Global and Integral e-learning in Artificial Intelligence Studies

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Abstract

In this paper, we report on the research results concerning the potential of e-learning for global and integral education in the EEES context, based on experience with the "Artificial Intelligence (AI) applications for human and sustainable development" module, part of the "Advanced AI" international master of the Spanish distance-learning university (UNED).

This multi-disciplinary module has been designed with the aim of giving the students ─ future AI technology developers and researchers ─ a wide and humanistic perspective on their specialisation area by addressing its global context: philosophical, anthropological, ethical and socio-political. In this way, the students acquire a deeper knowledge of the subjects they study in other modules of the master, a knowledge that resonates in other dimensions of their personal development path. The final objective is to educate the students for an ethical exercise of their profession in coherence with a human and sustainable technological development. The teaching objectives place emphasis on the "appropriate technology" concept, i.e. on the application of intelligent technologies to the satisfaction of basic human needs. Finally, the anthropological dilemmas raised by AI (e.g. the nature of self-awareness) concern the most intimate essence of the human being and predispose the student to profound questioning.

The pedagogical approach is socio-constructivist, participative and active. Resolution of practical cases, reflections on diverse documentation, working in groups, virtual debates, panels and conferences constitute the basis of the teaching methodology. This approach using an e-learning platform, together with the idiosyncrasy of the contents and teaching objectives of the course, pose difficulties that make this teaching experience interesting: coping with the lack of agility and warmth of the available communication media, evaluating group activities versus flexibility, assessing teaching objectives concerning attitudes (e.g. ethical attitudes) by using the "ethics of language" theory, etc.

Keywords: global and integral education; artificial intelligence; socio-constructivist, participative, active approaches.

Global and integral education in technical studies: promoting a technology for human and sustainable development

The European Higher Education convergence plan reaffirms the importance of a global and integral education, seeking an equilibrium between personal growth and development as a member of society, on the one hand, and professional and academic education, on the other. One of the main goals has been the convergence towards an educational model in accordance with the principles of the european educational tradition, where education is seen as a public service in the “Europe of citizens”. Global and integral education will be achieved both by means of including multidisciplinary subjects in the curricula and through transversal competencies. The emphasis on a student-centred learning process, on socio-political aspects of professions, on recognition of interculturalness, on mobility (mutual knowledge; potentiating less favoured universities), etc. (González and Wagenaar, 2003) clearly reveals the goal of promoting a comittment to ethics in europeean higher education institutions.

This view is in agreement with the educational approach currentely denoted "education for human and sustainable development" (EHSD) (Baselga et al., 2000), whose origins lie in the innovative pedagogic theories of Paulo Freire. A luminary of latin american popular education (Freire, 1970), in the sixties, Paulo Freire already spoke of “awakening conscienceness” when defining the objectives of his educational programmes in brazilian rural communities. Non Governmental Organisations for Development (NGODs) have since taken up his pedagogic ideas, placing the emphasis in their programmes on creating awareness of individual responsibility in human and sustainable development, understood as the expansion of human freedom (and not in the purely economic sense) of present and future generations.

In the university context, EHSD integrates the core ideas of different “education for” paradigms (for development, peace, the environment, multiculturalness, gender equality, human rights etc.). One viewpoint held in academia defines EHSD as “a transformational pedagogic strategy that affects feeling, thought and action, and strives to produce active and critical citizens” [...] “an educational process that favours understanding about economic, political, social and cultural interrelations between North and South, that promotes values and attitudes of solidarity and social justice, and looks for ways in which human and sustainable development can be achieved.” (Boni, 2004). Regarding the pedagogic aspects, socio-constructive perspectives and participative, creative, and active methodologies that promote dialogue, respect for autonomy, empathetic communication, involvement in collective projects etc. are considered indissociable from EHSD (Jares, 2004).

Though introduced later in universities than in schools in Spain, EHSD is the cooperation strategy in which the universities have been most active. In particular, in technical studies there are already a significant number of optional undergraduate modules, doctorate courses and masters degrees being offered in areas related to cooperation and human and sustainable development. In distance learning, particularly noteworthy is the catalogue of postgraduate courses offered at the UOC, the Universitat Oberta de Catalunya (the Catalan Open University), in a wide range of academic areas: science, technology and society; development studies; international cooperation; and sustainability (Pérez-Foguet at al., 2006). However, the enthusiasm of the teaching staff involved and the good reception on the part of the students constrasts, firstly, with the disperse and uncoordinated character of the initiatives that, furthermore, currently lack any institutional support, secondly, with their absence from the list of obligatory modules and, thirdly, with the lack of the transversal approaches that enable the contents of EHSD to be better related to professional practice.

