Reviews

edited by Philip Barker

Seels, Barbara B. and Richey, Rita C., *Instructional Technology: The Definition and Domains of the Field*, Washington DC, Association for Educational Communications and Technology, 1994. ISBN 0-89240-072-2.

Editorial note

This review differs from others we have so far published in ALT-J. In order to offer a multiple perspective on a contentious area, we approached three reviewers. We then asked Barbara Seels and Rita Richey, in the light of the reviews we received, to reconsider their position set out in their book. In addition, Ray McAleese (Heriot-Watt University) has commented both on the reviews and on the reactions to them by Seels and Richey. We welcome any comments you may have.

The order in which the reviews are published here has been determined by the extent to which the reviewers offered a description of the book's contents.

This review, written by the Foundation Director of the Institute for Education Technology (IET) at the Open University, reflects the OU's pre-eminence in course design. The IET was an early pioneer of collaborative course teams by including an educational technologist as well as a subject specialist.

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What is instructional technology (or, for that matter, educational technology)? That is a question asked repeatedly by lay people when they first hear the term, and it can be embarrassing, even tiresome, to have to explain. It is therefore entirely appropriate that AECT (Association for Educational Communications and Technology), founded in the USA, should have fostered this plain book about changes since 1977 in instructional technology as perceived by practitioners in the USA.

AECT does not pretend to be an international organization, and its Committee on Definition and Terminology consulted widely within the USA, not beyond. Nevertheless, all who work in the broad field of applying technology in education can benefit from reading this book.

The term *instructional technology* has no precise equivalent in Europe. Educational technology overlaps with it, as Seels and Richey note, but is it closer to *tecnologie didattiche* (Italian), *Unterrichtswissenschaft* (German) or *tecnología educativa* (Spanish)? The definition eventually agreed by AECT in 1994 is that instructional technology is the theory and practice of design, development, utilization, management and evaluation of processes and resources for learning. Seels and Richey tackle the issues of definition rather thoroughly, as we would expect in 124 pages. Drawing on a modicum of recent writings, they analyse in detail and comment upon the five domains in the definition. Fair enough, but then they discuss the sources of influence on instructional technology. Here they correctly note the major influence of positivist science, particularly behaviourism, without giving enough space to criticisms of its failures. In my opinion, they over-estimate the extent to which theory has determined practice: a great deal of instructional technology in practice is still atheoretical, much like a craft.

Having said that, however, am I right in saying that nowhere is there an exposition of the ontological and epistemological roots of instructional technology? If so, that is disappointing in a reference work like this. Was it left out because committees do not like such serious and abstract discussion? Or because nobody wants to know about it?

Seels and Richey describe briefly and uncritically certain aspects of practice and the practitioners. In their efforts to systematize instructional technology, they seem to focus their attention on what they believe they have seen rather than on what might be best practice. Their view of the practitioners is clear but limited when compared with, say, Eraut's book *Developing Professional Knowledge and Competence* (1994), which draws on Schon's ideas.

Finally, Seels and Richey examine the role and implications of the definition. It will aid communication and build a sense of community, they say, because it will add to shared understanding. They also suggest that the new definition, because it is different from the 1977 one, will aid new agenda-building. The chief difference, for me, is that in 1977 instructional technology was defined as a practice-oriented problem-solving process, while in 1994 the definition is oriented towards both theory and

The American national perspective does come over in the book, in spite of AECT's attempt to be more international. There is a degree of parochialism in the citations, and the flavour of the book defines it as American.

I am glad the reviewer has made the point about craft. Many activities are craft-like in their eclectic use of multiple paradigms and atheoretic assumptions. I do not feel that craft should be taken to imply 'lacking professionalism'; rather, it should locate the practices in the authentic world of learners and designers – students and teachers.

This must be getting at the heart of the matter. Practice leads to better practice and the development of criteria for producing such practice. These criteria must in time become an integrated body of knowledge, a theory of practice. Therefore, one would imagine that as the practice-based approach becomes more useful, the acquired procedures and knowledge contribute to a theory. The question one is left with when one reads the Seels and Richey book is 'Has learning technology come far enough?'

