and gives an understanding of this being a general problem in OEP, since teachers preferably would know the pedagogical value before adoption but need to invest time in the resource or alternatively trust the authors/producers or the users' recommendations.

The contradiction at the secondary level was focusing on the rules for the negotiations and three aspects of this were negotiated; 1) the need of scaffolding learning when using the OER, 2) the dilemma when communicating a simplified account of a subject with complex scientific foundation and 3) the importance of including the pedagogical quality in the assessment.

The final contradiction was at the quaternary level, which is between the core activity system and the related activity systems. This contradiction could be divided in three components, 1) about the interpretation of the concept of animal welfare, 2) about the conflicting interests related to animal welfare and 3) about values related to their interests.

That contradictions have a potential for change is mirrored in the discussion about accuracy and legitimacy, in which accuracy is about the con-

tent *per se* being correct and current whereas legitimacy is about the OER being relevant and socially accepted. The findings support that peer review is not comprehensive for quality assessment of OER and that higher education does not have the authority to be the only assessor of OER. This study shows that peer review is a social negotiation of knowledge but that participatory instruments can supplement the evaluation of OER in order to contribute to openness for the society.

CHAPTER 6
DISCUSSION

The key findings in the separate articles are discussed in relation to the research questions in this section by using the lens of CHAT. In order to further elucidate the essence of the studies this discussion is framed by thematic discussions as an attempt to contribute with an enhancement of knowledge about two specific approaches to the organisation of open learning in higher education in the domains of food science, food quality and animal welfare.

Both food quality and animal welfare can be described as concerns that are typically affiliated in numerous activity systems representing farmers, industries, citizens, consumers, authorities, NGOs, researchers, teachers and students, with diverse norms and interests. Such societal concerns need to be addressed for sustainability reasons (Wals, 2007), and higher education has an important role in how knowledge is produced, presented, taken up and utilised within these domains. Simultaneously, higher education is going through significant changes and one trend is more open approaches having both institutional and individual consequences (Iiyoshi & Kumar, 2008) and local and global prospectives (Atkins et al., 2007).

Therefore, this thesis has in several respects a multi-level approach. The second and the third articles are published in scientific journals within the field of food science and animal welfare, and the other three papers are published or submitted for publication in scientific journals in the field of educational sciences. At one plane this research is not only multi-disciplinary but transdisciplinary. A transdisciplinary approach is a holistic approach to a real-world problem that integrates the disciplines and contains a joint contribution beyond the various disciplines through active inclusion and participation of stakeholders (Klein, 2000; Hadorn, Bradley, Pohl, Rist & Wiesmann, 2006). Thus, the integration of food and animal sciences on the one hand and educational sciences on the other hand has in this research that also includes stakeholders, contributed to knowledge beyond each discipline.

Although the unit of analysis in the articles is the activities, the studies are not restricted to the micro level, rather the five studies can together be seen as analytically positioned at all three levels; micro, meso, and macro (Jones, Dirckinck-Holmfeld & Lindström, 2006). Study I and V are researching local interactions of learning, where small groups of individuals are acting in a particular social context. Study III and IV are studying broader social learning processes at community level, and finally study II is studying institutional processes related to education.

CHAT is used to better understand the complex activities in the specific open learning approaches in the subjects of food science and animal welfare, since it breaks down the problematic issues in smaller more manageable sub-problems.

6.1 RESEARCH QUESTION 1 – HOW CAN ONE UNDERSTAND WORK-BASED LEARNING IN FOOD SCIENCE AS A BOUNDARY ACTIVITY?

In the first paper the student projects in WBL are seen as boundary objects between the two activity systems, presenting the university and the industry, in which ideas, concepts and experiences are exchanged, which can be referred to as horizontal learning. However, the entire educational program is based on a mixture of horizontal and vertical learning, since

vertical learning from experts to the novice is insufficient but still important (Engeström et al., 1995). The learning mechanisms identified by Akkerman & Bakker (2011) apply to the boundary activities that have the function of bridging and at the same time representing a division between the activity systems. Examples of every of the learning mechanism at the boundary could be identified and were analysed, demonstrating that boundary crossing not only enhances subject specific learning but also the learning of generic skills for changing contexts (Lester & Costley, 2010). Furthermore, it shows that WBL broadens the learning opportunities for all three actors involved, having implications on widening participation and teachers' professional development (Fuller & Unwin, 2002). The negotiated WBL approach can be regarded as what Tynjälä has defined as a `connective learning model´ or as a `model of networked culture´, in which connections to workplaces and learning taking place at the boundary are embedded in the curricula structures and in the pedagogical and administrative practices (Tynjälä, 2013).

The initial negotiations coordinated the projects through setting up systemic premises that managed the expectations from each of the three parties. The negotiations not only enhanced the learning potential and gave students ownership of learning, but also broadened the learning opportunities beyond the formal education systems. The provision of opportunities for students to engage in desired questions in both higher education (Brew, 2013) and workplaces (Billett, 2001b) challenges student intellectually and make them life-long learners.

The contribution of *reason* to understanding and acting at the boundary and thus the *sharing of meaning* of why other people think and act in a certain way is a tacit knowledge that can be regarded as essential for being able to address shared goals for change and development (Guile, 2011). The teachers' own tacit knowledge about the sharing of meaning and their ability to scaffold students learning at the boundary seemed to be critical for the learning taking place at the boundary.

Since the teachers in this study also were the developers of the WBL model there was no sign of uncertainty. However, lack of self-confidence and need of further professional development are generally accepted as individual concerns when introducing WBL in higher education (Drexler, 2010). Yet another concern that was mentioned was that this team of

teachers saw themselves as lonely advocates for this learning approach within the university. It can be an expression of teaching being regarded as a secondary activity within academia and need for teacher training (Solomon, Boud, Leontios & Staron, 2001; Tynjälä, 2013). Furthermore, the need of systemic support and the assignment of agency to the teachers cannot be underestimated for the adoption of open learning approaches (Brew, 2013).

6.2 RESEARCH QUESTION 2 – WHICH ARE THE INSTITUTIONAL AND INDIVIDUAL INCENTIVES FOR ADOPTING OPEN EDUCATIONAL RESOURCES IN FOOD SCIENCE AND ANIMAL WELFARE?

The second paper argues for the adoption of open learning in animal welfare and for higher education to take an active role in the creation and sharing of OER in animal welfare in order to collaborate between institutions and reach beyond the boundaries of higher education, since animal welfare is a global and vivid domain (Broom, 2005; Fraser, 2008) and the demands of knowledge within society are paramount (Special Eurobarometer, 2007). Moreover it describes the diverse interests in different activity systems, related to animal welfare as a contested and normative domain (Fraser, 1995). This paper also concludes that the availability of OER produced by higher education is low, and legitimises a course of action in the direction of collaborative and participatory approaches for knowledge production through OER.

Paper IV analyses the survey answers from higher education teachers in the subjects of food science and animal welfare. CHAT is here used to move both up and outwards and down and inwards to understand better motivations at both the internal and external planes (Engeström & Sannino, 2010). The results indicate that the satisfaction of collaboration and sharing is a stronger incentive than sharing of knowledge in return of reputation. These underlying motivations have an altruistic side, since an important argument for teachers, and in particular animal welfare teachers, is education as a human right and the satisfaction of sharing of knowl-

edge. The study provides evidence that the specific subject area of animal welfare seem to have its own norms and expectations with regard to OEP.

Teachers in animal welfare also used OER developed by peers more often, which can be an expression of trust (Clements & Pawlowski, 2011) and peer-assistance (Camilleri et al., 2014). It is suggested that OER in order to be sustainable need to be developed in subject-centred communities or affinity spaces building on trust. Furthermore, OER and OEP are considered to be most successful when positioned in areas of societal interest and with a value-based component, such as animal welfare, which has particularly great potential in affinity spaces, that can enhance the feeling of trust and peer-assistance (Gee & Hayes, 2011; Ponti, 2014).

Teachers' individual incentives for creating OER were related to their agency at a systemic level and engagement with meaningful work, and with their contribution to knowledge sharing outside academia. Other studies have indicated that altruistic motives play a key role in teacher's intensions to share OER (OECD, 2007; Van Acker, van Buuren, Kreijns & Vermeulen, 2013). The potential of creating an affinity space for animal welfare teachers is related to the individual feeling of meaningfulness related to 1) an outreach reason, which has a strong dimension of democracy and altruism, 2) a collective reason, which has to do with a will to collaborate with peers and 3) an expansive reason, which is related to the need of reaching new target groups in animal welfare.

Systemic structures for quality assessment and a subject area narrow enough to create an atmosphere of trust and collectiveness seem to be important to enhance open learning. The results also indicate that open learning is promoted by the individual teachers rather than by the higher education institutions.