In the European context there is also a significant catalogue of development studies with a technological approach, most of them taking the EHSD perspective and some of them using e-learning (Hardgroves, 2004)(Monguet, 2004).

Artificial Intelligence for human and sustainable development through e-learning

In this paper, we report on the research results concerning the potential of e-learning for global and integral education in the EEES context, based on experience with the “Artificial Intelligence (AI) applications for human and sustainable development” module, part of the “Advanced AI” international master of the Spanish distance-learning university (UNED).

Until recently, it has been impossible to incorporate the pedagogic aspects of EHSD into distance learning. With current ICTs, this is no longer the case, as recent experiences in education for human and sustainable development have shown (Monguet et al., 2004)(Hargroves et al., 2004). Several authors have pointed out how a virtual learning environment constitutes a socialising space in which ethical values can be learned (Duart, 2002). Putting EHSD into practice in virtual form poses many questions, to which must be added others also raised by the pioneering nature of such courses but more related to the actual course contents and objectives.

This multi-disciplinary module has been designed with the aim of giving the students ─ future AI technology developers and researchers ─ a wide and humanistic perspective on their specialisation area by addressing its global context: philosophical, anthropological, ethical and socio-political. In this way, the students acquire a deeper knowledge of the subjects they study in other modules of the master, a knowledge that resonates in other dimensions of their personal development path. The final objective is to educate the students for an ethical exercise of their profession in coherence with a human and sustainable technological development. The teaching objectives place emphasis on the “appropriate technology” concept, i.e. on the application of intelligent technologies to the satisfaction of basic human needs. Finally, the anthropological dilemmas raised by AI (e.g. the nature of self-awareness) concern the most intimate essence of the human being and predispose the student to the a deep questioning.

The pedagogical approach is socio-constructivist, participative and active. Resolution of practical cases, reflections on diverse documentation, working in groups, virtual debates, panels and conferences constitute the basis of the teaching methodology. This approach using an e-learning platform, together with the idiosyncrasy of the contents and teaching objectives of the course, poses difficulties that make this teaching experience interesting: coping with the lack of agility and warmth of the available communication media, evaluating the trade-off: group activities versus flexibility, assessing teaching objectives concerning attitudes (e.g. ethical attitudes) by using the “ethics of language” theory, etc.

Teaching Methodology

Throughout the virtual course the students carry out the two types of activities: individual activities and group activities.

Individual activities. The activities to be carried out individually consist of assignments of varying types (reflections on a text, resolution of practical problems, compilation of data about a particular topic), on occasions followed by a general discussion, similar to that scheduled after group activities, aimed at defining a common position from the different students' conclusions. Among the individual activities proposed, by way of example we cite “The experience of self-awareness, idiosyncrasy of AI in the computer science context”, “From Frankenstein to Matrix,

socio-political implications of AI through science fiction” and “Examples of intelligent technology in underdevelopment contexts”.

Questionnaires. Initial questionnaires serve to make explicit the student's point of view and attitude before starting the course, as well as their objectives, needs and interests. Questionnaires carried out after each teaching unit serve to find out the student's evaluation of that unit and to assess their understanding of it. In the final questionnaire, the students carry out a global evaluation of whether or not their expectations have been adequately met. Questionnaires previous to each unit help the student become aware of any preconceived ideas and value judgements they may have. Among the activities of the latter type, we cite, for example, “Technological inequalities” and “Knowledge about the history of AI”.

Group activities. The group activities are similar to the indivicual activities and may also be followed by a general discussion. For each group activity, one student is designated as "group leader" and will take the initiative on issues such as the assignment of component tasks, work planning, synthesis of conclusions, etc., where it is understood that each decision must be taken with the agreement of all the group members. Groups have to monitor themselves and, after each content unit, respond to a brief questionnaire that should help them to take stock of their functioning. Among the group activities proposed, we cite “Compilation of information about areas under debate” and “State of the art of free / open source software in AI”

General discussions. The presentation of the conclusions from a group activity by each group spokesman, followed by a debate about these conclusions open to all the students. An example of an activity of this type is the discussion that follows the group activity “Compilation of information about areas under debate”.

