

E-Teaching in Undergraduate University Education and Its Relationship to Approaches to Teaching

Carlos GONZÁLEZ

*Faculty of Education, Pontificia Universidad Católica de Chile
Av. Vicuña Mackenna 4860, Macul, Santiago, Chile
e-mail: cgonzalu@uc.cl*

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Abstract. While researchers working within the *Student Learning Research* framework have developed or adapted questionnaires to gather information on students' experiences of blended learning, no questionnaire has been developed to enquire about teachers' experiences in such learning environments. The present article reports the development and testing of a novel questionnaire on 'approaches to e-teaching', which may be employed to investigate the experience of teaching when e-learning is involved. Results showed suitable reliability and validity. Also, when exploring associations between the novel questionnaire scales and those of the well-known 'approaches to teaching' inventory (Prosser and Trigwell, 2006), results from correlation and cluster analyses suggest that student-focused approaches to teaching are needed for significant use of digital technology to emerge. For practice, this relevant outcome implies that teaching needs to be considered holistically when supporting teachers to incorporate e-learning in their practice: because it seems they approach online teaching coherently with the face-to-face side of the blended experience.

Keywords: e-teaching, approaches to teaching, e-learning, higher education.

1. Background

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 and Goodyear, 2010; Laurillard, 2008). Accordingly, researchers working within the framework of *Student Learning Research* (Entwistle, 2007; Prosser and Trigwell, 1999; Ramsden, 2003) have extended their work by studying students' and teachers' experiences of blended learning (for example, Ellis and Goodyear, 2010). On the students' side, research has been conducted on conceptions of learning, approaches to study and expectations of networked learning experiences (Goodyear *et al.*, 2003, 2005; Zenios *et al.*, 2004), learning through online and face-to-face discussions (Bliuc *et al.*, 2010, 2011; Ellis *et al.*, 2008, 2006, 2007), enquiry-based learning using e-learning (Ellis *et al.*, 2008, 2005), learning science through writing using digital tools (Ellis, 2006), online peer assessment (Yang and Tsai, 2010), associations between approaches to studying and e-learning (Ellis *et al.*, 2009), and perceptions of the situation when e-learning is part of the learning experience (Ginns and Ellis, 2009). These studies – which have been conducted in settings using a variety of educational approaches (discussions, problem-based learning, case-based

learning, scientific writing, etc.) and in different academic disciplines (social sciences, engineering, pharmacy, vet sciences, science) – have suggested that cohesive conceptions and deep approaches (both face-to-face and online) are associated, and lead to a higher level of academic achievement. On the other hand, fragmented conceptions and surface approaches (both face-to-face and online) are associated to, and lead to, lower levels of academic achievement. Also, perceptions of the learning situation would have an impact on how students approach learning when using digital technology in blended environments. Positive perceptions would promote deep approaches; while negative perceptions would promote surface approaches.

On the teachers' side, research has been carried out on conceptions of teaching using e-learning (González, 2010; Lamerás *et al.*, 2007; McConnell and Zhao, 2006; Zhao *et al.*, 2009); conceptions of, and approaches to, teaching face-to-face and online (Lamerás *et al.*, 2012; Roberts, 2003); teachers' conceptions of learning through online discussion (Parisio, 2010); and conceptions of learning technology and approaches to design (Ellis *et al.*, 2009, 2006). These studies have shown consensus in their findings. It has been suggested 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. From the information-focused perspective, university teachers employ e-learning as a medium to provide information to students mainly in the form of lecture notes and online resources. It is understood as a delivery medium rather than a space for learning. Also, this view does not consider e-learning as a key and integrated part of the learning experience. From the communication-collaboration-knowledge building focused perspective, e-learning is seen as a medium to engage in discussing, debating, developing understanding and building knowledge. In this case e-learning is employed as a space for engaging in learning tasks and activities. In contrast to the previously described approach, e-learning appears as a key integrated element of the learning experience.

