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Motivating School Teachers to Learn: can ICT add value?

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Introduction

In recent decades, research on self-regulated learning (SRL) has unveiled how and under what circumstances students become skilful regulators of their own learning. Concurrently, SRL theories have grown in importance, accompanying the pace of expansion of an eLearning market where it is difficult to exercise control over the entire learning process.

Our inquiry into the impact of a Technology-Enhanced Learning Environment (TELE) on SRL departs from the assumption that teachers posit more highly than average dynamic self-regulation attitudes when acting as learners.[2] Hence, teachers would value settings that were supportive and expressive of a culture of learning and technology environments that sustained active learning skills.

Furthermore, we hypothesised that:

1. School teachers are proactive learners who require appropriate professional incentives to engage in demanding graduate education processes.
2. TELEs can play a prominent role in boosting both course attractiveness and motivation to learn, orienting students to future goals.
3. Sustaining SRL motivation is positively correlated to TELE features that support collaborative and social learning.
4. TELEs can act as a prime determinant of knowledge acquisition when teachers undergoing advanced training upgrade from technology familiarity to proficiency.

In specific terms, the study focused on some straightforward questions: What motivates a school teacher to enrol and undertake graduate studies? Can eLearning and technology play a positive role in attracting teachers to pursue such studies? Can a TELE increase the motivation to learn and broaden SRL capabilities? How does motivation evolve during a TELE graduate course?

The article is divided into six parts. Following the introduction, the next section spells out the context of the study. This is followed by a third part providing a brief overview of both the pertinent literature and the theoretical background. While section four reports on questions of method, part five focuses on the overall results of the study. The article ends with some concluding remarks (part six).

Context

The Catholic University of Portugal (UCP) undertook a major step towards dematerialising its portfolio of educational courses by offering an MA degree in Education Informatics that began in the academic year 2003–04. The decision to move forward was taken in May 2003 and the programme was first advertised in June 2003.

The opportunity to innovate arose from a combination of six factors:

- The Ministry of Education of Portugal announced the introduction of two new ICT subjects in the national curriculum.
- These subjects were made mandatory for all students in grade 9 (90 minutes/week) and grade 10 (180 minutes/week).
- The curriculum reform was set to be launched as of September 2004.
- There was an estimated need for 1800 trained teachers to teach the new ICT subjects.
- Priority in recruitment would be granted to experienced teachers who had undergone some additional training in ICT didactics.
- No formal offering in the in-service training market of teachers existed to address this need.

The selection committee approved 143 students from a sample of 230 applicants. Students were allocated to five groups ('classes') and were required to undertake a curriculum comprising five terms of studies and the completion of a dissertation. The course officially opened in October 2003.

The model placed a strong emphasis on group and social learning based on active tutoring and constant stimulation to work in forums and chats. Individual and group online assignments accompanied by ongoing appraisal and assessment exercises were designed to offer stimulating working packages. The choice of both the Learner Management System (LMS) and the complementary software tools promoted the idea of forging a TELE that could afford high levels of social interaction and induce meta-motivation gains.

Key Views on SRL, Motivation and Teacher Performance

The literature on SRL dealing with active participants in their own learning processes is abundant (Zimmerman, 1998, 2000; Pintrich, 2000, 2004; Winne & Hadwin, 1998).

In recent decades, social learning research (Zimmerman, 1989) has focused on self-reinforcement (Bandura, Grusec, & Menlove, 1967; Bandura & Kupers, 1964), standard setting (Mischel & Liebert, 1966), delay of gratification (Mischel, 1981; Mischel & Bandura, 1965), goal setting (Bandura & Schunk, 1981; Schunk, 1985), self-efficacy perceptions (Bandura 1982a; Schunk, 1984; Zimmerman & Ringle, 1981), self-instruction (Schunk, 1986; Schunk & Rice, 1984), and self-evaluation (Bandura & Cervone, 1983, 1986).

Hence, self-regulated students are meta-cognitively, meta-motivationally and meta-behaviourally active participants in their own learning processes (Zimmerman, 1989, p.4). Learners are actively involved in reorganising and reconstructing their existing knowledge with new knowledge (Carneiro, 2003; Perkins, 1992). Self-regulated learners also excel in the art of selecting, structuring and creating

social and physical environments that optimise acquisition (Zimmerman & Martinez-Pons, 1988, p. 284).

A theoretical distinction is often drawn between self-concept and self-efficacy (Bong & Skaalvik, 2003). While the former refers to a composite view of oneself, the latter is directed at beliefs in one's capacity to organise and execute the courses of action required to produce given attainments (Bandura, 1997, p. 3). In this case, efficacy judgement is less concerned with what skills and abilities individuals possess than with what they believe they can do with the skills and abilities they may possess (Bong & Skaalvik, 2003, p. 5).

A particular field of interest in research is the way in which learners can regulate their motivation and affect, sometimes also discussed under the terms of effort regulation or volitional control (Boekarts, 1993; Corno, 1993, 1994; Garcia *et al.*, 1998; Kuhl, 1984). The question under observation is how one can maintain focus and effort towards goals despite potential distractions, and concurrently sustain commitment to completing one's study goals by directing and controlling one's energy towards them.

The motivational beliefs affecting achievement that remain under scrutiny include such topics as goal orientation, self-efficacy, perceptions of task difficulty, task value beliefs and personal interest in the task (Pintrich, 2004).