Debates. The lecturer proposes a discussion on a given topic or case study with the participation of all the students. Normally, the debates are guided or inspired by some readings. The lecturer closes the debate, synthesizing the conclusions. An example of such a debate is the following: “Free / open source software: Is free / open source software an appropriate technology in underdevelopment contexts? What values does it promote? Does it constitute an attack on free competition? How can it be reconciled with the right to intellectual property?”.

Panels. A panel comprises a group of students each of which is given a position to defend in the panel debate, irrespective of their personal viewpoint. Participants are required to prepare for the debate by reading the appropriate subject matter. Following the debate between the panel members, there is a general debate in which anyone can participate. An example of a panel is the following: “Self-awareness: What is self-awareness? Is artificial self-awareness possible? Awareness and self-awareness from a biology and evolutionary pyschology perspective.” To prepare for this panel, the students were provided with bibliography relating to the topic of self-awareness from different fields of study: from computer science, from robotics, from physics, from neurophysiology and from spirituality.

Structure of the virtual learning environment

The Master is taught entirely via an instantiation of the .LRN teaching-learning environment. The structure of the Web reflects the participative approach to the teaching and in itself outlines the methodology used. In what follows, we explain the sections of which the e-learning course is composed:

News: Used to announce activities related to the course topics that may be of interest to the students such as conferences, seminars, exhibitions, etc.

Course handbook: Contains general information about the course.

Study guide: From this section the lecturer directs the course, introduces the different topics, announces the different activities and materials that are added to the Web as the course progresses, reminds the students about deadlines for the submission of coursework from the different activities, gives recommendations and instructions relevant for study, etc.

Study material: As for the detailed planning of the activities, the study material for the course is provided in stages as the course progresses. For each topic, a range of types of material is made available: texts (articles and extracts of significant texts that are of interest for reflection, debate and for carrying out individual and group activities), bibliography (compilation of bibliographic references about the topic, some of which are available in electronic form), Web addresses, activity descriptions.

Activities/grades: Section in which the students coursework is stored together with its grade.

Communication. This section contains the following forums:

- *Cafeteria*. This is a non-moderated forum, that is, it does not require supervision byt the lecturer. The students use it for meetings, exchanges, consultations, etc.
- *Activities forum*. In this forum the different activities are specified and the lecturer replies to any questions about carrying them out.
- *Debate forums*. Throughout the course, debate forums are opened as they are needed for the different debates.

Calendar: This is used as the diary of the course. As the course progresses, the detailed course schedule is added: start and finish dates of the activities, coursework submission deadlines, etc.

Subgroups. Each student has access to a space corresponding to the work group to which he or she belongs. This space contains a set of Web pages and facilities equivalent to those of the course, i.e. facilities to share files easily, a diary for the planning of the group's work, the possibility of defining forums, etc.

Evaluation of the experience

Since 2006-2007 was the first year that this Master has been taught, this study is still in progress. The conclusions we present below are therefore only preliminary.

Evaluation of the spaces for communication and debate

Since dialogue is a key tool of the teaching methodology, the lack of agility and warmth of the available means of communication could constitute a serious disadvantage. Appraisal of the first debate on the course (“Is free / open source software an appropriate technology in the underdevelopment context?”) shows, however, that by providing the students with basic guidelines (such as: keep contributions short and ensure that they follow a thread of debate that is centred on the topics of interest, provide clear references to previous messages, avoid monologues, etc.) it is eminently possible to achieve a fluid and animated debate that arrives at interesting conclusions. By contrasting this experience with similar debates in which the students

were physically present, we conclude that “virtual” communication encourages a more centered and reflexive debate, allowing freer expression (the contributors are less image-conscious), in which the participants find it easier to concentrate on the essence of the messages (in the absence of any prejudices based on physical image). Moreover, the students are also urged to follow the norms of “Netiquette” (Shea, 2000) (“social norms in cyberspace”). Arising in the Internet culture of liberty, solidarity and free association, netiquette contains implicit values of reflexive dialogue, sustainability, cooperation, public-private equilibrium etc. and it is to be hoped that its practice will foster the interiorisation of ethical values that can then be extrapolated to other social contexts, both “virtual” and “non-virtual”. In the rest of the course, we experimented with different usage norms in the spaces for communication and debate, with the aim of identifying which of them were most suitable (debates with or without a moderator, guided or unguided debates, debates with explicit or implicit assessment criteria, debates with or without strict norms concerning the length of contributions, etc.).