6.3 RESEARCH QUESTION 3 – WHICH ARE THE INSTITUTIONAL AND INDIVIDUAL CONCERNS FOR ADOPTING OPEN EDUCATIONAL RESOURCES IN FOOD SCIENCE AND ANIMAL WELFARE?

In article IV the institutional concerns with OER and OEP were identified as quality concerns related to the difficulties in assessing the quality of OER *per se* and assessing how the OER can be used in teaching practices. These quality concerns are well known and conceptualised as sticking points (McAndrew & Farrow, 2013b). An overarching concern was that some teachers considered that OER is threatening the robustness in higher education by challenging traditional forms of teaching and assessment practices. This kind of uncertainty has previously been documented (Camilleri et al., 2014), and this study indicates that the uncertainty partly is related to giving up authority for the benefit of students' agency.

The individual concerns for OER adoption were similarly to the institutional concerns related to quality. Teachers trust in and view on quality of OER for own specific teaching purpose have also been a hesitation for teachers in other studies (Clements & Pawlowski, 2011). Another individual concern identified in study IV was the lack of individual competences in how to handle OER in teaching practices. This is also generally mentioned as an important barrier (Atenas & Havemann, 2013; Camilleri et al., 2014).

The results indicate that sharing as an open learning approach is threatening quality and robustness in higher education, both at an institutional and an individual plane. However, it is the combination of the individual and the collective that also gives power to open learning. The open learning movement has characteristics similar to an open source community, which has been described as an amalgamation of collectivism and individualism (Bergquist & Ljungberg, 2001). Thus, the will to use OER as boundary objects is a way of converging different values and goals into common goals and may have four reasons. First of all, it is a way to be in dialogue in the open, which has particular importance for institutional representatives in contested areas of societal relevance (Algers, 2011). Secondly, sharing and collaborating on the creation of OER is a social culture creating satisfaction for teaching staff in the otherwise solitary profession

(Iiyoshi & Kumar, 2008). Thirdly, it can be argued both from a non-academic and from an academic viewpoint, that the power of participation in an affinity space can be harnessed and give a sense of equality (Brown & Adler, 2008). Finally, OER and OEP can be seen as ways of democratising higher education so that it works for all (Blessinger & Anchan, 2015).

Blessinger and Anchan (2015) have at the time of writing just released a book on the democratisation of higher education. The prevailing attitude in Scandinavia is here described as seeing higher education as a public good with the purpose to empower all students, so that they can contribute to society (Nielsen & Andreasen, 2015). However, they also describe another perspective seeing higher education as an individual investment, in which the best students of the applicants are selected and higher education is closed and funded by tuition at the expense of students (ibid.). This last perspective is a threat to opening up higher education.

6.4 RESEARCH QUESTION 4 – HOW CAN ONE UNDERSTAND PEER REVIEWING AS A QUALITY ASSESSMENT METHOD OF OPEN EDUCATIONAL RESOURCES IN ANIMAL WELFARE?

Peer review was suggested by teachers in study III and IV and has also been proposed for quality assessment of OER by other groups of users (Clements & Pawlowski, 2011). Therefore, the last study was conducted on peer review of an OER in animal welfare. However, the OER was not open in the sense of being collective; rather it was an openly accessible learning infrastructure for OEP including a game and static pages with information and downloadable presentations (Farmland, 2015). Farmland is here regarded as an infrastructure for boundary activities between the legislative institutions in EU and the society, in which children are appointed as a particular important target group (EC, 2006; EC, 2012b).

The analysis of the negotiations and contradictions in the peer review process showed that they were related to the object of activity itself (to the content and/or the pedagogical value of the OER), the rules (related to the recruitment and the competences of the reviewers) and finally the tensions between the core activity system and the interacting activity sys-

tems (related to the different understanding of the concept of animal welfare and thus different perception of the quality of the OER). This latter issue was connected to the values of the reviewers and the lacking dialogue with society when conducting the peer review. Thus, in this case the dynamic between structure and agency in the peer review process did not allow for the interpretations of society, which is understood as legitimacy.

Hence, accuracy and legitimacy related to OER and OEP are of equal importance, and a combination of peer review and crowd source review is suggested to underpin the openness and thus increase adoption of OER (Clements & Pawlowski, 2011; Camilleri et al., 2014). However, objecting to the hegemony of autonomous scientists (Gibbons et al., 1994), the role of higher education as an interpreter of knowledge in complex subject areas cannot be underestimated (Frydenberg, 2009).

6.5 RESEARCH QUESTION 5 – HOW CAN A PRODUCTIVE METHOD AND AN INFRASTRUCTURE FOR SHARING AND USING OPEN EDUCATIONAL RESOURCES BE DESIGNED?

Paper III presents an intervention, in which collaborative and participatory approaches are used for the creation of OER and infrastructures for OEP in the subjects of food sciences and animal welfare. It was not an issue of designing a single artefact but an infrastructure that was informed by the demands of knowledge and the pedagogical and organisational understanding of practices for a specific community in food sciences and animal welfare. In this paper, the cultural differences between activity systems are one kind of underlying reasons for tension that can also be turned into a potential for refining the activities between universities and society.

The intervention was formative rather than linear, since the researchers aimed at sustaining a transformation process owned by the participants and in which the goals were not known ahead of the intervention (Engeström, 2011). The needs of the users were initially analysed through surveys and workshops, and followed by negotiations resulting in a mutual view on formulated goals and processes. The design of an infrastructure

was viewed as a way to give structure in order to deliberate individual agency to adopt OER and use the wiki in local teaching activities.

The study also included considerations of quality and sustainability. The goal was to design an infrastructure and resources that were meaningful to university and industry both from a subject specific and pedagogical viewpoint. Thus, the aim was to create an affinity space (Gee & Hayes, 2011). The resources were seen as seeds of growth (Fischer & Ostwald, 2002; Fischer, 2011) in which users together create new knowledge through informed participation in a decentralised evolution of knowledge.

The intervention was addressed to a large target group with weak ties. Ryberg et al. (2012) have discussed the notion of networked learning and found that it focuses more on networks composed of individuals with strong ties, overlooking the value of weak ties between learners. In affinity spaces, which in the introduction are described as spaces organised around an interest which people have an affinity for, individuals with weak ties are gathering.

However, the intervention did not in some cases involve the users to such a degree that the activities necessarily were sustainable. Any designer anticipates that those who are going to use it will care for it, nurse and cultivate it (Nardi, 1996), but the technologies are likely to fail when those who benefit from them are not those who create them (Kaptelinin, 1996a). Engeström (2009, p. 2) has highlighted that "As educators we tend to define top-down the desirable patterns of mobility we want our mobile learners to engage in. The risk is that these patterns do not touch what is going on in the lives of the learners…".

6.6 TRANSFORMATIVE AND DISRUPTIVE LEARNING PROCESSES

The two open learning approaches have proven disruptive to higher education and this section highlights the similarity of the challenges represented by OER and negotiated WBL in the fields of animal welfare and food science. However, the approaches are not only different through the one being based on digital technologies and the other not; they also have a short and a long history. In conjunction this can explain the difference in the OER-movement repeatedly being described uncritically in glossy

terms and in need of scientific evidence (Falconer et al., 2013) and WBL being an approach described in more nuanced terms (Tynjälä, 2013).

The disruptive nature of the approaches is related to both the positive and negative motivations for their adoption. Teachers involved in WBL, did recognise both the pros and the cons of its disruptive characters. The fact that all actors learn from each other and that WBL is an approach that broadens learning opportunities beyond formal learning and give students agency at the boundary were related to positive motivations, whereas the risk of different expectations and threat to academic integrity were related to negative motivations. Lack of academic confidence in WBL as a learning approach has also been documented as an obstacle by Walsh (2007).

Both negotiated WBL and use of OER can be regarded as approaches that enhance equity and access to learning (Boud & Solomon, 2001; CTOED, 2007; Tynjälä, 2013). The ability to use WBL and OER for expanding the boundaries of higher education, to include the learners in the development of knowledge and meet internal and external expectations were regarded positive. Negative motivations were related to feelings of OER as something that does not belong in academia or threatens the robustness of the traditional higher education and to low self-confidence and need of new competencies. Teachers did not report negative motivations related to the present model of negotiated WBL, which can be explained by these teachers also being the creators of the model, however they were critical to the model when it was still based on internships.

The negative motivations to both open learning approaches need apparently to be handled in systemic collective processes and are sometimes in need of investment in new practices, such as creating a shared agreement for WBL and establishing a quality assessment routine for OER. However, higher education is driven by centrally established education requirements, sometimes resulting in limited room for interpretation to the individual teacher or teacher team. Furthermore, both approaches lack clear implementation strategies and guidance to teachers, which impede adoption (Brew, 2013; Kanwar et al., 2010).

