# 22

# Enabling Time, Pace, and Place Independence

*Som Naidu*
University of Melbourne, Australia

## CONTENTS

## ABSTRACT

This chapter examines technologies that enable time and place independence. Its particular focus is on the *affordances* of these technologies: their ability to support *self-paced learning*, offline or online, and *group-based learning*, asynchronously or synchronously. Self-paced learning *offline* is a mode of learning that enables individuals to study with the help of portable technologies in their own time, at their own pace, and in their own place. Technologies that support this mode of learning include printed books and a whole range of portable non-print media. Self-paced learning *online* is a mode of learning that enables individuals to study online and in their own time, at their own pace, and possibly from their own place. The most prominent technologies that support this model of learning include the Internet and various other computer-mediated communications technologies. Group-based learning *asynchronously* is a mode of learning that enables individuals to learn in groups with online technologies but in their own time, at their own pace, and from their own place. Technologies that support this mode of learning include online learning management systems, mailing lists, bulletin boards, Web logs, and wikis. Group-based learning *synchronously* is a mode of learning that enables individuals

to learn in groups with online technologies at the same time and at the same pace as that of the group, but from different places. Commonly known technologies that allow this kind of flexibility are audio and video conferencing, broadcast radio and television, and newer technologies such as Internet telephony (VoIP), inter-relay chat, and online games and simulations.

## KEYWORDS

*Group-based learning asynchronously:* A mode of learning that enables individuals to learn in groups with online technologies in their own time, at their own pace, and from their own place.

*Group-based learning synchronously:* A mode of learning that enables individuals to learn in groups with online technologies at the same time and at the same pace as that of the group but from their own place.

*Self-paced learning offline:* A mode of learning that enables individuals to study with portable technologies in their own time, at their own pace, and from their own place.

*Self-paced learning online:* A mode of learning that enables individuals to study online in their own time, at their own pace, and from their own place.

## INTRODUCTION

The time and place of any educational activity are of significant importance to learners and teachers as well as the educational organization that is offering the activity. They are of interest to learners because of their implications for when and where they need to be to learn. Teachers are similarly affected by the implications of time and place in terms of when they must teach and where they need to be to teach. The time and place of learning and teaching activities also affect educational organizations in terms of what infrastructure and resources they must have and how to organize them to meet the requirements of where and when learning and teaching must take place.

Learning and teaching activities in campus-based educational settings have conventionally been regulated by time and place. Learners and teachers in these educational settings are expected to be present at designated places and times to engage in the educational activities. In so doing, this mode of learning and teaching imposes constraints on both learners and teachers who, for various reasons, are unable to be present in a required place and at the appointed time. This prevents a large number of learners from participating in

their educational advancement because of their inability to be present at a particular place and time. The time and place of learning impose additional constraints on learners who are able to access campus-based educational provision but for various reasons are unable to complete their learning activities within a certain time frame.

## STRATEGIES

The constraints of the time and place of learning in campus-based educational settings potentially disadvantage a wide range of learners, such as those who are in regular employment or committed to other family care responsibilities, who are physically located too far away from the educational organization or source of the service, who are too poor to afford the various costs of campus-based education, or who lack the formal qualifications necessary to gain entry to this form of education.

### Correspondence Education

In most educational settings, the foregoing situation was found to be unacceptable, and something needed to be done about it. The growth of correspondence education was a direct result of an effort to address this problem. By capitalizing on two technological developments of the time—namely, the printing press and the postal services—correspondence education was able to offer education to those who were unable to access it in campus-based educational settings. Early initiatives with correspondence education involved individual teachers who were trying to reach small numbers of learners wherever they were. Notable instances included the teaching of shorthand, typing, and the English language. The successes of these early and solitary efforts with correspondence education led to established educational organizations rapidly adopting this approach alongside their campus-based educational programs.

As an alternative mode of learning and teaching, correspondence education developed rapidly and steadily in Europe, Canada, Australia, New Zealand, and South Africa and a little later in Asia and Africa. In the United Kingdom, for example, the growth of correspondence education was spearheaded by political will and with the establishment of the United Kingdom Open University by the Labor Government. In South Africa, the need for correspondence education was driven by the apartheid government's divisive policies of racial segregation that restricted certain racial groups from participating in mainstream educational provision leading to the establishment of the University

of South Africa (UNISA). In Asia and Africa, the drivers of correspondence education were the very large numbers of people (both children and adults) who needed education and training, as well as the inability of many of them to afford the comparably high costs of campus-based education. Currently, numerous educational organizations all over the world use correspondence education to provide educational opportunities to many students. Many of these efforts, despite having access to other delivery technologies, continue to rely on little more than printed study materials to offer formal education to very large numbers of learners throughout the world via postal services (Daniel, 1996; Keegan and Rumble, 1982).

