The role of self efficacy and internal locus of control in online learning

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The aim of the study is to analyze the structure of the relations among training goals achievement and some psychological features considered significant in Distance Learning (DL) where teacher's role is less active and students must be more autonomous in learning tasks. *Self-Regulated Learners* (SRLs) are able to activate and to sustain cognitions, behaviours, and emotions in a systematic way to reach learning goals in DL. Due to the difficulty in operationally defining SRL's construct, this survey describes a study on the effects of self-efficacy and Locus of Control (LOC) in online learning. Self-efficacy represents people's beliefs about their capabilities to produce designated levels of performance: people with a strong sense of self-efficacy view challenging problems, develop deeper interest in the activities in which they participate and recover quickly from setbacks and disappointments. Moreover, individuals with internal LOC engage in learning processes more than do individuals with external LOC, because the learners

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believe that the achievement of training goals depends on their effort.
The output demonstrates that online learning degree is influenced by the combined effect of internal LOC and external motivation to learn, as obtaining *Continuing Medical Education* (CME) credits. These results are strictly related to the research context, because the opportunity to acquire CME credits seems to be one of the most important motivational factor to attend DL courses, since it allows health professionals to continue their education or training while still working or with family responsibilities. In section 1 it is briefly described the general framework of survey. In Sections 2 there is illustrated the aim of the paper and in Section 3 instruments and methods. In Section 4 we describe datasets and statistical tools, while in Section 5 we discuss concluding points and open questions.

1 Introduction

This survey originates from an important health care project named SETT (*Italian acronym:* SErvizi di Telemedicina e Teleformazione) that aims to improve Distance Learning (hereafter named "DL") services through Web-based Training (WBT). DL courses, opened to 3.000 health care professionals picked out from Regional Health System, concern medical topics and are differentiated by difficulty's levels and Continuing Medical Education (hereafter named "CME") assigned. For these courses the students didn't pay the registration fee: thus, considering necessary to deep the study, we compare results with another survey conducted in a context where students paid the registration fee and where learning performances could be influenced by an internal motivational aspect. Some marked peculiarity is determined by the context of the study: the explosion in medical knowledge over the last 25 years has increased the demand for some form of continuing education, obligating health professionals to obtain a certain number of *Continuing Medical Education* (hereafter named "CME") credits in each year and, probably, increasing an external motivation to learn, mainly oriented to acquire CME credits.

Knowles' *andragogy*, supposedly the adult equivalent of *pedagogy*, is a leading "brand" in adult education theory. The theory is based on the following *key assumptions*: 1) adult learners need to know why they need to learn something before undertaking to learn it; 2) adults need to be responsible for their own decisions and to be treated as capable of self-direction; 3) adult learners have a background which represent the richest resource for learning; 4) adults are available to learn those things they need (Knowles, 1970; 1980; Knowles, Holton and Swanson, 1998). For learners, the critical features of good online learning are related to their capabilities to apply proper learning strategies, effective cognitive tools and goal settings, time management, continuous monitoring and self-evaluation: in DL teacher's role is less active and students must be more autonomous in learning tasks (Fazey & Fazey, 2001; Puzziferro, 2008). The emphasis is that the *Self-Regulated Learners* (hereafter named "SRLs") perceive themselves to be in control of their success in a learning context and are able

to activate and to sustain cognitions, behaviours, and emotions in a systematic way to attain learning goals (Pintrich, 2000; Cornoldi, De Beni & Fioritto, 2003; Trentin, 2003). As the literature has amply demonstrated Self-Regulated Learning is a multi-dimensional construct (Boekaerts, 1996; Boekaerts & Corno, 2005) and involves some psychological aspects. Due to the difficulty in operationally defining this construct, this survey examines the role of self efficacy and internal locus of control (hereafter named "LOC") in learning degree. LOC is firstly defined as a generalized expectancy for internal as opposed to external control of reinforcements (Rotter, 1966). This feature is a psychological construct related to some aspects of personality studies and plays an important role in learning goals achievement: individuals with internal LOC engage in learning processes more than do individuals with external LOC because the former believe that the achievement of training goals depends on their will. This one-dimensional construct (internal vs external control) has been reviewed and external control has been divided into the two dimensions of Chance and *Powerful of Others* (Levenson, 1973; Perussia & Viano, 2008).

As well as LOC, self efficacy is another effective predictor of students' motivation and learning (Zimmerman, 2002) and has been the topic of numerous studies involving adult learners, computer self-efficacy and online education (Hill *et al.*, 1987; Hofer & Pintrich, 1997; Pintrich & De Goot, 1990; Joo, Bong e Choi, 2000; Puzziferro, 2008; Brivio & Cilento Ibarra, 2010). Bandura (1997) has recorded achievement behaviours such as persistence, challenge, interest, curiosity, resilience to failure, and commitment to progress as being associated with high self-perceived competence, with high motivation at the intrinsic end of the motivational continuum (Deci et al., 1991), and with high behaviour-outcome contingency expectations or internal LOC (Rotter, 1966; Weiner *et al.*, 1971).