The above described studies have mostly employed interviews and questionnaires for data gathering. Interviews have typically been conducted following a phenomenographic approach (Bowden and Walsh, 2000). Questionnaires have been adapted from the widely employed 'Study Process Questionnaire' (Biggs *et al.*, 2001) and 'Course Experience Questionnaire' (Richardson, 2009). Also, a new scale for the 'Course Experience Questionnaire', specifically related to e-learning, has been developed and tested (Ginns and Ellis, 2009); and a novel questionnaire has been developed to evaluate students' perceptions of e-learning (Ellis *et al.*, 2009). However, no questionnaire has been developed or adapted within the *Student Learning Research* framework to gather information on university teachers' experiences teaching when e-learning is involved. This is a current limitation of this line of research since it is not possible to extend its findings to more widely explore experiences of teachers using e-learning or associations between this phenomenon and other related ones, such as approaches to teaching face-to-face or perceptions of the teaching environment. Prior research on teaching in 'traditional' settings has investigated similar issues providing relevant findings, which have, in turn, been employed for academic development. Similarly, at present is not possible to enquire into associations between students and teachers' approaches to blended learning environments.

In the past, how students approach learning has been related to how teachers approach teaching (see, e.g., Trigwell *et al.*, 1999), with important theoretical and practical implications. Having a questionnaire on approaches to teaching using e-learning could help to investigate these topics, with potentially positive implications for the practice and development of teaching in blended environments. The study reported here aims at bridging this gap by presenting the development and testing of a novel questionnaire on approaches to e-teaching.

2. Methods

2.1. Development of the 'Approaches to E-Teaching' Questionnaire

The 'approaches to e-teaching' questionnaire was devised based on a previously conducted qualitative study on approaches to e-teaching, approaches to teaching, and perceptions of the teaching situation when e-learning is involved (González, 2010). The study 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 sought from university teachers who were, at the time, involved in e-learning research and development projects. They provided written feedback on the relevance, scale structure, and wording of the items. This was collated and analysed, which led to a reduction in the number of items and the rewording of some of the remaining. This draft questionnaire was then sent to interviewees who participated in the above mentioned qualitative study. The aims of this step were to verify that the inventory was able to capture the approach to e-teaching they had described in their interviews and to receive their feedback and comments. This step confirmed that there was congruence between the questionnaire and what this group of teachers previously described in the interviews. A second expert judgement was then sought from three different university teachers. Professional judgement was requested to see whether judges allocated each item to the scale to which it belonged in the proposed design. In this way it was possible to check if the intended structure was likely to reflect the variation in experiences of e-teaching the questionnaire intended to capture. This stage showed that the structure of the questionnaire, representing the three broad approaches to e-teaching, was clear for the judges.

2.2. Data Gathering

A version of the novel 'approaches to e-teaching' questionnaire, together with the well known 'approaches to teaching inventory' (ATI; Prosser and 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 as part of the regular undergraduate student learning experience. 147 usable questionnaires were answered.

2.3. Analysis

The following analyses were carried out: descriptive statistics were run; including mean, standard deviation and percentage of responses for each item. These items were hypothetically grouped into scales based on results of the previously conducted interview-based study. Next, an exploratory factor analysis was carried out to test the hypothetical scale structure. Then, based on outcomes from factor analysis, scale scores were constructed and a reliability analysis, using Cronbach's alpha, was conducted. A correlation analysis was employed to see how the identified approaches to e-teaching were associated to approaches to teaching. Finally, a cluster analysis was conducted to identify qualitatively different approaches to teaching when e-learning is involved.

3. Results

3.1. Descriptive Statistics for the Items of the 'Approaches to E-Teaching' Questionnaire

Table 1 presents mean, standard deviation and percentages of responses for the items of the novel questionnaire.