One can not but be impressed with a Code of Ethics. The AECT Code certainly makes one think about the responsibilities designers have to ensure that knowledge is made accessible and is not hidden by a particular design philosophy. As historical gate-keepers, teachers and designers have this ethical role with regard to how learners acquire skills and competencies.

As NCET is the official Government-sponsored agency that supports, applies and advises on what is known about educational technology, one would expect this review to take a utility view. NCET plays a middle-of-the-road role between the academic community and the marketplace.

Abstract: No. Academic: Yes. If theory-building is not part of a discipline and profession, I do not know what is. I suspect Margaret Bell is more concerned with the utility of such a framework than how it contributes to the professionalization of the field.

practice. Seels and Richey say that the change implies the need for increased research and theory construction unique to this field, and decreased reliance upon the products of the research and theory of other fields.

For me, there's the rub. The boundaries of instructional technology are fuzzy, thank goodness, and in its eclectic approach should lie its strength. It cannot stand apart. It must change with changes in the arts and sciences it depends upon.

For good measure, Seels and Richey add a glossary. The terms selected indicate well the book's lusty positivist bias. Three appendices provide data of variable potential value. Do you really want 40 other glossaries of instructional technology? The directory of associations and their publications may be useful to students and practitioners, but is already looking dated.

The AECT Code of Ethics makes interesting reading, but I probably would not be able to sign up to it because I do not know how to represent accurately and truthfully the facts concerning educational matters. The facts change and need definition and re-definition. So does instructional technology.

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I should make it clear that I am not an academic, and am not familiar with the systems and processes which are of relevance and important in academia. I looked at this book in terms of its practical use in progressing the development of technology-based learning materials. I would be interested to know if the contents have been tested with a commercial producer of instructional technology, and if so, whether they were found to have made a contribution.

I am not convinced of the value of building an abstract academic subject of Instructional Technology. Understanding the effectiveness of instructional-technology materials, the full potential of them and the complexity of their design, is a living topic, one which continues to grow and develop rapidly. In my opinion, this approach could, at worst, hinder that natural progression and, at best, rapidly become out of step with what is happening on the ground.

Chapter 1 left me with only one question: 'so what?'. Why do we need a definition which is so carefully worked and in so much detail. Understanding of this area is in a fluid state, the technology is developing rapidly, new opportunities are opening up, and our understanding of technology's application to learning is growing. This continued development and change

cannot be tamed, controlled or better understood by a definition; neither should progress be constrained by it. There is no evidence that the development of instructional technology has been hampered through lack of definition.

Throughout this chapter there is, in my view, too much emphasis on instruction and teaching; not enough on learning. The main impact of the introduction of technology into the learning process is that students have more opportunity to develop into active learners. It changes the focus from the teaching to the learning process. In designing computer-based learning materials, we are challenged much more by understanding the necessary support to learning than in the required support to teaching.

Is it the lack of taxonomy that impedes communication and discourages transfer of expertise from one technology to another? In any case, does the taxonomy suggested in Chapter 2 not need to change to accommodate advances in technology?

The management domain does not appear to include learner management. This is a very important part of technology-based learning, and may provide the key to effective open and flexible learning.

In the development domain, what is meant by integrated technologies? The integration of what? CBT is an integration of approaches; it integrates the intelligence of the computer with text, graphics, etc., and now increasingly with pictures and sound. CBT and integrated technologies are surely part of the same continuum. I am not sure that there is a common understanding of the terminology used to describe the domains. I agree with the authors that Integrated Systems Design is an iterative process, but where, in the four areas of the domain of design, is there consideration of exploitation of the media? New media allow approaches not previously possible. How are these identified and integrated into the design? My experience is that new technologies require a re-think of learning processes.

Learning styles (cognitive, etc.) should be recognized and selected, but there is no reason why more than one should not be accommodated within a single product, adapting to the learner's requirements as identified and demanded.

In the domain of development, I am not sure why print is considered the foundation of all others. Some products do not have print. Print, audio-visual media and CBT are all components of integrated technologies. The key characteristics of computer-based materials are not those that are visible. You cannot, therefore, categorize/define the media by the visible characteristics. How will the new electronic

There is evidence that the imprecise definition of the field affects the way learning technologists are integrated into the academic community (Cummings, 1996). Surely learning technologists need some form of accreditation?