2 Purpose of study

In order to understand the cognitive, emotional, behavioural processes related to DL activities, the study aims to explore the role of some psychological features in online learning. More specifically, the scope of this survey is to analyse the structure of the relation among training goals achievement (based on distance education learning scores), self-efficacy, and LOC. The assumption is that high self-efficacy beliefs (Bandura, 1997; Puzziferro, 2008; Brivio & Cilento Ibarra, 2010; Salter, 2011) and internal LOC (Rotter, 1966; Levenson, 1973, 1981; Lefcourt, 1976; 1981) represent some of the most important variables in online learning (Bong & Choi, 2000; Salter, 2011; Fazey & Fazey, 2001) where teacher's role is less active and students must be more autonomous in learning tasks (Fazey & Fazey, 2001; Puzziferro, 2008).

Effective predictor of students' motivation and learning (Zimmerman, 2002), self-efficacy has been the topic of numerous studies involving adult learners, computer self-efficacy and online education (Pintrich & De Goot, 1990; Joo, Bong & Choi, 2000; Puzziferro, 2008; Brivio & Cilento Ibarra, 2010). In Cornoldi, De Beni & Fioritto' model (2003) given in the following scheme, self-regulation appears critical for online achievement and is related to students' implicit theories, self-effort attribution (as internal LOC), self-efficacy and motivation to use learning strategies when appropriate:

Fig. 1 - Cornoldi, De Beni & Fioritto, 2003

According to Bandura (1997) self-efficacy represents people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives. He further explains that people with a strong sense of self-efficacy view challenging problems as tasks to be mastered, develop deeper interest in the activities in which they participate, form a stronger sense of commitment to their interests and activities, and recover quickly from setbacks and disappointments.

As Rotter sustained (1966) people with an internal LOC recognize to have strong control under their achievement; they believe that the outcome of the activity is contingent upon behaviour are described as having an internal LOC. At the other end of the continuum is an external LOC, in which individuals perceive themselves to have little or no control over their achievement. This one-dimensional construct (internal vs external control) has been questioned repeatedly, giving rise to more elaborate conceptualizations (Lefcourt, 1973;1981) and the external orientation has been split theoretically into the two (arguably) discrete dimensions of *Chance and Powerful of Others* (Levenson, 1973; Perussia & Viano, 2008).

3 Instruments and methods

Survey aims to explore the relationship between online training goals achie-

vement, self-efficacy and LOC. As the literature has amply demonstrated the assumption is that high self-efficacy beliefs (Pintrich & De Goot, 1990; Bandura, 1997; Schwarzer, 1993; Joo, Bong & Choi, 2000; Puzziferro, 2008; Brivio & Cilento Ibarra, 2010; Salter, 2011) and internal LOC (Levenson, 1973; 1981; Lefcourt, 1976; Fazey & Fazey, 2001) represent some of the most important psychological features in DL.

Self-efficacy was investigated through the Italian version of ***Perceived Self-efficacy Test*** (Schwarzer, 1993), a self-report instrument composed of 10 items rated on a four-point Likert scale, covering the degree of belief that one is capable of performing in a certain manner to obtain certain goals. The scale presents a good reliability (Cronbach's alpha ranges are from 0.75 to 0.94).

LOC was investigated through the Italian version of the ***Mini Locus of Control scale*** (Perussia & Viano, 2008), a Self-report instrument composed of 6 items rated on a four-point Likert scale. The scale presents a quite clear and defined factorial structure based on 3 factors (Lefcourt, 1973; 1981): *Chance, Powerful others and Internality*. Specifically, *Chance* is related to *destiny or fate* (results are predetermined and individuals perceive themselves to have little or no control over their achievement), *Powerful of others* represents the influences applied from social context, and *Internality* is related to the will, the personal capabilities, and measures internal locus of control. Adding these up for the sum gives us a new factor named "*Total LOC*" that measures external locus of control. Psychometric index of validity and reliability are available at www.itapi.org, the web site directly managed by the Authors.