The underlying negative motivations of higher education teachers can be related to OER still being seen as "learning objects" using an acquisition model of learning. By adapting a collaborative and participatory model of learning in OEP, as argued for in the background of this thesis,

students need to be treated as agents, and this is based on a transition of consisting practices in higher education.

In paper V one of the most central practices in academia is studied; the peer review process. The peer reviewers in this study were acting at the boundary of their activity system and the challenges of quality assessment of OER highlight the disruptive character of OEP (Camilleri et al., 2014).

However, in OEP based on Web 2.0 knot working is a mode of collaboration that moves towards co-configuration requiring that the customer becomes a real partner to the producer, and thus is bridging the gap between developers and the users (Engeström & Sannino, 2010). The notion of knot working also captures important aspects of the activities in WBL. Both approaches underline the importance of dialogue, negotiation of meaning and of a physical or bodily interaction with digital or analogue resources and can be seen as a response to other teaching practices with a more individualistic focus as described by Ryberg et al. (2012).

Hence, WBL can transform learning but is only adopted by a small number of higher education teachers and only two studies on WBL in food science are published. On the contrary, OER has, judging from the results in this thesis, not yet transformed learning. It shows that teachers most often use OER for dissemination of knowledge, but building upon knowledge in OER seems rare, however, the statements in article IV indicate that teachers understand the potential although they still have not embraced it. One possible underlying explanation for this general hesitation is that the adoption of WBL and OER in higher education implies that students are assigned more agency, which is challenging the authority of the experts (Billett et al., 2006; Ponti, 2014).

6.7 INDIVIDUAL AGENCY AND COLLECTIVE ACTIVITIES

Open learning has implications for both students' and teachers' agency. Students' strong agency in their own projects in WBL in relation to the collective processes at the boundaries, and animal welfare teachers' agency to use OER because of individual, collective or altruistic reasons, provides evidence for this claim. The enacted agency that lies in the relation-

ship between individuals (Engeström & Sannino, 2010; Edwards & Kinti, 2010) in the open learning approaches needs further discussion.

The initial negotiations in the negotiated WBL approach coordinated the collaboration, which was characterised by a constant dynamic between structure and agency, where structure, the negotiated model, gave students a high degree of individual agency compared to traditional learning in higher education. Thus, students were on the one hand given a participating role in the systemic negotiations setting the premises for the projects, and on the other given individual agency to contribute to the shared with decreasing scaffolding during the projects.

The results from the study on perceived value and motivations for the use of OER showed that teachers in animal welfare had a stronger perception of the collective and of altruism and trust than other teachers. This illustrates that there is neither a dichotomy between the collective and the individual nor between the inter-individual and the intra-individual. The analysis is focusing on the two levels described by Engeström & Sannino (2010) but Stetsenko takes this a step further and describes a continuum between the inter-individual and the intra-individual processes that always "even in its seemingly 'pure' theoretical forms, has a practical relevance, ultimately contributing to real-life processes and practices in the world" (Stetsenko & Arievitch, 2004, p. 491).

Thus, the *self* is in Stetsenko's view seen not as an attribute but as a process or the very engagement that connects individuals to the social world and serves the purpose of organising these social connections and ties. Therefore, is also the agency to engage in activities that contribute to changing the world a strong driving force, which "places the emphasis on the self as value- and commitment-laden" (Stetsenko & Arievitch, 2004, p. 495). Stetsenko and Arievitch describe that the self is highlighted when people speak and act from a commitment to certain moral ideas and goals and also envision future conditions and contribute to their creation, as illustrated by animal welfare teachers in study IV.

Generally, higher education can be seen as targeting at making a change and one such change is when students learn as they engage in open and collaborative activities that are scaffolded by teachers. A common feature of the two open learning approaches in this thesis is that they are based on the ideas 1) to craft the outcome to satisfy various interests which is

described as dialectical co-authoring of development, which underlines the individualistic in peoples agency of their own development and thus their responsibility of the shared (Vianna & Stetsenko, 2006), and 2) to offer structure to learners that give them freedom to construct theoretical concepts that can be used as cognitive tools in further problem solving, so that they can engage in and re-enact meaningful activities embedded in these tools.

In the case of OER the activities become meaningful when the user can engage in the resource by being able to reorganise and manage content rather than just view it, and when an OER is based on Web 2.0 the user can even built upon other users work. The mutually independent activities in OEP can be seen as a social practice where goals and motives are co-evolving and co-created with the individual as an agentive actor. This has implications for the setup of OEP, where motives for social practice mold the individual goals in top-down practices and the goals form the individual motivations in a bottom-up process (Stetsenko & Arievitch, 2004). Hence, the initial negotiations are crucial in open learning approaches and to conceptualise the *self* as a learning activity, teachers have to reduce the emphasis on their own authority and at the same time emphasise a contribution to change that makes things meaningful for the student.

The studies on OER by West and O'Mahony (2008) were based on the idea that the community had a common goal and that the individuals within that community were collaborating toward that goal. However, it can be suggested that it is difficult, and maybe even not so wise, to define a detailed common goal at the start of an OER project because the desired outcome is impossible to define in advance and is impeding creativity. This critique is particularly relevant for complex and interdisciplinary fields.

6.8 RUNAWAY OBJECTS IN A SUSTAINABILITY CONTEXT

Both food quality and animal welfare are complex, interdisciplinary and contested fields. Food quality was previously limited to a question of nutritional and sensory quality in combination with food safety but includes today also ethical questions related to the productions methods such as sustainability, fair trade, and animal welfare in the case of animal products

(Murdoch & Miele, 2004; Peri, 2006). Environmental issues such as the sustainable use of land areas and the natural resources, e.g. freshwater, are issues of importance for food quality. The development and use of modern technology, e.g. biotechnology, to improve efficiency and volume of production are other issues.

When it comes to animal products, Fraser (2008) has pointed out that animal welfare is not only based on natural science but also on values, since scientists base their research questions and measurements on values. Fraser has summarised that values play a role at three different levels, which could also be applied on food quality; in deciding what to regard as important, how scientific evidence should be judged and again when we make decisions based on scientific evidence about how we morally should behave (ibid.).

Thus, sustainable development has not only a natural science dimension but also a social dimension, based on inclusiveness, democracy, altruism and trust. Sustainable development can be seen as a multidimensional optimisation process targeting environmental, economic, social, and institutional dimensions equally (Valentin & Spangenberg, 2000). Sustainable development is by nature a collective, complex and interdisciplinary endeavour. However, it is not only interdisciplinary, which is an integration of theoretical and methodological components from different disciplines. Sustainable development is characterised by intense research activities and fast moving knowledge development calling for a transdisciplinary approach, which among other things includes active participation of stakeholders (Klein, 2000; Hadorn et al., 2006).

To equip students with the ability to integrate and generalise knowledge is an important goal of higher education. Dewey (1916, p. 67) argued that "the end of education is not the bare reception and storage of information, but the formation of personal powers of attention, memory, observation, abstraction, and generalisation". By transforming the education system and its instructional practices in accordance with societal needs, creates the conditions for higher education becoming more in line with sustainable development.

One example is the need of higher education to keep pace with the digital society and economy. However, the European Commission has found that "digital technologies are fully embedded in the way people

interact, work and trade, yet they are not fully exploited in education and training systems across Europe" (EC, 2013). Therefore, an action plan for opening up education is put in place to support educational institutions to develop new pedagogical approaches and to support teachers' professional development (ibid).

Another example is that higher education has a responsibility to educate students and citizens in sustainable development including food quality and animal welfare. Lundholm (2011) also suggested that learning about sustainable development serves purposes of awareness raising, promoting moral understanding and developing metacognitive skills in order to enable the learners to participate and take action in society. Learning to understand, reflect on and discuss these issues presupposes that we are aware of our own values and the views of others.

Food citizenship is a rather new concept defined as the practice of engaging in food-related behaviours (defined narrowly and broadly) that support, rather than threaten, the development of a democratic, socially and economically just, and environmentally sustainable food system (Wilkins, 2005). Wilkins argues that food citizenship only can have an impact on sustainable development through a combination of individual changes in consumer behaviour and systemic changes at policy level (ibid.).

Thus, at a systemic level the traditional ways of providing learning opportunities are no longer adequate to equip teachers, students and citizens with the competences required to participate successfully in the emerging knowledge-based society (Geser, 2012). Rather, an open dialogue between academia and society is needed in order to create a shared view on these quality issues and thus for sustainable development.