Recent research tends to explain SRL by relating academic delay of gratification and future time perspective (FTP), defined as 'an individual's beliefs or orientation toward the future concerning temporarily distant goals' or 'the present anticipation of future goals' (Bembenutty & Karabenick, 2004, p. 36). SRL as the outcome of the interplay between proximal learning strategies and distal goal setting has found solid theoretical and empirical ground in recent literature (Miller & Brickman, 2004; Simons *et al.*, 2004). Indeed, high motivation levels often displayed by student teachers can be explained by FTP theories (Simons *et al.*, 2004). A balanced combination of internal regulation and high utility value attributed to one's studies is instrumental to the creation of purposeful motivation ('living in the future'). The impact of ICT on teachers' motivation and performance is a matter of high priority. Research findings generally agree in reporting greater motivation of actors (both teachers and students) in technology-enriched classrooms. ICT is a powerful tool to awaken the 'teacher as learner' features.

Knezek & Christensen (2002, pp. 370–371) provide a detailed account of major cross-cultural results related to the use of ICT in education from studies completed during the 1990s. Amongst other findings in the relevant literature, the authors underpin the following:

- Teacher competence and confidence with ICT are the principal determinants of effective classroom use by students (Collis *et al.*, 1996).
- Successful technology integration in a classroom environment appears to require will, skill, and access to technology tools on the part of the teacher (Knezek *et al.*, 2000).
- Teacher advances in technology integration seem to proceed through a set of well-defined stages, where the highest stages require changes in attitude more than in skills (Knezek & Christensen, 2000).
- Self-appraisal of level of technology integration can be effective in prescribing training for an educational professional (Knezek & Christensen, 2000).'

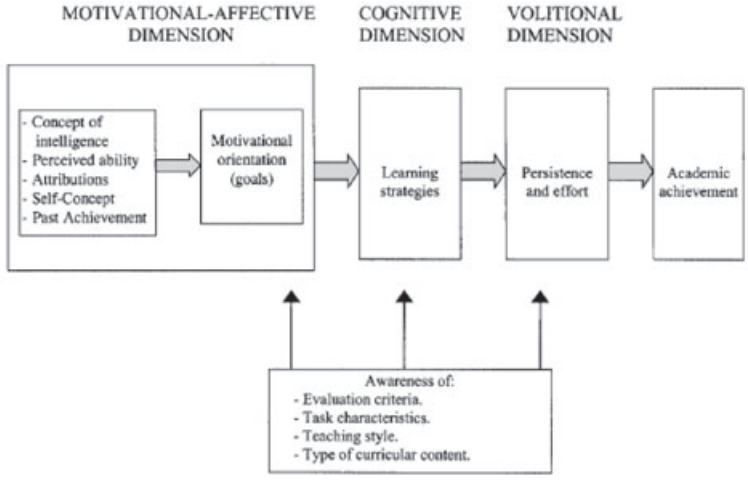

FIGURE 1. Model I: Valle *et al.* (2003)

Two models provide the fundamental inspiration for our quest on ICT-sustained motivation to learn. Indeed, one key assumption of our research on SRL is the foundation role played by a motivational-affective dimension. We bear in mind the comprehensive model proposed by Valle *et al.* (2003) to analyse the interplay of cognitive, motivational, and volitional dimensions in learning (Model I, see Figure 1).

The sustaining idea to this 'warm' theory of learning (Garcia & Pintrich, 1994) is that positive expectancy fosters intrinsic motivation and interest in the task, so students can apply the cognitive processes required for task performance (Marzano, 1998).

Theories in use concerning teacher preparation have tried to turn principles into practice. Paris & Winograd (2001) designed a set of concrete guidelines for the enhancement of self-regulation practices in the teaching profession.

Likewise, Neville & Bennett (2004) investigated the inter-relationships of concepts underpinning self-regulated learning, lifelong learning and FITness (fluency with information technologies) capabilities on teaching professional practice. The research was conducted on pre-service teacher education students and their model is illustrated in the following diagram (Model II, see Figure 2).

The authors conceptualise the strong links that exist between motivation, commitment, creativity, adaptability, learning strategies and self-reliance with both SRL and the deployment of sustainable lifelong learning abilities.

Method — Empirical Research

Our empirical research was based on the administration of three time-sequenced, purposefully designed and customised surveys to students who enrolled in the advanced teacher education course in informatics. The surveys were constructed around a system of closed questions structured along a six point Likert scale. A brief outline of these surveys follows.[3]

Firstly, in January 2004, a baseline survey was administered to student teachers who had enrolled in and were pursuing their first term of graduate studies (MA

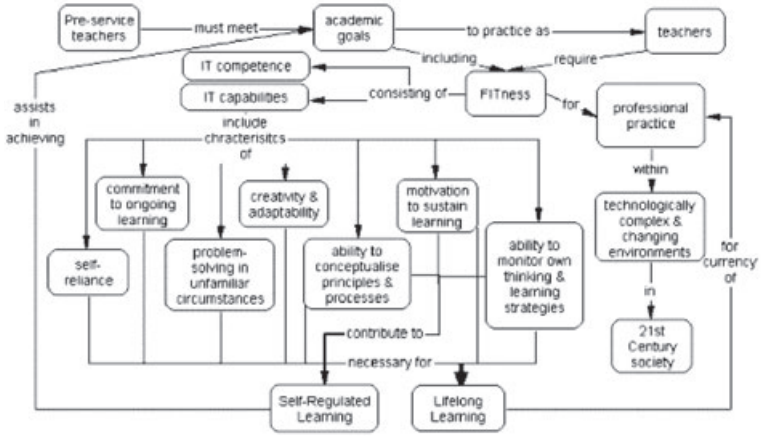

FIGURE 2. Model II — Neville & Bennett (2004)

level) in Education Informatics at the Catholic University of Portugal. The baseline survey (116 respondents) served to characterise the student population by initial training, professional activity, and Internet access and to understand their basic motivations in undertaking the course (Appendix 1).