That makes sense. The book does seem to avoid, if not miss, a perspective from the learner. Of course, the authors set out to examine the design of learning opportunities. One might argue that the whole emphasis should be *learning technology*, not *instructional technology*.

Taxonomies do seem to have an 'academic' flavour. What would be useful in the book is to have more instances and examples. With a classification and instances (for example, 'positive' and 'negative'), the reader might make more use of the framework. For an early taxonomy, readers should look at Bretz (1971) or Heidt (1978).

This seems very important. The mean-end-means dialectic of instructional design often alerts the designer to new media opportunities, and such opportunities often lead to radical new designs.

communication technologies be categorized, and what will be the result of the convergence of telecommunication and multimedia?

The main problem with this chapter, as I see it, is that it does not recognize that the relationships between and within the processes are more important than the component parts. In interactive design, the relationships and links are more important than the individual components. I do not believe the instructional design process can be understood through a reductionist approach. The principles of cognitive science are not confined to the development of CBT. (Again what is the difference between CBT and Integrated Technologies?) Even in CBT there must be some visual presentation of material, and most computers now have sound output.

The issue here, to my mind, is that of convergence. There is an inevitable convergence of all forms of technology. This will lead to less emphasis on media classification and selection (see above). To some it may be a pity that the unique characteristics of some media are lost, for instance the entertainment aspect of early film and the fun of early simulation games.

The concepts of media utilization and media selection are being overtaken by the digitization of the full range of media, and this is being driven by the increasing availability and bandwidth of electronic communications. We are moving rapidly to a situation where all media will have a common form; different types of information will be selected and combined for specific purposes.

In Chapter 4 (The Practice of Instructional Technology) the authors state that 'practice has had more influence than theory'. I agree entirely. But I was very interested in the assertion that instructional technology has moved from a craft via a profession to a field of study. Is it that mature? If so, has it followed that path? Can the field of study be separated from the profession and practice?

No, but practice or utility are not sufficient attributes for a technology of learning or instruction.

I would suggest that the developments have been, and still are, so rapid that a different approach may be needed. New stages in the history of instructional technology have often brought new practitioners; not necessarily learning from their predecessors. For example, the introduction of interactive video brought a number of video producers into the field who made many of the mistakes evident in the early years of CBT. Commercial producers work in a competitive environment; this can cause resistance to sharing experience and expertise.

My understanding of the link between a field of study and a profession is that the route to the profession is established through academic achievement; I think there is little evidence of that in commercial instructional technology.

This is a pity. I sense that there is a growing approach in education to the utility of skills for the present (being fit for the job) as opposed to an investment in generic skills (of use in some unknown setting). Commercial instructional technology may have to be more 'immediate' in its design philosophy.

The implications in the last chapter are not positive ones. Trying to capture and define the process has led to a feeling of stagnation, inflexibility and immobility in an area that is at the core of the changes impacting

on society. This is a dynamic, iterative process; it cannot be captured in a static medium. This area of work and thought may need a different approach.

I was left wondering about the purpose of the book. I assume it is to carve a position for instructional technology in academia; perhaps to fit educational technologists into the academic hierarchy. It may also be driven by a need to create a recognized profession and professionalism in this area.

All of those reasons are valid and probably worth pursuing. However, they are not on my agenda, nor do they contribute to my personal or corporate objectives. I am not qualified to comment on what a group of scholars agree to agree on.

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As one who in recent years has withdrawn from day-to-day involvement with instructional/educational technology (edtech), I was particularly interested to see if this latest attempt to define and delimit would appeal to me as a non-practitioner. I have to report that little has changed over the years: all is still enmeshed in a thicket of Brer Rabbitry. This is almost certainly inevitable: the academic leaders in the field have always tried to draw together threads which resolutely resist any such taxonomic weaving.