The essence of correspondence education was the asynchronous nature of the communication between the learners and their teachers or the educational organization (Holmberg, 1995, 2001; Moore, 1989; Peters, 1971). This model of learning allowed learners to study at a time, pace, and place that most suited them or their situation, regardless of where their teachers or the teaching organization may have been located. The acts of teaching included preparation of the study materials and assignments for the students and communication with them through feedback and comments on the assignments that they submitted.

Although correspondence education offered a viable solution for the constraints imposed by the time, place, and pace dependencies of campus-based education, it had many problems. The absence in such settings of various kinds of learning supports and services that are available to learners in campus-based educational settings caused many problems for learners as well as teachers. Some of these obvious learning supports included facilities for laboratory, tutorial, and small-group work and various forms of guidance and counseling services that students often need. The inability of correspondence education to provide a comparable level of such learner supports caused many learners to experience serious problems with their studies, often leading them to abandon their studies altogether (Amundsen and Bernard, 1989; Simpson, 2003; Sweet, 1986; Woodley and Parlett, 1983).

### Distance Education

To remain a viable educational alternative, correspondence education began to gradually incorporate in its armory increasingly more learner support strategies, ranging from local study center support to residential study sessions, usually during the summer breaks (Bernath and Szucs; 2004; Brindley et al., 2004; Sewart, 1993; Tait and Mills, 2003). It also included the use of a growing range of technologies to supplement the printed study materials to support the interaction between the learners and the teachers.

This shift in correspondence education from an exclusive reliance on the printed word and the postal services to the incorporation of a wider range of technologies for communication between learners and teachers made the term *correspondence education* increasingly unsuitable. With the growing use of non-print media in this mode of learning and teaching, much more than simply correspondence was taking place between the learners and the teachers or the teaching organization.

This led to a growing push for the adoption of the term *distance education* for this mode of learning and teaching. This new term was favored because it directed attention away from the mode of communication (i.e., print and postal services). The concept of distance in this mode of education focused attention on the nature of the separation of the learners from their teachers and the teaching organization and on the noncontiguous nature of the learning and teaching transaction (Keegan, 1990; Perraton, 1987; Rumble, 1989). Use of the term *distance education* for correspondence education grew due to the proliferation of newer technologies that were becoming available to support time, place, and pace independence. Although this shift has been a growing trend in the more developed and resource-rich economies, print and the postal services continue to be widely used for distance education in the less developed and resource-poor economies.

## TECHNOLOGIES

A meaningful way to cluster technologies that enable time, place, and pace independence is presented in Table 22.1 (Naidu, 2006; Romiszowski, 2004). The approach in this table helps to focus our attention on the key *affordances* of these technologies—that is, the opportunities that these technologies offer for individuals as well as groups of learners to work in their own time, at their own pace, and place, asynchronously or synchronously (see also Chapters 21 and 23 in this volume).

**TABLE 22.1**
**Clusters of Technology Affordances for Learning**

| | |
|---|---|
| Self-paced learning *offline* | Self-paced learning *online* |
| Group-based learning *asynchronously* | Group-based learning *synchronously* |

The concept of *affordance*, which was first developed by James Gibson in relation to his work on perception, refers to what an environment has, offers, or provides as clues or stimuli, either positive or negative, for perception or cognition to take place (Gibson, 1977, 1979). In relation to the use of educational technologies, the term *affordance* is being commonly used to refer to the *opportunities* that various *features* or *attributes* of technologies offer for various types of learning activities (Barnes, 2000; Gaver, 1991, 1992).

The review of research on the affordances of technology for learning adopts a consistent format. It starts off with a definition and description of the concept and mode of learning. This is followed by a description of attributes and affordances of the technologies that enable particular modes of learning. A review of key research directions on the mode of learning is then presented. This also includes key unanswered questions and some directions for further research.

## Self-Paced Learning Offline

The concept of self-paced learning implies freedom from the constraints of time and pace. In this mode of learning, individuals are able to carry out their learning activities within a time frame and at a pace that suits them, although some or all of these activities may have to be carried out at specific locations such as a library or a laboratory. Self-paced learning suits learners for different reasons. It is ideally suited for the independent learner who is pursing a hobby or who is learning something for very personal reasons and not necessarily for a formal credit (Brookfield, 1982). It is also suited to a learner who is studying for formal credit but who might need more or less time as well as a different pace from that of others.

A strong argument in the educational literature favors allowing the time and the pace that a learner needs to complete the required learning activities or to achieve his or her full potential (Carroll, 1963). Two models of learning that have been developed around the concepts of time and pace flexibility include Mastery Learning and the Personalized System of Instruction (Block and Anderson, 1975; Bloom, 1968; Keller, 1968). These models of learning are based on the premise that any learner is capable of achieving mastery if he or she has been allowed the time and the pace that he or she needs.