Following the first wave of data collection, a second survey was carried out in the middle of the course (September 2004). This intermediate survey (66 respondents) was designed to analyse learning motivations and to 'explain' how the TELE can assist students in achieving higher patterns of SRL. Particular attention was given to social and self-evaluative features of the TELE (Appendix 2).

The third wave of field work occurred in the latter part of the curricular requirements of the course (March 2005). It consisted in the administration of the same survey used at mid-course to assess consolidation or modification of students' perceptions as they approached the end of the required curriculum (63 respondents).

6 to 8 in-depth qualitative interviews and discussions in a virtual forum were also conducted (Appendix 3). To complement this, we distributed TELESTUDENTS-SRL, a Telepeers questionnaire,[4] to a limited number of students (11 valid responses). This case study approach proved to be instrumental to further clarify the meaning of a selected group of queries such as the extensive use of MSN, the preference for personal email, and the importance attached to content availability.

Finally, we asked one Telepeers partner — University of Barcelona (UB) — to apply our second survey model to a sample of students of Audiovisual Communication (Digital Video Course — classroom learning with the support of new media). Notwithstanding the marked difference in course layout and methodology, some of our findings could be compared against the data from Barcelona (15 respondents).

Results

Our student population was predominantly male (~60%) and young (70% under 40) (see Figure 3).

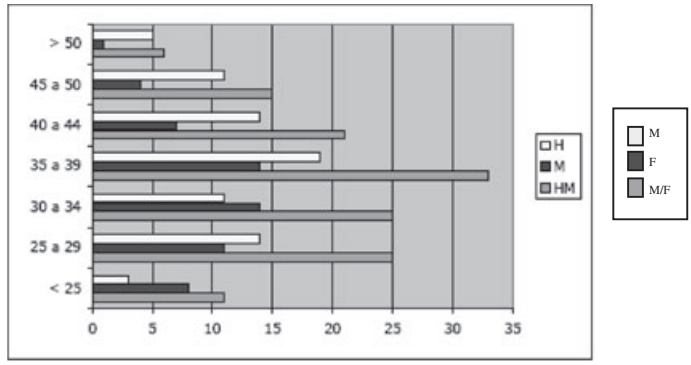

FIGURE 3. Age and gender breakdown (n = 116)

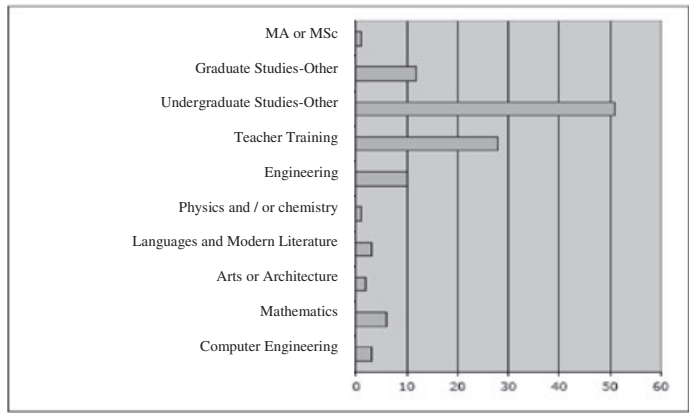

FIGURE 4. Background studies (n = 116)

Academic backgrounds display a variety of first degree majors and of specialisations. As expected, the original areas of studies cover a broad range of teacher training and subject matters, including 13 students who had previously completed advanced studies at graduate level (see Figure 4).

Out of a total of 113 professional educators, 36 were ICT teachers. The others were evenly spread across different subject areas. Eight were currently involved in managerial positions at their respective educational establishments.

A small proportion of about 10% accessed the Internet from a narrowband connection, while 90% currently dispose of broadband access (ADSL or cable modem).

Baseline motivations to enrol in the advanced course were (i) *accessibility/flexibility* — 47.7% referred to ease of time and space management and the use of distance learning technologies as attractive features of eLearning and, (ii) *professional* — 37% stated either theme of the programme of studies or career promotion as prime determinants, (iii) *quality/reliability* associated with the good reputation and profile of the Catholic University (see Figures 5 and 6).

Over 80% of the students reported that this course was their first experience in ODL.

