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Geoffrey Crisp, Di Thiele, Ingrid Scholten, Sandra Barker, Judi Baron

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FACTORS IMPACTING ON THE ADOPTION AND USE OF WEB-SUPPORTED TEACHING BY ACADEMIC STAFF

Susan J. Shannon

School of Architecture, Landscape Architecture and Urban Design
and Learning and Teaching Development Unit
The University of Adelaide, AUSTRALIA
susan.shannon@adelaide.edu.au

Loene Doube

Learning and Teaching Development Unit
The University of Adelaide, AUSTRALIA
loene.doube@adelaide.edu.au

Abstract

In 2002-03 the University of Adelaide funded a study into factors impacting on the adoption and use of web-supported teaching in this research intensive University. The University was committed to continuing face-to-face teaching, aided by web-supported teaching. The study included the beliefs and values about web-supported teaching and learning among three groups of University of Adelaide teaching staff:

- *those who had never used web-supported teaching*
- *those who had adopted the University centrally supported Learning Management System (MyUni)*
- *those who had adopted other web-based learning systems or platforms*

The reflections of these groups on what would be required to develop their use of MyUni and, for users of other systems, to migrate their courses to MyUni, were encompassed. For those who had used web-supported teaching their observations in relation to the impact of web-supported teaching on their students and on their own teaching were canvassed. Interviews and a survey were conducted. The findings were that more staff valued computers in higher education than were using them, and more staff valued web-based learning in higher education than were adopting it. The principal reasons given were time and workload and staff conceptions of University teaching.

Introduction

The University of Adelaide has devoted considerable time, money and expertise to selecting and developing an online learning and teaching platform from 2001. The University trialled the enterprise-level online learning system Blackboard version 5.0 (Blackboard Inc 1997-2000) through a pilot project titled 'PLATO' (Providing Learning and Teaching Online) in 2001. The scope of the pilot project was extended from 19 online courses in Semester 1 to 98 in Semester 2 2001. A decision was made in December 2001 to adopt Blackboard 5.5.1 as the University's online learning system, and a target was set to provide an online component for all courses in 2002 through 'MyUni', which mediates student access to courses based on enrolment data held within the University's PeopleSoft student administration system. The term 'MyUni' was adopted as a label for the various online services provided. In Semester 2 2002

there were 2695 courses listed in the MyUni course catalogue in which students were enrolled and 11% were populated with content in addition to that automatically uploaded by the University administration. In Semester 1 2003 this had risen to 16% of courses.

In spite of ambitious targets for students accessing courses online (Ellis, 2002), support from senior management and substantial investment, the potential benefits to staff and students from using MyUni continued to remain largely unrealised in mid-2003. An underlying premise of the University's funding of the current research study was that senior management supported the widespread adoption of the University-mandated and centrally supported content creation and course management system (MyUni) in addition to the continuation of face-to-face teaching.

The research question

The initial focus of the research project was to identify barriers to the adoption of MyUni by academic staff at the University of Adelaide. From the literature review and interviews it was evident that issues concerning not only the initial *adoption* of web-supported teaching but also its *development and use* were important to teaching staff. Indeed it became clear that 'adoption' was not something that occurred as a one-off event, and that academics' use of web-supported teaching tools involved ongoing decisions about the extent and depth of their use of these tools. There was a complex web of 'barriers' and 'motivators' that influenced these decisions. Thus the research question that motivated the development of the survey instrument and interviews was in two parts:
- What are the factors that influence the adoption and further use of web-supported teaching by teaching staff at the University of Adelaide?
- How can University decision-making be informed by these factors?

Review of Literature

As the research focus was to identify factors that have influenced the adoption and use of web-supported teaching by academic staff at the University of Adelaide, the initial focus in reviewing the literature was on factors that were important to individuals. This also uncovered institutional factors, which in most instances related to concerns and issues that individual academics expressed. Whilst there is little information relating to the adoption and use of web-supported teaching at the University of Adelaide, there are many studies on the factors that affect the adoption and use of web teaching tools in the school, vocational education and training, and higher education sectors. Several studies or reviews canvass a range of issues in these sectors (for example, McNaught, Phillips, Rossiter and Winn (2000) and Schifter (2000) in universities; Brennan, McFadden and Law (2001) in VET and higher education; and Dooley (1999) in schools).