The analysis for this survey originally included 118 health care professionals (involved in SETT project) who took part in the research, following an email introducing them to the purpose of the study. For these courses the students didn't pay the registration fee: thus, considering necessary to deep the study, we compare results with another survey conducted in a context where students paid the registration fee. This second group is composed by 40 health care professionals involved in low cost DL activities. So, data refer to 158 health care professionals. All students – registered on open source LMS (*Moodle*) – attended DL courses promoted by CEFPAS (Centre for training and Research in Public Health located in Sicily) primarily via Internet. The methods used for projecting DL courses have been evolving from CNIPA recommendations and provide interactive multimedia elements (text, audio, images, animation and video). In order for self-regulated learning, students had to come to fruition contents and learning evaluation totally online. To receive CME credits, participants had to give 75 percent of right answers to the online Multiple Choices Questionnaire filled out by every subject. The online multiple-choices questionnaire was strictly related to Distance Learning courses' topics and duration. To compare the scores belonging to the different scales it was applied the following transformation

procedure to obtain a unique distribution of values (Aiello & Attanasio, 2008):

$$z_i = x_i - \min(x_i) / \max(xi) - \min(x_i)$$

This procedure yelded a new set of scores $z_i \in (0,1)$, hereafter named "LS (Learning Scores)". In this survey, it was conducted a two-steps analysis. An explorative analysis was first conducted, based on both graphical investigation and non parametric test, useful when there are no assumptions about the population distribution. The last phase of analysis was devoted to study the structure of the relationship among the instrumental variables (LS degree, self-efficacy and LOC). In this case *binomial or binary logistic regression* was carried out.

4 Finding and results

Table 1 shows the average (*mean*) and standard deviations of variables by groups. Comparing the results, the two groups seems to have same values in self-efficacy while they change in external LOC' scale: in particular, health care professionals involved in SETT project (the first group) present higher and more spread out levels of Chance (that measures external LOC) than the other one (the second group) involved in the DL courses paying the registration fee.

TABLE 1
Distribution of subjects by Group of research study

		Group of research		
		I	II	Total
Gender (%)	Female	38.20	52.00	51.60
	Male	61.80	48.00	48.40
Age	Mean	50.00	49.00	49.50
	St. Dev.	5.50	6.80	6.15
Professions (%)	Physician	41.50	38.00	39.75
	Nurse	39.80	12.00	25.90
	Other	18.60	50.00	33.40
Self-efficacy	Mean	34.00	34.00	34.00
	St. Dev..	3.70	3.80	3.75
Chance	Mean	5.45	4.50	4.97
	St. Dev.	1.76	1.50	1.63
Powerful others	Mean	3.22	3.30	3.26
	St. Dev.	1.42	1.60	1.51
Internalism	Mean	6.90	6.80	6.85
	St. Dev.	1.05	1.20	1.12

		Group of research		
		I	II	Total
Total LOC (External)	Mean	15.60	14.60	15.00
	St. Dev.	2.53	2.50	2.51
Learning Scores or LS	Mean	0.38	0.46	0.42
	St. Dev.	0.27	0.67	0.47

Table 2 shows up the results of the non parametric tests (Mann-Whitney U test and Kruskal-Wallis ANOVA test) for each couple of variable. The Mann-Whitney U test (known as Wilcoxon Rank sum test) can be considered a non-parametric version of T Test and compares the medians of the two groups. The Kruskal-Wallis ANOVA test is a non-parametric method for testing whether samples originate from the same distribution. It is used for comparing more than two samples that are independent, or not related. The parametric equivalent of the Kruskal-Wallis test is the one-way analysis of variance (ANOVA). The results suggest that: 1) LS degree vary according to the age; 2) LS degree vary according to the group of research study.

TABLE 2

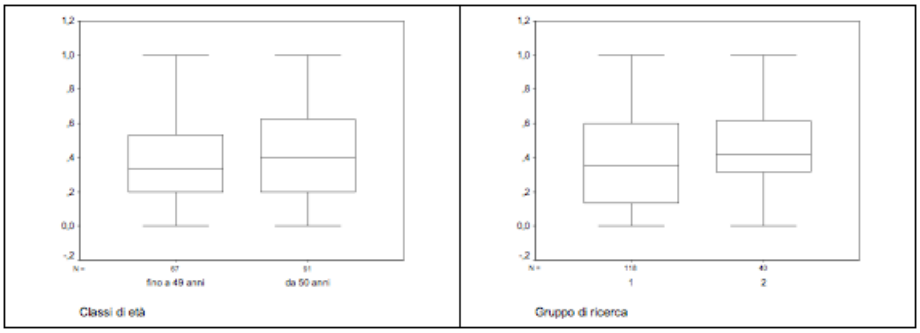
Results of non parametric tests (values and significance) on variables for independent groups

	Age		Group of research	
	U	p-value	U	p-value
Self-efficacy	3006.5	0.773	2346.0	0.955
Chance	2969.5	0.132	1607.5	**0.002**
Powerful others	2772.0	0.304	2355.0	0.983
Internalism	2614.5	0.108	2313.0	0.843
Total LOC (External)	2725.5	0.252	1806.5	**0.026**
Learning Scores o LS	2228.0	**0.004**	0.000	**< 0.001**

Bold results are significant at $\mathbf{p < 0.05}$.

