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STUDENT-CENTERED E-LEARNING: DESIGNING CURRICULAR UNITS IN HIGHER EDUCATION USING MULTIPLE INTELLIGENCES THEORY

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Abstract

The role of Higher Education (HE) in society has been irreversibly transformed by recent technological advances and the widespread access to the Internet, particularly concerning the knowledge production and to the training of qualified workforces. Higher Education Institutions (HEI) have been reacting slowly, in a "traditional" way, both to the fragmentation of their target audience and to the ever changing requisites of the global labour market.

An example of that is the design of Curricular Units (CU) in e-Learning in HE that remains, in most cases, a teacher-centered model, one-size fits all. We consider that e-Learning can indeed be a useful platform to promote learning that meets the needs and expectations of a heterogeneous audience as well as the labour market. It is, however, necessary to address some of the problems that hinder its success, namely the high dropout rates, which in some cases can reach up to 50% [1].

Within this perspective and to promote a more engaging and personalised learning system that accommodates different ways of learning, we bring to discussion the Multiple Intelligences (MI) Theory [3] as a guide to the instructional design of CU in e-Learning in HE. MI Theory application in e-Learning has been reported to promote intrinsic motivation [4], which is related to the increase of retention rates, a critical factor for HEI, both regarding their economy and credibility.

In this context, we defined the following research question: *is it possible to rethink the design of CU for e-Learning in HE based on MI theory to promote student-centered learning*? Having this issue as a compass, our project's primary goal is to develop a framework that supports student-centered education, to guide the instructional design of CU for e-Learning in HE, based on the MI theory.

We will use a Development Research methodology consisting of the following steps: 1. Problem analysis, 2. Solution design based on the theoretical framework, 3. Develop (prototype) a solution, 4. Evaluate and test, 5. Reflect and document the general design principles.

With this study we intend: (i) to contribute to the discussion and practical application of MI in e-Learning in HE, promoting student-centered learning; (ii) to promote wider awareness of the learning processes [5] both by the students and by the HE teachers; (iii) to contribute to ensure greater intrinsic motivation [4] and learning, helping to reduce dropout rates in e-Learning in HE.

The need to promote a diversity of intelligences increasingly necessary for the integration in the global labour market and the training of individuals able to contribute to solve the complex problems of our societies, aligned to the widely accepted realization that HE needs to engage in considerable structural changes, makes it for an interesting time to investigate the application of Multiple Intelligences Theory in HE instructional development.

In this paper, we present a research proposal with the aim to promote discussion on the subject, receive feedback from peers and audit the interest of potential future partners' contributions as a way to enrich the research project.

Keywords: Multiple Intelligences Theory, e-Learning, Higher Education, Dropout Rates, Student-centered Learning, Instructional Design.

1 INTRODUCTION

Higher Education, accordingly to Castells, fulfils four roles in society: ideological apparatus, selection and socialisation mechanism for the dominating elites, knowledge production, and training of a qualified workforce [6]. These roles are in some way contradicting with their relationship with society, by assuming either a transformative facet or by promoting the reproduction of a model that has suffered little to no changes since its creation. Technologic advances and their impact in today's

society, named by some as knowledge society [7], and by others as informational or network society [8], has called into question, for the first time in history the way HEI relate with society and even their possible irrelevance, reviving Illich essay, "Deschooling Society" [9].

In fact, with the widespread access to Internet, knowledge has become public, out of the jurisdiction of HEI, in a knowledge democratisation process that has irreversibly changed the labour market requisites. To a globalised society, and generally speaking, HEI has been unable of fulfilling their role of training a qualified workforce [10], namely in their (lack of) capability to prepare students in fundamental competencies like critical thinking, problem-solving, teamwork, proactive initiative or written and spoken communication [11]. But the challenges that HEI face aren't merely related to curriculum, their target-group, which historically have been high school graduates from a previous academic year, is, for a decade, very diverse in age, social class, race, ethnicity and academic preparation [12]. This diversity is partly explained by the growing tendency of re-education and lifelong learning [13].

To add, accordingly to Christensen (2012), HEI run "a big risk by continuing doing things the way they have always done" [14] due to the entrance of innovative concepts of Online Education in the HE market. Platforms such as Coursera, EdX, Udacity, Khan Academy, amongst others, have opened the doors of HE to previously non-consumers, by making free online teaching classes available to everyone. We are facing a case of "economic disruption" [15], which means, the entrance of competition in the lower part of the market with the potential, little by little, of conquering most of the market share. This process is possible by constantly improving products/services, reaching a target-group previously unavailable: HE current consumers. Christensen claims that we are facing a shift on HE metric, from the percentage of PhD's in the institution, scientific production and graduation percentage to the quality of education.