"When scientists debate different conceptions of animal welfare, the value issues, operational issues, and semantic issues are sometimes jumbled together and the true nature of disagreement may be hard to discern" (Fraser, Weary, Pajor & Milligan, 1997, p. 189). Scientists and teachers in animal welfare have sometimes passionately held motives - objects of desire - since many see themselves as advocates for animals as a vulnerable group. They often want to influence society through developing new scientific results and feeding the legislative authorities with evidence (Broom, 2010), and participating in the societal debate. Their passion can be a key for opening up higher education.

Both food quality and animal welfare, which is regarded as a food quality attribute (Broom, 2010), can be described as concerns that are runaway objects, since the domains are normative subject areas that are typically affiliated in numerous activity systems (representing e.g. farmers, industries, citizens, consumers and researchers) but the object (potentially shared view on and concern for food quality or animal welfare) is in need of negotiations. Furthermore, it is hard to draw the boundaries for the object of activity because it is constantly changing and because its intrinsic properties transcend the limits of an utilitarian profit motive (Engeström & Sannino, 2010). The subject areas also fit into the description by Engeström (2008, p. 3) "Runaway objects are contested objects that generates opposition and controversy" and big runaway objects are suggested to be either "natural forces" or "technological innovations".

6.9 FINAL REMARKS

Higher Education has an important role in the development of society and new and more participatory ways of organising higher education expand the agency of students and learners (Iiyoshi & Kumar, 2008; Thomas & Brown, 2011). Open learning in higher education enables students as well as other learners in society not only to be consumers of knowledge but also producers of knowledge. WBL and the use of OER are examples of such open learning approaches that are challenging the authority of the experts (Billett et al., 2006; Ponti, 2014) and the robustness and legitimacy of the educational system (Walsh, 2007; Camilleri et al., 2014).

Open learning approaches most often involve boundary activities that have inherent tensions and contradictions and both WBL and OER tend to meet a certain resistance (Tynjälä, 2013; Camilleri et al., 2014). In WBL, students act at the boundary between academia and industry with diverse premises, expectations and goals (Elmuti et al., 2005; Lester & Costley, 2010). Student projects as boundary (crossing) activities must fulfil demands from both higher education and industry where individual student agency becomes important. Tensions are resolved in different ways. Some times with a clear preseverance of the boundaries of the activity systems. This is exemplified by one student sending different reports on project to academia and to industry.

In working with OER there is a tension between institutional quality concerns and participatory approaches. Academic and pedagogical quality is a major concern. At the same time teachers value altruism as a fundamental motivation and trust as fundamental to collaboration and sharing, whereas reputation is of lower importance. These perceptions are suggested to be most vigorous in content-driven, subject specific and rather small and open communities such as the global community of animal welfare teachers compared to the broader and much larger network of teachers in animal and food sciences.

This thesis also suggests that initial negotiations in WBL and quality assessment of OER through peer review are productive institutional instruments that support the adoption of these approaches to open learning. Open learning can, when based on seeds of growth rather than closed infrastructures and products, provide students and learners "the opportunity and resources for engaging them in authentic activities, for participating in social debates and discussions, for creating shared understanding among diverse stakeholders, and for framing and solving personally meaningful problems" (Fischer, 2011, p. 53).

This thesis does not aim at generalising to higher education in other scientific fields than food science, food quality and animal welfare. However, some of the results could be generally applicable to learning at the boundary such as WBL carrying a learning potential and OER carrying a potential for a sharing culture. It could be argued, though, that open learning, seen as learning at the boundary between different activity systems, is more important in contested and complex subject areas when research is contradictive and includes ethical and moral concerns.

The thesis describes design of open learning approaches, and the studies show that the actors involved regard WBL and OER as productive approaches. However, it can also be concluded that open learning approaches are difficult to introduce in higher education and that such approaches might challenge traditional academic quality (Downes, 2007; Wiley, 2007; Lester & Costley, 2010). The results also indicate that higher education through open learning can be in dialogue with society, make the disciplines of food science and animal welfare more transparent and collective and thus contribute to a democratic and sustainable development of our common globe.

6.10 IMPLICATIONS FOR FURTHER RESEARCH

Democratic issues such as access to education considered as a fundamental human right and legitimacy of knowledge as considered in tune with societal demands are high on the agenda. A well-educated society should be better able to participate in global collaboration and intercultural understanding of increasingly complex issues. These changes enhance the incentives for the adoption of open learning approaches in the field of animal welfare, food science and food quality; however the results from this thesis also demonstrate the difficulties and inspire future studies.

A longitudinal study aligned to the European strategy for animal welfare (EC, 2012b) is suggested. It should study an intervention of a global affinity space based on Web 2.0 designed to 1) handle the communication on animal welfare, 2) analyse the needs of knowledge and approaches for open learning to children, professionals, consumers and citizens, 3) develop specific OER collectively based on Web 2.0, and finally 4) evaluate knowledge and values before and after the intervention for specifically selected target groups in different countries.

Knowledge creation in this domain needs to involve the whole society, children and adults, urban people and people living in the countryside, and people from different cultures. Giving students and citizens the possibility to engage in mutual knowledge construction in OEP might increase the sense of purpose, because it not only implies personal learning but also supports the learning of others.

In recent years, many farmers have viewed the animals as artefacts but today many citizens do not accept this view on farm animals. This has resulted in a dis-coordination between activity systems and contradictions between farmers, consumers and citizens. One illustrative example of dis-coordination is that in the global community a dog can be a tool for 1) producing meat and fur (China), 2) hunting animals or finding truffles, 3) providing company to humans as a pet and even family member, and 4) branding through accessories (carrying dogs in handbags is a rather new urban phenomenon).

Engeström & Sannino (2010) have described how concepts evolve through cycles of stabilisation and destabilisation. The welfare of animals and the quality of food are concerns that have evolved trough cycles, in which the first iterative loops when reaching stability are resulting in new loops with initially low stabilisation. These concerns are currently negotiated between global and European organisations like UNESCO, WHO; OECD, FAO, EC, EFSA, however the citizens and the consumers have difficulties making their voice heard if at all aware of the negotiations.

The need of further research on these transdisciplinary issues is perceived to be urgent because the combination of the need for scientific evidence and whose interests and viewpoints should be privileged, form the future.

CHAPTER 7

SWEDISH SUMMARY

ÖPPNA LÄRMILJÖER I LIVSVETENSKAPER - STUDIER AV ÖPPNA DIGITALA LÄRRESURSER I DJURVÄLFÄRD OCH VERKSAMHETSBASERAT LÄRANDE I LIVSMEDELSVETENSKAP

Denna avhandling behandlar metoder för en öppen högre utbildning i ämnena livsmedelsvetenskap, livsmedelskvalitet och särskilt djurvälfärd, och gränsaktiviteter i förhållande till samhället, industrin och andra akademiska institutioner. Öppenhet refererar till aktiviteter som antingen gynnar lärandet i formell utbildning eller genom informellt lärande (D'Antoni, 2009). En viktig aspekt är också att bidra till en hållbar utveckling och ett system för livsmedelsproduktionen som överensstämmar med samhällets åsikter.

Arbetet kräver av flera skäl en tvärvetenskaplig ansats. För det första är öppenhet i högre utbildning en ganska ny företeelse med stor demokratisk potential (Hylén, 2006; Iiyoshi & Kumar, 2008). För det andra kan öppenhet inom akademien både förstärka kollektiva och kollaborativa aktiviteter och utmana individer och systemer (McGreal et al., 2013). För det tredje

är livsmedelsvetenskap och livsmedelskvalitet vetenskapliga fält som berör oss alla och som omfattar normativa och värdeladdade aspekter av hållbarhet och livsmedelsförsörjning (Wright & Middendorf, 2008). För det fjärde ingår djurvälfärd i begreppet livsmedelskvalitet (Broom, 2010) och är en global och separat forsknings- och undervisningsdisciplin, om än relativt ung (Broom, 2005). Slutligen är den femte anledningen till att välja en tvärvetenskaplig ansats den potential och utmaning som öppenheten innebär för utbildning i ämnena livsmedelsvetenskap, livsmedelskvalitet och djurvälfärd. I denna avhandling har jag studerat olika aspekter av öppna lärmiljöer i högre utbildning och några aktiviteter som lärare, studenter och samhället deltar i när högre utbildning bedrivs med större öppenhet. Forskningen har bedrivits inom de specifika ämnesområdena livsmedelsvetenskap, livsmedelskvalitet och djurvälfärd.

En öppen utbildning relaterar till hur kunskap produceras, presenteras, accepteras, tas upp och används. Gibbons et al. (1994) argumenterade för ett nytt paradigm för kunskapsproduktion, som ersätter ett gammalt som karakteriseras av vetenskaplig hegemoni. I det nya paradigmet -"Mode 2"- är kunskapsproduktionen "socialt distribuerad, tillämpad, trans-disciplinär och problembaserad" (Nowotny et al., 2003, s. 179).