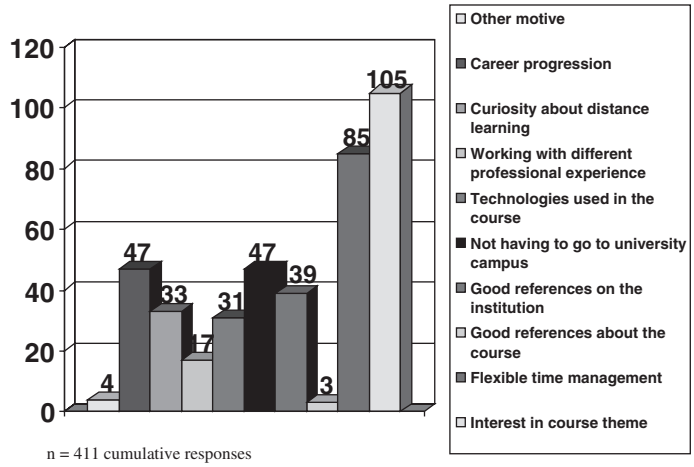

FIGURE 5. Determinants of enrolment

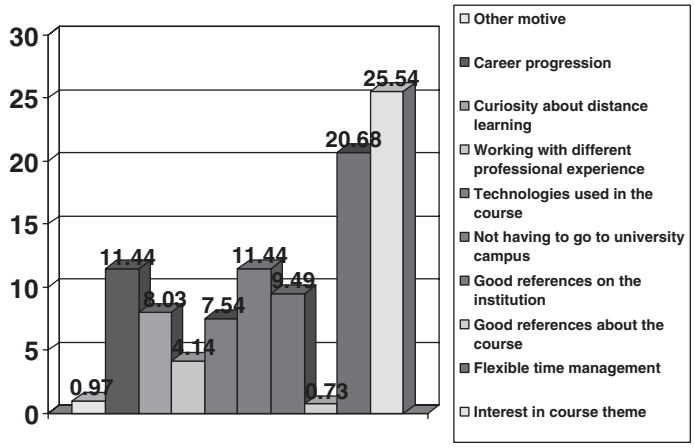

FIGURE 6. Determinants of enrolment (%)

The second and third waves of inquiry led to a deeper level of consolidation concerning the main variables under interpretation. These ongoing inquiries surveyed the students on their continued motivation to pursue and complete the course on the basis of the following categories: 'professional progression', 'improving knowledge and skills', 'investment in academic/University future', 'other'. Furthermore, respondents were requested to state their 'reasons for choosing the course' according to the following options: 'professional motivations met by course content', 'distance learning methodologies', 'profile of university', 'other'.

The follow-up inquiries, on a 1–6 scale, showed that 'professional progression' and 'improving knowledge and skills' registered the highest mean scores (2nd wave: 5.30/5.57; 3rd wave: 4.98/5.62), as opposed to 'investment in academic future' (mean scores of 4.00 and 3.65 in each wave). Corroborating these results the question on 'reasons for choosing the course' elicited 'professional motivations'

TABLE I. Relevance of functionalities for learning motivation (%)

		1	2	3	4	5	6	mean	s.d.
Forums	Sep-04	7.6	4.5	13.6	39.4	22.7	12.1	4.02	1.32
				25.7			**34.8**		
	Mar-05	3.2	7.9	15.9	25.4	36.5	11.1	4.17	1.25
				27.0			**47.6**		
Chats	Sep-04	0	6.1	13.6	36.4	31.8	12.1	4.30	1.05
				19.7			**43.9**		
	Mar-05	0	1.6	11.1	42.9	28.6	15.9	4.46	0.95
				12.7			**44.5**		
Emails	Sep-04	0	0	6.1	37.9	43.9	12.1	4.62	0.78
				6.1			**56.0**		
	Mar-05	0	0	19.0	28.6	34.9	17.5	4.51	1.00
				19.0			**52.4**		
Face-to-face	Sep-04	0	3.0	15.2	31.8	36.4	13.6	4.42	1.01
				18.2			**50.0**		
	Mar-05	0	1.6	12.9	29.0	29.0	27.4	4.68	1.07
				14.5			**56.4**		

Scale: 1–3 are 'none', 'very poor' and poor' while 4–6 are 'sufficient', 'much' and 'very much'. Thus, the two aggregate summations (1–3) and (5–6) represent gross 'negative' or 'positive' perceptions.
$n_1 = 66$; $n_2 = 63$

(2nd wave: 5.41; 3rd wave: 5.36) and 'distance learning' (2nd wave: 5.32; 3rd wave: 5.33). The Barcelona sample gave a 4.71 score for professional upgrading and 4.53 for knowledge and competence improvements. There remains little doubt that teachers were primarily motivated by professional and career-related factors.

Looking further into the data provided by these inquiries, Table I shows how simple technologies and course models were perceived as relevant to 'motivation to learn'. Both 'Chats' and 'Forums' saw their roles develop over time following a pattern of familiarisation with the system: in both cases mean values increased by about 0.15 between surveys. 'Emails' and 'traditional sessions' ranked highest in accordance with standard school teachers habits with a trend that enhanced the role of face-to-face activities (0.26 increase in mean value). The Barcelona data followed an identical pattern: chats obtained the highest score, followed by email and traditional classes, and finally forums.

It is worth mentioning that these results are very much aligned with those of the TELESTUDENTS-SRL evaluation tool. Respondents tended to rate the communication components and problem-solving features of the course very highly: working with colleagues (63.6%); communicating with colleagues (54.5%); discussing tasks with tutor (54.5%); help from tutor (63.6%).

