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## **JAGE-A595**

### **A new format for learning about farm animal welfare**

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**ABSTRACT.** Farm animal welfare is a knowledge domain that can be regarded as a model for new ways of organizing learning and make higher education more responsive to the needs of society. Global concern for animal welfare has resulted in a great demand for knowledge. As a complement to traditional education in farm animal welfare, higher education can be more demand driven and look at a broad range of methods to make knowledge available. The result of an inventory on "farm animal welfare," "e-learning," "learning resources," and "open educational resources" in three different search engines is presented. A huge amount of information on animal welfare is available on the Internet but many of the providers lock in the knowledge in a traditional course context. Only a few universities develop and disseminate open learning resources within the subject. Higher education institutions are encouraged to develop open educational resources in animal welfare for the benefit of teachers, students, society, and, indirectly, animal welfare.

**KEYWORD.** Animal welfare, open educational resources, e-learning, learning resources, web search

#### **1. Introduction**

Farm animal welfare is a knowledge domain that is of increasing concern in contemporary society (Bayvel et al. 2005; Special Eurobarometer 2007). Although there is an obvious role for improved knowledge in animal welfare for veterinarians, agricultural extension workers, and others involved in animal production (Fraser 2008), the target group is broader and includes consumers and citizens in an international context.

Higher education has an important role to play in this, both as developers and providers of scientific knowledge. Historically, access to this knowledge has been limited to formal structures such as classrooms in universities or journals in libraries. In order to respond to societal needs and demands it is important to examine new models for organizing learning and utilize the tools that modern information technology offers.

The purpose of this paper is to argue for providing open educational resources as a complement to traditional education in farm animal welfare and provide a selection of examples of learning resources (LR) and repositories respectively with such resources.

#### **2. Animal welfare – a global concern**

World production of meat is increasing rapidly and the less industrialized countries, following the convention of the FAO (FAO 2010), have experienced an exponential increase in animal production and these countries now produce the majority of the world's meat (Fraser 2008).

Accordingly, animal welfare has become an issue of global interest and is of considerable importance to consumers. Mahatma Gandhi (1869-1948) taught that nonviolence begins with what we eat and stated that the greatness of a nation and its moral progress can be judged by the way its animals are treated. OIE (World organization for animal health) has recently together with WHO and FAO started to coordinate medical and

veterinary health policies (OIE 2009) although people imprecisely claim that developing countries are not ready for the discussion on animal welfare pointing at the necessity of focusing on human welfare.

After all, the welfare of humans and the welfare of animals are closely linked (FAO 2009; EFSA 2009b). 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, the massive increase in animal production of the last decades has raised a wide range of ethical issues, including concern for animal welfare, which has to be considered alongside environmental sustainability and food safety. Nowadays it is increasingly accepted that food quality is not only determined by the overall nature and safety of the end product but also by the perceived welfare status of the animals from which the food is produced (Blokhus et al. 2008). The fact that improving the animal's welfare can positively affect product quality, pathology, and disease resistance also has a direct bearing on food quality and safety (Welfare Quality® 2009).

More than half of the inhabitants in Europe express a desire for more knowledge in animal welfare and animal ethics according to the Special Eurobarometer (2007). Concern for animal welfare is especially pronounced among young people. Students' attitudes towards animal welfare have been analyzed and students with low level of agricultural literacy had higher concern for animal welfare than students with agricultural backgrounds (Nordstrom et al. 2000). In order to effectively care and manage farm animals stock, people require knowledge about farm animal behavior, new techniques in husbandry and management, and farm animal welfare in general. Studies have shown that training programs that target the attitudes and behavior of stock people can successfully improve the attitudes and behavior of stock people towards their animals, with consequent beneficial effects on animal fear and productivity (Hemsworth et al. 1994; 2002; 2009).

Other sectors of society are also expressing a need for animal welfare knowledge. Numerous organizations are developing animal welfare assurance programs for a variety of purposes (Fraser, 2006) including niche marketing by producers, product differentiation by retailers, labeling for consumers, and development of legislation. Regardless of the purpose, animal welfare knowledge is required.