McNaught et al (2000) used five case studies to investigate factors that supported or inhibited the uptake of computer-facilitated learning (CFL) in Australian universities. The factors included:
- issues that related to policy and the management of policy change
- issues related to personal motivation of staff to use CFL, staff rewards, incentives, recognition and time, attitudes such as 'not invented here'
- teaching and learning models (the nature of the course, experience with distance mode, attachment to traditional teaching modes)
- support issues including IT, library and administrative infrastructures, provision of support staff, leadership, educational and instructional design support
- professional development and training for staff
- lack of time (even if otherwise motivated)
- lack of knowledge, IT literacy
- pressure to keep up the research quantum
- issues of funding (including funding for maintaining/updating CFL materials and approaches , staff time release)
- intellectual property/copyright

Dooley (1999, p. 35), reviews diverse literature on factors affecting adoption of educational technology in schools and identifies several 'uncertainties' concerning the benefits of technology and the changes that its adoption necessitates:

- the need for technical support
- pedagogical and instructional management issues
- professional development of teachers
- network infrastructure
- costs of all components

Dooley (1999, p. 37) also summarises (from Latham, 1988) characteristics that 'seem to explain' why innovations fail:

- practitioners are disenchanted and disillusioned because the innovation is more difficult than expected and it causes too much change and takes too much time
- innovation supporters depart
- personnel lack training and enthusiasm
- funds run out
- there is a 'take-it-or-leave-it' attitude

Brennan et al (2001, pp. 55-56) reviewed research on online delivery of education and training in Australia, and summarised the key issues for teachers. The issues related to changes to teachers' work contexts: they are not simply 'pasting a new set of tasks onto existing practice' but re-examining the very nature of teaching, often with 'patchy staff development' compromised by 'confusing inflated public claims about the value of technology'.

Schifter (2000) found that factors that motivated staff in higher education to use asynchronous learning networks (ALNs) and those that inhibited their use were not the same. Among staff who already used ALNs *and* those who did not, motivating factors were similar, and included intrinsic factors such as:

- personal motivation to use technology in teaching
- opportunity to improve teaching or develop new ideas
- opportunity to diversify course offerings
- greater flexibility for students

Administrators, on the other hand, considered that teaching staff would be motivated by extrinsic factors related to administration support and encouragement or which benefited the individual staff member. Teaching staff and administrators agreed that factors that inhibited the use of ALNs included:

- lack of technical, infrastructure and course development support
- concern about workload
- lack of time release
- concern about the quality of courses
- lack of funds ('grants') for materials and expenses

From this overview, many of the factors that have been seen to influence the adoption and use of web-supported teaching can be collected under the following broad headings:

- workload
- time
- knowledge and skills
- staff development and training
- tools and infrastructure
- recognition and rewards
- conceptions of teaching and learning, including concern about the value of technology, definitions of academic work in relation to teaching, and the quality of learning and other student outcomes
- support provided by the institution, including IT support and management and policy support

Methodology

Data for the study were collected using 12 face-to-face semi-structured interviews with staff from all academic areas/disciplines of the University and a paper-based survey sent to all academic staff.

The interview schedule was developed as a result of preliminary findings from the literature, and focussed on:
• the background of the interviewee and their discipline area in relation to the use of IT
• how online technology had been used in their discipline area
• factors that were important in their adoption or non-adoption of MyUni
• what they considered needed to change in relation to their use of MyUni

Based on the first ten interviews and the literature review, a questionnaire was developed which tested the hypothesis that there were multiple factors involved in decision-making about whether to adopt MyUni, and at which level to adopt it. The questionnaire also sought to explore the values respondents held in relation to computer-supported and web-based teaching. After piloting and evaluation the final survey instrument covered structured and open-ended questions relating to:
• background information, including the use, knowledge and valuing of electronic tools
• attitudes to the adoption of web-based teaching tools, and information about adoption
• the impact on students of the respondents' use of web-based tools
• the impact on teaching of the use of web-based tools
• future intentions and changes respondents would like in web-based teaching tools

The paper-based anonymous survey was administered to the target population of all academic staff (n=1073), with a response rate of 14.5% (n=156). This response was comparable with other University 'whole-of-staff' surveys (e.g. a 2002 'Values' survey response of 18%) and the response rate was considered adequate for the purposes and resources of the project.