In their seminal work defining the scope of educational technology Lumsdaine and Glaser (1960) even included arcane devices such as one for improving firearm trigger-work as an example of the genre. The 1960s impetus was very much geared to the concept of the teaching machine, with a generous overlay of psychological justification. Since that time, each and every promising candidate – and some not so promising – from the worlds of entertainment, military training, business management, computer technology, etc. has been press-ganged into educational technology, along with all the associated jargon and anecdotal evidence. Not surprisingly, the notion of what educational technology actually is becomes a little hazy along the way.

One solution would be to set out an operational definition; i.e. a statement of what educational technology really does. The problem with this approach is that it yields slim pickings: few of us could put hand on heart and list a series of benefits (to learners not to educational-technology professionals!) which have arisen as a result of all the educational technology developments since, say, 1954. In fact, an

This view is surely a little too anti-scholarship. Clearly, the real-world trainers need results not theories, but is not the approach that education supports of providing a generalizable explanation of what to teach, as well as how to teach, worth maintaining?

This review should be influenced by the fact that Derick Unwin was one of the founding fathers of programmed learning in the UK. He has seen the emergence of the technology of instruction and education over 30 years. Of course, it may be that with such a historical perspective he may yearn for the values of early UK-based programmed learners. One must read the enthusiasm of the early programmed learners to wonder where things went wrong. For example, Annett (1964) writes of 'putting teaching on a firmly scientific basis and from this develop a new technology adequate to meet the rapidly growing demands for training and education'.

It is fair to comment that this reviewer had his own attempts to classify media and provide guidelines for its use (Unwin, 1969).

unbiased observer of the educational scene might feel quite justified in concluding that the output of the educational systems in Western countries has improved little, if at all, in spite of the staggering increase of available technological resources, and huge investments in the design of materials. It is noteworthy that at the cutting edge of instruction, e.g. the provision of 'tutorials' for computer software, despite the use of interactive CD-ROM and other 1990s reincarnations of Sidney Pressey's teaching machine (Pressey, 1926), we frequently encounter absolutely abysmal teaching materials.

Nor does the quality of instruction encountered in Universities of the Air seem to have advanced much further than the 'Tell 'em what you're going to tell 'em, then tell 'em, then tell 'em what you've told 'em' school of educational communication. Instructional and educational technology can be usefully compared to the entertainment industry. Both are concerned with communication, and both have evolved from very basic uses of human skills and rudimentary technology, through to exploitation of the latest electronic and optical techniques. Both sets of endeavours employ a smorgasbord of experts, and in each case there is an end product, hopefully tailored to the requirements of the consumer. Why is there no equivalent in educational technology of internationally recognized producers, directors, performers, authors, photographers, and so on?

In fact, the only celebrities in educational technology are not practitioners at all: they are prominent academics whose main hands-on familiarity with educational technology is using a word processor to write lecture notes for their own courses. Without being discourteous, one might diffidently suggest that educational technology as defined and described in the volume under review has effectively been hijacked by an academic masonry, fiercely defensive of its rituals and esoteric protocols.

The word *academic* has such a pejorative ring. Perhaps there is a free masonry to the profession. Certainly to the uninitiated, design models that draw on 'epitomes' (Rigileuth) and 'algo-heuristic' paradigms (Landa) have the feel of arcane practice. There must be strength in having denotive models and practices if – and only if – they are used and are found to be useful.

In this context one can only admire the thoroughness of Seels and Richey: in a mere 124 pages (plus appendices, etc.) they have visited every possible aspect of their subject matter. This is a *tour de force* in its coverage of the liturgy of academic educational technology in 1994, a veritable catechism for the faithful.

There is no doubt that members of educational technology academia will find much to applaud in this rigorous exposition of the minutiae of their tools of trade. Perhaps fortunately, nothing here is likely to have much effect on learning and teaching.

Barbara B. Seels and Rita C. Richey: A considered reply (April 1996)
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A mature field demands a complementary and continuous relationship between practice and theory. Instructional/educational/learning technology has progressed to the point where both are well established. When a book intended to explain this interaction of practice and theory is examined only from a practitioner orientation, distortions can occur.

Our book describes the evolution of our field. The book was not intended to be evaluative; therefore, positions were not taken about one theoretical orientation or another. Apparent emphases only reflect historical development. Depending on the setting in which one works, there is a tendency to feel that more attention should have been paid to a specific theory. For example, many people in schools voice a concern for more attention to constructivism (Duffy and Jonassen, 1991; Wilson, 1996). Conversely, many working in corporate training environments would prefer more emphasis on performance technology (Geis, 1986).