A technology that affords the greatest amount of flexibility in terms of the time, pace, and place of study is clearly the printed textbook. This can come in the form of commercially produced reference books, customized readers, and study guides. Carefully designed textual material makes judicious use of a range of design strategies to capture and communicate its message to the readers. These strategies include anything from introductions, in-text questions, and summaries to pictures and graphic illustrations. The printed textbook is a widely portable and relatively durable item that can be used by anyone who is able to read. It gives the reader the flexibility to read it when and where he or she needs or wishes to read it. Also, readers can vary the pace at which they might read different kinds of textual material; for example, students might read much of the daily newspaper a lot more quickly than they might read a journal article for their studies.

A wide range of non-print media also affords a considerable amount of flexibility in terms of time, pace, and place of study. The more conventional of the non-print technologies include the audiocassette, videocassette, CD-ROMs, and DVDs. These technologies are capable of capturing sound, animation, and the moving image which is crucial for representing various kinds of content. They are very durable and portable, and they offer users a good deal of flexibility in terms of the time, pace, and place of its use.

Contemporary non-print technologies include a growing list of portable devices, including mobile phones, a variety of personal digital assistants (PDAs), iPODs, laptop computers, and tablet PCs. Although the form and function of these portable technologies continue to change incessantly, their unique attribute is their ability to support time, place, and in many cases pace independence. Mobile phones, for example, in addition to serving as communication devices are able to support a range of other functions such as organizing and scheduling. Personal digital assistants that are now coming onto the market have similarly progressed from serving as simple calendars or schedulers to also supporting communication. The laptop computer is now the main working machine for many, as its power and speed have expanded to match those of the desktop machine. The increasing power and potential of these technologies afford substantially improved opportunities for individuals as well as groups to work and study at a time, pace, and place that is convenient for them.

There has been extensive research on the educational uses of the more conventional mobile technologies, such as printed study materials and other non-print mobile technologies (Bernard and Naidu, 1990, 1992; Bernard et al., 1991; Hackbarth, 1996; Heinich et al., 1993; Lockwood, 1998; Naidu, 1994; Naidu, and Bernard, 1992; Rigney, 1978). Research on the use of the more contemporary mobile technologies in learning and teaching, such as mobile phones and personal digital assistants, is only just beginning (Kukulska-Hulme and Traxler, 2005).

A growing body of research on the use of hand-held devices such as mobile phones in the classroom (Prensky, 2005) indicates that hand-held devices, and especially mobile phones, are becoming increasingly more affordable in both developed and developing countries. These are powerful tools that offer voice-based communication, text messaging, graphic displays, and Web browsing; however, their ubiquity has yet to be fully explored for learning and teaching purposes (Prensky, 2005).

The PDAs currently appearing on the market are able to serve several useful educational functions, including content delivery, organization, communication, and access to various types of educational guidance and support services (Kukulska-Hulme and Traxler, 2005). Preliminary reports are beginning to emerge on the use of various mobile technologies for a variety of educational purposes. These include the use of mobile phones in language learning (Levy and Kennedy, 2005) and the use of PDAs by medical staff and physicians for accessing critical information while they are away from their offices (Kneebone and Brenton, 2005; Smordell and Gregory, 2005). There are also reports on the use of handheld devices and wireless computers to improve assessment of learning and instruction (Moallem et al., 2005).

As the demand for greater flexibility in learning and teaching and just-in-time learning opportunities (i.e., learning at the time of need) increases, it is likely that greater use will be made of mobile technologies. No doubt, the mobile technologies of the future will have a lot more capacity than today's personal computers; however, their attraction will lie in their targeted use to support specific learning and teaching activities. Reports on their use should focus on the following types of questions:

- What are the ways in which mobile technologies can be used to support learning in both individualized and group-based educational settings? What are the impacts of such use of mobile technologies on various aspects of learning?
- What are the ways in which mobile technologies can be used to leverage various learning and teaching activities? What are the impacts of such use of mobile technologies on various aspects of learning?

To adequately answer these types of questions, great care should be taken to focus attention on the foregoing affordances of these technologies and especially on the ways in which they can support specific learning and teaching functions. These studies will have to use the full range of approaches on research and evaluation and draw upon the collective wisdom on research and evaluation of technology-enhanced learning (Abrami and Bernard, 2006; Taylor, 2003).

## Self-Paced Learning Online

Self-paced learning online is a mode of learning in which an individual is able to study at his or her own pace with a range of online technologies. A growing list of technologies is becoming widely available and also affordable to make time and pace independence online a considerably more pleasant experience. Perhaps the most prominent among the technologies supporting self-paced learning online are the Internet and the World Wide Web. The Internet refers to the network of computers that are connected to one another, thus enabling the sharing of data, information, communication, and other types of subject matter among its users via file-sharing protocols. Another set of technologies that is able to support self-paced learning is the variety of computer-mediated communications technologies, such as e-mail, mailing lists, and discussion forums (Naidu, 1989). This suite of technologies uses the electronic text to enable users to communicate with, and share information with individuals and groups in their own time and at their own pace, and from a place that is convenient to them (Naidu, 2006).