Detta påstådda paradigmskifte i kunskapsproduktionen sker parallellt med en förändring i utbildningen. Ett exempel är Sfard´s (1998) artikel om de två metaforer av lärande – att motta kunskap genom överföring och utveckla kunskap genom att delta i produktionen av denna. En annan är Koschmann´s (1996) argument för CSCL (datorstött kollaborativt lärande) som ett nytt paradigm för lärande. Ett tredje exempel är Thomas och Browns (2011) beskrivning av "en ny kultur för lärande", där högre utbildning är efterfrågestyrd och kunskapen i samklang med och tillgänglig för samhället. Ett fjärde exempel är utvecklingen av mer öppna format för att organisera högre utbildning, från öppna digitala lärresurser (Open Educational Resources, OER) till verksamhetsbaserat lärande (WBL).

SYFTE OCH FRÅGESTÄLLNINGAR

Det övergripande syftet med detta arbete är att undersöka möjligheterna att organisera och stödja öppen utbildning och lärande i livsmedelsvetenskap, livsmedelskvalitet och djurvälfärd vid gränsen mellan samhället, uni-

versitet och andra akademiska institutioner. Ett viktigt perspektiv är att bidra till en hållbar utveckling och ett system för livsmedelsproduktionen som står i överensstämmelse med samhällets åsikter. Syftet är både analytiskt - att förstå aktiviteter i gränslandet inom dessa ämnen - och designorienterat - att utveckla modeller och metoder för att arbeta med och öka öppenheten. Målet realiseras genom att studera två former av öppna lärmiljöer i högre utbildning: Användning av verksamhetsbaserat lärande (WBL); och design, utveckling, användning och spridning av öppna digitala lärresurser (OER).

De övergripande frågeställningarna är:

1. Hur kan man förstå verksamhetsbaserat lärande i livsmedelsvetenskap som en gränsaktivitet?
2. Vilka är de institutionella och individuella drivkrafter för att införa öppna digitala lärresurser i livsmedelsvetenskap och djurvälfärd?
3. Vilka är de institutionella och individuella hinder för att införa öppna digitala lärresurser i livsmedelsvetenskap och djurvälfärd?
4. Hur kan man förstå peer reviewing som en metod för kvalitetsbedömning av öppna digitala lärresurser i djurvälfärd?
5. Hur kan en produktiv metod och en infrastruktur för att dela och använda öppna digitala lärresurser designas?

BAKGRUND

Två internationella initiativ stimulerar till öppenhet inom högre utbildning: Artikel 13 i FN:s deklaration är ett äldre initiativ, som hävdar att "högre utbildning skall göras lika tillgänglig för alla, på grundval av kapacitet, genom alla lämpliga åtgärder och i synnerhet genom gradvis införande av fri utbildning" (FN, 1966). Dessutom har Europeiska kommissionen (EC, 2013, s. 10) tagit ett nytt initiativ, som föreslår att medlemsstater och utbildningsinstitutioner bör uppmuntra digitalt innehåll, inklusive OERs, som kurslitteratur för studenter på alla utbildningsnivåer och uppmuntra produktion av pedagogiskt material av hög kvalitet vars upphovsrätt skulle tillhöra de offentliga myndigheterna".

Dessutom kan man genom att omvandla utbildningssystemet och undervisningsmetoderna i enlighet med samhällets behov bidra till att högre utbildning blir mer hållbar. Utbildning för hållbar utveckling kän-

netecknas av social sammanhållning, jämlikhet, rättvisa och välbefinnande och är en handlingsplan för att minska människans påverkan på miljön (UNESCO, 2009). Utbildning om hållbar utveckling ökar medvetenheten, främjar moralisk förståelse och utvecklar metakognitiva färdigheter för att kunna delta i och ta ansvar för samhällutvecklingen (Lundholm, 2011).

Hållbar utveckling är av naturen en kollektiv och tvärvetenskaplig strävan efter en optimering av ekonomiska, sociala, miljömässiga och institutionella dimensioner (Valentin & Spangenberg, 2000). En hållbar produktion av livsmedel är en av dessa dimensioner och i detta ingår att produktionsmetoderna är socialt accepterade och att t.ex. hanteringen av våra husdjur sker med vad allmänheten uppfattar som en god djurvälfärd (Algers, 2011).

Blessinger och Anchran (2015) skriver om demokratiseringen av den högre utbildningen. Här beskrivs den rådande inställningen i Skandinavien som att högre utbildning är en rättighet med syfte att skapa mervärde för alla för att man efter utbildning ska kunna bidra till samhället.

VERKSAMHETSBASERAT LÄRANDE

I den högre utbildningen pågår en diskussion om förhållandet mellan teori och praktik. Denna diskussion har inte bara sina rötter i Deweys tidiga idéer, men också i Schöns (1983) idéer, där kunskap och handling samverkar. I många yrkesutbildningar som i lärar- och sjuksköterskeutbildningarna finns en lång tradition av att integrera praktikinslag i läroplanen (Walsh, 2007; Webster-Wright, 2009). I verksamhetsbaserat lärande är studenten involverad i samproduktion av kunskap och bidrar därmed till att göra den högre utbildningen lyhörd för eller relevant för samhället (Billett, 2001).

Tynjälä (2013) har sammanställt forskningen om verksamhetsbaserat lärande. Ett stort antal modeller har utvecklats för att organisera samarbetet mellan akademiska institutioner och industri eller offentlig sektor för att främja ett ämnesspecifikt lärande (Walsh, 2007; Betts et al., 2009) eller utveckla generiska färdigheter (Yorke & Knight, 2006; Alpert et al., 2009). Verksamhetsbaserat lärande har också visat sig öka studenternas motivation och anställningsbarhet (Lester & Costley, 2010).

Men verksamhetsbaserat lärande kan också innebära motsättningar och spänningar. På systemnivå har man funnit att akademi och industri har olika premisser, förväntningar och mål (Elmuti et al., 2005; Lester & Costley, 2010), och på lokal nivå har de tre intressenterna (universitet, näringsliv och studenter) olika men överlappande behov (Alpert et al., 2009).

Brew (2013) visade att när man engagerar studenterna i forskning och utbildning förstärker man kopplingen mellan forskning och undervisning och ändrar synen på studenter från konsumenter till aktiva producenter av kunskap. Men hon pekar också på problemet att lärare med praktisk erfarenhet av att engagera studenterna i forskningen inte har befogenhet att fatta beslut om läroplaner (ibid.). Aktiviteter i gränslandet mellan akademi och industri är sålunda förknippade med både utmaningar och en lärandepotential. Denna potential påstås bestå av fyra inlärningsmekanismer: Identifikation, samordning, reflektion och transformation (Akkerman & Bakker, 2011), och de spänningar och motsättningar som framträder i det empiriska materialet analyseras med hjälp av dessa mekanismer.

ÖPPNA DIGITALA LÄRRESURSER

OER är ett ganska nytt fenomen. De som stöder OER argumenterar för en deltagandekultur, som bygger på Web 2.0 och på teorier om kollaborativt lärande, som kallas öppna undervisningsmetoder (OEP). Men vissa författare hävdar att vi fortfarande bara ser en delningskultur (Iiyoshi & Kumar, 2008), och att OER inte i sig utgör en ny form för lärande. Det är förändringar i undervisningsmetoderna man eftersträvar, där de nya verktygen införlivas i undervisningen och där lärandet sker genom kollegiala aktiviteter mellan studenter och/eller mellan lärare, studenter och medborgarna i samhället (ibid.).

En orsak till att man inte i någon större omfattning har anammat OEP (Atenas et al., 2014; Camilleri et al., 2014) är att det utmanar inarbetade strukturer och praktiker, vilket kräver kompetens, tid, engagemang och institutionellt stöd för att övervinna (Atenas et al., 2014). Clements & Pawlowski (2011) har funnit att förtroende för OER har stor betydelse för om man anammar en OER. De påpekade att vissa användare förlitar sig på organisationer med gott rykte; andra på teknik eller deras personliga vänner när de väljer att använda OER. Dessutom får OEP konsekven-

ser för: 1) synen på undervisning och lärande eftersom det respekterar och ger studenter en samproducerande roll i lärandet (Ehlers, 2011); 2) undervisningspraktiken, eftersom det omvandlar undervisningsmetoder (se t.ex. Camilleri et al., 2014). och 3) hur man kvalitetsgranskar, eftersom kvalitetsbedömningen av OER inte är självklar.