These controversies reflect the healthy diversity of the field. We deliberately included alternate perspectives, and viewed the field as broad and inclusive. One important area of discussion, as the project progressed, was the choice of domains and their components. We anticipate that both the sub-categories and the domains will grow and change as the field develops. Furthermore, the taxonomy presented in the book represents the points of view of a group of people at a given period in time, and continued analysis and discussion is desirable.

For example, we think the recommendation of the addition of learner management is valuable. It is true that the field has expanded historically primarily through changes in practice. The increasing demand for practice has created pressure for the many academic programmes in the field. In the United States, most practitioners either enter the field from academic programmes, or enter an academic programme after obtaining a position in the field.

There are about 50 doctoral programmes here, and more than twice that number with master's and six year programmes. In addition, there are over 50 graduate programmes in educational computing. These programmes are listed annually in *The Educational Media and Technology Yearbook* published by Libraries Unlimited.

There is also pressure for synthesis from over 40 years of extensive research, including the development and

The authors of the book were given the opportunity of reading the reviews above and of commenting. They were asked to extend the debate rather than make counter-claims or concentrate on justifying their own approach.

This was, then, the starting point. The field has come far enough to merit careful scrutiny, and one test that needs to be applied is 'Can the pragmatics of practice lead to a sustainable theory?'

Of course the book – like any volume – is time-stamped. But the question here is: 'Has the field come far enough to merit a defining treatment?' It is not a question of how Seels and Richey view it: it is instructional technology that is under the microscope.

The impressive influence of the ID 'free masonry' is not to be ignored. Surely the graduates of such programmes represent a critical audience for the value that a training in instructional technology provides?

This is where one wonders about the influences of instructional theorists on the AECT definition. Although there is ample citation given to theorists such as Rigileuth's (1983) Elaboration Theory, such theories are not instantiated in the AECT definition. One is left with a question about the atheoretic view this definition of instructional technology has. I do not see an attempt to synthesize Merrill's Component Display Theory with Gagné-Briggs' Events of Instruction. Perhaps AECT and its expert group could not reach a negotiated settlement based on the conflicting theories of instruction.

The authors are a little self-conscious here. The reviewers have not necessarily found that the book has no use; rather, one senses that they feel that *the field* does not merit such treatment.

This is where the Atlantic divide makes most impact. It may well be that there is a considerable influence felt in schools, training organizations and even business due to instructional technology – in the USA. The question one is left with is: 'Why has this not happened in the UK?'(see the reference to the development of programmed learning above). I would like a citation here to corroborate the assertion that instructional theory has an effect on teaching and learning.

dissemination of theory. The existence of this research and *theory is documented* by the forthcoming *Handbook of Research on Educational Communications and Technology* edited by David H. Jonassen and being published by Macmillan. Moreover, Pergamon has just released the second edition of the *International Encyclopaedia of Educational Technology* edited by Tjerd Plomp and Donald P. Ely, which emphasizes the field's rich theoretical history.

While we do not feel adequate to describe the situation in the United Kingdom, in the United States the areas of theory and practice are equally dynamic. Here, academic-programme faculty rightfully see themselves as training practitioners as well as those who will teach in higher education settings and do research.

It is seldom that one teaches or does research here without also developing materials and consulting on design. It seems likely that this orientation to academic programmes was not shared by the reviewers. Consequently, cross-cultural differences between our two countries lead to conflicting viewpoints.

We would like to explain why the book was written because the reviewers seemed to feel the project was neither needed nor useful. The AECT has an international focus. It has members from 42 countries, including a large contingent from Canada and a well-established international division.

Many of those who attend AECT's annual convention are international members. This convention is regarded by many as one of the most dynamic convocations of professionals in the field offered today. AECT has a long standing Committee on Definition and Terminology which has published a consensus on the field's functions and identity in 1963, 1972, 1977, and now in 1994. The Committee involved with the 1994 redefinition effort, which was an attempt to update language and description about the field, decided to focus the effort nationally in order to make the task manageable. However, several members of the Committee were active internationally, and one member was from Canada.