Table II illustrates that, when requested to state the importance of learning methods for knowledge acquisition, respondents tended to choose 'multimedia content' as the prime factor, followed at a distance by 'face-to-face sessions' (a pattern confirmed by the Barcelona control group): mean values of 5.24/5.27 and 4.26/4.57, respectively. This did not come as a surprise when taking into account the student composition: experienced teachers would be expected to overstate content and traditional methods that are germane to their own professional practices. Again, the survey provided evidence on the gradual role of forums over time

TABLE II. Importance of learning methods and functionalities for knowledge acquisition (%)

		1	2	3	4	5	6	mean	s.d.
Forums	Sep-04	3.0	7.6	13.6	33.3	31.8	10.6	4.15	1.21
				24.2			**42.4**		
	Mar-05	1.6	9.5	11.1	25.4	39.7	12.7	4.30	1.21
				22.2			**52.4**		
Chats	Sep-04	0	6.1	22.7	43.9	22.7	4.5	3.97	0.94
				28.8			**27.2**		
	Mar-05	0	6.3	20.6	42.9	20.6	9.5	4.06	1.03
				26.9			**30.1**		
Multimedia Content	Sep-04	0	3.0	0	9.1	45.5	42.4	5.24	0.86
				3.0			**87.9**		
	Mar-05	0	1.6	0	9.5	47.6	41.3	5.27	0.77
				1.6			**88.9**		
Face-to-face	Sep-04	1.5	4.5	15.2	34.8	33.3	10.6	4.26	1.09
				21.2			**43.9**		
	Mar-05	0	3.2	12.7	30.2	31.7	22.2	4.57	1.07
				15.9			**53.9**		

Scale: 1–3 are 'none', 'very poor' and poor' while 4–6 are 'sufficient', 'much' and 'very much'. Thus, the two aggregate summations (1–3) and (5–6) represent gross 'negative' or 'positive' perceptions.
$n_1 = 66$; $n_2 = 63$

as a consequence of enhanced awareness of the role of social and community learning.

The next batch of questions proposed four statements to probe students' attitudes to the use of technology. Table III merges into one single presentation the items included in two different questions addressing the role of technology.

The two waves replicate a high consistency of responses across the longitudinal data. *Circa* 90% of respondents recognised that technology constituted a 'natural learning environment' (the Barcelona control group scored about 93% on this statement). This sweeping result corroborates the existence of a contextual intra-personal process of attribution that is elicited by a technology-rich learning environment. Most students credited technology as a 'collaborative learning' booster (58.4/61.3) and as a 'facilitator' (58.5/62.3): mean scores varied between 4.61 and 4.75 for the two. From the very outset, technology was not regarded as a disturbing factor or a barrier to learning (mean values below 2). On the contrary, it was recognised as a very useful self-evaluative tool (69.7/74.6 and mean values of 4.63/4.90). By the same token, 90.9% of TELESTUDENTS-SRL respondents identified self-appraisal exercises as fundamental to their learning processes.

In line with this strand, both TELESTUDENTS-SRL survey and forum discussions confirmed that students valued the role of the TELE in: planning learning activities, encouraging participation in cooperative learning processes, allowing benchmarks for work to be carried out between colleagues, and sustaining a positive attitude towards collaborative work.

The last question surveyed the level of intrinsic motivation to complete the graduate education course. Students were asked to state their expectation of successfully completing the course (FTP — future time perspective) at the begin-

TABLE III. Use of technology (%)

		1	2	3	4	5	6	mean	s.d.
Initially, technology disturbed our work	Sep-04	43.9	30.3	13.6	9.1	3	0	1.97	1.11
				87.8			**3**		
	Mar-05	50.8	17.5	22.2	7.9	1.6	0	1.92	1.10
				90.5			**1.6**		
Technology turned into a facilitator	Sep-04	1.5	3.1	6.2	30.8	38.5	20	4.62	1.07
				10.8			**58.5**		
	Mar-05	3.3	3.3	6.6	24.6	39.3	23	4.61	1.20
				13.2			**62.3**		
Collaborative learning increased	Sep-04	0	3.1	6.2	32.3	29.2	29.2	4.75	1.05
				9.3			**58.4**		
	Mar-05	3.2	1.6	3.2	30.6	40.3	21	4.66	1.10
				8			**61.3**		
Technology is a natural learning environment	Sep-04	0	1.5	1.5	7.7	36.9	52.3	5.37	0.82
				3			**89.2**		
	Mar-05	1.6	0	0	11.1	30.2	57.1	5.40	0.89
				1.6			**87.3**		
Technology helps in the self-evaluation of learning	Sep-04	0	0	4.5	25.8	62.1	7.6	4.63	0.67
				4.5			**69.7**		
	Mar-05	0	0	3.2	22.2	55.6	19	4.90	0.73
				3.2			**74.6**		

Scale: 1–3 are 'none', 'very poor' and poor' while 4–6 are 'sufficient', 'much' and 'very much'. Thus, the two aggregate summations (1–3) and (5–6) represent gross 'negative' or 'positive' perceptions.
$n_1 = 66$; $n_2 = 63$

ning and at the end of each of the 1st, 2nd, and 3rd terms. Once again, the March 2005 wave worked as a 'validator' to the September 2004 wave perceptions. The data show great consistency.

