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An e-teaching inventory for blended environments in undergraduate higher education (0163)

The use of e-learning to enhance the learning experience of 'conventional' campus-based undergraduate students has become a regular practice in most universities (Ellis & Goodyear, 2010; Laurillard, 2008). Accordingly, researchers working on *relational* research on learning and teaching in higher education have extended their work by studying students and teachers' experiences of blended learning. Regarding students, research – which have been conducted in a variety of educational settings (discussions, PBL, case-based learning, scientific writing, etc.) and in different disciplines (social sciences, engineering, pharmacy, vet sciences, science) – has suggested that cohesive conceptions and deep approaches (both face-to-face and online) are associated, and lead to a higher level of academic achievement. Also, perceptions of the learning situation would have an impact on how students approach learning when using digital technology: positive perceptions would promote deeper approaches (see e.g., Bliuc, Ellis, Goodyear, & Piggott, 2011; Ellis, Goodyear, Brillant, & Prosser, 2008; Ellis, Goodyear, Calvo, & Prosser, 2008; Ellis, Goodyear, Prosser, & O'Hara, 2006; Ellis, Marcus, & Taylor, 2005; Goodyear & Ellis, 2008; Goodyear, Jones, Asensio, Hodgson, & Steeples, 2005). On the teaching side, studies have shown a high level of consensus of findings, suggesting that teachers' experiences range from e-learning seen as a medium to provide information to a medium for engaging in communication, collaboration and knowledge building (see e.g., Ellis, Hughes, Weyers, & Riding, 2009; Ellis, Steed, & Applebee, 2006; González, 2010; Lameras, Levy, Paraskakis, & Webber, in press; Lameras, Paraskakis, & Levy, 2008; McConnell & Zhao, 2006). These studies have mainly employed interviews and questionnaires for data gathering. In so doing, questionnaires for students have been developed or adapted (Ellis, Ginns, & Piggott, 2009; Ginns & Ellis, 2009). However, no questionnaire has been developed, within this *relational* line of research, to gather information on teachers' experiences of e-learning. The research reported here is aimed to bridge this gap by developing and testing a novel questionnaire on "approaches to e-teaching".

Methods

The "approaches to e-teaching" questionnaire was devised based on a previously conducted qualitative study (González, under review). It identified three approaches to e-teaching: one with a focus on information transmission, one with a focus on online communication, and one with a focus on collaboration and knowledge building. An original set of about 70 items was developed. Expert judgement was iteratively sought from expert university teachers. Also, those who participated in the qualitative study as interviewees were requested to provide their opinions. A version of the "approaches to e-teaching" together with the well known "approaches to teaching inventory" (ATI, Prosser & Trigwell, 2006) was sent through an online platform to university teachers from one Australian and one Chilean university.

Teachers were asked to answer the questionnaires thinking of one campus-based unit of study which employed e-learning to enhance the undergraduate students' experience of learning. 147 university teachers answered. An exploratory factor analysis was conducted to test the hypothetical scale structure, Cronbach's alpha was calculated for each scale to test reliability, correlation analysis was carried out to see how approaches to e-teaching were associated to approaches to teaching; finally, a cluster analysis was employed to identify qualitatively different approaches to teaching when e-learning is involved

Results

Exploratory factor analysis of the "approaches to e-teaching" questionnaire

A principal components analysis using Varimax rotation was carried out to test the hypothetical structure of the "approaches to e-teaching" questionnaire. A three factor solution, based on eigenvalues 5.5, 3.4 and 2.5; which explains 63.3% of the variance, emerged. When the factor loading cut off was set at .3, item "I see the LMS, and/or other online tools or resources, as a medium to support students' group work" cross loaded with the CF scale; and item "In online discussions, students are encouraged to reflect and apply what they are learning to their own experiences" cross loaded with the CKBF scale.

Table 1: Factor loadings of 18 items by principal components analysis

Item	CKBF	CF	IF
I see the LMS, and/or other online tools or resources, as a medium for the students to collaboratively develop their group projects.	.848	.125	.008
The LMS, and/or other online tools or resources, is good for fostering group work; as it gives students a space to keep track of project advances, search and store materials, and communicate in relation to their projects.	.831	.097	-.014
Students' groups make their projects available online so they can learn from each other.	.800	.163	.098
I give students the task of creating online content, such as blogs or wikis, etc.	.751	.139	.024
I see the LMS, and/or other online tools or resources, as a medium to support students' group work	.652	*.318*	-.151
In this unit, students have online space for storing drafts, papers, resources that they are using in their group work.	.606	.077	.221
In this unit of study I encourage active student participation in online discussions, as they promote deep thinking.	.177	.922	.004
I included online discussions with the aim of encouraging students to share reflection and thinking about what they are learning with their peers.	.151	.867	-.037
In this unit, online discussions may help students debate and exchange ideas.	.022	.816	.088
I use online discussions to provoke debate, so students can practice developing and supporting arguments.	.259	.711	.010
Online discussions are used in this unit as follow-up tutorial discussions.	.043	.684	.115
In online discussions, students are encouraged to reflect and apply what they are learning to their own experiences.	*.445*	.680	.000