Also growing in popularity for supporting self-paced learning online in both campus-based and distance education systems are online learning management systems. These are software applications comprised of a collection of tools that can support a variety of learning and teaching activities, such as self-paced independent study as well as group-based learning activities; they provide the opportunity to access and work on a particular subject matter at the learner's own pace and time and from a place of his or her choice. They also allow communication with peers and teachers at the learner's own convenience (Naidu, 2006).

A critical enabler of self-paced online learning is access to electronic resources, which are becoming increasingly available to users online. These include various types of electronic databases, learning object repositories and archives, journals, and books (McGreal, 2004; Richards et al., 2004). They allow learners to search for and retrieve data and information from rich repositories at a time, pace, and from a place convenient to them. Publishers and promoters of these electronic resources are suggesting that these resources are the "building blocks of e-learning … [and] the libraries of the e-learning era" (Richards et al., 2004, pp. 236, 242).

Despite its obvious advantages, self-paced learning online does have some limitations, particularly with relation to the loneliness and boredom that may set in due to the lack of *social presence*, which refers to the degree to which participants seem to be real in noncontiguous educational settings. Social learning theorists would argue that learning could be constrained by the lack of social presence (Bandura, 1977; Lave, 1991; Vygotsky, 1978; Wenger, 1998; Wertsch, 1991). This lack of social presence in self-paced online learning has been its major criticism and the subject of a great deal of research. The focus of that research is on the impacts and implications of the lack of social presence on learning (Gunawardena, 1995; Gunawardena and Zittle, 1997; Richardson and Swan, 2003; Swan and Shih, 2005) and on strategies that can be employed to reintegrate social presence in learning online (Conrad, 2005; Kreijns et al., 2002, 2003; Swan, 2002). A key premise of this line of research is that building social cohesiveness and community is essential to our learning and our learning capability (Kreijns et al., 2002, 2003).

## Group-Based Learning Asynchronously

Group-based learning is grounded in the principles of cooperative and collaborative learning and on the belief that the development of knowledge is a social process. It involves groups of people engaged in the negotiation of meaning and understanding (Slavin, 1990, 1994; Wenger, 1998). Although individuals can learn by themselves, proponents of group-based learning argue that group-based learning is a more powerful means for developing knowledge and understanding (Pea, 1993; Resnick et al., 1991).

Group-based learning asynchronously involves groups of learners working together without the need to be studying in the same place or at the same time. This is becoming increasingly possible with the availability of a range of technologies that can support asynchronous communication between individuals and groups who are not in the same location. Prominent among these is the suite of computer-mediated communications technologies, such as online learning management systems, mailing lists, Weblogs (blogs), wikis, and podcasts. Online learning management systems are software applications that allow learners to work together without the need to be at the same place or time. Students can log onto these systems at a time and from a place that suits them to carry out tasks that they have been assigned, and they are able to see what others have done. They can continue to work on these tasks for as long as they like or need to and as often as necessary until the group is satisfied

that the work is done. In this environment, teachers are able to monitor the contributions of individuals as well as the group.

Considerable research has been conducted on asynchronous group-based learning and the technologies that support it (Beldarrain, 2006; Mason, 1993; Mason and Kaye, 1989; Naidu, 1989; Rapaport, 1991). A predominant focus of much of this research is on the affordances of these technologies for collaborative learning (Koschmann, 1996; McConnell, 2000; Stahl, 2002), and building learning communities (Bernard and Lundgren-Cayrol, 2001; Hathorn and Ingram, 2002; Kanuka and Anderson, 1998; Paulus, 2004, 2005; Salmon, 2000; 2003).

Evidence and experience from this body of research suggest that, to achieve the best outcomes, asynchronous group-based learning requires the same level of rigor as any other mode of learning, including paying attention to structuring, managing, and moderating such activities. Although few would argue the benefits of asynchronous group-based learning, we must learn a great deal more about how to best assess learning outcomes within such educational settings. The affordances of the technology in this regard are still very primitive and underutilized. Future research on asynchronous group-based learning must focus on how learning achievement can be reliably and validly assessed in such educational settings.

## Group-Based Learning Synchronously

Group-based learning synchronously also enables groups of learners to work together; however, in this mode of learning, although the learners need not be in the same place, they must be present at the same time and progress pretty much at the same pace as the group. Commonly known technologies that offer this kind of flexibility include audio and video conferencing and broadcast radio and television. These technologies give learners who primarily study independently the rare opportunity to communicate and work with their peers for brief periods of intensive synchronous activities. These activities may include guest lectures, tutorials, and demonstrations. The use of these technologies is very popular in distance education settings, where they serve a critical role in complementing individualized self-paced study.

Audio and video conferencing, as well as radio and television, are widely known technologies that have demonstrated a great deal of opportunities for group-based synchronous learning (Hutton, 1984; Michel, 1987; Schramm, 1977; Thomas, 1987; Zuber-Skerritt, 1984). In distance education settings, widespread use of radio and television broadcasts enhances

and supplements classroom and home schooling activities (Green, 2006; Potter and Naidoo, 2006).

