

Education Innovation

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Innovating Education in Technology-Supported Environments

 Springer

Education Innovation Series

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Education holds the key to unlock human resources that a society needs to survive and flourish. This is particularly salient in a borderless knowledge economy. For the past decades, the sterling performance of economies such as Hong Kong, Finland, Japan, Singapore and Taiwan in international studies (e.g., TIMSS, PIRLS and PISA) has attracted much attention internationally.

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Billy Tak Ming Wong
Editors

Innovating Education in Technology-Supported Environments

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Series Editors' Foreword

Following the publication of *Innovations in Open and Flexible Education*, we are pleased to present this second volume, entitled *Innovating Education in Technology-Supported Environments*. It continues and extends the innovation spirit of the first volume to move into the laying out and discussing the significant role played by technologies when applied to teaching and learning. Comprising 26 chapters, this volume provides a good elaboration of efforts to adopt and apply technology in teaching, with empirical findings and analysis. Particular focus is placed on how to make use of social media services such as Facebook, Twitter, and instant messaging for teaching purposes. The collection of chapters has a strong focus on making use of these media technologies to achieve more effective teaching, addressing questions such as how to convert Facebook to a learning management system, how to make use of instant messaging to enhance learning experience, how to make use of the student response system (SRS) to enhance active learning in higher education, and how to utilize game-making to provide an inclusive, creative, and dynamic classroom environment.

This book is also an international exchange between contributors from a variety of regions, including:

- Various teaching projects at the Open University of Hong Kong, e.g., the development of Open Educational Resources (OER), mobile app that features a 3D hand model with acupoints for nursing students, etc.
- The experience of the University of the Philippines Open University in producing web streaming video lectures and tutorials
- The challenges of using Corpus for English language learning in a Japanese university
- The emergence of mobile and online learning environment for flexible and personalized learning in China as one of the six most important areas for educational researchers
- A report on e-learning and learning experiences as two major factors affecting learning outcomes in distance learning based on the experience of the Open University Malaysia

- A comparative study on the talking comic strip for nursing students in the Philippines and Thailand
- A comparative study on students' attitudes and perception towards ICT for learning geography in secondary schools in Japan and New Zealand
- A comparative study on utilizing computer game-making in the classroom across three European countries, namely Spain, Austria, and the UK, employing Create@School as the game-making mechanics and dynamics
- A report on the recent educational emphasis of the European Union towards framing an inclusive and innovative Europe

The above list shows the wealth of studies in applying technologies to teaching from diverse regional settings, in diverse university and school settings, and for different subjects. Yet, what is worthwhile to note is that most contributors are working towards making technology easy and useable for application both in the classroom and distance/online learning.

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Introduction to the Book

Innovation has been widely recognised as one of the major trends in contemporary education. ‘Newness’, as an essential ingredient of innovation, occurs in different aspects of education – time, space, curriculum, organisation, pedagogy, content, infrastructure and requirements. Education institutions across the globe have been facing a pressing need to find new and better ways to improve their learning and teaching in order to get learners well prepared for their future development. The pressure to innovate in education has become even greater with the imperatives of increasing equity, making education more flexible and enhancing educational outcomes.

Many educational innovations cannot be implemented without being supported by technological advances and breakthroughs. Educational technologies cover tangible devices, software systems or platforms, and web-based resources. They serve both as a driving force and instrument for educational innovations and are bringing about paradigm shifts in education. For example, the accelerating developments of information and communications technology (ICT) have reshaped various forms of learning – be it online, mobile, blended or conventional face-to-face — and have allowed education to become more flexible and personalised for learners and teachers in terms of content, design and delivery. The increasing penetration of mobile devices and open-access online learning resources have largely removed the barriers to participating in education for learners previously discouraged by factors such as remoteness or work commitments.

Educational institutions must keep themselves abreast of the latest technological developments and be ‘change-resilient’. Recent years have witnessed a broad range of research activities, novel ideas and emerging practices. They range from new forms of media and presentation to the use of education technologies for tackling the challenges and achieving the desirable outcomes – such as personalisation, accessibility, flexibility, engagement and interaction – that have been advocated in contemporary education. Traditional means of education have been challenged, or even displaced, by these new developments which have emerged with accelerating technological changes. However, simply changing existing practices with the use of technology does not necessarily help learning and lead to better learning outcomes.

Rather, the changes should be informed by research findings and experiences of best practices which show how innovations can be effectively established in a technology-supported environment.

This book – *Innovating Education in Technology-Supported Environments* – provides a wide range of ideas, research results and new practices. It includes 26 chapters from authors worldwide with unique experiences and perspectives, which present the latest developments in innovative education in various areas. In particular, the book offers empirical evidences of technology-supported educational advances in a range of contexts involving various groups of participants, subject disciplines, locations, learning modes and technologies. It contributes to advancing research and teaching for the benefit of educators worldwide.

