Self-concept of competence of higher education students learning in virtual environments

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PEst-OE/PSI/UI0192/2011 - Strategic Project - Institute of Cognitive Psychology, Social and Vocational Development (FPCE / UC) - 2011-2012
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Assuming that academic success is influenced not only by the power of learning but also by the way students perceive themselves [1], we have relied on national studies concerning self-concept of competence of students [2, 3]. The main issue was to situate the self-concept of competence of university students into new virtual learning environments. We aim validate the instrument for collecting empirical data adapted to virtual learning environments, identify the degree of self-concept of competence, when learning in such an approach, and estimate whether students perceive themselves as much or more competent than in real environments with face-to-face interaction. This research involved 280 higher education students in Social Sciences, who appraised perception and self-concept of competence. The main findings indicate favorable self-concept of competence. Also, the results suggest that the application of online pedagogical models [e.g., 4] may have a very positive impact on self-concept of competence of students in higher education, even in social dimensions and in the perception of a careful coaching.

Keywords: E-moderating; Problem-based-Learning; Self-concept of competence; Virtual learning environment.

1. Introduction

Higher Education institutions in Portugal, today, face unique challenges. Aware of the need for change, in general, these institutions have been introducing reform initiatives, covering in their strategic plans new frameworks of operation, in which *e-learning* and/or *b-learning* has its place. However, many teachers have resisted these arrangements, because they suspect that this imposes an impoverished learning experience, based only on the distribution of contents via a learning platform, and offering little diversity in terms of teaching-learning experience. To overcome these biases, it is necessary to use models that incorporate processes of deconstruction that promote "true" collaborative and constructivist learning environments.

In addition to this, to make changes in this sense also requires a reconstruction of the teaching profession and a comprehensible set of teaching, mentoring and monitored training. The innovation will allow co-participation on issues of pedagogy, developing what in Anglo-Saxon literature has shown great impact and is called *scholarship of teaching and learning* [5] or "learning communities" [6,7]. It is, therefore, important that all actors involved in higher education master skills such as team work, resource management, and maintain an open dialogue about quality, at the expense of individualism, and privilege of a culture of collegiality and mutual help in the resolution of educational problems [8].

In fact, from the scientific study of problem solving problems we know that a similar process occurs within a problem space, with an initial and a final state, rules, restrictions and legal operators [9]. Hence, any theory on human action should explain, along with the effective accomplishments, the predictable variations [10, 11, 12]. In other words, the trajectories of competence development rather than global changes, point to specification, to differentiated domains [13] or spheres of expertise [14], involving essential elements, its own operations, specific knowledge and inherent beliefs. Although the processes underlying learning and development provide a general route, its recursiveness throughout the experiences of the individual will come to manifest itself in the construction of its current skills, in specific areas [15].

The fact that development is dynamic and co-participated by the different systems and sub-systems implies positing procedures for self-regulated variation and selection, themselves subject to variations and selections – which explains the tendency to *learning to learn*. The analysis of heuristics may be instructive on how the subjects identify and solve problems [16, 9], but the study of restrictions to the development of heuristics can clarify how the subjects construct and apply them to different areas of knowledge, and are reorganized internally [15].

By this we mean that while the competences adjusted to new learning environments and activated from new formats of content presentation, whether as problems that students must solve or scenarios they must analyze, for the purpose of pragmatic use of information, incentives to new research and self-regulated epistemic growth to consolidate knowledge are now beginning to surface in academic pathways of students and their teachers and tutors. We have reasons to believe that its re-edited construction to address new problems or scenarios within a prescriptive model will tend to

generalize to the practices of teaching, learning and research. Thus, these competences, that we dare call info-cognitive and social, will enable new forms of management and organization of knowledge and its application.