There was a slight downgrading of expectations during the initial period of studies (beginning to end-1st term). Thereafter, the motivation to pursue the course to the end increased over time (beginning-2nd and 3rd terms). This trend can be depicted as a U-shaped curve: an initial fall in motivation due to a first realisation of unforeseen difficulties, followed by enhanced skills in management of future goals as the students' self-efficacy and self-esteem increased as each hurdle was successfully overcome (see Figure 7).

It is worth mentioning that the slope of the initial decline — a 'diagram of resilience' — would be considerably enhanced had we surveyed those students who did not complete the course (about 20 students who abandoned studies during the initial period).

Curiously, the Barcelona students showed a more pronounced U-shaped curve. The initial decline in motivation was more dramatic and the retrieval of motivational levels followed a steady but smoother slope than that of their Portuguese counterparts (see Table IV).

In conclusion, we may summarise the extensive analysis of the survey data in 10 key ideas:

1. Professional development was the prime motivator of teachers (young and mid-career) to undertake lifelong learning graduate studies.

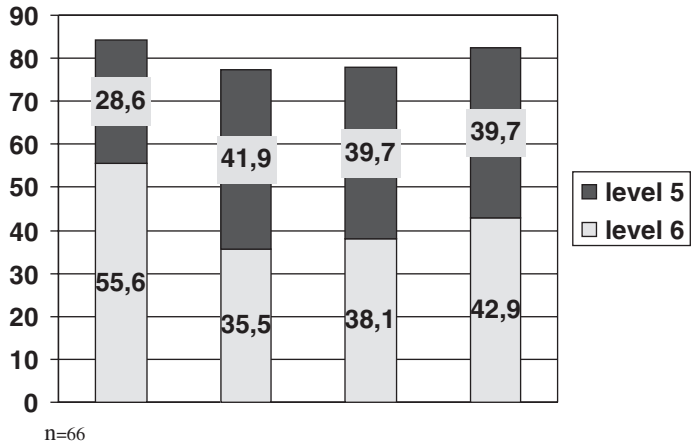

FIGURE 7. Motivation to complete the course (%)

TABLE IV. UCP-UB comparison on motivation timelines

	UCP (3rd wave)	UB (single survey)
Beginning	84.2 (28.6 + 55.6)	90.9 (63.6 + 27.3)
End 1st term	77.4 (41.9 + 35.5)	27.3 (18.2 + 9.1)
End 2nd term/1st year	77.8 (39.7 + 38.1)	27.3 (9.1 + 18.2)
End 3rd term / graduation	82.6 (39.7 + 42.9)	45.5 (18.2 + 27.3)

NB: Points are calculated as the sum of scores in levels 5 and 6.

2. Greater perception of accessibility and flexibility that are typical of eLearning and ODL played a key role in boosting attractiveness of studies.
3. Simple communication systems were crucial to create and sustain a high level of motivation to learn.
4. Preference of student teachers was skewed towards instant messaging/emails as collaborative tools. The use of forums followed an increasing trend over time as students became familiar with the tool and its ability to sustain virtual communities of practice.
5. Face-to-face 'traditional' methods were viewed as very effective, denoting an inclination to favour bLearning approaches instead of pure eLearning methods.
6. Good and high quality multimedia content was perceived as 'killer application' to learning effectiveness.
7. Notwithstanding the fact that over 80% were embarking on their first ODL experience, technology was never a barrier and the TELE gradually evolved into a 'natural learning environment'.
8. Respondents valued highly technology applications that assisted them in the self-assessment and evaluation of learning paths.
9. A primordial feature of the TELE in boosting motivation was its social learning features.
10. Students' motivation over time followed a U-shaped curve.

Conclusion

Explaining SRL and meta-motivation of teachers engaged in mid-career graduate education is the *leitmotiv* of the article. The strong technology setting present in a TELE constituted another relevant variable, particularly from a learner-centred instructional context inquiry.[5]

The main conclusions reached will have to be compounded against a backlog of difficulties that are typical of a first experiment in the application of eLearning on a vast scale to provide for advanced learning opportunities for practising teachers.

Our main conclusions can be clustered around seven findings:

1. Teachers sought professional development as their prime motivation to enrol in graduate education.[6] They sought gratification through (i) knowledge base expansion, especially in quality content and (ii) better career opportunities.
2. Technology can play an essential role in course attractiveness providing for increased accessibility (time and space) and flexibility in learning. The TELE rapidly evolved to become a 'natural learning environment', propitiating a gradual shift from process to outcome goals (Zimmerman & Kitsantas, 1997).
3. The TELE feature that was most valued by student teachers vis-à-vis motivation was social learning. Learners appeared to value opportunities supported by simple communication systems that were relevant to both virtual and real community building (instant messaging, email, forum, face-to-face sessions).[7]
4. Self-efficacy beliefs that sustained the intrinsic motivation to learn were highly dependent on the use of self-evaluative and monitoring tools that were readily available in the TELE.[8] A logical explanation stems from the belief that teachers' attributions of self-efficacy grow out of hetero-efficacy expectations (related to students) and that TELEs are reflective tools acting upon two dimensions that serve the purpose of self-efficacy boosting: self-monitoring (intrapersonal attributions) and peer interaction (interpersonal attributions).[9]
5. Teachers showed a preference for bLearning models that included regular 'traditional' sessions which they deemed instrumental to sustain collaborative learning.
6. The motivation timeline of students can be described as a U-shaped curve where initial enthusiasm was replaced by an immediate disenchantment, followed by a 'resilience' trend in conformity with the development of enhanced skills in future goals management.[10]
7. No evidence could be found to prove the hypothesis that the TELE *per se* could act as a prime determinant of knowledge acquisition.