The chapters in this book are grouped according to four sub-themes:

- I. Online, mobile and blended learning
- II. Educational resources
- III. Learning design and student engagement and support
- IV. Pedagogy and curriculum development

The chapters cover a broad range of topics related to educational innovation, such as blended learning, flipped classrooms, social media, instant messaging communication, mobile learning, augmented reality, educational resources, educational use of machine learning techniques, and technological support for students in specific contexts such as open and distance learning and career planning. This book also provides reviews of research in educational technology and identifies many areas for possible development and application of theories as well as innovative pedagogies and technologies in education. It also includes rigorous quantitative and qualitative studies, experimental and empirical cases, descriptive surveys, interviews and quizzes, which illustrate the theoretical frameworks and the effectiveness of the innovative practices.

Overall, *Innovating Education in Technology-Supported Environments* is intended to provide readers from diverse backgrounds with the latest scholarly thinking, research and practices in the field of innovative education. The research, case studies and practices reported in the chapters illustrate ways of utilising technologies for effective innovation in education in the global context. The connections between research results and practical experiences, together with the insights and implications presented by the authors, shed light on how technologies can support education in different settings.

Part I of this book covers the sub-theme *online, mobile and blended learning*.

The increasing adoption of technologies in education has largely expanded the possibilities of educational practices, of which online, mobile and blended means have become prevalent. In particular, the ICT devices and applications commonly used in daily life, such as smartphones, instant messaging communication and social media, demonstrate a high potential in educational use. Plenty of initiatives in research and practice have been carried out in recent years.

For example, highlights of recent developments include powering existing learning platforms or approaches with additional features and customising them for specific learner groups. The conventional styles of blended and distance learning have been enriched with mobile learning elements. Mobile instant messaging and social media have been used to enhance communication with students. Mobile applications have been integrated with augmented reality to provide learners with a more interactive and engaging learning experience. The research studies and practices in these areas also show a need to review them to summarise their developments as well as identify trends and opportunities. In this regard, there are eight chapters in this part presenting various findings and experiences.

The first chapter by Norman Vaughan provides an overview of the latest research and practices in blended learning, an area in which there is an increasing number of studies. It describes how blended learning can be delivered in campus-based and online learning environments. The chapter also discusses relevant research trends from the perspectives of students, faculty, and administrative staff and the research sources available. The major conferences and publication venues in the field are also introduced.

Thah and Latif's chapter presents the factors affecting the learning outcomes in distance learning based on the experience of the Open University Malaysia. They identify three key factors – teaching and materials, e-learning and learning experiences – together with their effects on learning outcomes, where e-learning was found to play a mediating role between the other two factors. It was also found that learners' perceptions of these factors were positively correlated with the length of time they spent on the online learning system, implying the significance of engaging learners through these factors for success in online learning.

Almodiel and Lacaste explore the use of social media – Facebook – as a learning management system and learners' acceptance in relation to their learning styles. Their findings suggest that verbal learners perceive Facebook as easy to use and useful for learning, while active and intuitive learners have a stronger inclination to continue using it for learning. This chapter shows the potential of social media for educational purposes, but its acceptability may depend on the types of learners.

Francis Yue analyses the use of instant messaging in tutoring undergraduate students and the students' learning experience. The students' learning experience on a course was surveyed, and its relationships with the students' use of instant messaging for communication with tutors, and their course results, were examined. Despite a mild positive correlation between the use of instant messaging and learning experience, these two factors were found to be negatively associated with the students' course results. Yue suggests that weaker students tend to benefit more from instant messaging, and its use is not a direct factor in determining study results.

Jiyou Jia adopts a macro perspective to reveal the research trends on ICT in education in mainland China. Based on a keyword frequency analysis and textual data-mining from academic papers published in seven relevant journals in China, the subjects of most interest to researchers in the field were learners, teachers and the learning process. The results reflect six areas of achievement for educational technology research in recent years, covering, for example, the impact of a mobile,

online environment for flexible and personalised learning, as well as a fair and balanced development of education in China. The existing problems and research opportunities in the Chinese contexts are also discussed.

Ng et al. present a case study of mobile learning with augmented reality on nursing students' learning of acupoints in traditional Chinese medicine. Their mobile app features a 3D hand model with acupoints and their details, a quiz for testing a user's knowledge of acupoints, and an application system which introduces the use of acupoints in daily life. Their work demonstrates the potential of augmented reality in mobile learning for enhancing learners' learning experiences and memorisation in some difficult subject areas.

Larry Ka-wai Ching introduces the latest technologies for mobile learning and explains their key functions, covering learning management systems, global positioning systems, augment reality, instant messaging and social networking apps. Despite being widely applied in mobile learning, the possible challenges for users in their applications, which are discussed in detail in the chapter, are not negligible. A list of key factors leading to a well-designed mobile learning application is suggested by the author.

Gwo-Jen Hwang suggests strategies for adding innovation and value to technology-enhanced learning research. The strategies range from using innovative technologies to investigating seldom-discussed issues or subjects, new approaches or tools, and seldom-studied domains. In particular, he emphasised the importance of finding a good research topic and recommends ways of assessing the innovative elements in existing studies, so as to know if a topic remains innovative and contributes to the field at the time being studied.

