Active-Learning Strategies to Increase the Students' Engagement to an Environmental Science Course in a Distance-Learning Program

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Abstract

The universalization of World Wide Web (WWW) and Information and Communication Technologies (ICTs) has fostered a great development of on-line and distance-learning courses, and a fast growth in the number of students enrolled in such programs. Besides, on-line and distance-learning programs have been able to overcome a number of handicaps that face-to-face programs have, mostly due to great flexibility that on-line programs offer to students regardless of their location and/or time availability. As a drawback, students enrolled in on-line and distance-learning programs might feel isolation and lack of motivation. In order to overcome these problems, this research aims to study how active-learning teaching strategies influence the students' study approaches, their motivation and strategy to learn environmental science in a distance-learning program along with the Revised Two – Factor Study Process Questionnaire (R-SPQ-2F) employed. The study was carried out in the National University of Distance Education of Spain in the Environmental Science undergraduate program during the 2017/18 course. The results of the study indicate that the active-learning methodology implemented in the course helped the students to reach a deep approach to the learning, their motivation to the course and to achieve better learning outcomes.

Keywords: *Environmental science; active-learning; distance-learning; motivation*

1. Introduction

The important growth of distance learning programs could be attributed to the fact that distance learning programs satisfy many of the obstructions that conventional campus-located educational programs have, such as the need to attend classes that normally means a geographical relocation, conflicts between work and course schedules and family commitment conflicts [1]. The main difficulties that students enrolled in such programs are due to the fact that students and professors do not share the same physical and time space. This situation causes a growth of an "isolation feeling, lack of self-direction and management, and a decrease in motivation levels" because of the lack of interaction [2]. The effects of this isolation not only influenced the students' academic achievements, but also the promotion of negative attitudes and dissatisfaction with the learning experience causing even course abandonment [2].

The selection of proper learning strategies is crucial in the acquisition of knowledge [3]. Active learning is defined as any instructional method that engages the students in the learning process, and requires the students to do meaningful learning activities and thinks about what they are involved more cognitive processing and meaning building [4].

The student approach to learning (SAL) theory [5] assumes that each student has a unique approach to solve a particular learning task. Biggs' study [5] established that a deep learning approach is characterized by an interest for the topic from the students, its willingness to understand the topic and a feeling of joy when studying. A surface learning approach is characterized by memorizing facts, routine learning and by doing the minimum to pass test or the course.

2. Research aims

This research aims to explore how the implementation of active learning methodologies, adapted to a distance- environmental science course, influences the students' approach to learning, their motivation and their strategy to learn environmental science.

3. Methodology

3.1 Sample
This study was carried out the Environmental Science program of the National Distance University of Spain during the course 2017/18. A total of 64 students participated in the study (53 % female and 47% male) with and average age of 48 years old. Figure 1 summarizes the demographics information of the sample.
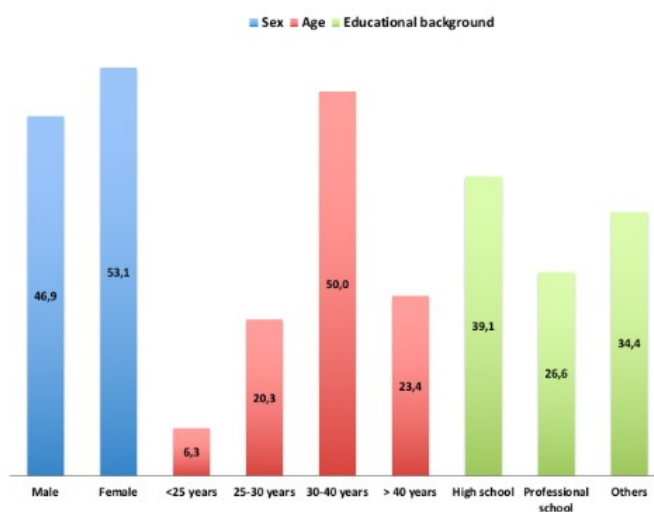

Figure 1. Demographics information of the study sample.

3.2 Research instrument

To collect the students' information the R-SPQ-2F questionnaire (*Revised Two-Factor Study Progress Questionnaire*) was employed. This questionnaire as it was described by Biggs [5] and consists of 20 items Likert-type (5 levels) and allows to gauge the students deep approach (DA), surface approach (SA), deep motive (DM), deep strategy (DS), surface motive (SM) and surface strategy (SS) to the students learning processes. The questionnaire was validated and its reliability was assessed by means of Cronbach test. The questionnaire was submitted to the students before and after the course, in order to assess the influence of teaching methodology implemented in the course.

3.3 Course design

This subject is structured in 10 chapters dealing with different aspects of the atmosphere, its pollution, pollutants distribution and analysis, and the local, regional and global environmental consequences. It also includes the aspects of engineering control of air pollution and environmental laws and regulations. The course is taught by followed a distance-learning program, and according with the course syllabus, the students need 125 hours to complete all the contents and assessments exercises. The students are given all the course materials at the beginning of the course together with a student's guide.

For this course, an active learning methodology was followed, consisting of different "case study activities" to apply the specific contents taught during the course. In addition, the students are provided with interactive instructional materials through the virtual campus, such as podcast, hot potatoes exercises, lectures presentation, conceptual maps and summaries of theoretical contents. Some of these activities are applied as a source of on-going feedback with the aim to improve teaching and

learning and consequently as a tool of formative assessment [6]. For each case study, the students need to submit a report addressing all the questions and solving the situations states in the case studies. The submission of all proposed activities is mandatory. The course final grade consists of the grades obtained in the different activities arranged during the course together with a final exam. Portfolio was other assessment tool employed to analyse the student's evolution in terms of learning contents and competences. Each student's portfolio includes self-assessment results, on-line and in-person test evaluations and the students' opinion surveys. Portfolio was a multimodal tool in the learning processes [7].