In conclusion, many people in society are involved and interested in food animal production, handling, and humane treatment. There is a clear global desire and need for increased knowledge and access to existing knowledge about animal welfare that is not currently being met by traditional educational structures.

### **3. Animal welfare - a scientific knowledge domain**

Animal welfare is based on two components; science and values (Fraser 2004). Animal welfare science can in turn be divided into how an animal responds to stress, injury, and disease, physiologically and emotionally.

At one time, many people denied that animals could feel pain and distress, but over the years animal welfare has become a subject where science has rapidly improved on knowledge. Half a century ago it was still considered to be pseudoscience lacking scientific status. In 1965 the UK government commissioned a technical committee chaired by Professor Brambell to investigate the welfare of intensively farmed animals, partly in response to concerns raised in Ruth Harrison's book, *Animal Machines* (Harrison 1964). On the basis of the Brambell report, the UK government set up the Farm Animal Welfare Advisory Committee in 1967, which later became the Farm Animal Welfare Council that had an important role in making animal welfare a scientific area of global importance. Recently the European Food Safety Authority (EFSA) has addressed the issue of the capability of fish to experience pain, fear, and distress (EFSA 2009a).

EFSA and more specifically the Panel on animal health and welfare (AHAW) provides independent scientific advice to the European Commission, European Parliament and Member States on all aspects of animal health and animal welfare (EFSA, 2009b). Improvements in animal welfare have previously focused on the European level and were based entirely on scientific research and legislation. The European Commission has initiated a strategy for focusing on international implications of animal welfare that are based on risk assessment, animal welfare auditing in practice, labeling of products of animal origin for the consumer and on education (European Commission 2002).

Scientific knowledge about animal behavior and animal needs is extensive but more effort is needed to disseminate and implement existing knowledge and standards into practice through various measures, e.g., consumer information and enforcing legislation through penalties in case of non-compliance. A large European scientific project named Welfare Quality® has recently been finalized with the objective to develop European standards for on-farm welfare assessment and product information systems as well as practical strategies for improving animal welfare.

Although animal welfare problems are extremely diverse, certain generic challenges occur on a global basis (FAO 2009) related to similar animal needs in spite of a great variation in housing and management. However, the

discipline has suffered from controversies and subjectivity particularly because its potential effects in compromising trade between countries. Animal products derived from production systems prohibited in some countries can be easily exported abroad, making even more evident the need for a global approach (European Commission 2009).

Governments are accountable for the national legislation that in Europe is generally initiated by pressure from voters on elected politicians. The politicians would usually seek advice from civil servants before formulating new legislation. In recent years in Europe, whenever any legislation on animal welfare is proposed, advice is sought from committees or working groups of scientists (Broom 2009).

With growing attention and concern in society, efforts have been increased to develop a methodology for the scientific assessment of animal welfare through qualitative and semi-qualitative approaches. Risk assessment is a way to standardize the estimation of animal welfare in the production systems and the risk managers are obliged to take action to ensure that the production of food of animal origin is in accordance with societal demands (Algers 2009). The risk managers could be national authorities or professional associations.

Multiple voices show an interest in animal welfare; these include animal welfare scientists, food industry, agricultural industry, government, environmental scientists, animal advocacy groups, and concerned citizens (Broglia 2009) all of which have their own agendas. For example the agricultural industries may position themselves to protect existing practices, while advocacy groups may have different goals ranging from promoting traditional, non-intensive methods to abolishing animal agriculture itself. The multiple messages from such a large variety of actors generates conflicting and confusing messages regarding scientific standards on how livestock should be treated. Furthermore, the audience in this dialogue, the public, is both fragmented and asked to play a variety of roles with competing concerns such as consumer, citizen and moral agent (Broglia 2009).

Thus, higher education institutions and especially animal welfare scientists play an important role in providing scientific information to students, citizens, and consumers on the welfare of our animals, how it should be measured and how it should be improved.