There are no differences between the scores distributions conditioning on gender or professions. Graphical analysis support these findings: 1) *those under 50 Years Old have lower and less spread-out levels of LS than those Over 50 Years Old ones* (Box plot 1). This finding can be better argued calling back attention to Bandura's thought: in spite of biological concepts that focus on mental decline in middle age, the Author sustains that adaptive skills increase with age (Bandura, 2000, p. 279); 2) *the average of the LS degree in the second group of research is significantly higher than the first one* (Box plot 2): despite to the second group of research study, students involved in SETT project (belonging to the first group of research) did not adhere voluntarily to DL courses,

they were recommended by Central System and attended in DL courses free of charge. According to Knowles' thought (1980), adults are available to learn only if new knowledge are in order to cope effectively with life or job situations and if they feel themselves to be responsible for their own decisions (Knowles, 1990, p. 63).



To explore the relationship between adult learning degree, self-efficacy and LOC, *binomial or binary logistic regression* was carried out. ***Logistic regression*** is a type of regression analysis used for predicting the outcome of a categorical dependent variable based on one or more predictor variables. To do that, LS *under the average* (0.50) has been transformed in "0" and LS over the value average (0.50) has been transformed in "1". The backward elimination technique starts from the full model including all independent effects categorized on the quartiles of each distribution (group of research study, self-efficacy and *Internalism* or internal LOC). The EXP (B) column represents odds ratio that is the ratio of the probability something is true divided by the probability that it is not. When odds are greater than 1.0, the event is more likely to happen than not. Thus, results suggest an overall effect of internal LOC on LS (Step 3, Table 4) ***and the probability to obtain LS over the value average (0.50) is related to high levels of internal LOC*** (Internalism, level 3). Moreover, the 69 percentage of observations are correctly classified out of all the data points.

TABLE 3

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	group	-,133	,405	,107	1	,744	,876
	self-efficacy (1)			1,097	3	,778	
	self-efficacy (2)	,208	,512	,164	1	,685	1,231
	self-efficacy (3)	-,258	,528	,239	1	,625	,773
	self-efficacy (4)	-,103	,603	,029	1	,865	,902
	Internalism (1)			4,751	2	,093	
	Internalism (2)	,595	,505	1,386	1	,239	1,813
	Internalism (3)	,993	,457	4,721	1	,030	2,699
	Constant	-1,250	,512	5,970	1	,015	,286
Step 2[a]	group	-,116	,401	,083	1	,773	,891
	Internalism (1)			5,316	2	,070	
	Internalism (2)	,630	,460	1,874	1	,171	1,877
	Internalism (3)	1,007	,437	5,309	1	,021	2,739
	Constant	-1,294	,462	7,832	1	,005	,274
Step 3[a]	Internalism (1)			5,609	2	,061	
	Internalism (2)	,629	,460	1,868	1	,172	1,875
	Internalism (3)	1,025	,433	5,609	1	,018	2,788
	Constant	-1,386	,337	16,912	1	,000	,250

a. Variable(s) entered on step 1: GRUPPO, AUTOEFF, INTERN_L.

Leading to partial disconfirmation-of-expectations, these results demonstrate that online learning degree is influenced by the combined effect of internal LOC (Internality), as a necessary condition for online learning, and external motivation to learn, as obtaining Continuing Medical Education (CME) credits.

Conclusions

As literature has amply demonstrated, SRL emphasizes autonomy and control by the individual who monitors, directs, and regulates actions toward goals of information acquisition, expanding expertise, and self-improvement, determining success or failure in online training (Pintrich & De Goot, 1990; Joo, Bong & Choi, 2000; Cornoldi, De Beni & Fioritto, 2003; Puzziferro, 2008; Brivio & Cilento Ibarra, 2010). Due to the difficulty in operationally defining this construct, this survey examines only some aspects of SRL, such as self-efficacy's degree and typology of Locus of Control (LOC) in online achievement.

Leading to partial disconfirmation-of-expectations, the results demonstrate

that online learning degree is influenced *by the combined effect of internal LOC (Internality) and external motivation to learn*, as obtaining Continuing Medical Education (CME) credits. For these reasons the findings of this survey can be better argued calling back attention to the ***research context***. In fact, results demonstrate that the LS degree is influenced by the combined effect of internal LOC (*Internality*) and extrinsic motivation. As Fazey and Fazey (2001) retain, *autonomous people perceive themselves to be in control of their decision-making, take responsibility for the outcomes of their actions and have confidence in themselves* (Fazey & Fazey, 2001, p. 345). So, once they complete the online course, the health care professionals don't try again the online Multiple Choices Questionnaire until reaching the top, but they stop when they achieve the *minimum sufficient* level to obtain CME credits.

In conclusion this exploratory survey seems to suggest that self-regulated learning (SRL) performances are influenced by some of the aspects above mentioned. However, health care professional's learning degree seems strongly related to ***external motivation***, mainly oriented to acquire CME credits.

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