In this sense, we have witnessed in recent years the emergence of various models of learning in virtual environments related to the development of communities of practice and learning and to problem solving [17], that have sought to address these concerns and have allowed a reflection on the "new" functions that teachers and students are called to perform in new learning environments. Among the existing models, we highlight the models of research communities [18, 19], of e-moderation [4] related to the development of learning communities and the learning processes within these communities, and the learning models involving the solution of problems as envisaged by Jonassen [20] called CLE- *Construtivist Learning Environments* and the model *Multiple Perspectives to Structure Learning Objects* [21].

The study now presented is therefore designed to better understand the operability of some of these *blended learning* models, analyzing the impact of new learning scenarios, and of these models in students' perception of competence, in particular with regard to self-sufficiency, responsibility, self-direction and self-regulation, confidence in its own competences, ability to solve problems, problematisation, planning and decision making, in applying knowledge to practical situations, to invest and motivate to learn, as well as to explore and deepen learning, reflected in improved outcomes.

The self-concept of learning competence under analysis is a predictive variable of the academic relationship, and refers to the perception of oneself in the ability to deal effectively with the environment, enjoy successes and deal properly with failures, triggering cognitive and affective mechanisms that promote persistence, effort and the active search for challenges to achieve objectives focused on learning. The high concept of competence is associated with objectives focused on results, and with a low concept of competence, vulnerability to failure and dropout achievement patterns [22].

Although cognitive skills are considered most representative of competence [23, 24, 25], like Faria and collaborators [26, 3] we define self-concept of competence as a set of perceptions of personal competence in the cognitive, social and creativity areas.

2. Methodology

2.1 Participants

The participants in this study were undergraduate students (n = 280) enrolled in blended online courses offered through Moodle platform during one semester at different Portuguese high schools and university, involving students of diverse courses (especially in Health and Education). Aged between 17 and 54 years old, there were 133 female and 95 male students (cf. table 1).

Table 1 – Sample characterization by cross tabulation between age and sex

		Age				
		[17 – 24]	[25 - 34]	[35 - 44]	[45 - 54]	Total
Sex	Female	83	26	16	8	133
		36.4%	11.4%	7.0%	3.5%	58.3%
	Male	63	21	9	2	95
		27.6%	9.2%	3.9%	.9%	41.7%
Total		146	47	25	10	228
		64.0%	20.6%	11.0%	4.4%	100.0%

2.2 Instrument

The instrument used to study the learning community in our teaching environment was the Self-Concept of Competence Scale (SCCS) [26, 2] adapting its 31 items to virtual learning environments.

The *Self-Concept of Competence Scale* - SCCS, as mentioned above, is formed by 31 items, each rated on a 5-point *Likert* scale in which"1-Totally Disagree" indicates a low self-concept of competence and "5- Totally Agree" indicates a high self-concept of competence, reflecting the degree to which each individual self-characterizes itself in each field of competence. The SCCS items are organized into 3 broad areas: *Cognitive, Social and Creativity.*

The first includes three sub-scales called:

(i) *Resolution of problems,* assessing the perception of competence in the field of cognitive learning, problem solving and applying knowledge to practice, formed by 7 items: (2) "I easily find essential issues in the resources available on the platform"; (8) "I understand things quickly in online environments"; (14) "I learn new things easily in online

environments"; (20) "I can apply knowledge in virtual classrooms"; (26) "I can solve problems quickly in online environments"; (30) "I can analyze, in virtual classrooms, issues from various points of view" and (31) "I can integrate different knowledge in virtual classrooms"; (ii) *Sophistication in Learning,* which assesses the perception of competence in the field of investment and motivation in learning, formed by 5 items: (5) "I am interested in subjects that require thinking"; (11) "I have good general knowledge"; (17) "I read a lot to meet the challenges posed by teachers in virtual classrooms"; (23) "I keep myself updated (a) on the knowledge in virtual learning environments"; (28) "I am keen (a)/ on learning in online environments"; and (iii) *Prudence in Learning,* which assesses the perception of competence in the field of accuracy and depth in learning, totaling 4 items: (4) "I am accurate (a) in my activities in an online environment"; (10) "I plan my activities prior to participating in virtual classrooms"; (16) "I analyze problems thoroughly in online environments"; (22) "I have detailed knowledge of how the online environments and virtual classrooms work".