#### **4. Animal welfare in higher education**

Higher education is going through a period of rapid change with increasing globalization, with new forms and a rapid rate of knowledge production (Gibbons et al. 1994), and increasing competition between institutions on an international educational "market." At the same time higher education institutions in general have to handle larger and more diverse groups of students that also call for new ways of organizing learning (Biggs 2003). The development of modern information technologies and infrastructural provisions such as the Internet gives new options for education and for learning.

Fraser (2008) pointed at the potential impact of international e-learning initiatives, international corporations (chains, restaurants etc), and of international standards. It has even been suggested that e-learning is necessary to respond to the complex training demands on animal welfare (de Boo and Knight 2005; Siegford et al. 2005; Alessandrini 2008).

The notion of e-learning covers many different educational formats and forms of technology use. For example, the American Society for Training & Development (ASTD 2010) defines e-learning as:

Covering a wide set of applications and processes, such as web based learning, computer-based learning, virtual classrooms and digital collaboration. ASTD even includes the delivery of content through audio and videotape; satellite broadcast, interactive TV and CD-ROM in its definition on e-learning.

Mason and Rennie (2006) argue that e-learning refers to the major forms of teaching and learning that can be enabled or facilitated by computers and the Internet to deliver a broad array of solutions that enhance knowledge and performance. It should be

- networked
- delivered to the end-user via a computer using standard Internet technology
- focused on the broadest view of learning.

Often e-learning is coupled to a "push" approach to learning, i.e., knowledge is pushed out in society. This kind of approach is characteristic for most traditional formats of higher education, where the institutions provide programs and courses in which knowledge is "transmitted" to the learners. The primary mission of institutions of higher education is to develop curricula and offer programs and courses and formally certify the knowledge of the learners.

Formal teaching, such as programs and courses in animal welfare, are delivered in traditional on-campus formats or in the form of off-campus programs and courses (often with the use of e-learning). One reason for this is that educational institutions offer learning or study environments to students, with built in didactical support for their learning process.

However, there is also demand from society. For example, learning in formal institutional settings is sometimes of little interest to employed people (Beer et al. 2006). One reason is that many employees want to enhance their knowledge on an advanced level but do not need an exam for their career. Another example is a broad demand for information and knowledge on a certain issue that has caught attention in society. Thus, a complement to traditional methods of operation is to take more of a “pull” approach, where higher education is demand driven, and look at a broad range of methods to make knowledge available to the society.

## 5. Open educational resources in animal welfare

One idea is to design and provide “resources” for learning that can be used outside the formal educational context, in more informal settings. The quality of learning resources is multi-faceted and depends on the content and the context (Duval, 2006) and it should be emphasized that learning resources as well as repositories of learning resources also can be used within formal settings.

Learning resources are often considered as key intellectual property. However, more and more institutions and individuals are sharing their digital learning resources over the internet, openly and freely, as Open Educational Resources (OECD 2007). The benefits of Open Educational Resources (OER) are many and include aspects such as democracy and preservation of public education (Siemens 2003). Furthermore, OER gives teachers alternatives and increases competition between providers of teaching and training. From a more individual point of view, open sharing increases publicity, reputation, and the pleasure of sharing with peers. It also means broader and faster dissemination and the content can be quality assured with a scientific standard. In addition, OER enhance the motivation of more active learning students since they take part in problem solving and the intellectual development of learning resources. This makes learning more rewarding and will in the long run increase the amount of learning resources over time.

Teachers and trainers in higher education institutions worldwide impart general knowledge on animal welfare and have to continuously adapt their teaching in order to disseminate new findings within the area. Small research groups and teaching institutions may have difficulties in providing students with teaching and learning resources of high quality standard and it may have considerable impact on students learning when a leading teacher moves or retires. Obviously, there are many advantages in sharing the same kinds of learning resources between peers (OECD 2007). In some countries curricula in, e.g., veterinary science have only few hours of teaching in animal welfare due to lack of expertise and staff training (Siegford et al. 2005). The provision of peer-reviewed teaching resources is likely to support the development of new courses and better educated students.

An inventory of the present stage of available material in animal welfare on the Internet 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 more specific type of educational material discussed above. We have used the same set of search terms (in advanced searches) in Google, Alta Vista, and Yahoo, recognizing the fact that Yahoo belongs to Alta Vista. The results from the web searches are shown in Table 1.

