Modern Environmental Science and Engineering (ISSN 2333-2581)
September 2018, Volume 4, No. 9, pp. 783-790
Doi: 10.15341/mese(2333-2581)/09.04.2018/001
Academic Star Publishing Company, 2018
www.academicstar.us

Distance Education on Water Resources Management

Gilmar da Silva, António José Guerner Dias, and Pedro Luiz Côrtes
Faculty of Sciences, University of Porto, Portugal

Abstract: Education in Brazil and in the world has undergone several transformations. The student of the 21st century is a new student who longs for changes, among which the possibilities offered by Distance Education. At the same time, freshwater consumption worldwide has been increasing considerably, both by expanding industrial activities in developing countries and by population growth. There are several situations where conflicts have been verified by the use of water. Water scarcity and hydric crises have multiplied, which demands a better planning and management of water resources. Faced with this fact, this project has as main objective to implement a discipline of Water Resources Management in the distance modality aimed at the training of students of Undergraduate and/or Graduate Courses in Universities of Brazil and Abroad. Proposals for management of water resources that prioritize contemporary water management practices are addressed, always seeking to ensure the sustainable development of human activities, as well as natural resources and the environment. As an instrument to develop this proposal, will be used the Moodle plataform, available in Brazilian and foreign universities. This virtual learning environment offers the teacher Internet resources such as discussion forum, chat, mail, calendar, readings, among others. With this proposal of teaching and learning, a more effective interaction between students and teachers is expected, increasing the didactic experience and the students' learning. At the same time, it has the objective is to train critical and reflective professionals, raising the interest to change the way water resources are used and managed. With this proposal, we are looking for to achieve the objectives of sustainable development and better conservation of water resources.

Key words: water resources management, distance education, Moodle

1. Introduction

We live in a world with more than 7 billion inhabitants, where more and more information is shared. The industrial age has passed and now we are in the digital age. However, something very important remains the same in several places: the school. Everything has changed very fast and the education systems is also seeking new paths in the midst of contemporary hyper connectivity. The teaching model practiced by some universities, where students are in queued portfolios, has been shown to be an obsolete model. It is necessary to think of different models that allow to increase the performance of the whole process. Shared learning is a new possibility of teaching in which the teacher ceases to be centralizing the knowledge and acts as a hub that interconnects different persons and facilitates the exchange of information and experiences between the students.

The student of the 21st century is a new student who longs for changes, among which the possibilities offered by Distance Education. Even if oral tradition and face-to-face interaction continue to play an important role in education, today it is no longer necessary to be present physically in places to obtain quality teaching and share experiences and opinions. In large urban centers, too much time is lost with traffic jam, which — sometimes — makes it difficult for all potential students to meet in the same classroom. On the other hand, there is also the problem of distant cities that have no university.

Besides that, problems associated with the use and quality of water affect both large and small cities indiscriminately and are part of the daily life of several countries. There are cases in which the occurrence of

Corresponding author: Gilmar da Silva, Ph.D., Professor; research areas/interests: water resources, sanitation and environment. E-mail: prof.dr.gilmar@gmail.com.

conflicts over the use of water manifests itself in my most intense ways. It is up to the managers to implement processes and improvements that minimize these conflicts, thus ensuring a sustainable development of human activities and the conservation of these resources and the environment. It is in this context that Distance Education assumes a preponderant role in higher education and postgraduate education, providing subsidies for the training of managers and proposing solutions to the issues of water resources and the environment.

2. Objective

Implantation of a discipline of Water Resource Management in the distance modality aimed at the students of Undergraduate and/or Postgraduate Courses of Universities of Brazil and abroad, where they will be approached proposals of management of the water resources that bring solutions to the associated conflicts water use and quality.

3. Bibliographical Review

3.1 Water Resources Management

According to C. R. de. Mello and A. M. da. Silva (2013) [7], since time immemorial, access to water has become a source of power or a point of dissension, in this case, resulting almost always in conflicts, thus requiring the intervention and the intermediation of an authority that bring a solution. Essential to life, water is an important factor for the development of society and for environmental sustainability, being in this context to be better known as a water resource, which is endowed with economic value asserts [7].

The Management of Water Resources is an activity that aims to establish rights and duties, through administrative rules, so that the sustainable use of the resource is given in a fair and equitable way to all citizens involved, according to A. C. Zuffo (2016) [11].

According to C. R. de. Mello and A. M. da. Silva (2013) [7], the management of water resources encompasses surface, underground and marine resources, which are inseparable because they are interconnected by the hydrological cycle. Still according to C. R. de. Mello and A. M. da. Silva (2013) [7], another point to be addressed is that the management of water resources consists only of a part of the environmental management, being indispensable to the articulation and harmonization with the management of other natural resources, such as soil and vegetation cover, as well as social, economic and technological resources.