In future research it will be necessary to monitor changes in classroom performance and teaching strategy as teachers tended to relate their professional practices to SRL skills acquired during their own graduate training. Moreover, TELEs should pay greater attention both to the development of students' SRL capabilities[11] and to the ways in which the TELE can motivate the student to learn and perform.[12]

Finally, it is worth mentioning that, in the context of lifelong learning, new research is needed to shed light on the extent to which TELEs can usefully drive 'learning to learn' efforts within transformed school cultures and teachers' attitudes.

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NOTES

1. Correspondence concerning this article should be addressed to Roberto Carneiro: rc@cepcep.ucp.pt.
2. Our research was conducted in the framework of TELEPEERS, a project on Self-Regulated Learning in Technology-Enhanced Learning Environments at University Level: a Peer Review. The project was carried out with the support of the European Commission (Grant agreement 2003-4710-/001-001 EDU-ELEARN).
3. The motivation questionnaires that were applied to our Lisbon and Barcelona students can be found at http://www.lmi.ub.es/telepeers/rcdocs/.
4. The TELESTUDENTS-SRL questionnaire can be found at http://www.lmi.ub.es/taconet/#. TELESTUDENTS-SRL is one of the two evaluating tools developed by Telepeers to investigate the students' point of view on the extent to which the TELE is instrumental in developing self-regulating skills.
5. 'Learned-centred instructional contexts, such as computer-supported collaborative inquiry, provide occasions for students to experience contextual control and regulation' (Salovaara & Järvelä, 2003, p. 272).
6. Simons *et al*. (2004)'s correlational studies provide empirical evidence on the relationship between usefulness of course and jobs (instrumentality) as a prime motivation factor and determinant of task orientation.
7. Bandura (1986, 1997) posited that social factors were prime determinants of self-regulation efforts during learning.
8. This finding is totally consistent with a triadic cyclical model of self-regulation with particular reference to its third phase where *self-reflection* is strongly contingent on *self-evaluative* practices and reciprocal feedback loops (Zimmerman, 1998, 2000; Zimmerman & Martinez-Pons, 1990).
9. Learner as 'scientist' and learner as 'judge' attributions (Tollefson, 2000; Weiner, 2000).
10. The underestimation of the commitment required by web-based learning is an important cause of early drop-out. The literature on insufficient perceptions of the effort required at the beginning of a TELE course is abundant. For other empirical evidence, see for instance Muse Jr. (2003), Persico & Delfino (2004), Delfino, Persico & Sarti (2004).
11. Self-regulation is woven into the narrative experiences and the identity of each individual and can be taught with explicit instruction, directed reflection and metacognitive discussions (Paris & Winograd, 2001).

12. TELEPEERS' major outcomes are TELE-SRL — a peer review tool designed and validated to measure the effectiveness of a TELE in supporting SRL — and TELESTUDENTS-SRL — a questionnaire to be used by students to evaluate the extent to which a specific TELE supports the self-regulation of their learning. Both tools can be found and downloaded at: http/www.lmi.ub.es/taconet/#.

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APPENDIX 1

Baseline Survey (January 2004)

1. Name: _____
2. Mail: _____@_____; 3. tel: _____ 4. mobile: _____

Residence:

Road: _____
Town: _____
District: _____

Place an 'x' in front of each option that corresponds to your personal situation.

Academic Background:			
	Degree in Computer Engineering or Informatics		
	Degree in Mathematics		
	Degree in Arts or Architecture		
	Degree in Modern Languages and Literatures		
	Degree in Physics or Chemistry		
	Other Degrees in Engineering		
	Degrees in Teaching:		
		Area of Science/Technology	
		Area of Languages and Literatures	
		Area of Sports	
		Other Degrees	
	Other Degrees:		
	Post-graduate studies in (area of .....)		
	Masters in (area of: .....)		

Professional activity:

	Teaching/Level of Education		
		Higher	
		Secondary and Basic II/III	
		Basic I/II	
	Public Administration or Local Administration		
	Private Company		
	Liberal (self-employed)		

Area of activity

	Teacher			
		Subject area	39	
			11	
			Other (which? .....)	
	Currently teaching			
	Serving in	school management board		
		other duties in public services		
	Engaged in other activities related to			
		informatics and with education/training		
		education and t.raining (exclusively)		
		informatics (exclusively)		
		none of the above-mentioned		
			Indicate area:	

How did you know about the masters course in which you enrolled?

	Ad in newspaper	
	Poster in school	
	Poster in the Catholic University	
	UCP web page	
	Online ad	
	Information via colleagues or friends	
	Other: (which?)	

Internet access — what do you use:

	Analogue modem	
	ADSL	
	Netcabo (cable)	
	Other (which?)	