**Table 1. Results from searches in Google, Alta Vista, and Yahoo.**

Search terms \ Search engine	Google	Alta Vista	Yahoo
"animal welfare"	4 770 000	35 600 000	35 800 000
"farm animal welfare"	53 200	399 000	401 000
"elearning" OR "e-learning"	26 700 000	178 000 000	157 000 000
"learning resource(s)"	5 640 000	40 500 000	40 500 000
"open educational resources(s)"	4 030 000	1 410 000	1 400 000

"animal welfare" AND ("e-learning" OR "elearning")	26 800	386 000	387 000
"farm animal welfare" AND ("e-learning" OR "elearning")	1700	533	520
"animal welfare" AND "learning resource(s)"	34 700	33 600	33 800
"farm animal welfare" AND "learning resource(s)"	167	156	88
"animal welfare" AND "open educational resource(s)"	480	1 250	540
"farm animal welfare" AND "open educational resource(s)"	6	3	3

Note: The expression "resource(s)" means that we have searched for "resource" OR "resources."

The numbers of hits are the result from a search from Sweden on April 19, 2010. It should be recognized that both numbers and content change from day to day.

First of all, the table shows that there is a lot of material to be found on the Internet concerning "animal welfare" and "farm animal welfare." The hits on "farm animal welfare" comprise about 1 percent of the hits on "animal welfare." The table also shows that there is a huge amount of hits on "e-learning," which presumably illustrates that e-learning is a widely accepted and encompassing concept. The number of hits on "learning resources" might be a reflection of the focus on students' learning and use of resources in contemporary pedagogical thinking. It is also interesting to note the number of hits on "open educational resources," which, as we pointed out above, is part of a more recent "movement" towards open source and open resources not the least in higher education settings. The difference between Google and AltaVista/Yahoo is hard to explain. The difference between "animal welfare" and "farm animal welfare" in combination with "e-learning," "learning resources," and "open educational resources" shows that both in relative and absolute measures there are substantially fewer hits for "farm animal welfare." In absolute numbers, there are very few hits on "farm animal welfare" and "open educational resource(s)" and the number of hits on "farm animal welfare" and "learning resource(s)" is in the hundreds. We believe that this strengthens the general argument in this article that it is important for higher education institutions working with farm animal welfare to engage in the OER-movement.

In order to illustrate to what extent higher education institutions are providing resources on farm animal welfare, we have taken the analysis of the material from the web searches above a step further. The first 30 Google-hits in all of the combined searches above have been analyzed. In Table 2 the higher educational institutions that show up are listed together with some characteristics of the sites, target group, and if the resources have open access.

**Table 2. Examples of higher education institutions and organisations providing learning resources.**

Address	Provider	Target group	Access	Commentary
<a href="http://www.umb.no/animal-welfare-library/">http://www.umb.no/animal-welfare-library/</a> [Accessed 2010-04-12]	Norwegian Uni. of Life Sci. and Norwegian School of Vet. Sci.	Students, Teachers, society	Open access	Repository with link to courses, LR, encyclopedia
<a href="http://www.yourviews.ubc.ca/">http://www.yourviews.ubc.ca/</a> [Accessed 2010-04-19]	University of British Columbia	Students, teachers, society	Open access	Web-based surveys to facilitate discussion.
<a href="http://www.porktraining.org/">http://www.porktraining.org/</a> [Accessed 2010-04-12]	Q-PorkChains (EU-project, collaboration between universities)	Students, teachers, society	Open access	Repository with LR.
<a href="http://animalwelfare.msu.edu/">http://animalwelfare.msu.edu/</a> [Accessed 2010-04-12]	Michigan State University	Students	Open access and locked in	Animal Welfare Judging and Assessment Contest.