According to Michael G. Moore and G. Kearsley (2007) [8], distance learning is planned learning that normally occurs in a place other than the teaching location, requiring special techniques of course creation and instruction, communication through various technologies, and organizational and administrative arrangements special.

At the beginning of the twentieth century, it became a form of teaching learning capable of attending at all levels, including formal education programs, those offering diplomas or certificates and non-formal programs, whose purpose is to provide training for improvement in development of professional activities.

The number of public and private educational institutions that offer courses in this modality has grown significantly in Brazil after the publication of the Law of Guidelines and Bases in 1996. According to data from the Associação Brasileira de Educação a Distância [1], the number of institutions that offered in distance undergraduate courses increased by 36% in the period from 2004 to 2006 (from 166 to 225). The number of students increased by 150%, from 309,957 to 778,458 in the same period.

According to J. Vianney, P. L. Torres and L. Roesler (2010) [10], we can say the distance learning in Brazil, from the beginning to the present, has developed from five models, which are:

- The model of tele-education with live broadcast and via satellite in an open channel for the whole country. The best known and national

example is the Telecurso of the Roberto Marinho Foundation.

- The education video model with pre-recorded reproduction in the form of normal class.
- The semi-presential model, with a university internalization proposal combining distance and face-to-face education at regional poles, which function as attendance units for students' access to laboratories, libraries, and classrooms for face-to-face tutoring in partnership with municipal governments.
- The virtual university model, with an distance learning characterized by the intensive use of digital technologies for the delivery of contents and activities for students and to promote their interaction with teachers, colleagues and technical and administrative support. In this model, the face-to-face stages are reserved for exams, with other activities being carried out at a distance.
- The model in which distance-learning students spend regular periods in the institution (in person) where they have exams and activities in the laboratory, for example.

3.2 Virtual Learning Environment-Moodle

Virtual Learning Environment is the virtual place where, in general, distance learning courses take place. These are environments that use specially designed platforms to host courses, such as the “Moodle” platform.

Moodle is a platform for distance learning based on free software. It is an acronym for Modular Object-Oriented Dynamic Learning Environment. It has been and continues to be continuously developed by a community of hundreds of programmers around the world, who also constitute a user support group, adding new features under the GNU philosophy of free software. A foundation [6] and a company [4] respectively provide support for their translation and support for their installation and use.

Moodle is also a teaching and learning management system (known as a LMS — Learning Management System), i.e., it is an application developed to help educators create online courses, online courses, or online support for face-to-face, high quality courses with many types of resources available.

Fig. 1 illustrates all the features that Moodle provides for teachers and students.

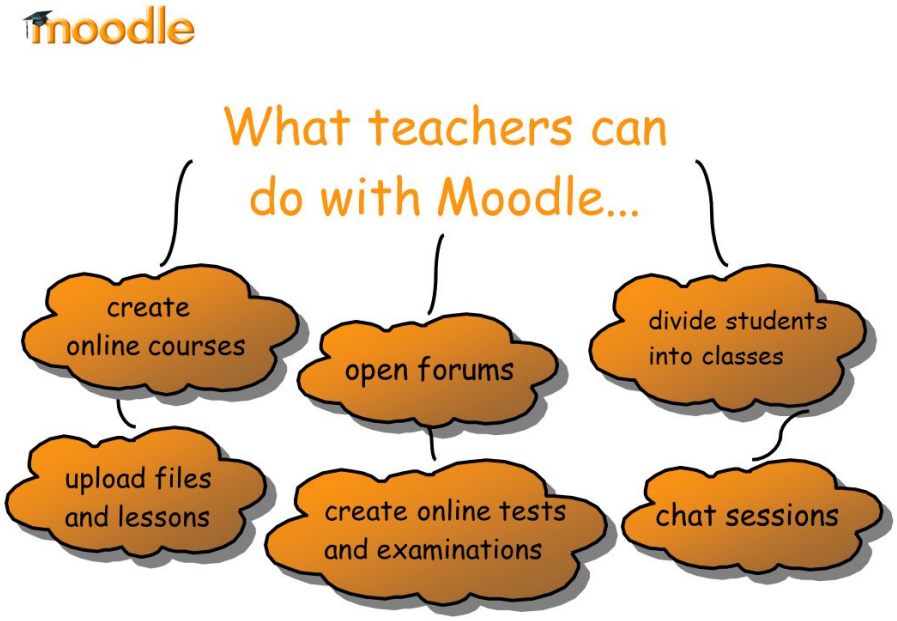

Fig. 1 Resources available through the Moodle platform [6].

4. Methodology

The discipline Water Resources Management in Distance Education will be a project to be implemented in conjunction with the Pro-Rectory of Undergraduate and Graduate and Secretariat of Distance Education of universities in Brazil and abroad.