The survey data were entered onto SPSS version 11.5.0 and descriptive statistics were calculated using SPSS. Significance tests for the respondent population were commissioned from an external consultant, John Petkov. Coding of qualitative open-ended questions was performed, and the codes were modified and collapsed as coding progressed.

Results

Interviews
The interview data coding proceeded on the assumptions that MyUni was the centrally supported learning management system (LMS) and that the literature suggested that there were factors that tended to support the adoption of a central LMS, and factors that inhibited its adoption. The interview responses were coded for the interviewees' backgrounds as teachers and as IT users, and for the history of their discipline area in adopting and promoting IT use, as well the already listed factors (which tend to support or inhibit adoption) - workload, time, knowledge and skills, policy, administration, staff development and training, tools and infrastructure, conceptions of teaching and learning in the discipline area, and personal values.

Generally, the 12 interviewees held strong positions, whatever those positions were. In seven instances the interviewees were early adopters of online technology that predated MyUni, for whom the arrival of MyUni without consultation (with them) was somewhat unwelcome. They considered that, through research and action, they already knew what they, their students and their section needed. The advent of a centrally supported LMS was not the direction their research and teaching practices would necessarily have supported.

In three of these cases, respondents were continuing to use a parallel means of web-supported teaching. As early adopters these interviewees already had a well-functioning learning management system, which the functionality of MyUni largely replicated. Some valued factors over which interviewees exercised control in their local LMS were servers, downtime, staff access, networking, the portal and interface, local computer officers, and encryption and security.

Four other early adopters spoke enthusiastically of their 'conversion' to MyUni at a time when they could not have continued to support a parallel system in their own section, due to staffing, hardware and software issues.

The remaining five respondents were administrators or managers of learning management systems in several faculties. Three of the five revealed that they were administering and managing a parallel system to MyUni. In two of these three instances the interviewees themselves placed learning material online for academics - in their sections academics did not manage their own learning sites within the LMS, and the interviewees gave valid reasons why this did not happen (time and workload of senior academic staff). In each of the three instances valid reasons were also advanced for continuing to use the parallel system.

One of the reasons cited by these systems administrators for their sections not adopting MyUni was the 'not built here' mentality. They said that instead of the University's central IT systems administrators asking 'What are your [local] issues in teaching and research?' the MyUni solution was delivered ready-made - 'Here's a piece of software: you have to use it'. This lack of recognition of sectionally different research and teaching needs spilt over into reasons for continuation of parallel web teaching systems. In particular the contrast with the normally celebrated autonomy of different academic sections to establish different priorities led to feelings of frustration and lack of self-government in the selection and support of a University-wide LMS. The feeling that administration should run parallel to academic needs, rather than dictating them, was particularly strong from four Health Sciences interviewees.

One administrator respondent also reflected that, while technology was well funded at the University, a less well funded area was that of 'helping tail enders', who needed time, exposure and the confirmation that they would not be able to survive without the relevant technology. In his experience these staff 'came on board' when they observed others getting over the hump of adoption, if given sufficient appropriate personalised support.

In summary, the MyUni adopters among the interviewees countered many of the arguments of the users of parallel systems, as all had previously used similar parallel systems or simple web pages. They were 'past proselytising the benefits of MyUni'. They considered that a centrally supported, stable, integrated system, despite myriad irritations, was preferable to multiple school or department-based systems: 'Why should students have to use a parallel system when MyUni is working, and working well?' However, their advice was that the question of uptake should be resolved at departmental level, not be a University mandated necessity.

Survey Findings

Section A: About the respondents: the sample
The profile of survey respondents was representative of the faculty staff distribution of the University. 84% of survey respondents held full-time compared with part-time positions, which compared with the University overall figure of 86%. There was a significant difference between the 69% of respondents holding tenured or tenure-track positions and the University tenure profile of 58%. Most respondents taught undergraduate courses (96%) and 42% taught postgraduate courses (generally as well as undergraduate courses). Compared with the University as a whole, the survey sample had an over-representation of tenured/tenure track staff, and of less experienced (in teaching) staff, as 35% of all Adelaide academics had worked for the University for less than 10 years whereas 62% of respondents had been teaching for less than 10 years. Females comprised 40% of respondents compared with 30% of University academic staff.