These results show that the 'information focused' (IF) approach items attracted widespread agreement, ranging from 73% to 97%; while the items associated to the 'communication focused' (CF) and 'collaboration-knowledge building focused' (CKBF) approaches presented relatively low levels of agreement. Remarkably, items related to provide academic information to students are the ones with higher agreement percentages ("Information about important unit dates, such as, assignment deadlines, exam dates, etc., is available in the LMS, and/or other online tools or resources"; "In this unit, handouts, tutorial guides and/or other academic materials are uploaded to the LMS, and/or other online tools or resources"; and "The unit's outline is available online for students"). On the other hand, items related to activities which seem to generate more work for the teachers ("Online discussions are used in this unit as follow-up tutorial discussions"; and "I use online discussions to provoke debate, so students can practice developing and supporting arguments") present high levels of disagreement. Items related to creative students' work presented through the web ("I give students the task of creating online content, such as blogs or wikis, etc."; "In this unit, students have online space for storing drafts, papers, resources that they are using in their group work"; and "Students' groups make their projects available online so they can learn from each other") also present very high levels of disagreement. In general, these results may suggest that, for the surveyed group of teachers, digital learning technology tools are used mostly in its transmissive form.

3.2. Principal Components Analysis of the Approaches to E-Teaching Questionnaire

A principal components analysis using Varimax rotation (Thompson, 2004) was carried out to test the hypothesised structure of the 'approaches to e-teaching' questionnaire. This is presented in Table 2.

Table 1
Descriptive statistics for the items of the 'approaches to teaching' questionnaire

Item	Mean	SD	Likert scale response (%)		
			Disagree	Neutral	Agree
Information focused approach items					
The LMS, and/or other online tools or resources, makes providing administrative information to students easier.	3.96	1.41	21	6	73
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.	4.07	1.22	13	11	76
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.	3.99	1.41	20	3	77
Information about important unit dates, such as, assignment deadlines, exam dates, etc is available in the LMS, and/or other online tools or resources.	4.36	1.16	11	2	87
In this unit, handouts, tutorial guides and/or other academic materials are uploaded to the LMS, and/or other online tools or resources.	4.60	.88	6	1	93
The unit's outline is available online for students.	4.79	.65	3	0	97
Communication focused approach items					
In this unit, online discussions may help students debate and exchange ideas.	2.62	1.40	53	19	28
In this unit of study I encourage active student participation in online discussions, as they promote deep thinking.	2.49	1.41	60	10	30
Online discussions are used in this unit as follow-up tutorial discussions.	1.99	1.61	78	6	16
I included online discussions with the aim of encouraging students to share reflection and thinking about what they are learning with their peers.	2.27	1.44	66	10	24
In online discussions, students are encouraged to reflect and apply what they are learning to their own experiences.	2.48	1.48	55	21	24
I use online discussions to provoke debate, so students can practice developing and supporting arguments.	1.80	1.34	70	14	16
Collaboration-Knowledge building approach items					
I see the LMS, and/or other online tools or resources, as a medium to support students' group work.	3.20	1.48	41	12	47
Students' groups make their projects available online so they can learn from each other.	2.08	1.32	74	8	18
I see the LMS, and/or other online tools or resources, as a medium for the students to collaboratively develop their group projects.	2.63	1.49	51	19	30
I give students the task of creating online content, such as blogs or wikis, etc.	1.62	1.05	87	6	7
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.	2.60	1.46	52	17	31
In this unit, students have online space for storing drafts, papers, resources that they are using in their group work.	1.80	1.22	76	10	14

$N = 147$

Table 2
Factor loadings of 18 items by principal components analysis

Item	Factor		
	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
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

$N = 147$, $KMO = .78$; Bartlett's test statistically significant, $X^2 = 1559,036$. Eigenvalues 5.5, 3.4 and 2.5. 63.3% variance explained.

A three-factor solution based on eigenvalues 5.5, 3.4 and 2.5; which explain 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 approach 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 approach scale.

3.3. Reliability Analysis

Results of reliability analysis for the scales of the ‘approaches to e-teaching’ questionnaire are presented in Table 3. Following criteria developed by DeVellis (2003), Cronbach’s alpha scores are very good for the scales of the novel questionnaire: IF, $\alpha = .81$; CF, $\alpha = .89$; and CKBF, $\alpha = .86$.