Part II of the book is devoted to *educational resources*.

The development of educational resources has also benefited from technological advances. Emerging technologies such as augmented reality and web streaming have enabled more possibilities for the presentation, delivery and use of learning materials. The trend of openness in educational resources has also promoted new approaches for their customisation for user needs. Another issue derived from such development is the effective use of the resources, which involves institutional experience and users' feedback on the resources.

There are five chapters in this part to capture the latest research and experience on these areas. They cover the production of learning materials with new approaches and technologies as well as students' feedback on the materials.

Tsang and Choi illustrate the use of instructional design models and emerging technologies in developing textbooks as open educational resources. They also explain how various formats for materials, such as PDF, EPUB(s) and mobile apps, can be used appropriately in pre-class, in-class and after-class learning environments. In their survey of teachers and students' feedback on the textbooks, the significance of allowing users to customise the materials is highlighted.

Pugoy et al. describe their development and use of technology-enhanced learning material – the talking comic strip – for nursing students in the Philippines and Thailand to improve English proficiency. The material allows learners to read the

comic strip and hear its audio at the same time. Pugoy et al. report positive results from their usability evaluation of the material, in particular for younger respondents (i.e. 30–39 years old) who gave the highest mean ratings among all age groups and male respondents whose ratings were about 10% higher than those of the female respondents. The results also show the respondents' preference for technology-enhanced materials over printed materials.

Yoko Hirata's study deals with the challenges faced by Japanese university students in using a corpus (a large electronic database of authentic texts) for English language learning and how these challenges can be handled by instructors. The participants, who had no previous experience in using a corpus prior to the study, showed capability in making use of this language resource for self-learning. However, the students' appreciation of this language learning approach was affected significantly by their educational backgrounds, such as whether they had been trained to memorise individual words and learn grammar rules discretely.

Choi and Tsang introduce an initiative to adapt commercial textbooks for distance learning students in order to address the high cost of developing distance learning materials. In what they called the 'custom-textbook approach', book chapters from textbooks in the market are selected and compiled into a tailor-made edition for a course. In their evaluation, the learning materials developed using this new approach received a positive response from students. A list of criteria for providing quality customised textbooks for distance learners is provided, covering areas such as language, organisation and learning support.

Gelisan, Nunez, Platon and Banasihan share the experience of the University of the Philippines Open University in producing web streaming of video lectures and tutorials. They present the tasks involved in the pre-production, production and post-production phases, covering a broad range of issues on the coordination, technical and instructional aspects. The experiences discussed in this chapter apply also to other provisions of online education such as massive open online courses.

Part III of the book focuses on *student engagement and support*.

The importance of enhancing student engagement in learning and student support services has been recognised by educational institutions. Related work has generally focused on two areas. First, attempts have been made to examine the potentials of emerging technologies and techniques, such as learning analytics and machine learning which have inspired a broad range of innovative applications to collect and utilise learner data. Second, research has been conducted to study students' attitudes and needs on issues such as school subjects and support services.

There are six chapters in this part covering the two areas. They present the development and use of applications to tailor student support services and engage students in learning based on their characteristics and responses. They also show the research findings on student attitudes and needs in various aspects.

Latif, Subramanian and Khatab describe the development of an instrument for building up learner profiles, covering a learner's personality, attitude and motivation. Using this instrument, an overview of the learner profiles for Open University Malaysia shows that the learners were generally open to experiences and

conscientious, but more effort is needed to enhance their autonomy and improve their engagement in learning. The results show the usefulness of learner profiles for facilitating the formulation of strategies for retention and engagement.

Wong and Yau examine the use of a student response system (SRS) for enhancing active learning in higher education. They analyse four aspects of instruction based on SRS – questioning strategy, time interval, rewards and feedback – and identify the factors involved in effective use of SRS for each aspect. Their findings also suggest a lack of empirical evidence for the outcomes of SRS use, particularly on its impact on learners' academic performance, thus highlighting a need for further research in this area.

Hirata and Hirata investigate students' attitudes and their perception of ICT for learning geography in secondary schools in Japan and New Zealand. The findings show observable differences in terms of students' understanding of the subject contents, the perceived usefulness of the subject for the future, attitude towards ICT and reasons for choosing the geography subject, which could be attributed to the differences in learning and curriculum design between the two school contexts.

Wong and Wong address student engagement through exploring learners' needs for support related to their wellness in the distance learning context. Following a six-dimensional framework, which includes the occupational, physical, social, intellectual, spiritual and emotional dimensions of wellness, their findings from a survey and focus group interview highlight career development as the most important aspect for the students among the wellness dimensions. They also identify a number of aspects of learning support which are most desirable for the students, such as the enhancement of the social network and the provision of academic advisory services.