The second dimension comprises the sub-scale: (iv) *Social Assertiveness,* which assesses the perception of competence in the social area, especially the ability to express opinions, make new acquaintances and initiate actions, and is formed by 5 items: (3) "I dare assert my opinion in virtual classrooms"; (9) "I participate spontaneously in virtual classrooms"; (15) "I make new acquaintances easily in online environments"; (21) "I am a lively person in online environments"; (27) "I have a sense of humor when I participate in virtual classrooms"; and the sub-scale (v) *Social Cooperation*, which assesses the perception of competence in the field of cooperation with others, containing 6 items: (1) "I take into account the opinion of others in virtual classrooms"; (7) "I can read /analyze the opinion of others in virtual classrooms"; (13) I fell I'm prepared (a) to help others participate in the dynamics of online environments; (19) "I am a friendly person"; (25) "I have empathy (a) in contacts in virtual classrooms"; (29) "I do not downgrade the participation of others in virtual classrooms".

And finally, the third dimension formed by the sub-scale (vi) *Divergent Thinking,* which assesses the perception of competence linked to creativity, and is formed by 4 items: (6) "I am skilled at what I do in online environments"; (12) "I participate creatively in virtual classrooms"; (18) "I am a student with skills in online environments"; (24) "I am a good student in online environments".

2.3 Procedures

In different courses (in Health and Education) of undergraduate degrees, students were enrolled in blended online courses offered through Moodle platform, during one semester at different Portuguese high schools and university. At the end of the courses, these students answered the SCCS survey, which has been adapted to online learning in virtual environments. The survey was presented in paper format and the database was constructed in SPSS (Statistical Package for the Social Sciences, version 17.0). The main issue was to situate the self-concept of competence of university students into virtual learning environments through online methods of teaching. We intended to validate the instrument for collecting empirical data, adapted to virtual learning environments, but also to identify the degree of self-concept of competence, when learning involves the management of knowledge and relationships in virtual environments, at a time when we started using methodologies based on information technology and distance communication. It is also our aim to estimate whether, in virtual environments, students perceive themselves as much or more competent than in real environments face-to-face interaction in synchronous time. Ordinal responses were scored using the 5-point scale (scaled from 1=Strongly Disagree to 5=Strongly Agree). There were no inverted items.

Moreover, we have considered a previous study [2] in which the authors analyzed the discriminative power of the scale items and published the results of average percentages of each of the alternative responses. We have taken that distribution to compare with the results now obtained when students learn in a blended environment. In this way, we wish to estimate the potential pedagogical value of this modality in fostering self-concept and, thus, the probability of success in learning.

3. Results

The study of reliability revealed that the instrument used in this study is valid (Table 2).

Table 2 - Reliability Statistics found for SCCS and each dimension

Variables	Cronbach's Alpha	N of Items
SCCS	0,964	31
Cognitive	0,935	16
Social	0,891	11
Criativity	0,829	4

In spite of all this, items were scored along all points of the range (from 1 = Strongly Disagree or 2 = Disagree to 5 = Strongly Agree), mean responses for the 31 items extended from 3.60 to 4.13, with a standard deviation range of 0.669 to 0.921. That means that students recognize each dimension of self-concept of competence relevant when learning in an online web-base.

Table 3 presents the descriptive statistics (minimum, maximum, mean and standard deviation) for each sub-grouped variables in the respective dimension of the SCCS.

Table 3 – Statistics observed in each dimension of the SCCS survey

SCCS_dim	min.	max.	Mean	S.D
Cognitive	1,5	5	3.76	0.56
Social	1	5	3.79	0.57
Criativity	1	5	3.68	0.67

The main results of this study indicate that the students had high perceptions of their self-concept of competence, with central issues around item 4 (e.g., mode = 4), supporting the recognition of ownership of the cognitive, social and creative characteristics, indicating a high self-concept. It is nevertheless interesting to see that the social dimension is, on average, the one that scores more favorably.