Newer technologies that offer opportunities for synchronous activity include voice over IP (VoIP), inter-relay chat (IRC), and various types of games that can be played with MOOs and MUDs by multiple users on the Internet (MOO is an acronym for MUD, object-oriented, and MUD stands for multi-user domain).

The growth of online distance learning seems to be spearheading a growing interest in the newer collaborative learning technologies that promise group-based synchronous learning opportunities. Noteworthy work in this regard has attempted to integrate proven learning strategies such as role playing and problem solving with technologies to promote the concept that school learning should be more like life itself (Childress and Braswell, 2006; Doering, 2006; Naidu et al., 2000). This is encouraging and is the direction that research and development activity in synchronous group-based learning should be taking.

## DISCUSSION

Frequently asked questions about technology and education include (Clark and Solomon, 1986; Kozma, 1991): How does technology influence learning? Is this influence an improvement over face-to-face instruction? This line of inquiry is problematic, as it suggests that face-to-face education is an ideal form of learning and teaching and that it serves as a benchmark that must be met to establish success. Furthermore, it fails to define the meaning of the term *influence*, nor does it address how such influence is being ascertained and in relation to what specific attributes of face-to-face education.

Although the search for the influence of technology on learning is justified, much of the research in this regard is misguided (Clark, 1983, 1994; Kulik, 1985). Too many of these studies focus attention on the unique impacts of technology, which are almost impossible to delineate from how the technology is being used and for what purpose. Researchers have argued that with that kind of focus these studies run the risk of reporting results that cannot be attributed to the technology alone, as they are very likely to be due to the combined effects of both the technology and the teaching method (Clark, 1994; Kozma, 1991).

There is growing consensus around the view that research on the influence of technology on education should focus on the affordances of these technologies and not the technology itself (Clark, 1983, 1994). These affordances include the capabilities of technologies to capture and represent different types of content and messages, activate learning, provide opportunities for socialization, assess learning outcomes, and provide feedback and remediation to learners (Naidu, 2003). Although these are common educational activities, research should focus on how these activities are enhanced and supported by various technologies; for example, do time- and place-independent technologies have particular advantages for these learning and teaching activities? What are these advantages? How can these advantages be optimized with the use of various technologies? Research should focus on how technologies can be used to capture data and other types of information to make them accessible to users when and where they are needed. e-Books, for example, might be a great idea, but are they best delivered on a PDA or an iPOD? What types of information are best delivered on mobile technologies and to support what kind of learning and use?

## CONCLUDING REMARKS

Technologies that enable time, pace, and place independence are becoming widely available in both developed and developing societies. As these technologies become more accessible and affordable, they are likely to permeate all aspects of our daily lives; therefore, it would seem sensible to deploy them appropriately in learning and teaching rather than limit or ban them from these contexts. Inefficient use of these technologies will only lead to blaming the technology for ensuing problems, as we have done in the past. Technologies that enable time, pace, and place independence have particular advantages for various types of learning activities and different groups of learners. They allow learners and teachers to do things that are not possible within the parameters of campus-based educational settings. Many of these technologies can put a great deal of resources within easy reach of learners and in so doing can empower them in various ways and open up new opportunities for learning and teaching. These types of learning opportunities will require teachers as well as educational organizations to rethink their learning and teaching processes and how they may have been conducting their business in conventional campus-based educational settings (Herrington et al., 2006). This kind of reorientation to learning and teaching will have numerous implications for the design and development of such learning environments, and this is where research and development activities in the field ought to place much of their emphasis.

# REFERENCES

Abrami, P. and Bernard, R. M. (2006). Research on distance education: in defense of field experiments, *Distance Educ.*, 27(1), 5–26.

Amundsen, C. L. and Bernard, R. M. (1989). Institutional support for peer contact in distance education: an empirical investigation, *Distance Educ.*, 10(1), 7–27.

Bandura, A. (1977). *Social Learning Theory.* Englewood Cliffs, NJ: Prentice Hall.

Barnes, S. (2000). What does electronic conferencing afford distance education? *Distance Educ.*, 21(2), 236–247.

Beldarrain, Y. (2006). Distance education trends: integrating new technologies to foster student interaction and collaboration. *Distance Educ.*, 27(2), 139–153.

Bernard, R. M. and Lundgren-Cayrol, K. (2001). Computer conferencing: an environment for collaborative project-based learning in distance education. *Educ. Res. Eval.*, 7(2–3), 241–261.

Bernard, R. M. and Naidu, S. (1990). Enhancing interpersonal communication in distance education: can 'voice-mail' help? *Educ. Training Technol. Int.*, 27(3), 293–300.

Bernard, R. M. and Naidu, S. (1992). Post-questioning, concept mapping and feedback: A distance education field experiment. *Br. J. Educ. Technol.*, 23(1), 48–60.