Ng, Lui and Poon present an application for supporting students' career planning, which features the use of machine learning evaluation for identifying the thinking patterns of students and recommending appropriate career choices based on these patterns. It also helps parents to understand better their children's talents and facilitates teachers' central management of student profiles for actions such as class grouping or individualised counselling. Despite finding that the application has an accuracy of 96% for identifying students' thinking patterns, manual checking is still needed for each case. The authors' work demonstrates the potential of machine learning technology for giving suggestions for students' development based on their characteristics.

Wong and Li compare the support needs of face-to-face and distance-learning students. Their findings from a survey and focus group show that both groups of students shared a great concern for their career development. The face-to-face students' expectations focused more on career-related support such as internships and experience-sharing with alumni, while the distance-learning students preferred academic advisory services and social activities. The role of ICT is highlighted to cater for students' diverse needs, such as online provision of learning support services and study-related information.

Part IV of the book addresses the innovations in *pedagogy and curriculum development*.

Although pedagogical innovations and curriculum development do not merely rely on technologies, the affordance, ease of use and adaptability of technologies make them very often a key element in these areas. For example, new developments in computer game-making and simulation technology have made them easier to use in class, following which pedagogical strategies have been devised incorporating their use. On the other hand, major trends in education such as personalisation and inclusiveness have also promoted the innovations in pedagogy and curriculum development as a response to the trends.

There are seven chapters in this part which illustrate various kinds of pedagogical and curriculum innovations. They cover the incorporation of technologies and the relevant experience of educational institutions in these areas as well as discuss the lessons learnt from the experience.

Boulton, Brown, Hughes-Roberts and Beltrán introduce an innovative use of computer game-making in school curricula across three European countries. They present a pedagogical framework for utilising game-making in lessons, covering curriculum adaptation and planning; the teaching and learning process and assessment; a module framework, which supports the pedagogical approach in different curriculum areas; a lesson framework; and a lesson plan template and a game-making template for supporting the implementation. The provision of these resources aims to facilitate an inclusive, creative and dynamic classroom environment.

Tristan Currie presents an innovative way of promoting learners' metacognition via a video-based curriculum for English learning which features tasks involving abductive reasoning. The curriculum was implemented in both formal in-class learning and out-of-the-class mobile learning, and the adult learners responded to the tasks more comfortably in the informal learning settings which allowed more flexibility. As the author states, developing one's English proficiency is not simply a matter of "more practice, more confidence" but rather of building up a learner's confidence in his/her analytical judgement.

Wong, Wu and Suen conducted an integrative review of pedagogical strategies supported by simulation technology to enhance clinical competence in nursing education. In 11 case studies, they compared the pedagogical goals, scenario designs and instructional approaches before, during and after simulation, and how students are assigned the roles of performer, observer and partner in practice. Analysis of the various simulation-based learning practices revealed that no single pedagogy can satisfy all the learning needs of nursing students and further research on the synthesis of pedagogical strategies is needed.

Linda Yin-king Lee's chapter is concerned with the knowledge and skills of academics in teaching and reports on the use of flipped classroom pedagogy for their continuing professional development. The evaluation results show that the use of flipped classroom helped the participants rectify misconceptions about teaching, acquire relevant new knowledge and skills and make changes in their teaching

practice. The chapter also presents the challenges faced in sustaining the changes made in teaching practice and the uncertainty about the benefits for students and institutions.

Li, Wong and Wong present an institution-wide programme for building up the research capacity of a teaching university, which aims to keep its academics active in scholarly activities which, in turn, inform their teaching. The programme covers the areas of developing an institutional research culture, enhancing academics' knowledge of research, delivering efficient administrative support for research, providing a consultation service, and facilitating the university's positioning of research and development in a sustainable research environment. The chapter also illustrates how the design of the programme is informed by a needs analysis and the roles of technology in research capacity-building.

Samson Hau-lung Yuen examines how the experience of school-based curriculum development in Hong Kong informs the planning and implementation of a more personalised curriculum to cater for students' needs. In investigating the association of teachers' mind styles with the delivery of a school-based curriculum, the author found that teachers with the same style shared common features in their lesson activities. While emphasising personalisation, the work presented in this chapter demonstrates how teachers' autonomy can also be respected in curriculum planning.

Finally, Alan Bruce's chapter looks in depth at the values and objectives of the European Union on social inclusion and the creation of sustainable learning communities for promoting excellence in innovative learning and outlines the European policy and funding support for innovative learning. While the global focus on education is on mobility, skills, innovation and equitable participation, Bruce points out that the European experience demonstrates transnational action resting on commitment and passion for community needs as the only viable method for attaining these goals.

Overall, the four sub-themes in this book reflect the diversity of innovative education supported by technology. The authors' diverse perspectives give a comprehensive coverage of state-of-the-art practices as well as the opportunities and challenges in related areas. We hope that they provide insights for unleashing the full potential of technology for generating more innovations in education.

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Part I
Online, Mobile and Blended Learning

Chapter 1

Blended Learning: Approaches, Trends, Research, and Publication Opportunities



Norman D. Vaughan

Abstract This chapter focuses on blended learning approaches, trends, research, and publication opportunities. It begins with a discussion about campus-based and fully-online approaches to blended learning. Research trends are then described from student, faculty, and administrative perspectives. Research opportunities and challenges are presented for each of these three categories. The chapter concludes with an overview of the resources, conferences, and publication venues that are available in the field of blended learning.