One of the reasons AECT makes a continuous commitment to the process of redefinition is to improve communications with the many organizations that contribute research and practice to the field and that use instructional technology. As for the point that the field and its theory have no effect on teaching and learning, research does not support this.

Research and theory help practitioners justify their roles and predict the impact of specific strategies and techniques. This is especially important in an era of limited resources. It is much more difficult to defend programmes and jobs without a consensus on identity

and areas of contribution. It takes the joint efforts of practitioners and academicians to sustain a field and profession.

The book is intended for all those in the field: researchers, academicians, and practitioners. Hopefully, everyone finds a home, though clear boundaries are established and not set in concrete. Nevertheless, the reviewers are right in stating that academic programmes led the redefinition effort, and that they need the book more than practitioners. What is missing from this observation is that in today's world, practitioners need the theory disseminated by academic programmes in order to collaborate and be competitive, just as academic programmes need interaction with practice in order to make dynamic contributions.

Every year in the United States, a loosely organized group of academic professors in Instructional Technology meets at a lake near Indiana University in Bloomington. Attendance is usually about 120. Typically, practitioner representatives also attend this meeting, and there have been representatives from the international arena. The redefinition effort was successful because of support from this group (Professors in Instructional Design and Technology). It is not surprising that there is more interest among academic programmes than among practitioners.

The definition does not change the tasks or functions of a practitioner. The impact is greater in academic programmes because redefinition can have a direct effect on (a) teaching and learning about instructional technology, (b) reporting and synthesizing research and theory, and (c) communicating across disciplines and areas. The domains and sub-categories can illuminate gaps in theory that need to be addressed and thus help build support for research agendas.

Other issues arose during the redefinition project such as whether to use the term *instructional* or *educational* technology, and whether the field is a discipline. *Instructional* was chosen because in the USA the field of instructional technology is more active in corporate and government settings than in schools, and *educational* implies schools only.

This term also allowed us to begin the definition with the word *instruction* and end it with the word *learning*, which many felt reflected the field's focus more than the word *educational*. Nevertheless, we continue to be concerned about the different usage internationally, although we treat the terms as synonymous. A further discussion of these issues and the redefinition process is found in a case study we wrote for the 1994 *Educational Media and Technology Yearbook*.

We would like to conclude by responding briefly to a

This must be the test. Can such a definition help the practitioner? This is the question that all three reviewers have been asking. I had hoped for a stronger case to be made for the expertise of instructional designers. The book does seem to avoid the evidence that particular instructional strategies can and do make for effective learning situations. Do I want a theory of design or a theory of learning? I feel that there are too many learning theories to be of any practical use to courseware or learning designers.

Terms such as *instructional technology* can be seen as pejorative in the UK. The same is true of *IT – Information Technology*. I fail to see, in its many definitions, the effective use of 'information' when we use this term as being synonymous with educational technology in UK higher education. It was probably for this reason that the Association for Learning Technology adopted the term *learning technology*.

few specific points raised by the reviewers, starting with Margaret Bell's comments. We agree that a definition cannot and should not contain or control or even constrain the field. We believe, however, that it can improve communication. Each AECT definition has become part of the historical record of our field. One way in which the field is hampered by lack of currency in definition is in defending jobs and programmes. We also agree that many aspects of the definition need elaboration and discussion.

The committee always intended to expand the debate internationally once a national consensus was achieved and opportunities were available. The book contains visual representations which emphasize important relationships among domains and between theory and practice. The authors take the position that a field of study cannot be separated from the profession or practice. The book relates practice to the knowledge bases of the field.

Finally, we address specific points made by Derick Unwin. The field has progressed beyond purely operational or practice-based definitions. These are fine but are not adequate to meet all the field's needs for definition. Hopefully, one benefit of taxonomic theory presented in the book is the continued progress of a profession that provides support for learning. If nothing in teaching or learning has or will change due to instructional technology, then neither practice nor theory in the field are justifiable. This is patently not true as the demand for instructional technology and the performance of instructional technologists, in the USA at least, documents.