Section A: About the respondents: Use of computer tools in teaching
The use by survey respondents of computers in teaching and of web teaching tools was not matched by the value they placed on them, or by the knowledge they considered they had about MyUni, revealing a gap that may provide an opportunity for effective support activities.
Sixty two percent of respondents used computers more than a moderate amount in their teaching (scores 5-7 on a 7-point Likert scale where 1= nil, 4= moderate and 7= a lot). 27% used computers in their

teaching less than a moderate amount (scores 1-3). 48% of respondents used Internet resources in their teaching more than a moderate amount while 32% used them less than a moderate amount. 35% of respondents had used web-based teaching more than a moderate amount and 55% less than a moderate amount. 33% of respondents reported more than moderate use of a web teaching platform (e.g. MyUni or similar), with 35% using such a platform less than moderate amount (*Table 1*).

There were no significant differences in the use of web teaching tools between male and female respondents or tenured/tenure track and non-tenured respondents. There were also no significant differences between respondents who had used web teaching tools and those who had not, in the length of time they had taught at a university. Respondents who had used web teaching tools were significantly more likely to be full-time than part-time employees. Respondents from the Faculty of the Professions used web teaching tools the most commonly (90%) and the lowest users were respondents in the Faculties of Health Sciences and Humanities and Social Sciences (66%). However, these differences were not significant.

Respondents were asked what *value* they placed on the use of computers and web teaching tools in higher education teaching. The questions used 7-point Likert scales where 1= 'none' and 7 = 'very high' value (*Table 1*).

	Less than moderate >4		Moderate Likert scale =4		More than moderate <4			
	No.	%	No.	%	No.	%	Mean	SD
Use of computers	41	26.6	17	11.0	96	62.3	4.95	1.971
Value of computers	20	13.0	17	11.0	117	76.0	5.34	1.510
Use of web teaching tools	85	54.8	16	10.3	54	34.8	3.45	2.007
Value of web teaching tools	42	28.0	27	18.0	81	54.0	4.53	1.617

Table 1 Use of and value placed on computers and web teaching tools in higher education

Table 1 data reveals that 13% of respondents *valued* computers in teaching to less than a moderate extent, while 27% *used* them to less than a moderate extent. 28% of respondents *valued* web teaching tools in higher education to less than a moderate extent, while 55% *used* them to less than a moderate extent. 76% of respondents valued *computers* in higher education to more than a moderate extent, and 54% valued *web teaching tools* to more than a moderate extent. Only 60% of respondents knew more than a moderate amount about MyUni, which may account for part of the 'gap' between the value placed on web-based teaching and the use of web teaching tools.

Section B: For respondents who had never used web-based teaching tools
Of the 36 respondents who had never used web-based teaching tools, when asked "Would you like to use web-based teaching tools?" 18 would like to do so, 6 were undecided and 6 did not want to use them (6 cases were missing). The main contributors to their decisions were their concerns about quality of learning and teaching and their conceptions of teaching at University. Also important were issues relating to their own skills, personal motivation, IT training and staff development, and work issues (*Table 2*).

These 36 respondents elaborated on factors that might affect their decision to initially adopt web teaching tools or to use them to a greater extent or differently, along with 24 adopters who also responded to this open-ended question (*Table 3*). Their concerns were primarily about the perceived extra time or work required for web-based teaching (n=25). Combined with 7 comments about the need for more skills and knowledge, this gave a total of 32 comments that related to staff members' personal concerns about their own work or knowledge. Another 22 comments indicated concern about the level of support provided by the University for web-based teaching: concerns about infrastructure or the tools provided for web-based teaching (n=8, including 4 comments concerning access to infrastructure by students), the need for training and staff development (n=9), and management or other support (n=5).

There was also considerable concern about the quality of learning outcomes from web-based teaching:

this was evident in 31 comments, which related directly to quality of learning outcomes (n=11), which expressed opinions about the suitability of web-based teaching for some aspects of courses (n=12), or which expressed negative perceptions about web-based teaching as a whole (n=8).