<a href="http://www.animaethicsdilemma.net">http://www.animaethicsdilemma.net</a> [Accessed 2010-04-12]	Collaboration between universities	Students, teachers	Open access	LR, text based with some videos.
<a href="http://www.intute.ac.uk/">http://www.intute.ac.uk/</a> [Accessed 2010-04-12]	Consortium of 7 universities, UK	Students	Open access and locked in	Repository with links to text based and video based resources.
<a href="http://www.moulton.ac.uk/animal-welfare-guide.asp">http://www.moulton.ac.uk/animal-welfare-guide.asp</a> [Accessed 2010-04-12]	Moulton College	Students	Password protected	Learning Resource Center.
<a href="http://www.vet.ox.ac.uk/">http://www.vet.ox.ac.uk/</a> [Accessed 2010-04-12]	Oxford University	Teachers, students	Password protected	Course information.
<a href="http://www.warkscol.ac.uk/">http://www.warkscol.ac.uk/</a> [Accessed 2010-04-12]	Warwickshire College	Society, students	Password protected	Links to local animal welfare courses.
<a href="http://www.cambridge-elearning.com/">http://www.cambridge-elearning.com/</a> [Accessed 2010-04-12]	Cambridge e-learning institute	Teachers, students, society	Password protected and open access	A few learning resources can be accessed.
<a href="http://bufvc.ac.uk/">http://bufvc.ac.uk/</a> [Accessed 2010-04-19]	British Universities Film and Video Council	Students, teachers	Open access	Repository with videos and audios.
<a href="http://www.ifaw.org/">http://www.ifaw.org/</a> [Accessed 2010-04-12]	International Fund for Animal Welfare	Society	Open access and locked in	Repository with videos.
<a href="http://www.oie.int/">http://www.oie.int/</a> [Accessed 2010-04-12]	The World Organization for Animal Health (OIE)	Society, veterinarians	Open access	Links, text based information,
<a href="http://www.fao.org/ag/againfo/themes/animal-welfare/en/">http://www.fao.org/ag/againfo/themes/animal-welfare/en/</a> [Accessed 2010-04-12]	FAO	Society, students, pupil, teachers	Open access	Repository with LR, links and videos.

\*LR means Learning Resource

The three organizations mentioned in the table are included because of their importance in the field of farm animal welfare.

It can be concluded that numerous higher education institutions and organizations provide knowledge in farm animal welfare on the Internet but that many of these institutions seem to lock in the knowledge in a traditional course context. The term “E-learning” seems generally to be more pronounced than the use of “learning resource” in universities and colleges. Although, some universities are early adapters of the production and dissemination of accessible resources, only very few provide “open educational resources.”

## 6. Development of international learning resources

In 2005 the World Organization for Animal Health (OIE) adopted the first global guidelines for animal welfare, especially in the area of animal transport, slaughter of animals for human consumption, and killing of animals for disease control (OIE, 2005). The guidelines were ratified by the OIE membership and from that date animal welfare officially became a global issue (Bayvel et al. 2005).

OIE has identified a need for educational resources and an OIE-hub is under development (Pajor et al. 2008). The OIE-hub is planned to include information from various groups including, veterinary authorities, statutory bodies, OIE reference laboratories, collaborating centers, as well as veterinary and agricultural training institutes. Finally, individual experts, identified based on a record of publication in peer reviewed scientific journals, are also

included. The OIE-hub will search three categories 1) individual experts 2) opportunities for training and 3) educational materials. Individual experts, their contact details, area of expertise and their availability to advice on animal welfare topics will be highlighted. Opportunities for training will identify distance education courses, institutions offering courses or other education in animal welfare, institutions offering graduate education in animal welfare, as well as the opportunity for internships or sabbaticals. Finally the search of educational materials will focus on scientific periodicals, books, CD's, and DVD's. The hope is that this project will result in a searchable database to provide science-based information on animal welfare to educators, governments, veterinarians, and others worldwide.

Another promising example is "The gateway to farm animal welfare," a repository or hub developed by FAO with the goal to provide a single access point for international and national information related to farm animal welfare (FAO, 2009). The repository can ideally be used to search for information (including publications, guidelines, courses, learning resources, multimedia etc.), to share information, and to feed national or regional portals with information. The goal is to build awareness and foster partnerships and sharing of information and to host web-based events like electronic conferences and fora and participatory projects.