I am left a little disappointed. I had hoped that after being in the field for 25 years, I could begin to use the description of 'educational technologist'. In fact, I find the more relevant 'learning technologist' still difficult to sustain. I feel that the field should have progressed more. Seels and Richey have brought a scholarly treatment to *selective* elements. I would have liked them to address the integration of instructional theories. I feel that such a bottom-up approach would have been more useful than the top-down approach adopted by Seels and Richey.

References
Annett, A. (1964), Editorial, *Programmed Learning*, 1 (1), 2-4.

Bretz, R. (1971), *A Taxonomy of Communication Media*, Englewood Cliffs NJ, Educational Technology Publications.

Cummings, L.E. (1996), 'Educational technology – a faculty resistance review', *Educational Technology Review*, 5 (Winter), 18–20.

Duffy, T.M. and Jonassen, D.H. (1991), 'Constructivism: new implications for instructional technology', *Educational Technology*, 31 (5), 7–12.

Geis, G.L. (1986), 'Human performance technology: an overview' in Smith, M.E. (ed.), *Introduction to Performance Technology*, Vol. 1, Washington DC, National Society for Performance and Instruction.

Heidt, E. (1978), 'Media classification', in Unwin, D. and McAleese , R. (eds), *Encyclopaedia of Educational Media Commechnology*, London, Macmillan.

Lumsdaine, A.A. and Glaser, R. (eds) (1960), *Teaching Machines and Programmed Learning*, Washington DC, N.E.A.

Pressey S.L. (1926), 'A simple apparatus which gives tests and scores – and teaches', *School & Society*, 23, 373–6.

Unwin, D. (1969), *Media and Methods: Instructional Technology in Higher Education*, London, McGraw Hill.

Wilson, B. G. (1996), *Constructivist Learning Environments: Case Studies in Instructional Design*, Englewood Cliffs NJ, Educational Technology Publications.

Judith Jeffcoate, *Multimedia in Practice – Technology and Applications*, BCS Practitioner Series, Prentice-Hall International, 1995. ISBN: 0-13-123324-6. £24.95.

Ray Welland concludes his editorial preface to this book with the sentence: 'If you want to find out what multimedia is and what it has to offer this is an excellent place to start'. The comment reflects the major strength of this book, which does provide an excellent starting place for anyone wanting to learn more about multimedia. The author explains what multimedia is today and the technology involved, gives example applications, and projects current trends forward to explore the use of multimedia in the future. She clearly states the perceived audience for the text as 'business managers and project leaders who need to introduce multimedia technology into their applications'. A guide to using the text is provided: Parts I and III are suitable for readers with no technical knowledge; Part II requires familiarity with computer architecture, and Part IV is most suitable for managers planning a multimedia project. These guidelines are useful, but the text as a whole will appeal to anyone who has an interest in learning about multimedia. Technical knowledge is advantageous in some sections, but the author takes time to explain clearly, and uses examples to illustrate points.

The book is very well structured. The author provides an excellent summary of the content in the preface. This clarity of structure continues throughout the text; for example, each chapter begins with a brief outline of its contents and concludes with a summary and references.

Multimedia is a subject engulfed by acronyms and, to prevent confusion, the author provides a detailed glossary which at times proves to be very useful. A bibliography and a full index are further resources which the reader can draw upon.

Part I, 'Multimedia Today', begins by painting a scenario of a modern family using new technology in their everyday lives, then projects the same family into the year 2001, highlighting the role technology may play in their lives in the future.

Part II, 'Technology', deals with the complex areas that make up multimedia, and is the most technical section of the book, dealing with different platforms, development tools, storage methods and the components that make up a truly multimedia application such as images, audio and video. The chapters focusing on the different media are divided into sections describing applications, capture, compression and standards, as well as detailing information specific to each medium. A history of the media is provided, enabling the reader to see, for example, how standards have evolved. This technique of placing information within its historical context is used throughout the book, and is vital for a reader who may be coming to the topic for the first time.

Part III returns to the theme with which the book began: 'Applications'. It focuses on present use and future trends. Again the author places the use of multimedia in its historical context: the early use of multimedia was largely for off-line training and education using interactive videodisk and standalone players.