3.4. Associations Amongst University Teachers’ Approaches to Teaching and Approaches to E-Teaching

A correlation analysis was carried out investigate associations between the novel questionnaire and the well-known ATI (Prosser and Trigwell, 2006). Results presented in Table 4 show the following. First, there are no significant correlations between the ITTF

Table 3

Reliability estimates for the scales of the ‘approaches to e-teaching’ questionnaire. Cronbach’s alpha and 95% confidence intervals

Scales	Number of items	Cronbach’s coefficient alpha
Information Focused scale (IF)	6	.81 (95%CI .756 – .855)
Communication Focused scale (CF)	6	.89 (95%CI .861 – .918)
Collaboration-Knowledge Building Focused scale (CKBF)	6	.86 (95%CI .827 – .896)

$N = 147$

Table 4

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)	1	.031	.065	-.143	-.038
2. Conceptual Change/Student Focused (CCSF)		1	.187*	.206*	.168*
Approaches to e-teaching					
3. Information Focused (IF)			1	-.008	.138
4. Communication Focused (CF)				1	.411**
5. Collaboration/Knowledge Building Focused (CKBF)					1

$N = 147$. * $p < 0.05$; ** $p < 0.01$

Table 5

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 ($n = 56$)		t -test	p
	M	SD	M	SD		
Approaches to teaching						
Info. transfer/T. Focused	3.56	1.02	-.59	.64	6.866	.000
Con. change/S. Focused	-.02	1.15	.03	.72	-.302	ns
Approaches e-teaching						
Information Focused	-.14	1.09	.23	.80	-2.212	.050
Communication Focused	-.26	1.06	.42	.74	-4.559	.000
Collaboration/K. building Focused	-.47	.78	.75	.80	-9.190	.000

$N = 147$.

scale and the scales of the approaches to e-teaching questionnaire. Second, there are low significant positive correlations between the CCSF scale and the IF ($r = .187$), CF ($r = .206$) and CKBF ($r = .168$) scales. Third, there is a positive significant correlation between the CF and the CKBF scales ($r = .411$).

Table 5 presents the results of a hierarchical cluster analysis using the Ward's technique (Hair, 1998) 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 of 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. The scores suggest an orientation towards transmissive teaching with very little involvement with e-teaching. In contrast, the second cluster, composed of 56 university teachers, presents a relatively low score in the ITTF scale and relatively high scores in the CCSF, IF, CF and CKBF scales. The scores suggest an orientation towards student learning and relevant use of digital learning technology. The only variable not significant in the t -tests was the CCSF approach.

4. Discussion and Conclusion

This study had the purpose of developing a questionnaire focused on university teachers' approaches to e-teaching. This would allow the extension of current research on blended learning from a *Student Learning Research* perspective. Results suggest that, in principle, the novel questionnaire would be suitable to this purpose. Three underlying factors related to e-teaching were identified and these were coherent with the qualitative study from where items were devised. Additionally, reliability scores were very good for the scales, which provided a strong measure of the scales' internal consistency. When considering associations between variables, low significant positive correlations were found

between the CCSF scale and all the 'approaches to e-teaching' questionnaire scales. The final relevant result is that, at the level of groups of teachers, two qualitatively different experiences emerged: one group oriented towards transmissive teaching with very little involvement with e-teaching; and the other oriented towards learning focused approaches to teaching and significant e-learning use.