Lane (2013) menar att OEP har störst potential inom intressegemenskaper som attraherar individer kring ett ämne, en disciplin eller en fråga. Denna kultur för lärande har också kallats "passionsbaserat lärande" (Brown & Adler, 2008) och Gee (2014) har använt begreppet "affinitetsyta" för att beskriva en plats, som är organiserad kring ett ämne som människor har ett intresse för. Att bidra till den samlade kunskapen på en sådan plats beskrivs vara viktigare än den enskilda deltagarens kunskap (Gee & Hayes, 2011; Ponti, 2014).

Altruistiska motiv spelar en nyckelroll i lärarens intensioner om att dela OER (OECD, 2007; Van Acker et al., 2013). I praktiken kan de flesta utbildningsresurser vara mer eller mindre lätta att återanvända beroende på sammanhanget, och beror alltså inte nödvändigtvis på själva resursen (McAndrew & Farrow, 2013a). Flera författare har pekat på att högre utbildning har ansvar för att stödja öppna lärmiljöer bland annat genom utvecklingen av systemiska strukturer, men hållbarhet och kvalitetssäkring utgör utmaningar (Downes, 2007, Wiley, 2007).

UNDERVISNING I LIVSMEDELSKVALITET

Mat är en angelägenhet för alla, och produktionen och förädlingen samt handeln med livsmedel är ett alltmer sammanlänkat och globalt fenomen (Murdoch & Miele, 1999). Detta nya globala livsmedelsscenario ger upphov till komplexa frågor kring hållbarhet, rättvis handel och etik som leder till ett behov av utbildning, inte bara för konsumenten, utan även för anställda inom livsmedelssektorn och samhället som helhet.

Parallellt med denna globala trend har en trend mot en systematisk syn på livsmedelskvalitet blivit allt mer central (Peri, 2006). Matens kvalitet kan definieras på olika sätt, men en av de mer vanligt förekommande definitionerna är att livsmedelskvaliteten är "de krav som är nödvändiga för att tillgodose konsumentens behov och förväntningar" (Peri, 2006, s. 4).

Matens kvalitet var tidigare begränsad till en fråga om näringsinnehåll och sensorisk kvalitet i kombination med livsmedelssäkerhet, men innehåller idag också etiska frågor relaterade till produktionsmetoder såsom hållbarhet, rättvis handel och, när det gäller animaliska produkter, djurvälfärd (Murdoch & Miele, 2004, Peri, 2006).

Det finns därför ett omfattande behov och också viss förekomst av fortbildning i livsmedelsvetenskap, som ofta sker genom distansutbildning till anställda inom livsmedelssektorn (t.ex. Shanley et al., 2004), men trots detta har inte mycket forskning publicerats om användningen av OER eller WBL i livsmedelsvetenskap och livsmedelskvalitet.

UNDERVISNING I DJURVÄLFÄRD

Djurvälfärd är en del av både livsmedelskvalitet och livsmedelssäkerhet, vilket i sin tur är en del av hållbarhetsbegreppet, eftersom det handlar om vad som är socialt accepterat (Broom et al., 2013). Djurvälfärd blev en vetenskaplig disciplin på 1980-talet och utvecklingen av ämnet djurvälfärd i högre utbildning var långsam i början men idag undervisas studenter i ämnet vid veterinärmedicinska fakulteter i hela världen (Broom, 2005).

I grundskolan och på gymnasiet är undervisning i ämnet djurvälfärd obefintlig, men den senaste tidens utveckling på EU-nivå förväntas ha ett starkt inflytande på de nationella lagar som reglerar utbildning så att undervisning i djurvälfärd blir obligatorisk på alla nivåer (EG, 2012a). Behoven av kunskaper i djurvälfärd är omfattande (Butterworth, 2009; Algers, 2011) och går utöver vad man kan åstadkomma inom nuvarande formella utbildningsstrukturer på grund av följande omständigheter: 1) den globala produktionen av kött har ökat och produktionsmetoder intensifierats (Fraser, 2008), 2) ett alltmer reducerat antal personer är inblandade i djurhållningen (Israelsson, 2005), 3) ett ökande antal samhällsmedborgare är uppmärksamma på våra livsmedelsproducerande djurs välfärd (Bayvel et al., 2005), 4) lagstiftning och standarder har utvecklats som ett svar på den samhälleliga utvecklingen (Mench, 2008; Bracke, 2009), och slutligen 5) har vår vetenskapliga förståelse av djurens kommunikation, perception och lidande ökat kraftigt (e.g. Fraser, 2008).

Forskningen och undervisningen om djurvälfärd var vid början koncentrerad till begreppsförståelse och mätning av djurens reaktioner på

olika situationer (Broom, 2005). Senare anammade man mera holistiska och tvärvetenskapliga metoder, eftersom förståelsen och bedömningen av djurens välfärd bygger på kunskap inom flera vetenskapliga områden och idag är forskning och undervisning fokuserad på vetenskapen om djurs kognition inklusive deras positiva och negativa känslor (t.ex. hundars lekbeteende och elefanters sorg).

I slutet av 90-talet började djuretik bli ett etablerat ämne men djurvälfärd och djuretik var två separata ämnen och kulturer (Fraser, 1999) till att Fraser föreslår att djurvälfärd bör diskuteras i termer av värden (Fraser, 2008). Fraser har sammanfattat att värden spelar en roll på tre olika nivåer, vilket också skulle kunna tillämpas på livsmedelskvalitet; när beslut fattas om 1) vad man ska betrakta som viktigt att beforska, 2) hur vetenskapliga bevis ska bedömas och 3) hur vi på vetenskapliga grunder bör handla moraliskt (ibid.). Sammanfattningsvis, kan man konstatera att det finns ett stort behov av OER i djurvälfärd men att publicerad forskning om OER i djurvälfärd är näst intill obefintlig.

TEORETISK INRAMNING OCH METOD

Denna avhandling grundar sig på en sociokulturell kunskapssyn, som kännetecknas av att förståelse och kunskap genereras i samspelet med andra individer och påverkas av sammanhanget. De teoretiska analyserna i avhandlingen baseras på det teoretiska ramverk som beskrivits som Cultural Historical Activity Theory (CHAT).

CHAT ger verktyg för att analysera komplexa aktiviteter mellan individer och de komponenter, som artefakter, traditioner och intressen, som omger dem på system och lokal nivå (Engeström, 1987). Det bidrar därför dels till att bättre förstå människans aktiviteter och dels till att generalisera resultatet av analysen (Kaptelinin & Nardi, 2006).

Spänningar och motsättningar mellan komponenterna, eller inom komponenterna och i synnerhet mellan aktivitetssystem kan leda till förändringar, och det är studier av dessa spänningar, motsätningar och förhandlingar som kan ge kunskap om en potential för förändring och varför förändingen sker eller uteblir (Engeström & Sannino, 2010).

Sociokulturella skillnader inom och/eller mellan olika aktivitetssystem kräver att aktiviteter måste förhandlas på lokal nivå, och samspelet mel-

lan aktivitetssystem kan leda till att dels relatera aktivitetssystemen närmare till varandra och dels tydliggöra skillnader mellan dem (Akkerman & Bakker, 2011). Genom att använda Akkerman & Bakker's definitioner av lärandemekanismer tydliggörs de aktiviteter, som sker i gränslandet mellan aktivitetssystem.

Motivet för aktiviteter är anledningen till att individer eller grupper av individer väljer att delta i en aktivitet, och relationen mellan aktörer och deras motiv och tvivel ger således aktiviteten en särskild riktning och är därför viktig att förstå (Kaptelinin, 2005). Anna Stetsenko har bidragit med en diskussion om den enskilde individens `agency´ i förhållande till aktiviteterna. Hon hävdar att den enskilde påverkas av aktiviteterna i de gemenskaper, som individen tillhör, och att man genom att delta i dessa aktiviteter "skapar en integrerad syn på sig själv" (Stetsenko & Arievitch 2004, s. 447).

METOD

Det empiriska materialet, som avhandlingen bygger på, behandlar deltagarnas gränsaktiviteter och består av enkätresultat (Artikel 1, 3 och 4), intervjuer med studenter (Artikel 1), samt av videoinspelade interaktioner i en peer review process (Artikel 5). Dessutom ingår en artikel i avhandlingen som bygger på en inventering med hjälp av olika sökmotorer på Internet efter OER i djurvälfärd samt en argumentation för behovet av OER i ämnet (Artikel 2). Se Tabell 4.

Artikel 1 bygger på en kombination av totalt 139 enkätsvar från studenter, lärare i högre utbildning och handledare i industrin, och intervjuer med 11 studenter före och efter deras senaste projektarbete i industrin. Intervjuerna transkriberades och analyserades i NVivo. Dessa empiriska fynd användes både för analys av hur parterna uppskattade den undersökta WBL-modellen samt för CHAT-analys av lärandemekanismerna.