Bernard, R. M., Naidu, S., and Amundsen, C. L. (1991). Choosing instructional variables to enhance learning in distance education, *Media Technol. Hum. Resource Dev. J. Educ. Technol.*, 4(1), 3–13.

Bernath, U. and Szucs, A., Eds. (2004). Supporting the learning in distance and e-learning. In *Proceedings of the Third European Distance Education and e-Learning Network (EDEN) Research Workshop*, March 4–6, Carl von Ossietzky University of Oldenburg, Germany.

Block, J. H. and Anderson, L. W. (1975). *Mastery Learning in Classroom Instruction.* New York: Macmillan.

Bloom, B. (1968). Learning for mastery (UCLA-CSEIP). *Eval. Comment*, 1(2), 1–12.

Brindley, J. E., Walti, C., and Zawacki-Richter, O. (2004). *Learner Support in Open, Distance and Online Learning Environments.* Oldenburg: Bibliotheks- und Informationssystem der Universität Oldenburg.

Brookfield, S. (1982). Independent learners and correspondence students, *Teaching Distance*, 22, 26–33.

Carroll, J. B. (1963). A model of school learning. *Teachers Coll. Rec.*, 64(8), 723–733.

Childress, M. D. and Braswell, R. (2006). Using massively multiplayer online role-playing games for online learning, *Distance Educ.*, 27(2), 187–196.

Clark, R. E. (1983). Reconsidering research on learning from media. *Rev. Educ. Res.*, 53(4), 445–460.*

Clark, R. E. (1994). Media will never influence learning. *Educ. Technol. Res. Dev.*, 53(2), 21–30.*

Clark, R. E. and Solomon, G. (1986). Media in teaching. In *Handbook of Research on Teaching*, 3rd ed., edited by M. Wittrock, New York: Macmillan.*

Conrad, D. (2005). Building and maintaining community in cohort-based online learning. *J. Distance Educ.*, 20 (1), 1–21.

Daniel, J. S. (1996). *Mega-Universities and Knowledge Media. Technology Strategies for Higher Education.* London: Kogan Page.

Doering, A. (2006). Adventure learning: transformative hybrid online education, *Distance Educ.*, 27(2), 197–215.

Gaver, W. W. (1991). Technology affordances. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems: Reaching Through Technology*, edited by S. P. Robertson, G. M. Olson, and J. S. Ohlson, pp. 79–84. New York: ACM Press.

Gaver, W. W. (1992). The affordances of media spaces for collaboration. In *Proceedings of the 1992 ACM Conference on Computer-Supported Cooperative Work*, edited by M. Mantel and R. Baecker, pp. 17–24. New York: ACM Press.

Gibson, J. J. (1977). The theory of affordances. In *Perceiving, Acting, and Knowing: Toward an Ecological Psychology*, edited by R. Shaw and J. Bransford, pp. 67–82. Hillsdale, NJ: Lawrence Erlbaum Associates.*

Gibson, J. J. (1979). *The Ecological Approach to Visual Perception.* Boston: Houghton Mifflin.

Green, N. C. (2006). Everyday life in distance education: one family's home schooling experience. *Distance Educ.*, 27(1), 27–44.

Gunawardena, C. N. (1995). Social presence theory and implications for interaction and collaborative learning in computer conferences. *Int. J. Educ. Telecommun.*, 1(2/3), 147–166.

Gunawardena, C. N. and Zittle, F. (1997). Social presence as a predictor of satisfaction within a computer mediated conferencing environment. *Am. J. Distance Educ.*, 11(3), 8–26.

Hackbarth, S. (1996). *The Educational Technology Handbook: A Comprehensive Guide.* Englewood Cliffs, NJ: Educational Technology Publications.

Hathorn, L. G. and Ingram, A. L. (2002). Cooperation and collaboration using computer-mediated communication. *J. Educ. Comput. Res.*, 26(3), 325–347.

Heinich, R., Molenda, M., and Russell, J. D. (1993). *Instructional Media and the New Technologies of Instruction.* New York: Macmillan.

Herrington, J., Reeves, T., and Oliver, R. (2006). Authentic tasks online: a synergy among learner, task, and technology, *Distance Educ.*, 27(2), 233–247.

Holmberg, B. (1995). *Theory and Practice of Distance Education.* London: Routledge.

Holmberg, B. (2001). *Distance Education in Essence: An Overview of Theory and Practice in the Early 21st Century.* Oldenburg: Bibliotheks- und Informationssystem der Universitat Oldenburg.

Hutton, D. (1984). Video technology in higher education: the state of the art? In *Video in Higher Education*, edited by O. Zuber-Skerritt, pp. 11–25. London: Kogan Page.

Kanuka, H. and Anderson, T. (1998). Online social interchange, discord and knowledge construction. *J. Distance Educ.*, 13(1), 57–74.

Keegan, D. (1990). *Foundations of Distance Education*, 2nd ed. London: Routledge.