In order to estimate whether in virtual environments the students perceive as much or more competent than in real environments of synchronous face-to-face interaction, we have compared the distributions of responses over the points of the scale (cf. Table 4)

Table 4 - Comparison between actual results and those of a previous study [2] about the percentage of choice for each alternative response

Item **(a)** n=105 (Faria & Santos, 1998) **(b)** n=280 (actual study)	1 Strongly Disag.	2 Disag.	3 Indiff.	4 Agree	5 Strongly Agree
1 **(a)**	0	1	16.2	62.9	20
(b)	0.7	1.8	9.7	65.1	22.7
2	1	7.6	45.7	41	4.8
	0.4	3,2	19.4	62.2	14.4
3	1.9	10.5	41.9	34.3	11.4
	1.8	5.4	26.3	54	12.6
4	0	4.8	31.4	55.2	7.6
	1.1	4	27	52.5	15.5
5	1	6.7	30.5	45.7	15.2
	0.4	4.3	19.8	57.2	18.3
6	2.9	21	35.2	26.7	14.3
	0.7	6.5	29.9	48.6	14.4
7	0	1	13.3	41	43.8
	1.1	4.3	17.3	63.3	14
8	0	1.9	36.2	53.3	7.6
	1.4	6.1	29.1	49.3	14
9	0	5.7	34.3	44.8	15.2
	2.2	8.6	21.2	53.6	14.4
10	2.9	24.8	35.2	24.8	11.4
	2.5	7.6	23.4	50.7	15.8
11	0	5.7	61.9	31.4	1
	0.7	4	30.2	52.9	12.2
12	0	10.5	35.2	36.2	18.1
	1.4	5.8	32	48.6	12.2
13	0	1.9	20	52.4	25.7
	2.2	4.3	26.6	54	12.9
14	0	1	26.7	54.3	18.1
	1.4	4.7	23.7	55.4	14.7

15	1.9 1.8	11.4 7.9	31.4 23.4	29.5 52.2	25.7 14.7
16	0 1.4	3.8 6.8	41.9 25.5	41 55	13.3 11.2
17	5.7 2.5	15.2 7.6	47.6 24.1	24.8 50.4	6.7 15.5
18	24.8 2.2	35.2 5	20 25.9	14.3 52.2	5.7 14.4
19	0 1.4	1.9 1.1	19 13.3	56.2 51.1	22.9 33.1
20	0 1.1	6.7 1.8	43.8 18.3	41.9 58.6	7.6 20.1
21	0 2.5	4.8 7.2	34.3 28.8	43.8 45.3	17.1 16.2
22	0 2.2	16.2 5.4	64.8 6.6	18.1 54	0 11.9
23	1 1.4	11.4 3.2	51.4 26.6	30.5 54.7	5.7 14
24	8.6 1.8	32.4 6.8	27.6 27	21 53.6	10.5 10.8
25	0 1.8	4.8 5.4	22.9 35.3	53.3 45.7	19 11.9
26	0 1.1	9.5 5.8	47.6 30.6	36.2 50-7	6.7 11.9
27	1 1.8	7.6 7.2	29.5 32.4	42.9 46.4	19 12.2
28	0 1.1	1.9 6.5	29.5 30.9	47.6 50.4	21 11.2
29	0 1.1	2.9 4.3	15.2 16.9	47.6 56.1	33.3 21.6
30	0 0.4	3.8 2.5	25.2 20.1	52.4 64	8.6 12.9
31	1 0.7	6.7 1.1	41.9 20.5	44.8 62.2	5.7 15.5

Overall, the results highlight a higher self-concept that tends to be higher than in the situation of traditional classroom-based learning. The results, therefore, suggest that the application of online pedagogical models can have a very positive impact on the self-concept of competence of higher education students, and can even improve social competences and the perception of a more supervised development of social characteristics.