In this way, animal welfare is a subject area that is well suited for the Internet. For instance, animals express with their behavior if they have good or bad welfare, e.g., animals in poor welfare are often passive or show abnormal behavior and animals in good welfare have a wider behavior repertoire including playful activities. Even vocalization can be used for monitoring animal welfare (Dawkins 2004; Döpjan et al. 2008). Video, audio, and photo are media carrying a great amount of information that contextualize animal welfare and therefore facilitate understanding.

Developing learning resources based on these media and making them accessible on the Internet can be of benefit not only to teachers and learners but may also have a rapid and global impact on the development of animal welfare practices and standards. In line with animal welfare being based on both science and values it has been suggested that teachers in animal welfare also should teach animal ethics (Edwards, 2002; Hanlon, 2008). Internet based resources on animal ethics can thus be used in a variety of learning contexts to support student understanding (Hanlon et al. 2009).

Greater collaboration between higher educational institutions will enhance the development and the reuse of high quality learning materials, be more cost-efficient, and will at the same time increase competition by making teaching within individual institutions visible to a potentially worldwide audience (OECD, 2007). One argument for higher education institutions to develop OER is by participating to guarantee the quality of the resources. An educational institution has the means and procedures of quality assuring both the content and the pedagogical quality of the resources. There are a number of frameworks and models that can be used for this (van Assche and Vuorikari 2006; Masoumi and Lindström 2009).

## 7. Conclusion

The provision of more attractive and engaging learning by utilizing better use of Information and Communication Technology (ICT) is a way to respond to the challenges of global need of knowledge in farm animal welfare. The e-learning format covers a wide range of delivery systems and it should be emphasized that open educational resources can be used in both formal and informal settings.

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## References

- Algers, B. 2009. A risk assessment approach to animal welfare. In: Smulders, J.M. & Algers, B. (Eds.). *Food safety assurance and veterinary public health*. Vol 5. Welfare of production animals: assessment and management of risks. Wageningen Academic Publishers. ISBN: 978-90-8686-122-4. The Netherlands, pp. 223-235.
- Alessandrini, B. 2008. The role of the IZS A&M as OIE Collaborating Centre on veterinary training, epidemiology, food safety and animal welfare. OIE Animal Welfare conference, Cairo, 20-22 October. [http://www.oie.int/eng/A\\_AW2008/PDF/Session%20II/8\\_OIE\\_AWCairo\\_B\\_Alessandrini\\_EN.pdf](http://www.oie.int/eng/A_AW2008/PDF/Session%20II/8_OIE_AWCairo_B_Alessandrini_EN.pdf) (Accessed January 2010).
- ASTD, 2010. American Society for Training & Development. <http://www.astd.org/> (Accessed January 2010).
- Bayvel, A.C.D., Rahman, S.A., and Gavinelli, A. (Eds.). 2005. Animal Welfare: Global -issues. Trends and challenges. *Revue Scientifique et Technique de l'office International des Epizooties*, 24, 463-813.