Keywords Blended learning · Research trends · Research opportunities and challenges

Introduction

The idea of blending different learning experiences has been in existence ever since humans started thinking about teaching (Williams, 2003). Over the years, new features in blended learning practices have advanced educational delivery in terms of ease of access, cost effectiveness, and learning outcomes (Dziuban, Graham, Moskal, Norberg, & Sicilia, 2018; Smith & Hill, 2019). Higher educational institutions have been identifying the diversity of learning contexts, such as cross-cultural learning and promotion of internationalization, and exploring how blended learning can be effectively implemented (Philipsen, Tondeur, Roblin, Vanslambrouch, & Zhu, 2019). Examples include integrating blended-learning with mobile learning (Suana, Distrik, Herlina, Maharta, & Putri, 2019) and corrective feedback (Chen, Breslow, & DeBoera, 2018). What has recently brought blended learning into the

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limelight is the infusion of web-based technologies into the learning and teaching process (Clark, 2003). These technologies have created new opportunities for students to interact with their peers, faculty, and concepts in online courses and programmes.

The new developments in blended learning have also brought forth new opportunities for research and publication. They cover various potential topics such as the effectiveness, attitudes, and popularity of blended-learning (Clayton, Blumberg, & Anthony, 2018; Ma, Li, & Liang, 2019; Smith & Hill, 2019). At present, blended learning has been mainly deployed on a small-scale basis by individual teachers instead of an institutional basis. Related research has focused mainly on learning outcome, suggesting that many relevant research issues remain to be investigated (Smith & Hill, 2019). This chapter describes research trends in blended learning from student, faculty, and administrative perspectives, as well as providing an international perspective on resource, conference, and publication opportunities in this field.

Blended Learning Approaches

Blended learning is often defined as the combination of face-to-face and online learning (Williams, 2002). Ron Bleed, the former Vice Chancellor of Information Technologies at Maricopa College, argues that this is not a sufficient definition for blended learning as it simply implies “bolting” technology onto a traditional course, using technology as an add-on to teach a difficult concept or adding supplemental information. He suggests that, instead, blended learning should be viewed as an opportunity to redesign the way that courses are developed, scheduled, and delivered in higher education through a combination of physical and virtual instruction, “bricks and clicks” (Blead, 2001). The goal of these redesigned courses should be to join the best features of in-class teaching with the best features of online learning to promote active, self-directed learning opportunities for students with added flexibility (Garnham & Kaleta, 2002). This sentiment is echoed by Garrison and Vaughan (2008) who state that “blended learning is the organic integration of thoughtfully selected and complementary face-to-face and online approaches and technologies” (p. 148). A survey of e-learning activity by Arabasz, Boggs, and Baker (2003) found that 80% of all higher education institutions and 93% of doctoral institutions offer hybrid or blended learning courses.

With the development and growth of web-based synchronous communication tools, Power (2008) argues that a campus-based definition of blended learning (Fig. 1.1) needs to be expanded. He has coined the term “blended online learning environments” (BOLE) to describe the simultaneous and complementary integration and implementation of an asynchronous-mode learning environment (i.e. a

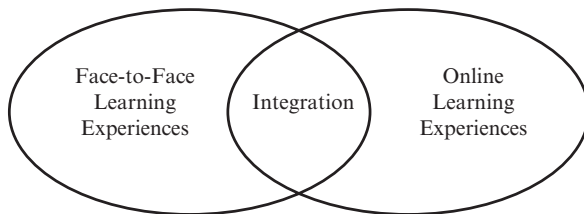


Fig. 1.1 Campus-based blended learning approach

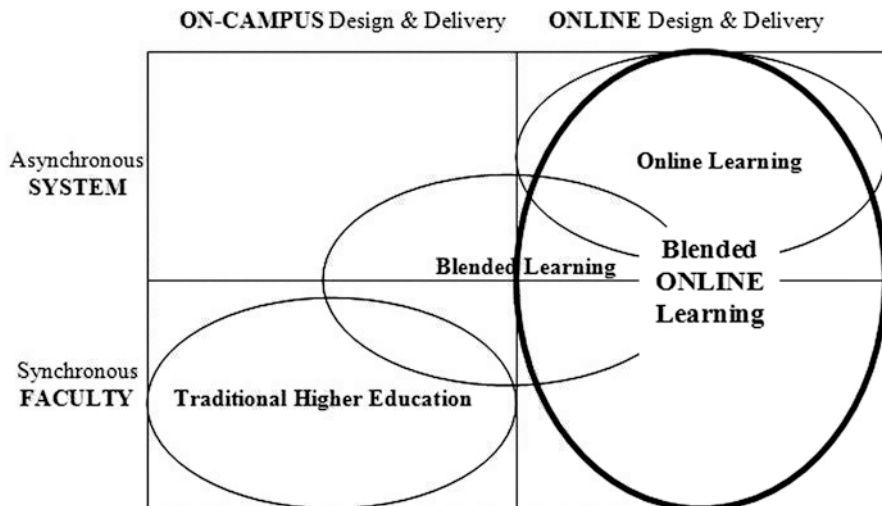


Fig. 1.2 Blended online learning environment (Power, 2008, with permission from Thomas Michael Power)

learning management system, or LMS) and a synchronous desktop conferencing environment (i.e. a virtual classroom) (Power, 2008). Figure 1.2 illustrates the distinction between campus-based and blended online learning environments.