The outcomes of this investigation allow a few conclusions to be made. The first two findings suggest that the proposed questionnaire is preliminarily suitable as an instrument for gathering data on teachers' approaches to e-teaching. Therefore, it may allow for the exploration of experiences of teachers using e-learning in samples bigger than the qualitative studies conducted so far (for example, Lameris *et al.*, 2012; Zhao *et al.*, 2009). In this way, associations between e-teaching and other related phenomena, such as approaches to teaching in face-to-face settings or perceptions of the teaching environment, will be possible to enquire into a wider group of teachers. At the same time, it may allow the investigation of how teaching and learning are related in contexts where e-learning is part of the regular on-campus experience. In the past research with a similar focus, conducted in face-to-face settings, has helped develop university teachers' practice and align academic policies to quality learning experiences (for example, Ginns *et al.*, 2008; Postareff *et al.*, 2008; Trigwell *et al.*, 1999). Research such as the one proposed here may help to shed light on similar issues for the context of blended teaching. On the other hand, both the results of correlation and cluster analyses suggested that, for significant use of digital technology to emerge, student-focused approaches to teaching are needed. This can be interpreted as follows: attention needs to be paid to teaching holistically when considering the use of e-learning in teaching, as the results presented in this article suggest a coherent approach when teaching face-to-face and online. If this is correct, training in 'technical skills' would not be enough for realising digital technology potential in teaching. It implies e-learning related academic development should emphasise student-focused approaches both face-to-face and online when supporting teachers who face teaching in blended learning environments.

Finally, it is important to acknowledge the limitations of the present study. While the results suggest that the novel questionnaire is suitable for investigating university teachers' approaches to e-teaching, it is important to mention that the sample employed for testing its properties was small and came from only two universities. Therefore, replications in other universities, with bigger samples, are needed. Besides, it is important to highlight that the questionnaire reflects what emerged from a qualitative study on teachers' approaches to e-teaching, approaches to teaching, and perceptions of the teaching situation when e-learning is involved. This implies that other uses of digital technology in teaching (e.g., simulations) cannot be captured by the current version of the 'approaches to teaching' questionnaire.

In summary, taking into account the limitations of the present study, it is possible to state that the 'approaches to e-teaching' questionnaire may be considered, preliminarily, as a relevant tool for investigating teachers experiences of teaching using e-learning. For research, this would allow investigations in wider samples of teachers, focusing on the associations between phenomena and extending what is already known in this area from

a *Student Learning Research* perspective. For practice, this would allow the alignment of academic development with the promotion of a holistic student-focused approach to blended learning, which, in turn, may have a positive impact in how university teachers incorporate e-learning in their teaching. Also, further testing and development is required for a stronger questionnaire to emerge.

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C. González is an assistant professor and director of research at the Faculty of Education, Pontificia Universidad Católica de Chile. He obtained a PhD in education from the University of Sydney and spent time as postdoctoral researcher at the Institute of Education, University of London. His research areas are e-learning and university teaching and learning. He has been involved in research projects funded by the Australian Learning and Teaching Council, the Chilean Council for Science and Technology, the Chilean Ministry of Education and the Chilean National Council of Education.

El. mokymas universitetinėse bakalauro studijose ir jo sąryšis su mokymo metodais

Carlos GONZÁLEZ

Pastaruoju metu išsamiai nagrinėjamas studentų mokymasis, jam tirti kuriami ar pritaikomi klausimynai apie studentų mokymosi patirtį, tačiau nėra kuriama klausimynų, skirtų tirti mokytojų patirtį el. mokymo kontekste. Straipsnyje pristatomas naujo klausimyno, skirto tyrinėti mokytojų patirtį, kai įgyvendinamas el. mokymas, kūrimas ir testavimas. Sukurtas klausimynas gali būti pritaikytas mokytojų patirčiai el. mokymo kontekste. Rezultatai rodo pakankamai gerą patikimumą ir validumą. Tyrinėjant asociacijas tarp naujojo klausimyno skalių ir gerai žinomų priemonių (Prosser ir Trigwell, 2006), klasterizacijos ir koreliacijos analizės rezultatai rodo, kad siekiant labiau studentams pritaikyto mokymo reikia reikšmingiau panaudoti skaitmenines technologijas. Žvelgiant iš praktinių pozicijų, rezultatai rodo, kad mokymas turi būti suprantamas kaip holistinis procesas, kai mokytojams taip pat padedama integruoti el. mokymąsi.