It will be offered to undergraduate and/or graduate students of universities in Brazil and abroad, especially in environmental engineering and civil engineering courses where it should be compulsory, and may be optional for all other undergraduate and/or postgraduate courses of educational institutions.

The program of the discipline of Water Resources Management in Distance Education will be subdivided into 4 modules to be made available in the Moodle Virtual Learning Environment, as follows:

4.1 Program of the Course Management of Water Resources in Long Distance Education

(1) Module 1: Hydrology, Hydraulic and Monitoring of Water Resources Management

- Fundamentals of hydrology and hydraulic;
- Hydrological cycle and analysis of the factor which influence both the demand and the availability of over and under land waters in urban and rural activities;
- Qualitative and quantitative monitoring of water resources management.

(2) Module 2: Water Management

- Water resources management;
- Water resources management models and their evolution;
- Organization of management processes.

(3) Module 3: Planning of Water Resources

- Water resources master plans;
- Making of water resources master plans as a management tool;
- Risk analysis;
- Risk management.

(4) Module 4: Case Study: An Approach to Cantareira System

- The Cantareira System;
- System management.

The course of Water Resources Management will be held as a long-distance course with the accompaniment of 1 tutor and the help of the virtual learning environment Moodle.

The course will be offered for the period of 1 semester depending on its contents.

Simply putting, the course follows the structure bellow, with scheduled dates to finish the modules and the activities proposed. The discussion of relevant topics in the forums, the access to units and the undergoing of the activities will be accompanied by a professor/tutor. The participation on forums will fundamental for the success of the course in its respective field of graduation and/or postgraduate studies.

The platform Moodle which will house the course of Water Resources Management in Long-Distance Education will have the following configuration, according to Fig. 2.

Setting: Here the student can understand how the long-distance learning model from the university works. When starting the course, the user will be recommended to access the material from setting in order get accustomed to Moodle's Virtual Learning Environment Platform.

Modules' content: Both material and discussion related to the topic will be held here. Throughout the course there will be offered:

Interactive content: content in hypertextual format, with texts, illustrations, animations glossary, bibliographical references and issues for reflection.

Video: video with experts on either interview or debate contest, to spark reflection about modern and relevant topics and practices, or videos on tactics and procedures to facilitate the (re)construction of knowledge.

Fig. 2 Structure for Moodle's virtual learning environment.

Complementary material: material that complements de content from the modules and has technical-scientific texts, a list of websites for research and links for content available online.

Moment of practice and reflection: presents a situation-problem that requires a solution. There will be a case study for each module proposed and one of the requirements of that study will be the participation

in the forum's discussion for analysis of the situation-problem.

Discussion Forum: For the discussion of relevant topics to the modules or proposed activities, always monitored by a teacher tutor.

Individual activity: Task related to the skills practiced in the modules.

Virtual meeting: Chat with the professor-tutor to discuss de activities and the ending of the course. If the student can't make it to the scheduled date, the recording of the meeting will be available within 48 hours of its completion.

Closure: Ending of the course and satisfaction assessment submitted by the student.

This procedure follows an example of a standard methodology. There might be slight deviations from the structure of the course according to the field of graduation and/or postgraduate studies, as well as the number of videos, complementary material, articles, discussion forums, etc.

4.2 Regulation

4.2.1 Avaliation Criteria

The student must obtain a final average higher or equal to 7.0 to pass the course.

The final average consists of:

Individual Activity (AI): grade about the completion of the activity graded from 0 to 5 points

Participation (PA): Grade about the participation in the course and in the discussion foruns graded from 0 to 5 points.

Bonus Chat (BC): bonus about the participation in the chat graded from 0 to 1.0 points.

FINAL AVERAGE = AI + PA + BC

If the student does not pass, there will be a recovery activity and to get the approval the student needs a grade no lower than 7.0.

A grade lower than 7.0 or failing to send the recovery activity within the deadline, results in the student's failure on the course. An extension of the deadline for the student to send the activity may be granted only in cases of medical problems, if it is reported within the applicable period of the activities and only if proven by medical certificate. Requests made after de deadline, even with certificate will not be considered and the student will fail the course.

If the student wishes to retake the course after failing, he must apply again, as long as he sends a request by email to the EaD team.

4.3 Requirements to Access the Course

Equipment (hardware), program (software) and access to the internet, email and/or cellphone, enabling access to own computer with all the requirements and technical specifications detailed bellow, necessaries for the proper development of the course:

(1) Operating Systems Windows, Mac OS and Linux

- Browser Internet Explorer 9.0 or higher, Firefox 22.0 or higher, Google Chrome 27.0 or higher, Safari 5.0 or higher and Opera 11.0
- Processor of 1GHz or higher
- RAM memory of 512MB or higher
- Monitor with, at least, 1024 x 768 pixels
- Sound card
- Broadband internet connection equal to or greater than 1Mbps. Low speed connections will interfere with the loading of course content.