Campus-based environments have their roots in traditional higher education systems where classes have been delivered by faculty in synchronous lecture settings. Initially, blended learning has been used to complement these synchronous lectures through the use of asynchronous discussion forums and learning management systems such as Blackboard and Moodle. With the advent of synchronous tools, such as Adobe Connect, opportunities have been created to provide students at a distance with both synchronous and asynchronous communication possibilities. In this chapter, these educational contexts are referred to as *online* blended learning environments in order to distinguish them from the campus-based versions.

Research Trends

The adoption of blended learning environments in higher education poses a series of research opportunities and challenges from student, faculty and administration perspectives. This section provides an overview of the research opportunities of both campus-based (see Garrison & Vaughan, 2008) and online blended learning (see Power, 2008), from the above perspectives.

Student Perspective

Opportunities

Students who have been involved in campus-based blended learning courses are generally very positive about their experiences. At the University of Wisconsin, Milwaukee campus, 80% of the students who took a blended learning course indicated that they thought the experience was worthwhile and that they would recommend a course offered in a blended format to others (Aycock, Garnham & Kaleta, 2002). The principal reason that students gave for their high level of satisfaction was the time flexibility provided by a blended format (see Table 1.1). Time flexibility was defined as the ability to control the pace of one's learning, the convenience of scheduling coursework, and a decrease in time spent commuting (Garnham & Kaleta, 2002). Table 1.1 summarises the key findings from the University of Wisconsin student survey.

Time Flexibility

The students surveyed indicated that they liked to be able to control the pacing and location of their learning. They appreciated the blended design because it provided them with the flexibility to work from home, which was perceived much more positively than working from other locations, such as campus computer labs or work-places (Garnham & Kaleta, 2002).

The blended design also provided students with a much greater range of course scheduling options because of the reduction in synchronous meeting sessions. This

Table 1.1 Survey questions administered to students (n = 282) in blended courses at the University of Wisconsin, Milwaukee at the end of the spring 2001 semester (Garnham & Kaleta, 2002)

Statement	Agree	Disagree	No opinion
I could control the pace of my own learning.	69%	19%	12%
I could organise my time better.	77%	11%	12%
The time I spent online would have been better spent in class.	16%	67%	17%
There should be more courses like this.	61%	16%	23%

convenience of scheduling is increasingly important for the growing number of students who have multiple responsibilities such as work and family commitments.

In addition, a study by the National Clearinghouse for Commuter Programs in the United States (1999) found that 87% of all post-secondary students in the United States do not live in institution-owned housing on campus and thus commute to get to the institution. The costs of commuting are steadily increasing, as are the challenges of finding an available parking space at higher education institutions.

Improved Student Learning Outcomes

Several research studies have demonstrated that blended learning designs contribute to improved learning outcomes for students (Dziuban, Hartman, Juge, Moskal, & Sorg, 2005; Garnham & Kaleta, 2002; Twigg, 2003a). In the United States, the Pew Foundation sponsored a study to investigate how large-enrolment introductory courses can be effectively redesigned using a blended format. The programme involved 30 institutions, with 20 of them reporting improved learning outcomes and 10 reporting no significant difference (Twigg, 2003b). In addition, 18 of the study institutions demonstrated a decrease in student drop-failure-withdrawal (DFW) rates compared to the face-to-face only sections (out of 24 institutions which measured DFW changes).

The University of Central Florida has been involved in an ongoing evaluation of web and web-enhanced courses since the inception of its Distributed Learning Initiative in the autumn of 1996 (Dziuban, Hartman, Moskal, Sorg, & Truman, 2004). These evaluation studies indicate that, on average, blended learning courses have higher success rates (percentage of students obtaining an A, B, or C) and lower withdrawal rates than their comparable face-to-face courses. The studies also show that student retention in blended courses was better than in totally online courses and equivalent to that of face-to-face courses.

Qualitative research studies at the University of Wisconsin in Milwaukee (Garnham & Kaleta, 2002) also suggest that students learn more in blended courses than they do in comparable traditional class sections. Teachers responsible for the blended sections report that students write better papers, perform better in exams, produce higher quality projects, and are capable of more meaningful discussions on course material. Sands (2002) states that, because of the text-based nature of web-based discussion forums and email, blended courses become “de facto writing intensive courses when the teachers work carefully to integrate the online and classroom components” (p. 1). Spika (2002) adds that the increased opportunities for self-directed learning in the blended model help students to develop project and time management skills.