4. Conclusions

Normally, studies in Portugal focused on learning experiences have clarified the concept of education in higher education [27, 28], but few have shed light on virtual environments on academic achievement and feelings of competence of students as they learn. On the assumption that academic success is influenced not only by the power of learning but also the way students perceive themselves, and that these factors predict their subsequent success [1], we have relied on studies concerning self-concept of competence of students [2, 3]. The main issue was to situate the self-concept of competence into virtual learning environments through online methods of teaching, a new trend in our educational system. We intended to collect empirical data, identify the degree of self-concept of competence when learning involves the management of knowledge and relationships in virtual environments, at a time when we started using methodologies based on information technology and distance communication. It is also our aim to estimate whether, in virtual environments, students perceive themselves competent. We conclude that online pedagogical models are valuable to foster pedagogical gains [4, 20], and that new learning scenarios have effective impact in raising self-concept of students' competence.

Assuming that the self-concept of competence is a significant predictor of academic relationship, referring to the perception of itself in the ability to deal effectively with the environment, assess the successes and the failures to adequately deal with, causing cognitive and affective mechanisms that promote the persistence and effort to learning

and problem solving, we arrive to the conclusion that virtual environments are beneficial to elevate the learning results. The high self-concept of competence is associated with good results, while a low self-concept of competence is associated with vulnerability to failure and dropout patterns.

The main findings in this study indicate that the students had high perceptions of their self-concept level of competence. However, the cognitive dimension dominates, being the most representative of the self-concept of competence. But also we must attend to the social and creative domains of students' experience. When someone knows that he/she is able, have more will to get the goal and predisposes to the supply and demand of help, in a healthy relational climate and cooperative problem-solving.

And to some extent, it is curious to note that students in virtual environments can keep a closer proximity to each other than in person in classes. A blended methodology seems to validate the intent of the Bologna process, humanizing the teaching and the student responsible for the quality of their learning and intensity of their involvement in educational process. We've observed that the self-concept of competence is strengthened in relation to the face-to-face learning experience, except for some aspects of social cooperation. This observation enforces de empirical validity, calling attention to the insufficiency of distance learning in some of the relationship and communication components of the process of learning. Therefore, the results suggest that the application of online pedagogical models simultaneously to face-to-face approaches may have a very positive impact on self-concept of competence of students in higher education, even in social dimensions, and in the perception of a careful coaching.