Artikel 3 belyser en metod och en infrastruktur för att dela och använda OER och är baserad på en interventionsstudie, som genomfördes i samarbete med lärare och instruktörer i ett globalt nätverk av individer i industri och akademi. Studien kan alltså betraktas som designbaserad forskning (DBR), som är en serie metoder för att utforma artefakter och

praktiker och samtidigt öka vår förståelse av utbildningsfenomen (Barab & Squire, 2004).

Artikel 4 är en djupare analys av motiven för att lärarna i högre utbildning ska delta i öppna lärandepraktiker. En faktoranalys i kombination med CHAT användes för att bättre förstå de bakomliggande motiven för strukturella och personliga för- och nackdelar med att införa OER i undervisningen och incitament för att skapa OER.

Artikel 5, slutligen, utgör en analys, med hjälp av CHAT, av de aktiviteter som genomfördes under en peer review-process av en OER.

Tabell 4. Sammanställning av det empiriska materialet

	Tid	Deltagare	Fallstudier	Empiriskt material
Studie I	Juni-Oktober 2009	100 studenter, 31 handledare och 8 lärare svarade på enkäter, 11 studenter intervjuades före och efter deras projekt i ett lokalt utvecklat bachelorprogram.	Utbildningsprogram med en förhandlad WBL-modell.	Enkätresultat från enkäter till tre olika målgrupper och intervjuer av 11 studenter.
Studie II	April 2010	-	-	Sökresultat från en inventering av elektroniska utbildningsresurser i djurvälfärd från tre olika sökmotorer på Internet.
Studie III	April-November 2007	99 lärare, 70 instruktörer och användare av OER i ett globalt nätverk av individer i industri och akademi.	EU-projekt.	Enkätresultat från enkät till två olika målgrupper.
Studie IV	Juni-September 2012	101 forskare och lärare från samma globala nätverk som i studie III.	EU-projekt.	Enkätresultat från enkät till lärare.
Studie V	Oktober-December 2012	6 PhD-studenter och en processledare med kunskap i djurvälfärd.	Peer review-process.	Videos från fyra möten och producerade dokument.

SAMMANFATTNING AV EMPIRISKA STUDIER

Avhandlingen innefattar således 5 artiklar, varav den första analyserar WBL och de andra fyra OER som modeller för öppna lärmiljöer.

I artikel 1 analyseras en WBL-modell där studenter i livsmedelsvetenskap genomför projekt i gränslandet mellan ett svenskt universitet och livsmedelsindustrin. Universitetet och industrierna representerar två olika aktivitetssystem, som har olika kulturella traditioner och intressen. Studenterna fungerar som gränsgångare och deras projekt, gränsobjekten, fungerar delvis som en brygga mellan de olika aktivitetssystemen. De mer precisa målen är att undersöka aktörernas åsikter om projekten som gränsverksamhet och att öka förståelsen av det lärande, som sker vid gränsen mellan aktivitetssystemen.

WBL-modellen bygger på inledande systemiska förhandlingar mellan aktörer från alla tre parter: Akademin, industrin och studenterna. Förhandlingarna mellan aktörerna är centrala i den process som leder till utformningen av en projektbeskrivning. Studenter är däremot oftast tvingade att hantera de lokala förhandlingarna själva. Gränsobjekten har olika betydelser i de olika aktivitetssystemen, vilket ibland leder till att studenter har olika rapportering till olika aktörer, och samtidigt har gränsobjekten en potential att sammanföra resurser från de olika praktikerna och underlätta gränsövergången mellan aktivitetssystemen.

Resultaten visade att WBL-modellen, som bygger på initiala förhandlingar, utmanar alla aktörers flexibilitet, och att studenterna var mer kritiska till samarbetet mellan akademi och industri än representanter från de två institutionerna var. Detta kan vara en direkt följd av att det var studenterna som fick ansvara för att hantera de lokala förhandlingarna i händelse av konflikt och för att omsätta de systemiska förhandlingarna till mer precisa manuella uppgifter. Det visade sig också att studenterna utvecklade en stark egen agens i gränslandet. Det finns en spänning mellan de systemiska kraven och deras egen agens, men analysen visade att studenterna prioriterade att leva upp till arbetsplatsens förväntningar mer än till utbildningens och att de i viss mån redan såg sig själva som anställda. Det verkade också som att industrin såg studenterna som om de var en del av sitt aktivitetssystem.

Studenternas lärande studerades med hjälp av vad Akkerman och Bakker (2011) har kallat för lärandemekanismer. Den första mekanismen, identifiering, är enligt Akkerman och Bakker (2011) uppdelad i två processer, "olikheten" och "legitimerad samexistens". Det framkommer att både studenter och lärare är medvetna om de olika förväntningarna och en lärare påpekar att det därför är viktigt att klargöra från början att projektet är en del av en utbildning. Den andra mekanismen, samordning, delades i fyra processer, och uttalanden från de tre parterna ger exempel på vikten av att studenten och företaget har ett gemensamt mål och "artikulerar det", "anstränger sig att förstå", "förbättrar gränspermeabilitet" och "utvecklar nya rutiner". Den tredje mekanismen, transformation, delades i två processer; "att förstå nya perspektiv" och "att klargöra egna perspektiv". En student beskrev t.ex. att man måste presentera vad industrin är intresserad av att höra och en annan student beskrev behovet av att analysera mottagarnas reaktioner för att vara säker på att man gjort sig förstådd.

Slutligen visade den fjärde mekanismen, transformation, som delades in i sex processer varav det första var "konfrontation", att WBL-modellen ändrades och att första steget i den processen var att det blev tydligt att studenterna utnyttjades de första åren när modellen var en form för co-op. De övriga processerna, att "erkänna en gemensam problematik", "att upprätthålla det unika", "att fortlöpande utveckla det gemensamma arbete vid gränsen", "hybridisering" och slutligen "kristallisering", i vilken nya verksamheter blir inbäddade i de ursprungliga, exemplifierades med uttalanden från de olika aktörerna.

Artikel 2 beskriver incitamenten för att använda öppna digitala lärresurser i djurvälfärd och behovet av nya lärandestrategier i ämnet. Den pekar på att högre utbildning har ett stort ansvar för att skapa och dela nya kunskaper i ämnet, och att digital teknik kan öka tillgången till kunskap och erbjuda en ny strategi, som bygger på att samhället söker upp kunskap snarare än den traditionella, där högre utbildning trycker ut kunskap, som inte nödvändigtvis är samhällsrelevant. Förekomsten av öppna digitala lärresurser i djurvälfärd undersöktes med hjälp av tre olika sökmotorer och visade att endast ett fåtal universitet utvecklar och delar OER i djurvälfärd, men att kunskapen snarare är inlåst bakom lösenord. I artikeln föreslås universiteten samarbeta både för att skapa och dela med sig av

OER i djurvälfärd samt att engagera sig i kvalitetsbedömningen till gagn för lärare, studenter, samhälle och, indirekt, djurvälfärden.

Artikel 3 är design-orienterad. I artikeln beskrivs utvecklingen av en infrastruktur för OER inklusive av öppna digitala lärresurser i djurvälfärd, husdjursvetenskap och livsmedelsvetenskap för kunskapsdelning i gränssnittet mellan akademi och samhälle. För det första beskrivs identifieringen av designproblemet och motiven och förutsättningarna för den nya lösningen, som omfattar en strukturerad affinitetsyta för att dela erfarenheter och resurser mellan lärare, instruktörer och studerande. För det andra beskrivs processen för designutveckling, som baseras på hög grad av delaktighet av involverade aktörer, vilken resulterar i riktlinjer för ämnesinnehåll och pedagogik. För det tredje, dokumenteras den kollektiva utvecklingen av infrastruktur och öppna digitala lärresurser, som baseras på efterfrågan både vad gäller innehåll och pedagogik. Det framkom också att en peer review process bidrar till att skapa förtroende för kvaliteten och för att öka användningen av OER.

I Artikel 4 analyseras det upplevda värdet av öppna digitala lärresurser och motivation för att använda dessa inom ämnena husdjurs- och livsmedelsvetenskap, och särskilt djurvälfärd. Syftet är att analysera lärares värderingar och drivkrafter i relation till OER, hur de är relaterade till själva användningen av OER samt hur och varför implementeringen av öppna lärandepraktiker skiljer sig mellan lärare i djurvälfärd och andra lärare. Resultaten visade att OER utmanar den enskilde läraren samt gränserna för högre utbildning genom att ändra undervisningsmetoderna och kraven på kvalitetsbedömning. Både individuella och systemiska hinder hade tre underliggande förklaringar, varav de två första var identiska, nämligen svårigheter i bedömning av kvalitet och i anpassning till pedagogik. Den tredje underliggande förklaringen var på systemnivå att OER är avvikande och på det individuella planet att det finns ett lågt förtroende för egen kompetens i hur man hanterar OER.