3.4 Data analysis

The analysis of the collected data was carried out according to Biggs et al. [5]. To get the students' score for DA or SA, points given by students were summed up for each group of questions (DA or SA), thus the maximum score for each approach could be 50 points per student. To assess the students' motivation and strategy to learning, similar analysis was carried out considering four different subcategories of the questionnaire, that were DM, DS, SM and SS.

4. Results and discussion

The data collected from the questionnaire was organized and analysed after the course completion. Figure 2 summarized part of the results obtained for each of the students participating in this research. These results indicate that the number of students with a DA score over the mean value, considering the whole class, increased at the end of the course, and a significant difference was appreciated when data from the pre- and post-test were considered. Besides, it is also remarkable the decrease of the number of the students who scored a SA below the mean value. Different studies [8] indicated that DA scores over the mean value denoted a DA in the learning of the study subject.

Estudiante	Nº Item Deep Approach (DA)										DA TOTAL	Nº Item Surface Approach (SA)										SA TOTAL
	1	2	5	6	9	10	13	14	17	18		3	4	7	8	11	12	15	16	19	20	
ALC	1	4	5	4	2	2	4	3	1	1	27	1	1	1	3	1	1	1	2	1	1	13
AAAM	5	5	5	5	4	4	5	4	4	3	44	1	3	1	2	4	2	2	2	2	2	21
ABC	5	5	4	4	5	5	4	2	4	4	42	1	3	1	1	1	1	1	2	2	1	14
BMERL	4	4	4	3	3	4	4	3	3	3	35	1	2	1	2	1	2	1	1	2	1	14
BCEA	4	4	5	4	4	3	4	3	2	2	35	2	3	1	1	2	2	2	3	3	2	21
BSA	4	5	4	2	4	5	4	3	4	3	38	1	2	1	1	1	2	2	3	2	2	17
BSVF	4	4	3	4	4	5	4	4	4	4	40	1	3	1	2	2	1	2	3	4	3	22
BCFJ	5	4	4	5	4	3	4	2	1	4	36	2	4	1	1	1	2	1	1	1	2	16
BNRA	5	5	5	5	5	5	4	3	2	5	44	1	1	1	1	1	1	1	1	1	1	10
CRL	4	4	5	4	4	3	4	2	1	2	33	2	4	1	2	2	3	3	3	2	4	26
CPR	5	4	3	2	4	4	2	2	2	1	29	4	4	3	1	1	2	1	1	1	3	21
CLJ	5	5	4	4	5	4	4	3	4	4	42	2	3	2	2	2	1	2	2	3	3	22
CSB	4	5	5	4	3	4	3	2	2	2	34	1	1	1	2	2	2	1	2	2	2	16
CCFR	5	5	5	2	5	3	5	2	4	3	39	4	5	1	1	4	3	2	3	3	3	29
DVJ	5	5	5	5	5	5	5	5	4	5	49	1	1	1	1	1	1	1	1	1	1	10

Figure 2. Scores given for each student to each item of the R-SPQ-2F questionnaire at the end of the course (only a portion of information is shown).

Regarding the students' motive and strategy to study, the results obtained indicated that the teaching methodology contributed to achieve a deep approach, however relevant differences were determined between the students participating in the research. A DM is related with a higher interest in the learning process while a DS regards a meaningful significance of the learning. Finally, when a relation between the learning approach and the students' outcome is analysed, it is observed that there is a positive correlation between DA scores and higher grades, and a negative correlation between SA scores and lower grades. Similar results were obtained when motivation and strategy were analysed.

5. Conclusions

This research assessed how active-learning teaching strategies influence the students' study approaches, their motivation and strategy to learn environmental science in a distance-learning

program along with the R-SPQ-2F employed. The study was carried out in the National University of Distance Education of Spain in the Environmental Science undergraduate program during the 2017/18 course. The results obtained in this research allowed to describe how was the students approach to the study process and allowed to classified them based on their deep or surface approach, motivation and strategy to learning. The results also indicated that better grades are obtained when a deep approach is reached.

References

[1] Kurzman P.A. (2013). The evolution of distance learning and online education. J Teach Soc Work 33(4-5):331-338.

[2] Ali A., Smith D. (2015). Comparing social isolation effects on students' attrition in online versus face-to-face courses in computer literacy. Issues Inform Sci Inform Technol 12:11-20.

[3] Weinstein C.E., Acee T.W., Jung J. (2011). Self-regulation and learning strategies. New Direc Teach Learn, 126:45-53.

[4] Prince M. (2004). Does active learning work? A review of the research. J Eng Educ 93(3):1-10.

[5] Biggs J.B., Kember D., Leung, D.Y.P. (2001). The revised two factor study process questionnaire: R-SPQ-2F. British Journal of Educational Psychology 71:133-149

[6] Gikandi J.W., Morrow D., Davis N.E. (2011). Online formative assessment in higher education: A review of the literature. Comput Educ 57:2333-2351.

[7] Dysthe O., Engelsen K.S., Lima I. (2007). Variations in portfolio assessment in higher education: Discussion of quality issues based on a Norwegian survey across institutions and disciplines. Assess Writ 12:129-148.

[8] Hamm, S., Robertson, I. (2010). Preferences for deep-surface learning: A vocational education case study using multimedia assessment activity. Australasian Journal of Educational Technology 26(7):951-965.