Student Challenges

Studies at the University of Central Florida (Dziuban & Moskal, 2001) and the University of Wisconsin, Milwaukee (Garnham & Kaleta, 2002) both indicate that students encounter a number of challenges with blended courses. The four key challenges identified are: the expectation that fewer classes meant less work, inadequate time management skills, problems with accepting responsibility for personal learning, and difficulty with more sophisticated technologies.

Expectations

Students new to blended learning initially equate fewer in-person classes to having less coursework. In addition, a number of these students do not perceive time spent in lectures as “work,” but they definitely see time spent online as work, even if it is time they would have spent in class in a traditional course (Aycock, Garnham, & Kaleta, 2002).

Time Management

Time management is a struggle for many higher education students. This can become particularly acute in a blended online course where there is a lack of physical presence.

Responsibility for Learning

Many first-year undergraduate students, who are away from home for the first time, are in the early stages of “learning how to learn.” The notion of taking responsibility for one’s own learning can be very difficult for students accustomed to being passive learners within a traditional lecture format. Initially, students may be unprepared for the active learning role they must play in a blended course.

Technology

Most technology-related problems that students encounter in blended online courses usually occur within the first weeks of the semester. These problems are usually related to the procedure for accessing the online material and resources (i.e. website address and logon information). Problems that persist throughout the semester

sometimes involve either downloading large files or accessing more sophisticated web-based applications such as video clips (Aycock et al., 2002).

Faculty Perspective

Benefits

Faculty staff who have taught blended courses indicate that their teaching experiences were very positive. At the University of Wisconsin, Milwaukee, 100% of the faculty members involved in a blended learning pilot project recommended using this approach to others and planned to teach a blended course again (Aycock et al., 2002). Reasons for this high level of satisfaction included: enhanced interaction with students, increased student engagement in learning, flexibility of the teaching and learning environment, and opportunities for continuous improvement.

Enhanced Teacher and Student Interaction

Initially, one of the major concerns expressed by faculty members teaching blended courses at the University of Wisconsin was that they would become less connected to their students because of the decrease in face-to-face sessions (Aycock et al., 2002). In contrast, after teaching a blended course, they almost universally reported feeling more connected to their students and knowing them better. The faculty teaching blended courses at the University of Central Florida echoed these comments (Dziuban & Moskal, 2001). They indicated that not only did more interaction occur in their blended courses but they also thought this interaction was of a higher quality than what they typically see in the face-to-face classroom. Aycock et al. (2002) suggest that this increased interaction is often fostered by teachers developing new ways to engage their students online and through the creation of online communities. Bleed (2001) stresses how important this interaction is for restoring the “human moment in the educational process” (p. 18).

Increased Student Engagement in Learning

Faculty staff who have taught blended courses have observed that students do a better job of writing, learning course material, mastering concepts, and applying what they have learned compared to students in their traditional sections (Aycock et al., 2002). They suggest that this improvement is due to students being more engaged in

their learning process. This sentiment is captured in a comment from a faculty member at the University of Wisconsin who teaches blended courses, “My students have done better than I have ever seen; they are motivated, enthused and doing their best work” (Garnham & Kaleta, 2002, p. 3).

More Flexible Teaching and Learning Environment

Faculty at the University of Wisconsin indicate that they can accomplish course learning objectives more successfully within a blended course than within a traditional course because of the flexibility of the blended model (Garnham & Kaleta, 2002). The flexibility of time and the ability to use web-based multimedia allow the faculty to “develop solutions to course problems and to incorporate new types of learning activities that were not possible in traditional courses” (Aycock et al., 2002, p.1).

The Environment Forces Continuous Improvement

The blended model also allows teachers an ongoing opportunity to experiment with new approaches to learning and new types of educational technology. At the University of Central Florida, learning to use technology was cited as one of the outcomes that the faculty liked most about teaching on the web (Dziuban & Moskal, 2001).

Challenges

From a faculty perspective, the key challenges of teaching in a blended format are: time commitment, lack of support for course redesign, difficulty in acquiring new teaching and technology skills, and the risk factors associated with this type of course (Dziuban & Moskal, 2001; Garnham & Kaleta, 2002; Voos, 2003).

Time Commitment

The increased time commitment involved in a blended course is regarded as the biggest challenge by faculty (Dziuban & Moskal, 2001). Johnson (2002) states that planning and developing a large enrolment, blended course takes two to three times

the amount of time required to develop a similar course in a traditional format. At the University of Central Florida, the faculty members who are considered to be “web veterans” indicate overwhelmingly that a course with online components requires more time for both the development and weekly administrative duties than a similar course delivered face-to-face (Dziuban & Moskal, 2001). Despite this increase in workload, all the faculty involved in a blended learning pilot programme at the University of Wisconsin, Milwaukee stated that they would teach these types of courses again, as they believed their time was wisely invested in improving the learning environment for both students and themselves (Garnham & Kaleta, 2002).