Factor	Yes	Per cent	No	Per cent
Quality of learning and teaching	21	58	10	28
Your conception of teaching at university	13	42	18	58
IT training	13	42	18	58
Your own skills	12	39	19	61
Personal motivation	9	29	22	71
Staff development	8	26	23	74
Work issues	7	23	24	77
Course administration	6	19	25	81
Funds	6	19	25	81
Technology issues	6	19	25	81
University decision making	5	16	26	84
Other	5	16	26	84

Table 2 Factors that would influence non-user respondents' decisions about web-based teaching

Comment category (101 responses coded)	Frequency	Per cent
Time / workload	25	25
Some courses / aspects of courses	12	12
Quality / benefits / outcomes concerns	11	11
Training / staff development	9	9
Negative perceptions of web-based teaching	8	8
Skills / knowledge	7	7
Students [including 4 relating to infrastructure]	7	7
Other	6	6
Support	3	3
Infrastructure	3	3
Positive perceptions of web-based learning	3	3
Benefits for students	3	3
Policy / management support	2	2
Tools/ web-based teaching system	1	1
Not own decision	1	1

Table 3 Elaboration of factors affecting respondents' decision about adopting
or further using web-based teaching

Respondents were invited to nominate 'What needs to change so that you would use web teaching tools?' which revealed similar concerns with time and workload and respondents' skills and knowledge. There was a greater emphasis on concerns about infrastructure and the tools provided for web-based teaching (n=15, including 6 comments concerning access to infrastructure by students), the need for training /staff development (n=15) and the need for changes in management or other support (n=15). Concerns about the quality of web-based learning (n=14) were not as evident as in the comments about decision factors. Two comments were made about the new copyright regulations, and their impact on proposed use of web teaching tools.

Section C: For respondents who had used web-based teaching tools

66% of respondents who had used web-based teaching believed it had benefited their students, leaving a considerable minority did not or were uncertain, indicating a possible need for respondents to use more or more focused student evaluation in their courses.

Respondents were asked to rate the impact on their students of a set of 15 items, ranked on 7-point Likert scales from 1, very decreased, to 7, very increased. The means and standard deviations for each item were calculated from the 7-point Likert scales (*Table 4*).

Item (n of respondents) Likert 1=very decreased, 4= no change, 7= very increased	Increase % Likert >4	No change % Likert =4	Decrease % Likert <4	Don't know %	Mean	Std Dev
1. Attendance (n=78)	19	52	21	8	3.91	1.071
2. Summative grades (n=65)	36	48	6	11	4.43	.829
3. Continuance in course (n=72)	33	51	8	9	4.42	1.004
4. Continuance in program (n=66)	26	57	7	11	4.23	0.873
5. Use of self-directed formative assessment (n=59)	48	37	6	9	4.81	1.293
6. Communication skills (n=83)	54	29	9	9	4.76	1.206
7. Collaboration and working in groups (n=78)	45	28	18	9	4.56	1.344
8. Time management (n=82)	53	30	9	8	4.84	1.319
9. Independent learning (n=92)	67	20	6	6	5.15	1.240
10. IT skills (n=92)	77	14	2	7	5.49	1.084
11. Critical thinking & problem-solving skills (n=83)	35	49	10	7	4.35	1.115
12. Lifelong learning orientation (n=79)	45	37	7	11	4.65	1.121
13. Enjoyment while learning (n=78)	55	24	11	10	4.73	1.389
14. Discipline area knowledge (n=77)	55	31	5	9	4.86	1.106
15. Education linking with future & current employment (n=74)	48	36	5	11	4.81	1.119

Table 4 Teachers' perceptions of impacts of web-based teaching on student outcomes

Respondents considered the benefit to students to be evident mainly in the development of generic skills, particularly IT skills and independent learning. They were less certain about the development of lifelong learning skills and whether web-based teaching had had an effect on links with employment. In terms of equity and access issues for students, respondents were most concerned about University infrastructure and access to and the cost of printing.

Section E: Teaching outcomes and values

Respondents who had used web teaching tools (n=120) were asked a number of questions about the impact of their use of web teaching tools on their teaching and related activities. 76% thought that using web teaching tools had benefited their teaching or other activities, but only 42% believed that benefit was in all courses they taught.

Respondents were asked to rate the impact on their teaching or other activities of 19 items, ranked on a 7-point Likert scale from 1, very decreased, to 7, very increased. While the means for all time and work-related measures indicated increased time and work needed for web-based teaching (means > 4.0), particularly time on preparation of teaching (mean = 5.11) and work on preparation and delivery of content (5.19), staff also reported mean increases in their IT skills (5.07), teaching confidence (4.48), pedagogical skills (4.37) and re-evaluation of teaching aims (4.60).