Item	Factor		
	CKBF	CF	IF
In this unit, handouts, tutorial guides and/or other academic materials are uploaded to the LMS, and/or other online tools or resources.	-.065	-.022	.843
I think the LMS, and/or other online tools or resources, is good to upload resources as they are developed or become available during the semester.	.233	.067	.821
The LMS, and/or other online tools or resources, allows me to keep students updated about things happening during the semester: changing times or rooms, invited speakers, future activities, etc.	.267	-.155	.728
The unit´s outline is available online for students.	-.190	.118	.725
Information about important unit dates, such as, assignment deadlines, exam dates, etc is available in the LMS, and/or other online tools or resources.	-.148	.157	.691
The LMS, and/or other online tools or resources, makes providing administrative information to students easier.	.186	.003	.687

n=147. KMO= .78; Barlett's test statistically significant, χ^2 = 1559,036. Eigenvalues 5.5, 3.4 and 2.5. 63.3% variance explained
IF=Information Focused; CF: Communication Focused; CKBF: Collaboration-knowledge building Focused.

Associations amongst university teachers' approaches to teaching and approaches to e-teaching

Results presented in table 2 show the following. Firstly, there are no significant correlations between the ITTF scale and the scales of the "approaches to e-teaching" questionnaire. Secondly, there are significant positive correlations between the CCSF scale and the IF (r =.187), CF (r =.206) and CKBF (r =.168) scales. Thirdly, there is a positive significant correlation between the CF and the CKBF scales (r = .411).

Table 2: Correlations between approaches to teaching and approaches to e-teaching

Variables	ITTF	CCSF	IF	CF	CKBF
Approaches to teaching					
1. Information Transmission/Teaching Focused (ITTF) (α = 0.76)	1	.031	.065	-.143	-.038
2. Conceptual Change/Student Focused (CCSF) (α = 0.71)		1	.187*	.206*	.168*
Approaches to e-teaching					
3. Information Focused (IF) (α = 0.89)			1	-.008	.138
4. Communication Focused (CF) (α = 0.81)				1	.411**
5. Collaboration/Knowledge Building Focused (CKBF) (α = 0.86)					1

n=147. *p<0.05 (two tailed); **p<0.01 (two tailed)

From table 2, it is also possible to see that Cronbach´s alpha scores are very good: IF, α = 0.89; CF, α = 0.81; and CKBF, α = 0.86.

Table 3 presents the results of a cluster analysis carried out to look for different experiences of teaching when e-learning is involved. A two-cluster solution emerged as a parsimonious and theoretically coherent description of the identified groups. The first cluster is composed by 90 university teachers. This group can be characterised as having a high score in the ITTF scale and relatively low scores in the CCSF, IF, CF and CKBF scales. It suggests an orientation towards transmissive teaching with very little involvement with e-teaching. In contrast, the second cluster, composed by 56 university teachers, presents a relatively low score in the ITTF scale and relatively high scores in the CCSF, IF, CF and CKBF scales. It suggests an orientation towards student learning and relevant use of digital learning technology.

Table 3: Mean standardised scores and standard deviation of the subscales of the questionnaires ATI and approaches to e-teaching

Variables	Cluster 1 (n=90)		Cluster 2 (n=56)	
	M	SD	M	SD
Approaches to teaching				
Info. transfer/T. Focused*	3.56	1.02	-.59	.64
Con. change/S. Focused*	-.02	1.15	.03	.72
Approaches e-teaching				
Information Focused*	-.14	1.09	.23	.80
Communication Focused*	-.26	1.06	.42	.74
Collaboration/K. Building Focused*	-.47	.78	.75	.80

n=147. *indicates statistically significant differences between clusters (p<0.00)

Discussion and conclusion

The results presented here are the first testing of a novel inventory on "approaches to e-teaching". There are four important issues emerging from these findings. In the first place, it identified three underlying factors related to e-teaching, which were coherent with the qualitative study from where items of the "approaches to e-teaching" questionnaire were devised. In the second place, reliability scores are very good for the scales. It provides a strong measure of their internal consistency. In the third place, at the variable level, significant correlations can be interpreted as follows: attention need to be paid to teaching in general when considering the use of e-learning in teaching, as it seems there is a coherent approach both when teaching face-to-face and online. In the fourth place, at the level of groups of teachers, differences showed two qualitatively different experiences: one group is oriented towards transmissive teaching with very little involvement with e-teaching; and the other is oriented towards learning focused approaches to teaching and advanced e-learning use. These results have important implications for research and practice. Regarding research, further studies testing the validity and reliability of the novel questionnaire are needed. At the

same time, it may be used for e-learning research. For example, clarifying whether there are disciplinary differences in e-teaching, inquiring associations between teachers and students approaches to teaching and learning in blended environments, or exploring the role of e-learning training in changing approaches to e-teaching. In relation to practice, findings presented here have important implications. Both the results of correlation and cluster analyses suggested that, for significant use of digital technology, student focused approaches to teaching are needed. If this is correct, e-learning academic development programs should emphasise this kind of approach for a coherent student focused approach to blended teaching to emerge.

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