References

[1] Schunk, D.H., & Pajares, F. (2005). Competence perceptions and academic functioning. In A.J. Elliot & C.S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 85-104), New York: Guilford Publications.
[2] Faria, L., & Santos, N. L. (1998). Escala de avaliação do auto-conceito de competência: Estudos de validação no contexto universitário. *Revista Galego-Portuguesa de Psicoloxía e Educación, 3* (2), 175-184.
[3] Faria, L., & Santos, N. L. (2001). Auto-conceito de competência: estudos no contexto educativo português. *Psychologica*, *26*, 213-231.
[4] Salmon, G. (2000). *E-moderating: the key to teaching and learning online*. London: Kogan Page Limited.
[5] Shulman, L. (2000). From Minsk to Pinsk. Why a scholarship of teaching and learning?. *Journal of the Scholarship of Teaching and Learning*, *1*, 48-53.
[6] McMillan, D., & Chavis, D. (1986). Sense of Community: A Definition and Theory. *Journal of Community Psychology*, 14, 6-23.
[7] Senge, P. (1990). *The fifth discipline: The Art and Practice of the Learning Organization.* New York: Doubleday.
[8] Vieira, F., Almeida, J., & Silva, J. (2008). What does being a teacher at university mean? Professional development through the scholarship of pedagogy. *53rd Wordl Assembly of the Internacional Council on Education for Teaching. Internacional Yearbook on Teacher Education*. Il Wheeling: ICET, 629-638.
[9] Newell, A., & Simon, H. (1972). *Human problem solving*. Englewood Cliffs, N.J.: Prentice Hall.
[10] Busse, D., & Johnson, C. (1998). Modeling Human Error within a Cognitive Theoretical Framework. In F.E Ritter e R.M. Young (Eds.), *Proceedings of the 2nd European Conference of Cognitive Modeling (ECCM-98)* (pp. 90-97), Nottingham University Press.
[11] Norman, D., & Shallice, T. (1980). Attention to action: Willed and automatic control of behaviour. In R. Davidson, G.E. Schwartz e D. Shapiro (Eds.), *Consciousness and self regulation* (pp. 1-15). New York: Plenum Times.
[12] Reason, J. (1990). *Human Error.* Cambridge: Cambridge University Press.
[13] Feldman, D. (1980). *Beyond universals in cognitive development*. Norwood, NJ: Ablex.
[14] Demetriou, A. (1998). Nooplasis: 10 + 1 postulates about the formation of mind. *The Journal of the European Association for Research in Learning and Instruction* [Special issue: Learning and Instruction], 8 (4).
[15] Campbel, R., & Bickard, M. (1991). Types of Constraints on Development: An Interactivist Approach. *Developmental Review*, 12 (3), 311-338.
[16] Simon, H. (1969). *The sciences of the artificial.* Cambridge, MA: MIT Press.
[17] Garrison, D. R., & Kanuka, H. (2004). Blended Learning: Uncovering its Transformative Potential in Higher Education. *The Internet and Higher Education*, 7(2), 95-105.
[18] Garrison, D., Anderson, T., & Archer, W. (2000). Critical Inquiry in a Text- Based Environment: Computer Conferencing in Higher Education. *The Internet and Higher Education*, 2 (2-3), 87-105.
[19] Garrison, D. R, & Anderson, T. (2003). *E-learning in the 21st Century.* London: RoutledgeFalmer.
[20] Jonassen, D. H. (1999). Designing constructivist learning environments. In C. M. Reigeluth (Ed.), *Instructional design theories and models: A new paradigm of instructional theory, Volume II* (pp. 215-239), Mahwah, NJ: Lawrence Erlbaum Associates.
[21] Carvalho, A. (2009). *O Modelo Múltiplas Perspectivas: Uma proposta para o Ensino Online*. Lição das provas de Agregação. Braga, Universidade do Minho.
[22] Dweck, C. S., & Leggett, E. L. (1988). *A social-cognitive approach to motivation and personality*. Psychological Review, 95(2), 256-273.
[23] Raty, H., & Snellman, L. (1992). Does gender make any difference? Common-sense conceptions of intelligence. *Social Behavior and Personality,* 20, 23-34.
[24] Sternberg, R.J. (1985). *Beyond IQ*. New York: Cambridge University Press.

[25] Sternberg, R. J., Conway, B. E., Ketron, J. L., & Bernstein, M. (1981). People's conceptions of intelligence. *Journal of Personality and Social Psychology, 41,* 37-55.
[26] Faria L., Santos, N. L., & Bessa, N. (1996). Auto-conceito de competência: Adaptação de um instrumento a adolescentes portugueses. In L. Almeida, S. Araújo, M. Gonçalves e M. Simões (Orgs.), *Avaliação Psicológica: Formas e Contextos* (vol. IV, 165-176) Braga: APPORT.
[27] Santos, L. (2001). *Adaptação Académica e Rendimento Escolar: estudo com alunos universitários do 1º ano*, Braga, Grupo de Missão para a Qualidade do Ensino Aprendizagem, Universidade do Minho.
[28] Tavares, J., & Silva, I. (2001). Sucesso académico no ensino superior. In Sousa, R., Sousa, E., Lemos, F., Januário, C. (orgs.), *III Simpósio – Pedagogia na Universidade*, Lisboa, Reitoria da Universidade Técnica de Lisboa.