Professional Development Support

These faculty members also indicated that blended learning is not a “solo” activity. To ensure a successful blended learning experience for students, there must be faculty support for course redesign and learning new teaching and technology skills. The course redesign support involves assistance in deciding what course objectives can be best achieved through asynchronous online learning activities, what can best be accomplished in synchronous events, and how to integrate these two learning environments (Dziuban et al., 2004). The faculty indicated that they needed to acquire new teaching skills, such as how to foster online learning communities, facilitate online discussion forums, and address and manage students’ online learning problems (Aycock et al., 2002).

In terms of technology, many faculty members initially needed to overcome their own fears and resistance through “hands-on” experience with various tools and applications. In addition, they are also challenged to provide “front line” technical support for their students. The faculty staff at both the University of Central Florida (Dziuban & Moskal, 2001) and the University of Wisconsin, Milwaukee (Aycock et al., 2002) were adamant that, in order to overcome these support issues, there must be an institutional professional development programme for the development phase of a blended learning course and ongoing institutional support during the initial delivery phase (Voos, 2003).

Risk Factors

The major risk factors identified by those who have taught blended courses include fear of losing control over the course, lower student evaluations, and an uneasiness about how this type of learning model fits into the university culture of teaching, research, and service (Dziuban & Moskal, 2001; Voos, 2003).

Administrative Perspective

Benefits

From an administrative perspective, blended learning presents the opportunity to enhance an institution's reputation, expand access to its educational offerings, and reduce operating costs.

Enhanced Institutional Reputation

The opportunity to enhance an institution's reputation is often linked to improving the quality of the institutional learning environment for students and increasing student and faculty satisfaction (Garrison, 2017; Twigg, 2003b). Heterick and Twigg (2002) have found that blended learning designs can have a positive impact on student learning when thoughtfully applied to support "active learning pedagogies" and increased student "time on task." Voos (2003) suggests that blended designs can enhance both student and faculty satisfaction with learning when the design, training and development, and systems and support are well organised. Graham Spanier, President of Pennsylvania State University, boldly stated that the ability of blended learning to support the convergence of online and residential instruction is "the single, greatest unrecognised trend in higher education today" (cited in Young, 2002, p. 4). Bleed (2001) has also actively explored how these types of courses can be used to recombine learning and social experiences within the Maricopa Community College District of Arizona.

Expand Access to the Institution's Educational Offerings and Increase Enrolments

As previously mentioned, blended learning provides increased choice and flexibility for students in the way that courses and entire programmes are delivered. Many students are now able to balance family and work commitments with their academic studies as a result of this blended model. Numerous higher educational institutions also hope that this expanded access will translate into increased revenue streams, but the results to date have been mixed (Carr, 2001).

Cost Reduction Strategies

Many in higher education are currently asking the question “How can we best serve our students in today’s society in light of increased enrolments and decreased government funding?” (Bates & Poole, 2003, p. 24). Twigg (2003b) suggests that blended learning provides institutions with two principal cost reduction strategies. These options are to either increase student enrolments in courses with little or no change in course expenditures or to keep student enrolments the same while reducing the instructional resource costs for the course.

In the Pew course redesign study, coordinated by Twigg (2003b), the majority of the 30 institutions involved in the study selected the second option. They attempted to keep the same student enrolment numbers and reduce costs while maintaining quality. The predominant technique used to accomplish this objective was to reduce the time faculty staff and other instructional personnel spent on large enrolment courses by transferring a number of tasks to technology. This was achieved through the use of online course management systems, online automated assessments, online tutorials, shared resources and staffing substitutions. These strategies are outlined in Table 1.2 and they allowed the study institutions to reduce course costs by about 40% percent on average, with a range of 20–84% (Twigg, 2003a).

One of the greatest cost savings, which is currently attributed to blended learning, is the reduction in space requirements. Prior to the deployment of blended

Table 1.2 Strategies for using technology to reduce costs in blended courses (Twigg, 2003b)

Technique	Description
Course management systems	The course management systems played a central role in a majority of redesign projects. These systems reduced (and in some cases eliminated) the amount of time that the faculty spent on non-academic tasks, such as grade calculations, photocopying handouts, posting changes to the course schedule, sending out special announcements, and updating course material for subsequent semesters.
Automated assessments	Over half of the projects used automated grading of exercises, quizzes, and tests. This dramatically reduced the amount of time the faculty and/or teaching assistants spent on preparing quizzes as well as grading, recording, and posting results.
Tutorials	Online tutorials were used in a number of the course redesign projects. The faculty involved with these projects reported that students came to the lectures and the face-to-face tutorials more prepared to ask good questions. In addition, the faculty and teaching assistants no longer had to present content in class which was already available online. This created more time for discussion and questions within the face-to-face sessions.
Shared resources	The use of shared resources across multiple sections of the same course allowed for a significant saving of faculty time. This was usually achieved by having one common general resource website for all sections of a particular course.
Staffing substitutions	The substitution of graduate teaching assistants with lower cost undergraduate learning assistants in these blended courses resulted in a substantial cost saving (non-technology).