Group activities versus flexibility

The surveys we carried out concerning the working of the student groups reveal that it is difficult to make the synchronisation demanded by group activities compatible with the flexibility characteristic of distance education.

Humanistic nature of the course

We initially had doubts about whether the course contents would be sufficiently motivating and accessible for students with a technical profile, such students being unaccustomed to philosophical and humanistic reflection in an academic context, and even about whether such students would feel that there was an element of indoctrination in the contents. However, the surveys carried out so far have revealed a high level of satisfaction among the students, and their motivation and ability to handle the current material is manifest in the high quality of the assignments submitted.

Evaluation of the teaching objectives concerning attitudes and values

The evaluation of attitudinal competencies such as “ethical commitment” is the most difficult aspect to tackle in the teaching project described here and requires a preliminary reflection about what such competencies really comprise. Our understanding is that the student will have acquired a professional ethical commitment if, after the course, he or she has interiorised the ethical values taught, to the extent that he or she shows a predisposition to ethical behaviour. Interiorising values involves not only their intellectual understanding, that is, their recognition as such in the realm of reason, but also their assimilation in the deeper cognitive levels from which volition emanates.

The interiorisation of values occurs insofar as one is able to distinguish them as such, and insofar as one accumulates positive life experiences as a result of acting in harmony with them. Regarding the second aspect, initially, we considered that in a virtual course the furtherance of experiences involving the exercise of ethical values would prove difficult, since experimentation with case studies is a long way from being real life experience. However, one of the activities of the course, “From Frankenstein to Matrix: socio-political implications of AI through science fiction”, consisting of a guided analysis of a series of classical readings of the genre, unexpectedly turned out to have significant worth in this respect, this being patent from the emotion and intensity communicated by the students' submissions. Literature, and art in general, is thereby demonstrated to be a medium of great potential for education in values.

We conclude from the experience of this course that the acquisition of ethical competencies can be virtually evaluated in two different dimensions: cognitive and experiential.

The cognitive dimension

In this dimension, the competency of the student to argue that the professional ethical values considered constitute assets is assessed. We consider that a student has not assimilated a certain value at the cognitive level when:

a. He or she professes to be in favor of the value but does not argue this convincingly
- He or she argues in favor, but the argument (assessed according to criteria of clarity, precision, exactness, relevance, depth and scope – see (Elder & Paul 2002)) is weak
- He or she claims to adhere to the value but presents no argument for it, treating it as a question of belief or subjective opinion.

The reason for this could be that the student is disposed to taking on board the value but his or her understanding is deficient, or that he or she is not convinced but believes that showing himself or herself to be in favor will improve his or her grade. In the second case, the student's arguments may even reveal a manifest falseness, resorting to platitudinous beliefs and “talisman” terms.

b. The student directly argues against the value. This attitude can reveal different grades of assimilation of the value in that the student may be critical as a consequence of a solidly-based skeptical attitude, underlain by an authentic desire to understand real-life; or the student may simply seek to vindicate their current way of thinking. Clearly, a skeptical attitude should be more highly valued than the attitude of students who are reluctant to think for themselves and who merely seeks to adhere to beliefs that give them a better image of themselves or confer greater social acceptance.

The experiential dimension

The emotional involvement of the students can be assessed by analysing their coursework looking for linguistic manifestations of expressiveness, explicit emotive terms or literary language, as opposed to the use of distant language.

The possibility also exists of assessing the assimilation of ethical values on the part of the students not with respect to the application in a professional context but in the context of day-to-day virtual social interaction. To this end, we could analyse the contributions in the spaces for debate, as well as the working of the student groups, from the point of view of the ethics of language, using as criteria (Elder & Paul, 2002):

- intellectual humility (awareness of the limitations of one's own viewpoint)
- an attitude of respect and of recognition of others' arguments
- the lack of determination to “win” the debate, or to impose one's own point of view in a radical manner
- the disposition to changes of position
- etc.

We recognise that the reflections contained in this section are of a preliminary nature and that they are a long way from constituting a rigorous system of assessment of objectives relating to

ethical attitudes. Our intention is simply to define basic guidelines to approaching this difficult problem.

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