We believe that, for the first time in history, HEI will be forced to react to scientific progress and a deeply impacted society. There is a real risk of a disruption in the HE business model, and with it, all institutions that aren´t able to adapt to the current and future society can, in fact, close their doors [16].

We consider e-Learning capable of promoting learning that meets the needs and expectations of a heterogeneous audience as well as the labour market, making it possible to face the threat of a non-formal education, non-degree, which is free and with open access, as Christensen describes. It is however necessary to address some of the problems that hinder its success, namely the high dropout rates, which in some cases reach 50% [1].

Within this perspective and to promote a more engaging and personalised learning system that accommodates different ways of learning, we bring to discussion the application of MI Theory.

Howard Gardner, the theory's mentor, argues that contrary to what traditional education makes us believe, we possess a diverse set of Intelligences. So far, and according to Gardner's criteria, eight intelligences have been qualified. With more or less degree, every individual possesses those eight intelligences, but the education system only focuses its efforts in just two, the linguistic and the logical-mathematical ones [2], excluding everyone that doesn't have them sufficiently developed to keep up with the rhythm.

Today's technology, namely e-Learning platforms, allow for student-centered learning and evaluation and their multiple intelligences. For Gardner, e-Learning has the potential of changing education in order to reach each individual in the best way possible considering his time and learning rhythm and to present courses and concepts in different ways through available resources at Virtual Learning Environments [17]. Despite that, e-Learning at HE, replicates, in most cases, traditional face-to-face instruction, promoting the already mentioned bits of intelligence: linguistic and logical-mathematic [18]. Based on this description, we aim to anticipate not only the need to evaluate e-Learning courses in a MI vision but also to design them having the theory in mind.

1.1 Problem and Research question

Having as starting point that the application of the MI theory in e-Learning would be advantageous for all stakeholders involved, it is hard to comprehend why there aren't more practical cases [19]. In HE in particular, where e-Learning has been gaining importance, there is very little information if the MI theory is taken into consideration and if that is reflected in CU planning [20]. We anticipate, based on little literature found, that the research done in this matter will reveal that, as to the image of face-to-face learning, e-Learning potentiate the linguistic and logical-mathematical intelligences, neglecting the remaining MI [21].

Given this scenario, we have defined the following research question: *is it possible to rethink the design of CU for e-Learning in HE based on MI theory to promote student-centered learning?*

1.2 Objectives

Having this question as a compass, our project's primary goal is to develop a framework that promotes student-centered education, to guide the instructional design of CU for e-Learning in HE, based on the MI theory. This main objective is supported by nine specific objectives:

a) to recognise the potential of MI in the design of student-centered CU;

b) to know the MI present in curricular units of e-Learning courses provided by HEI;

c) to identify if e-Learning courses in HE replicate the face-to-face learning model where the linguistic and logical-mathematical intelligences are the focus;

d) to understand if traditional and non-traditional learners have distinct learning profiles based on their intelligences;

e) to understand how each MI is promoted in the design of CU;

f) to analyse literature and practical cases that allow the re-design of CU for an education based on MI;

g) to redesign CU for an education based on MI building from practical cases;

h) to promote the instructional design of curricular units for e-Learning in HE, based on the MI theory;

i) to create a prototype, and test it, leading to the functional solution.

1.3 Study relevance

We find it important to contribute to this subject knowledge, as only one study was conducted focusing in MI in e-Learning [18].

There is also a need to promote a diversity of intelligences increasingly necessary for the integration in the global labour market and the training of individuals able to contribute to solve the complex problems of our societies, aligned to the widely accepted realization that HE needs to engage in considerable structural changes, makes it for an interesting time to investigate the application of Multiple Intelligences Theory in HE instructional development.

For a genuinely inclusive education, besides looking at technical issues, logistic and accessibility norms, it is necessary to reach everyone in their MI [22].

e-Learning allows the access to HE to a non-conventional audience. For many of the actual and future students, it's the only way of obtaining post-secondary education. But the true democratisation of education isn't only about making it accessible, it is necessary to think about the differences and needs of an increasing heterogeneous public. An e-Learning inspired in MI promotes intrinsic motivation [3] which by turn will promote higher retention rates. It is a factor of vital importance for HEI, either for economic reasons, either in for the sake of e-Learning credibility. This way, with this study we intend: (1) to contribute to the discussion and practical application of MI in e-Learning in HE, promoting student-centered learning; to (2) Promote wider awareness of the learning processes [5] both by the students and by the HE teachers; (3) to contribute to ensure greater intrinsic motivation [3] and learning, helping to reduce dropout rates in e-Learning in HE.