These findings echo the concerns expressed in open-ended questions about time and workload, but they also make more explicit some of the benefits of web-supported teaching. Issues of increased workload

in communicating with University administration regarding courses, and on the administration of online courses must be addressed, as this is 'dead' time for teachers.

Impact item (n of respondents) Likert 1=very decreased, 4=no change, 7=very increased	Increase % Likert >4	No change % Likert = 4	Decrease % Likert <4	Mean	Standard deviation
1. Time on preparation of teaching (n=106)	68.9	18.9	12.2	5.11	1.368
2. Time on delivery of teaching (n=101)	29.7	52.5	17.9	4.27	1.067
3. Time on administration of course (n=105)	54.3	23.8	21.9	4.62	1.333
4. Time on assessment (n=89)	24.7	62.9	12.4	4.22	1.053
5. Time on communicating with students (n=108)	44.4	23.1	32.4	4.29	1.504
6. Time on communicating with peers (n=93)	24.8	59.1	16.2	4.13	1.096
7. Time on communicating with University administration regarding the course (n=93)	47.3	46.2	6.4	4.72	1.146
8. Work on preparation and delivery of content (n=108)	75.0	15.7	9.3	5.19	1.300
9. Work on organisation of course process and structure (n=103)	60.2	31.1	8.8	4.80	1.141
10. Work on administration of online course (n=94)	81.9	14.9	3.2	5.48	1.095
11. Communication with students (n=107)	62.6	22.4	14.9	4.78	1.362
12. Extent of re–evaluation of teaching aims (n=90)	43.3	52.2	4.4	4.60	0.969
13. Teaching confidence (n=97)	38.1	55.7	6.2	4.48	0.937
14. Pedagogical skills (n=92)	34.8	58.7	6.6	4.37	1.024
15. IT skills (n=101)	71.3	25.7	3.0	5.07	0.951
16. Use of online assignment submission (n=64)	57.8	35.9	6.2	4.98	1.266
17. Use of online assignment assessment (n=56)	48.3	48.2	3.6	4.84	1.218
18. Use of online assignment feedback (n=67)	68.7	28.4	3	5.15	1.118
19. Use of online assessment grades visible to students (n=58)	62.1	32.8	5.2	5.00	1.243

Table 5 Perceptions of impacts of web-based teaching on teaching or other activities

Discussion

Academics at the University of Adelaide who had adopted web teaching tools revealed that by so doing they had increased their workload in preparing, administering and delivering their courses, and time on assessment. Time on communication with students and peers had increased. Time communicating with the University administration regarding courses had increased markedly. These demands for increases in time may be offset against the (perhaps beneficial) increases in re-evaluation of teaching aims, pedagogical and IT skills, and teaching confidence as well as communication with students. However, whether desirable goals for the contemporary academic or not, all these activities are net time users, and the issue of time and workload was at the top of the list of reasons for non-adoption and lack of adoption to a greater extent or differently. Despite 66% of respondents believing that web-based teaching had benefited their students, net time users are unwelcome activities for many academics in a research intensive university.

Conclusions

As Kearns (2003, p 43) notes, Australian systems are currently in Stage 2 of three stages of development in international policies for information and communication technology in education, from Stage 1 'rolling out computers' to Stage 3 'transforming the way we learn'. The University of Adelaide is among those stage-2 systems. The findings of this project have underlined some of the issues that arise in the change process involved. There are challenges for the University to further develop and disseminate a culture, policies and strategies that value web-supported teaching, foster its use and provide support to alleviate time and workload pressures, provide adequate staff development and training to meet all levels and varieties of Web use in teaching, and to provide infrastructure and tools to meet the needs of teaching staff and students.

The transformative stage 3, envisaging the embedding of information and communication technologies in all learning, is some way off for most higher education institutions. Nevertheless, the University of Adelaide has strategies in place to support this transformation, including the LMS (MyUni), the integration of the student administration and learning management systems, staff development and training programs, a graduate attributes program, a Digital Resources Management Centre and other initiatives. The project findings indicate that some teaching staff find it difficult to access adequate support to enable them to achieve teaching excellence in relation to web-supported teaching.

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