- Beer, D., Busse, T., Hamburg, I., Mill, U. & Paul, H. (Eds.). 2006. E-learning in European SMEs. Observations, Analysis & Forecasting. Proceedings of the ARIEL final Conference, 08112005 in Brussels, pp 222. ISBN-10 3-8309-1631-0. Waxman, Germany.
- Biggs, J. 2003. *Teaching for quality learning at university. What the student does*. 2nd ed. Pp 309. The society for Research into Higher Education & Open University Press. Berkshire, UK.
- Blokhuis, H. J., Keeling, L. J., Gavinelli, A. and Serratos, J. 2008. Animal welfare's impact on the food chain. *Trends in Food Science and Technology*, 19, 75-83.
- Broglio, R.S. 2009. Animal welfare in science and society. In: Smulders, J.M. & Algers, B. (Eds.). *Food safety assurance and veterinary public health*. Vol 5. Welfare of production animals: assessment and management of risks. Wageningen Academic Publishers. ISBN: 978-90-8686-122-4. The Netherlands, pp. 45-58.
- Broom, D.M. 2009. Animal welfare and legislation. In: Smulders, J.M. & Algers, B. (Eds.). *Food safety assurance and veterinary public health*. Vol 5. Welfare of production animals: assessment and management of risks. Wageningen Academic Publishers. ISBN: 978-90-8686-122-4. The Netherlands, pp. 339-350.
- Dawkins, M.S. 2004. Using behaviour to assess animal welfare. *Animal Welfare* 13:3-7.
- De Boo, J. and Knight, A. 2005. *Journal of Veterinary Medical Education* 32: 451-453.
- Duval, E. 2006. LearnRank: Towards a real quality measure for learning. In: Ehlers, U.D. & Pawlowski, J.M. (Eds.) *Handbook on Quality and Standardisation in E-learning*, pp 457-463. Springer Berlin.
- Düpján, S., Schön, P.C., Puppe, B., Tuchscherer, A. and Manteuffel, G. 2008. Differential vocal responses to physical and mental stressors in domestic pigs (*Sus scrofa*). *Journal of Appl. Anim. Behav. Sci.* Vol. 114:105-115.
- Edwards, S.A. 2002. A synthesis of animal bioethics teaching in agricultural and veterinary courses in Northern Europe. In: Proceedings Teaching Animal Bioethics in Agricultural and Veterinary Higher Education in Europe. AFANet Workshop, INPL, Nancy France, 23-24 May 2002. pp 57-61.
- EFSA, 2009a. Scientific Opinion of the Panel on Animal Health and Welfare on a request from European Commission on General approach to fish welfare and to the concept of sentience in fish. The EFSA Journal (2009) 954, 1-26
- EFSA. 2009b. [www.efsa.europa.eu/EFSA/efsa\\_locale-1178620753812\\_1211902134066.htm](http://www.efsa.europa.eu/EFSA/efsa_locale-1178620753812_1211902134066.htm) (Accessed December 2009).
- European Commission. 2002. Communication from the commission to the council and the European Parliament on Animal Welfare Legislation on farmed animals in third countries and the implications for the EU, COM (2002) 626 final. [http://ec.europa.eu/food/animal/welfare/references/2002\\_0626\\_en.pdf](http://ec.europa.eu/food/animal/welfare/references/2002_0626_en.pdf). (Accessed December 2009).
- European Commission. 2009. [http://ec.europa.eu/food/animal/welfare/international/index\\_en.htm](http://ec.europa.eu/food/animal/welfare/international/index_en.htm) (Accessed December 2009).
- FAO. 2009. Gateway to Farm Animal Welfare. <http://www.fao.org/ag/againfo/programmes/animal-welfare/about-the-gateway/what-is-the-gateway/en/> (Accessed 6 January, 2009).
- FAO. 2010. Food Balance Sheet. FAOSTAT Database, 14 July 2005 update. Available at: <http://faostat.fao.org/site/565/default.aspx>. (Accessed January 2010).
- Fraser, D. 2004. Applying science to animal welfare standards, Proceedings of the Global Conference on Animal Welfare: An OIE Initiative, Paris, 23–25 February 2004 (2004), pp. 121–127.
- Fraser, D. 2006. Animal welfare assurance programs in food production: A framework for assessing the options. *Anim. Welfare* 15:93–104.
- Fraser, D. 2008. Toward a global perspective on farm animal welfare. *Journal of Appl. Anim. Behav. Sci.* Vol. 113, Issue 4, pp 330-339.
- Gibbons, M., Limognes, C., Nowotny, H., Schwartzman, S., Scott, P., and Trow, M. (1994). *The new production of knowledge. The dynamics of science and research in contemporary societies*. London: Sage Publications.
- Hanlon, A.J. 2008. Animal Welfare in Veterinary Medicine Education. *Redvet*. <http://www.veterinaria.org/revistas/redvet/n101008B/BA022.pdf> (Accessed January 2010).
- Hanlon, A.J., Algers, A., Dich, T., Hansen, T., Loor, H. and Sandøe, P. 2009. 'www.animaethicsdilemma.net: a learning resource for university lecturers in animal sciences and veterinary medicine. In: Millar, K., Hobson-West, P. and Nerlich, B. (Eds.). *Ethical futures: bioscience and food horizons*. Wageningen Academic Publishers. ISBN: 978-90-8686-115-6. The Netherlands, pp. 187-191.
- Harrison, R. 1964. *Animal Machines: The new factory farming industry*. pp 186. London: Stuart.
- Hemsworth, P.H., Coleman, G.J. and Barnett, J.L. 1994. Improving the attitude and behaviour of stockpersons towards pigs and the consequences on the behaviour and reproductive performance of commercial pigs. *Applied Animal Behaviour Science*, 39, 349-362.