Analysen visade också att OER värderas positivt. På systemisk nivå fanns en stark underliggande dimension av uppsökande och rådgivande aktivitet. Det kan uppfattas som en demokratisk dimension, med syfte att ge samhället fri tillgång till utbildning och vetenskaplig kunskap. Två underliggande faktorer på det systemiska och individuella planet relaterade till de kollektiva och expansiva egenskaperna hos OER. Analysen visade också att lärare upplever att man bör lägga stor vikt vid samarbete i syfte att utnyttja den samlade kompetensen inom forskarsamhället så att det förbättrar undervisningen och gör den mer forskningsbaserad. Det framkom också att det finns både interna och externa förväntningar på att anamma nya digitala undervisningsmetoder och att de kan utgöra en attraktionskraft som kan leda till en expansion av högre utbildning, med andra ord att nå nya målgrupper. Motiven för att delta i utvecklingen av OER var dels att leva upp till förväntningar på en akademisk karriär och dels att bidra med akademisk kunskap till samhället.

Studien stödjer också vikten av affinitetsutrymmen, ämnesspecifika nätverk och passion för att skapa förtroende och vilja till att dela och samarbeta. Lärare i djurvälfärd visar sig ha andra värderingar och motiv för en delningskultur, t.ex. är det altruistiska incitamentet att sprida kunskap som något gott i sig, mer uttalat bland lärare i djurvälfärd. Vidare föreslår studien att ämnesområdet djurvälfärd är en tillräckligt liten gemenskap av lärare för att bilda ett affinitetsutrymme med förutsättningar för nya och gränsöverskridande initiativ. Slutligen visade studien att lärare i högre utbildning har stort förtroende för peer review som ett instrument för kvalitetsbedömning och att de föredrar detta också för bedömning av OER. Men lärarna i djurvälfärd tyckte i större omfattning att studenter kunde delta i utvecklingen av OER än lärare i andra ämnen, med argumentet att studenternas motivation förväntas öka om de får delta i kunskapsproduktionen genom att utveckla OER.

Artikel 5 presenterar en analys av en peer review av en OER i djurvälfärd. Analysen av granskningsprocessen visar att denna skedde inom ett aktivitetssystem som bestod av 6 PhD-studerande och deras processledare, och som gränsar till andra aktivitetssystem, där man har en annan syn på begreppet djurvälfärd och på lärresursernas kvalitet. Artikeln betonar vad som förhandlades, identifierat som: a) OER-ämnesinnehållet och b)

OER-användningen. En närmare analys av dessa förhandlingar identifierar motsättningar på tre (av fyra) olika nivåer.

Den första motsättningen handlar om granskningsaktiviteten i sig; att granskarna genomför sin bedömning utan att ha specifika kompetenser i pedagogik och inte har möjlighet att bedöma resurserna i undervisningssituationen. Denna motsägelse diskuteras i ett större sammanhang och ger en förståelse för att kvalitetsbedömning av OER baserad på peer review generellt kan vara ett problem.

Motsättningen på nivå två fokuserar på reglerna för förhandlingarna och tre aspekter av detta förhandlades; 1) behovet av lärarstöd vid användning av OER, 2) dilemmat vid kommunikation av en förenklad framställning av ett ämne med komplicerad vetenskaplig grund och 3) betydelsen av att inkludera den pedagogiska kvaliteten i bedömningen. Motsättningen på nivå fyra, som ligger mellan det primära aktivitetssystemet och övriga aktivitetssystem, handlar om 1) tolkning av begreppet djurvälfärd, 2) olika intressen som rör djurvälfärd och 3) olika underliggande värderingar.

Att dessa motsättningar utgör en förändringspotential speglas i diskussionen om kunskapens exakthet (accuracy) och legitimitet, där exaktheten handlar om innehållet i sig är korrekt och aktuellt, medan legitimitet handlar om resursen är relevant och socialt accepterad. Resultaten av analysen bekräftar att peer review inte räcker för bedömning av kvalitet och att högre utbildning inte har befogenhet att vara den enda bedömaren av OER. Denna studie visar att peer review kan betraktas som en social förhandling om kunskap, men att peer review behöver kompletteras med strukturer för delaktighet i syfte att bidra till öppenhet för samhället.

AVSLUTANDE DISKUSSION

Högre utbildning har en viktig roll att spela för samhällsutvecklingen och studenters och deltagares inflytande ökar genom nya och mer deltagande former för att organisera utbildning (Iiyoshi & Kumar, 2008; Thomas & Brown, 2011). Öppna lärmiljöer inom högre utbildning möjliggör att studenter men även andra i samhället inte bara är konsumenter utan även producenter av kunskap. WBL och användningen av OER är exempel på sådana metoder, som samtidigt utmanar experternas autoritet (Billett et

al., 2006; Ponti, 2014) och utbildningssystemets robusthet och legitimitet (Walsh, 2007; Camilleri et al., 2014).

Aktiviteter i öppna lärmiljöer sker dessutom i gränsland, som kan leda till spänningar och motsättningar och både WBL och användningen av OER tenderar att möta ett visst motstånd (Tynjälä, 2013; Camilleri et al., 2014). I WBL agerar studenterna i gränslandet mellan akademi och industri, som har olika premisser, förväntningar och mål (Elmuti et al., 2005; Lester & Costley, 2010). Studentprojekten som gränsaktiviteter måste leva upp till förväntningarna från både högre utbildning och industri, och studenternas agens blir viktig för att hantera inneboende systemiska motsättningar och spänningar. Metoderna för detta kan innebära olika former för gränsöverskridande, men också lösningar som tydligt konserverar gränser mellan systemen. Ett exempel på det senare är en student, som skickade olika rapporter om sitt WBL-projekt till akademien respektive industrin.

I arbetet med OER uppstår spänningar mellan institutionellt kvalitetstänkande och ökat deltagande. Akademisk och pedagogisk kvalitet är centralt. Samtidigt värderar lärare altruistiska motiv och de säger sig vara mer benägna att engagera sig i gemensamma gränsöverskridande aktiviteter när de uppfattar ett ömsesidigt förtroende. Akademiskt anseende är en mindre viktig faktor. Detta är några av skälen till att an ämnesspecifik, homogen och förhållandevis liten miljö, som det globala nätverket av djurvälfärdslärare, med en stark gemensam agenda (identitet) har större potential att utveckla öppna lärmiljöer med användning av OER än större och mer heterogena nätverk, som nätverket av lärare i djur- och livsmedelsvetenskap.

Avhandlingen pekar också på att inledande förhandlingarna i WBL och peer review av OER är produktiva institutionella redskap för att stödja användningen av dessa ansatser till öppna lärmiljöer. Öppna lärmiljöer kan, när de baseras på att ”så ett frö för tillväxt” snarare än färdiga infrastrukturer och produkter, ge “möjlighet och resurser för att engagera dem i autentiska aktiviteter, för att delta i samhällsdebatten och diskussioner för att skapa gemensam förståelse mellan olika aktörer och för att utforma och lösa personligen meningsfulla problem” (Fischer, 2011, s. 53).

Resultatet i denna avhandling kan inte utan vidare generaliseras till högre utbildning i andra vetenskapsområden än livsmedelsvetenskap, livsmedelskvalitet och djurvälfärd. Några av resultaten kan dock vara

tillämpbara på lärande i gränsland inom andra ämnen, som att WBL som generellt ansats har en lärandepotential och att OER en potential som instrument i en delningskultur. Man skulle dock kunna argumentera för att öppna lärmiljöer, definierat som lärmiljöer på gränsen mellan olika aktivitetssystem, är viktigare inom omtvistade och komplexa ämnesområden, där forskningen är motsägelsefull och där etiska och moraliska dimensioner är viktiga.

Avhandlingen beskriver också design av öppna lärmiljöer, och studierna visar att de inblandade aktörerna betraktar WBL och OER som produktiva metoder. Men man kan dra slutsatsen att det är svårt att införa öppna lärmiljöer i högre utbildning och att metoderna utmanar kvaliteten (Downes, 2007; Wiley, 2007; Lester & Costley, 2010). Resultaten visar också att högre utbildning genom öppna lärmiljöer kan vara i dialog med samhället och skapa mer transparanta och deltagande metoder inom disciplinerna livsmedelsvetenskap och djurvälfärd och därmed bidra till en demokratisk och hållbar utveckling av vår gemensamma värld.

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