(2) Tablets

- Android version 2 or higher and IOS (iPad, iPhone, iPod) version 3 or higher;
- Native system browser.

4.4 Technical Support

- The Long-distance Learning team will provide technical support through email or forum of the virtual environment itself. Doubts and technical difficulties will be answered within a maximum period of 24 hours from the receipt of the request, except on weekends.
- In case of doubt, the contact will be through the technical support email.

4.5 Course Access

- Once the registration is completed, the Student will automatically be granted access to the virtual learning system. Important: access to course discipline content will be released according to the schedule provided at the start of the course.
- The “login” is the full RA and the password is the same one that was used to make the registration, being for personal and non-transferable use.

4.6 Privacy Policy

4.6.1 On Behalf of the Universities

The University undertakes not to disclose or commercialize the information of the students enrolled in the subject of the course. All the registration data will be stored in a protected and confidential database.

4.6.2 On Behalf of the Students

The student is expressly forbidden to distribute all or part of the content of the course, information sent or received in “forums”, mailing lists or course work without express and written permission from the University Teaching, as well as the use of the didactic material for any purpose other than the study of the student who enrolled and attended the course.

The fact that the student is taking the course does not give the right to reuse or resell the study material to third parties.

5. Expected Results

It is expected with this project in Universities of Brazil and Abroad:

- To present a new model of teaching learning, where mediatization of knowledge must take place;
- Transform teaching into shared learning, where the teacher ceases to be a centralized one and begins to share information;
- Enable more effective integration between students and teachers, enhancing didactic experience and student learning;
- Meet the aspirations of the new student of the 21st century, where he will be a virtual student;
- Provide the student with access to the contents of the discipline “Water Resources Management”, and study anywhere in the world without necessarily being present in a classroom;
- To translate into a contemporary language the main theoretical and practical aspects of Water Resources Management;
- Through recent reports, drawn from newspapers and magazines of great circulation, and case studies, to bring to the day-to-day of the student situations experienced, effectively, by the organizations;
- Contribute to train critical and reflective professionals, raising the interest to change the way Water Resources are used and managed, in order to achieve the goals of sustainable development and conservation of water resources.

References

[1] Associação Brasileira de Educação a Distância: ABED, acessed on 19 Sept. 2016, available online at: http://abed.org.br/site/pt/.

[2] Brasil, Lei nº 9.394, de 20 de dezembro de 1996. Estabelece as diretrizes e bases da educação nacional. Diário Oficial da União, Brasília, DF, 23 dez. 1996, accessed on 19 de setembro de 2016, available online at: http://portal.mec.gov.br/sesu/arquivos/pdf/lei9394.pdf.

[3] Brasil, Decreto nº 5.622, de 20 de dezembro de 2005, Regulamenta o art. 80 da Lei nº 9.394, de 20 de dezembro de 1996, que estabelece as diretrizes e bases da educação nacional, Diário Oficial da União, Brasília, DF, 20 dez. 2005, accessed on 19 de setembro de 2016, available online at: http://portal.mec.gov.br/seed/arquivos/pdf/dec_5622.pdf.

[4] Empresa Moodle, accessed on 19 de janeiro de 2017, available online at: http://www.moodle.com.

[5] S. R. K. Franco, Educação a distância na Universidade Federal do Rio Grande do Sul, Porto Alegre: UFRGS, 2004.

[6] Fundação Moodle, accessed on 19 de janeiro de 2017, available online at: http://www.moodle.org.

[7] C. R. de. Mello and A. M. da. Silva, *Hidrologia: princípios e aplicações em sistemas agrícolas*, Lavras: Ed. UFLA, 2013.

[8] Michael G. Moore and G. Kearsley, Educação a distância: uma visão integrada – Edição especial ABED – Associação Brasileira de Educação a Distância, São Paulo: Thomson Learning, 2007.

[9] G. L. F. Ribeiro, Tecnologia do Ensino aplicada à educação a distância: uma avaliação. Tese (Doutorado em Psicologia Experimental: Análise do Comportamento) – Pontifícia Universidade Católica, São Paulo, 2014.

[10] J. Vianney, P. L. Torres and L. Roesler, Educación superior a distancia en Brasil In Torres, P. L e RAMA, C. (Coor). La Educación Superior a Distancia em America Latina y el Caribe - Realidades y tendencias. Santa Catarina, UNISUL, 2010.

[11] A. C. Zuffo, *Gerenciamento de recursos hídricos: conceituação e contextualização*, Rio de Janeiro: Elsevier, 2016.