- Hemsworth, P.H., Coleman, G.J., Barnett, J.L., Borg, S. and Dowling, S. 2002. The effects of cognitive behaviour intervention on the attitude and behaviour of stockpersons and the behaviour and productivity of commercial dairy cows. *Journal of Animal Science* 80, pp. 68-78.
- Hemsworth, P.H. & Coleman, G.J. 2009. Animal welfare and management. In: Smulders, J.M. & Algers, B. (Eds.). *Food safety assurance and veterinary public health*. Vol 5. Welfare of production animals: assessment and management of risks. Wageningen Academic Publishers. ISBN: 978-90-8686-122-4. The Netherlands, pp. 133-147.
- Mason, R. & Rennie, F. 2006. *Elearning : The key concepts*. London ; New York: Routledge.
- Masoumi, D. & Lindström, B. 2009. Foundations of cultural design in e-learning. *Int. J. Internet and Enterprise Management*, 6(2), 124-142.
- Nordstrom, P.A., Richards, M.J., Wilson, L.L., Coe, B.L., Fivek, M.L. and Brown, M.B. 2000. Assessing student attitudes towards animal welfare, resource use, and food safety. *Journal of Agricultural Education*. Vol. 41 Issue 3, pp 31-39.
- OECD. 2007. *Giving knowledge for Free - the Emergence of Open Educational Resources*, no 3, pp. 153. Paris, France. [www.sourceoecd.org/education/9789264031746](http://www.sourceoecd.org/education/9789264031746) (Accessed October 2009).
- OIE. 2005. Terrestrial Animal Health Code. 2005. World Organization for Animal Health (OIE), Paris, France.
- OIE. 2009. [http://www.oie.int/eng/Edito/en\\_edito\\_apr09.htm](http://www.oie.int/eng/Edito/en_edito_apr09.htm) (Accessed December 2009).
- Pajor, E.A., Kahn, S. and Stuardo, L. 2008. Animal Welfare Education and Research Resources Database. OIE Animal Welfare conference, Cairo, 20-22 October. [http://www.oie.int/eng/A\\_AW2008/PDF/Session%20VII/23\\_OIE\\_AWCairo\\_E\\_Pajor\\_EN.pdf](http://www.oie.int/eng/A_AW2008/PDF/Session%20VII/23_OIE_AWCairo_E_Pajor_EN.pdf) (Accessed January 2010).
- Siegford, J.M., Bernardo, T.M., Malinowski, R.P., Laughlin, K. and Zanella, A.J. 2005. *Journal of Veterinary Medical Education* 32: 497-504.
- Siemens, G. 2003. Why we should share learning resources, available at: [www.elearnspace.org/Articles/why\\_we\\_should\\_share.htm](http://www.elearnspace.org/Articles/why_we_should_share.htm) (Accessed December 2009).
- Special Eurobarometer. 2007. *Attitudes of EU citizens towards Animal Welfare*. [http://ec.europa.eu/public\\_opinion/archives/ebs/ebs\\_270\\_en.pdf](http://ec.europa.eu/public_opinion/archives/ebs/ebs_270_en.pdf) (Accessed December 2009).
- van Assche, F. & Vuorikari, R. 2006 A framework for quality of learning resources. In: Ehlers, U.D. & Pawlowski, J.M. (Eds.) *Handbook on Quality and Standardisation in E-learning*, pp 443-456. Springer Berlin.
- Welfare Quality®. 2009. [www.welfarequality.net](http://www.welfarequality.net) (Accessed December, 2009).