2 LITERATURE

2.1 Multiple Intelligences

When Gardner initially proposed the IM theory, he did it as a way to challenge the institute notion of intelligence. An intelligence which is quantified through *Intelligence Quotient* (IQ) tests and promoted by schools in teaching models to the image of institutions like Harvard and Stanford [23]. The "uniform school" [2], is no more than a linguistic and mathematic competence validation instrument, although it is known, by studying the human mind (cognitive science) and through neuroscience (the study of the brain), that intelligence isn't unidimensional.

The IM theory recognises that we all have "different cognitive strengths and contrasting cognitive styles" [2] (p. 5) and suggests, within Gardner vision, the concept of a school centred on the individual, in his various intelligences. Intelligences those who are no more than a set of skills, talents or mental capabilities, in a concept defined in the following way: "An intelligence is a computational capacity - a capacity to process a certain kind of information - that originates in human biology and human psychology. Humans have certain kinds of intelligences, whereas rats, birds, and computers foreground another kind of computational capacities. An intelligence entails the ability to solve problems or fashion products that are of consequence in a particular cultural setting or community. The problem-solving skill allows one to approach a situation in which a goal is to be obtained and to locate the appropriate route to that goal. The creation of a cultural product allows one to capture and transmit knowledge or to express one´s conclusions, beliefs, or feelings. The problems to be solve range from creating an end for a story to anticipating a mating move in chess to repairing a quilt. Products differ from scientific theories to musical compositions to successful political campaigns." [2] (p. 6–7)

Seven intelligences were firstly proposed: linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal and lastly intrapersonal [23]. Later on, the naturalistic intelligence was added, questioning the possibility of ninth intelligence, the existential [2]. So, there are eight recognised intelligences at the moment.

To think of learning based on MI theory in e-Learning, we put the future possibility of digital platforms capable of mediating educational interaction, in a perspective of connectionist network and learning, namely in the principle that "learning can reside in non-human devices "(Siemens, 2005, p. 5). Paradoxically, and taking into account the current technology, the first versions will not have the potential for the application of the connectionist theory, being only suitable for behavioural / behaviourist approaches which may be contrary to the principles of MI theory. In a future that envisions an artificial intelligence with interpretation and adaptation capabilities, you can think of other teaching strategies.

Such systems have the potential to reduce the necessity of teacher / student interaction possibly allowing a larger number of students per class, there is no decrease in the quality feedback (which will be instantaneous), and only replaced by a non-human element. If we are in the presence of a new "generation of distance education" only the future will tell.

2.2   Higher Education and Multiple Intelligences

Although some studies recognise the relevance of the applying MI at HE and it´s positive impact on the quality of learning [22], there is virtually no literature for practical cases [19] [20]. One exception was a study which was specifically related with e-Learning in HE: a Culture and Society Master dissertation done at the Universidade Federal do Maranhão, Brazil. The main objective of this study was to "understand the way human intellectual competencies are being stimulated and combined in a Distant Education context, producing other forms of teaching-learning capable of promoting different abilities", free translation from authors [18] (p. 15), being a study case performed at Bachelor degree in Pedagogy at the Núcleo de Educação a Distância, da Universidade Federal do Maranhão (NEAD-UFMA). Behavioural and/or socio-affective variables of 35 students were assessed, mainly using a quantitative methodology, to define their cognitive profile and their technology domain competences and exercises proposed in the Moodle platform. This last analysis revealed that the activities performed, mainly promote the linguistic and logical-mathematical intelligences, based on the reading, writing and logic problem-solving abilities as an assessment parameter.

Furthermore, we can try to understand the implications of the MI theory applied to HE.

First, with growing numbers of access to HE worldwide and the rise of the non-traditional learners, we presume that there has been a fragmentation of intelligences strengths. Understanding if indeed that's the case, may not only help to design better CU in a e-Learning setting but also set the ground for further research in face-to-face courses.