Motivation that led you to enrol in the master course (indicate a maximum of 4 options — the most important)

	Interest for the theme of the course	
	Flexibility in time management to learn	
	Good references on the course	
	Price	
	Good references on the institution that offers the course	
	Not having to go to the university to attend classes	
	The technologies used in the course	
	Working with people with a different background or professional experience	
	Curiosity for distance learning	
	A more rapid career progression	
	Other motive: indicate which:	

APPENDIX 2

Mid-course surveys (September 2004 and March 2005)

Please answer the following questions stating your agreement/disagreement in a 1 to 6 scale, bearing in consideration the following correspondence:

1 — none	2 — very poor	3 — poor
4 — sufficient	5 — much	6 — very much

---

1. Is this the first time that you enrol in a distance learning course?

11	Yes	☐
12	No	☐

2. Your objective when enrolling in the Master course was:

	1	2	3	4	5	6
21. Professional upgrading / Career Progression	☐	☐	☐	☐	☐	☐
22. Improving knowledge and skills (Lifelong learning)	☐	☐	☐	☐	☐	☐
23. Investiment in university / academic career	☐	☐	☐	☐	☐	☐
24. Other: —	☐	☐	☐	☐	☐	☐

3. Your preference for this Master in Education Informatics was determined by:

	1	2	3	4	5	6
31. The fact that the curriculum content corresponded to the objectives that you pursued	☐	☐	☐	☐	☐	☐
32. The fact that the course is offered by UCP	☐	☐	☐	☐	☐	☐
33. The fact that the course is in a distance learning system	☐	☐	☐	☐	☐	☐
34. Other: —	☐	☐	☐	☐	☐	☐

4. Indicate which technologies/softwares had a stronger influence in your learning motivation:

	1	2	3	4	5	6
41. LMS Netforma	☐	☐	☐	☐	☐	☐
42. LMS Blackboard	☐	☐	☐	☐	☐	☐
43. Messenger (MSN, Yahoo, . . .)	☐	☐	☐	☐	☐	☐

5. Indicate the level of influence that the following functionalities or activities exercised on your learning motivation:

	1	2	3	4	5	6
51. Forums	☐	☐	☐	☐	☐	☐
52. Chats	☐	☐	☐	☐	☐	☐
53. e-mails	☐	☐	☐	☐	☐	☐
54. Face to face sessions	☐	☐	☐	☐	☐	☐

6. Indicate the level of influence that the following functionalities or activities exercised on your knowledge acquisition:

	1	2	3	4	5	6
61. Work in forums	☐	☐	☐	☐	☐	☐
62. Chat sessions	☐	☐	☐	☐	☐	☐
63. Utilization of multimedia content	☐	☐	☐	☐	☐	☐
64. Participation in face to face sessions	☐	☐	☐	☐	☐	☐

7. Reflect upon your learning experience during the Master course focusing in particular on the influence of technology on your learning performance. Choose the appropriate level for each of the following sentences:

	1	2	3	4	5	6
71. At the beginning technology disturbed my work	☐	☐	☐	☐	☐	☐
72. As time went by technology became a facilitator of my work	☐	☐	☐	☐	☐	☐
73. Collaborative learning was made more effective as familiarity with technologies developed	☐	☐	☐	☐	☐	☐
74. Today, technology is embedded into my 'natural' learning environment	☐	☐	☐	☐	☐	☐

8. In your opinion, do 'technology-enhanced' contexts help the student in:

	1	2	3	4	5	6
81. The management of learning effort, resources and time	☐	☐	☐	☐	☐	☐
82. Self-regulating learning motivation	☐	☐	☐	☐	☐	☐
83. Creating and participating in learning communities	☐	☐	☐	☐	☐	☐
84. Self-assessing own learning path and performance	☐	☐	☐	☐	☐	☐

9. Your motivation to conclude successfully the Master course in Education Informatics was:

	1	2	3	4	5	6
91. At the beginning of the course	☐	☐	☐	☐	☐	☐
92. At the end of the 1st trimester	☐	☐	☐	☐	☐	☐
93. At the end of the 2nd trimester	☐	☐	☐	☐	☐	☐
94. At the end of the 3rd trimester	☐	☐	☐	☐	☐	☐

APPENDIX 3

Guidelines for interviews and online forum discussions
(November 2004 to March 2005)

1. Please comment on the influence of technology-enhanced environments on your student behaviour, namely at the level of:
   a. Motivation to learn;
   b. Management of learning time;
   c. Self-assessment of learning path and performance.

2. MSN is a functionality used by a majority of students to achieve synchronous communication. In your opinion this is due to:
   a. Habit / being a current day to day tool;
   b. Trust in interlocutors;
   c. Simplicity and robustness;
   d. Appeal of communicating in a playful way.

3. Communicating via e-mail was elicited as one of the most popular work tools, greater in use to forums and chats. In your opinion, this is due to:
   a. Familiarity/habit in the use of e-mail;
   b. Feeling of security in private communications;
   c. Notion that expected results are identical to those obtained using other communication tools.

4. Work in forums rank high in importance. Do you feel that some of the following points are good explanatory factors?
   a. Because they are natural collaborative work environments;
   b. Because they facilitate communication between students and tutors;
   c. Because they can evolve easily from a simple means of communication to a potent learning environment.

5. In an ODL / e-Learning model how does the use of multimedia content rate in relation to other learning resources, such as scientific articles, online discussions, mailing lists, joint activities, etc.

6. Does the fact that content is more interactive and lay-outs more attractive have a primordial importance for the effectiveness of a TELE (such as Education Informatics)? Or do you rate more importantly the training strategy adopted by the university?