Keegan, D. and Rumble, G. (1982). Distance teaching at university level. In *The Distance Teaching Universities*, edited by G. Rumble and K. Harry, pp. 15–31. London: Croom Helm.

Keller, F. S. (1968). Good-bye, teacher…. *J. Appl. Behav. Anal.*, 1, 79–89.

Kneebone, R. and Brenton, H. (2005). Training perioperative specialist practitioners, In *Mobile Learning: A Handbook for Educators and Trainers*, edited by A. Kukulska-Hulme and J. Traxler, pp. 106–115. London: Routledge.

Koschmann, T., Ed. (1996). *CSCL: Theory and Practice of an Emerging Paradigm.* Mahwah, NJ: Lawrence Erlbaum Associates.

Kozma, R. B. (1991). Learning with media. *Rev. Educ. Res.*, 61(2), 179–211.*

Kreijns, K., Kirschner, P. A., and Jochems, W. (2002). The sociability of computer-supported collaborative learning environments. *J. Educ. Technol. Soc.*, 5(1), 8–22.*

Kreijns, K., Kirschner, P. A., and Jochems, W. (2003). Identifying the pitfalls for social interaction in computer-supported collaborative learning environments: a review of the research. *Comput. Hum. Behav.*, 19(3), 335–353.*

Kukulska-Hulme, A. and Traxler, J. (2005). *Mobile Learning: A Handbook for Educators and Trainers*. London: Routledge.

Kulik, J. A. (1985). The importance of outcome studies: a reply to Clark. *Educ. Commun. Technol. J.*, 34(1), 381–386.*

Lave, J. (1991). Situating learning in communities of practice. In *Perspectives on Socially Shared Cognition*, edited by L. B. Resnick, J. M. Levine, and S. D. Teasley, pp. 63–82. Washington, D.C.: American Psychological Association.

Levy, M. and Kennedy, C. (2005). Learning Italian via mobile SMS. In *Mobile Learning: A Handbook for Educators and Trainers*, edited by A. Kukulska-Hulme and J. Traxler, pp. 76–83. London: Routledge.

Lockwood, F. (1998), *The Design and Production of Self-Instructional Materials*. London: Kogan Page.

Mason, R., Ed. (1993). *Computer Conferencing: The Last Word*. Victoria, B.C.: Beach Holme Publishers.

Mason, R. and Kaye, A., Eds. (1989). *Mindweave: Communication, Computers, and Distance Education*. Oxford: Pergamon Press.

McConnell, D. (2000). *Implementing Computer Supported Cooperative Learning*. London: Kogan Page.

McGreal, R., Ed. (2004). *Online Education Using Learning Objects*. London: Routledge.

Michel, C. (1987). Education radio and television: their transfer to developing societies, pages. In *Educational Technology: Its Creation, Development and Cross-Cultural Transfer*, edited by R. M. Thomas and V. N. Kobayashi, pp. 125–142. Oxford: Pergamon.

Moallem, M., Sue-Jen, C., and Kermani, H. (2005). Using handheld wireless computers to improve assessment of learning and instruction, *Educ. Technol.*, 45(6), 12–21.

Moore, M. G. (1989). Editorial: three types of transaction. *Am. J. Distance Educ.*, 3(2), 1–7.

Naidu, S. (1989). Computer conferencing in distance education, *Int. Counc. Distance Educ. Bull.*, 20, 39–46.

Naidu, S. (1994). Applying learning and instructional strategies in open and distance learning. *Distance Educ.*, 15(1), 23–41.*

Naidu, S., Ed. (2003). *Learning and Teaching with Technology: Principles and Practices*. London: Kogan Page.

Naidu, S. (2006). *E-Learning: A Guidebook of Principles, Procedures, and Practices*. New Delhi, India: Commonwealth Educational Media Center for Asia (CEMCA) and the Commonwealth of Learning.

Naidu, S. and Bernard, R. M. (1992). Enhancing academic achievement in distance education with concept mapping and inserted questions. *Distance Educ.*, 23(1), 218–233.

Naidu, S., Ip, A., and Linser, R. (2000) Dynamic goal-based role-play simulation on the Web: a case study. *Educ. Technol. Soc.*, 3(3), 190–202.

Paulus, T. (2004). Collaboration or cooperation? Small group interactions in a synchronous educational environment. In *Computer-Supported Collaborative Learning in Higher Education*, edited by T. S. Roberts, pp. 100–124. Hershey, PA: Idea Group.

Paulus, T. (2005). Collaborative and cooperative approaches to online group work: the impact of task type. *Distance Educ.*, 26(1), 111–125

Pea, R. D. (1993) Practices of distributed intelligence and design for education. In *Distributed Cognition: Psychological and Educational Considerations*, edited by G. Salomon, pp. 47–86. Cambridge, MA: Cambridge University Press.*

Perraton, H. (1987). Theories, generalizations and practice in distance education. *Open Learn.*, 2(3), 3–12.