Second, for Higher Education to be truly available to everyone, and not limit our potential as a society, the first step should be to re-think the admissions criteria as they just assess each candidate linguistic and logical-mathematical intelligence, exception going to Arts and Music HEI [19].

2.3 Higher Education in Portugal

Since the revolution of 1974, HE in Portugal grew unparalleled in Europe, both in the number of public and private institutions, in courses and the number of candidates.

Later and with the Bologna process was possible to open the doors of HE to non-traditional students in other age groups, socio-economic background and professional situations through exclusive contests like Over 23 (O23) and technological specialisation diplomas (TSD) allowing to increase the number of candidates.

However, and accordingly to data from 2012 (The Organization for Economic Co-operation and Development [24], the proportion of adults with 25 to 34 years who completed a tertiary education is still quite distant from the OECD average, 28.3 to 39.7%, and an even higher deficit in the range of 25 to 64 years, 18.5 to 32.6%.

For Portugal to reach the OECD average levels, it is necessary to maintain a steady pace of applications to HE and graduations. Whilst methods of combating school failure have been found, through programs such as "Resume" ("Retomar"), it has been difficult to avoid the decrease in applications to HE, largely due to the economic crisis. In 2014, and completed the three phases of access, there were 9356 vacancies unfilled, i.e. a fifth of vacancies, particularly affecting Polytechnics. Beja, Portalegre, Tomar, Guarda and Bragança did not fill half of the openings [25].

Since HE is also governed by the laws of supply and demand, and although there was a small reversal of the trend in 2014, it is clear that if there are no new ideas, new markets and ways of doing business, some institutions in Portugal will face economic difficulties in the short and medium term.

One of the immediate solutions may be the export of education, attracting international students to Portugal, since according to the McKinsey (2015) in 2020 the educational services to international students can assert to Portugal around 1.4 billion Euros / year, twice of current revenues from the export of wine and cork [26]. Another trend, this time with medium and long term impact will be e-Learning, with the potential to reach "non-traditional" students and the wider market of Portuguese speaking countries.

3 METHOD

To reach the objectives we propose, and having in mind the connection between theory and practice, we plan on using Development Research as a methodological approach [27]. We analyse the problem aiming to build a process or a product, using a cyclical design process, testing and redesigning [28]. Feedback from all actors is paramount for improving, shaping a new theoretical and empirically found process or product. For the creation of the framework prototype, which will guide the instructional design of CU for e-Learning in HE, based on the MI theory, we will retrieve data in a participatory manner, making clear of the reasons that lead to decisions in shaping it, and creating the needed conditions for improving the product.

In this way, the research process is not aimed in obtaining a descriptive knowledge, it is instead, focused in obtaining feedback from the product development, solving different features of the problem.

3.1 Research Design

We will use a development research methodology consisting of the following steps:

1 Problem analysis, based on a systematic review of literature [4];
2 Solution design based on the theoretical framework;
3 Develop (prototype) a solution;
4 Evaluate data collected;
5 Release functional solution with set policies for iterative improvement.

3.2 Data collection techniques

For this proposal, we aim to follow a qualitative methodology. A document collection, mainly through the Internet will be made on the websites of the selected HEI and in documents which describe the design of the courses. Later we will privilege the survey method by collective interview of the type

focus group to find out the opinion of professional experts in CU design in distance education in HE and to obtain more qualitative data.

3.3 Data analysis techniques

For the analysis of qualitative data, we will focus on content analysis [29]. Bardin [29] describes content analysis as empirical and, therefore, cannot be developed based on an exact model. However, for its operation, we must follow some basic rules by means of which we depart from a foreground literature to reach a deeper level. The researcher that works with data collected from the perspective of content analysis is always looking for a text behind another text, a text that is not apparent on the first reading and that needs a methodology to be unravelled.

3.4 Study limitations

The limitations relate to as well, in addition to sample size issues, with the characteristics of the investigator. In the case of an investigation that aims to contribute to the understanding of MI theory, the researcher assumes, too, that he possesses a set of intelligences that affects unequivocally the whole process, and thus reflect the MI owned. Future studies will benefit from contributions from other researchers with complementary MI.

4   EXPECTED RESULTS

In this article, we present a research proposal with the aim to promote discussion on the subject matter, receive feedback from peers and audit the interest of potential future partners' contributions as a way to enrich and augment the research project.

After assessing the state of the art and retrieve data from literature and practical cases, we will propose a framework for re-designing CU based on MI. A prototype will be implemented in several test CU, data will be collected and analysed so a functional solution will be released.

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