Peters, O. (1971). Theoretical aspects of correspondence instruction. In *The Changing World of Correspondence Study: International Readings*, edited by O. Mackenzie and E. L. Christensen, pp. 223–228. University Park, PA: The Pennsylvania State University.

Potter, C. S. and Naidoo, G. (2006). Using interactive radio to enhance classroom learning and reach schools, classrooms, teachers, and learners, *Distance Educ.*, 27(1), 63–86.

Prensky, M. (2005). What can you learn from a cell phone? Almost anything! *Innovate*, 1(5), 1–7.

Rapaport, M. (1991). *Computer Mediated Communications: Bulletin Boards, Computer Conferencing, Electronic Mail and Information Retrieval*. London: John Wiley & Sons.

Resnick, L. B., Levine, J. M., and Teasley, S. D. (1991). *Perspectives on Socially Shared Cognition*. Washington, D.C.: American Psychological Association.

Richards, G., Hatala, M., and McGreal, R. (2004). POOL, POND, and SPLASH: portals for online objects for learning. In *Online Education Using Learning Objects*, edited by R. McGreal, p. 237. London: Routledge.

Richardson, J. C. and Swan, K. (2003). Examining social presence in online courses in relation to students' perceived learning and satisfaction. *J. Asynchronous Learn. Netw.*, 7(1), 68–88.

Rigney, J. W. (1978). Learning strategies: a theoretical perspective. In *Learnings Strategies*, edited by H. F. O'Neil, Jr., pp. 165–205. New York: Academic Press.

Romiszowski, A. (2004). How's the e-learning baby? Factors leading to success or failure of an educational technology innovation, *Educ. Technol.*, 44(1), 5–27.

Rumble, G. (1989). On defining distance education. *Am. J. Distance Educ.*, 3(2), 8–20.

Salmon, G. (2000). *E-Moderating: The Key to Teaching and Learning Online*. London: Kogan Page.

Salmon, G. (2003). *Etivities: The Key to Active Online Learning*. London: Routledge.

Schramm, W. (1977). *Big Media, Little Media: Tools and Technologies for Instruction*. Beverly Hills, CA: SAGE.

Sewart, D. (1993). Student support systems in distance education. *Open Learn.*, 8(3), 3–12.

Simpson, O. (2003). *Student Retention in Online, Open, and Distance Learning*. London: Kogan Page.

Slavin, R. E. (1990). *Cooperative Learning: Theory, Research, and Practice*. Englewood Cliffs, NJ: Prentice Hall.*

Slavin, R. E. (1994). Student teams achievement divisions. In *Handbook of Cooperative Learning*, edited by S. Sharan, pp. 3–19. Westport, CT: Greenwood Press.

Smordell, O. and Gregory, J. (2005). Knowmobile: mobile opportunities for medical students. In *Mobile Learning: A Handbook for Educators and Trainers*, edited by A. Kukulska-Hulme and J. Traxler, pp. 99–105. London: Routledge.

Stahl, G. (2002). Contributions to a theoretical framework for CSCL. In *Proceedings of the International Conference on Computer Supported Collaborative Learning (CSCL, 2002)*, pp. 62–71. Hillsdale, NJ: Lawrence Erlbaum Associates.

Swan, K. (2002). Building communities in online courses: the importance of interaction. *Educ. Commun. Inform.*, 2(1), 23–49.*

Swan, K. and Shih, L. (2005). On the nature and development of social presence in online course discussions. *J. Asynchronous Learn. Netw.*, 9 (3).

Sweet, R. (1986). Student dropout in distance education: an application of Tinto's model. *Distance Educ.*, 7(2), 201–203.

Tait, A. and Mills, R. (2003). *Rethinking Learner Support in Distance Education. Change and Continuity in an International Context*. London: Routledge.

Taylor, J. (2003). A task-centered approach to evaluating a mobile learning environment for pedagogical soundness. In *Learning with Mobile Devices: Research and Development*, edited by J. Attewell, and C. Savill-Smith, pp. 167–72. London: Learning and Skills Development Agency.

Thomas, R. M. (1987). Educational radio and television: their development in advanced industrial societies. In *Educational Technology: Its Creation*, *Development and Cross-Cultural Transfer*, edited by R. M. Thomas and V. N. Kobayashi, pp. 105–124. Oxford: Pergamon.

Vygotsky, L. S. (1978). *Mind and Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press.

Wenger, E. (1998). *Communities of Practice: Learning*, *Meaning and Identity.* Cambridge, U.K.: Cambridge University Press.

Wertsch, J. V. (1991). *Voices of the Mind: A Sociocultural Approach to Mediated Action*. Cambridge, MA: Harvard University Press.

Woodley, A. and Parlett, M. (1983). Student drop-out. *Teaching Distance*, 24, 2–23.

Zuber-Skerritt, O. (1984). *Video in Higher Education*. London: Kogan Page.

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* Indicates a core reference.