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What is an authentic learning environment?

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Chapter 1.8

What is an Authentic Learning Environment?

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ABSTRACT

Recent research and learning theory provides a wealth of thought, ideas and strategies to inform the design and implementation of learner-centered, realistic and effective learning environments. This chapter proposes guidelines for designing authentic learning environments for higher education that can be applied across a range of disciplines and in a variety of modes. Characteristics of the approach are explored in depth, and the chapters of the book are introduced as examples of authentic learning environments in diverse subject areas and contexts. The chapter provides a practical framework for teachers wishing to break away from traditional, teacher-centered approaches in higher education, and who are willing to create learning environments where

students are motivated to learn in rich, relevant and real-world contexts.

TOWARD AUTHENTICITY IN HIGHER EDUCATION

Take a walk around most university campuses and observe what you see in the way of adult teaching and learning. If you are fortunate, you will find students engaged in motivating and challenging activities that require collaboration and support. The tasks the students do reflect the tasks seen in real professions and workplaces, and the problems they solve are complex and sustained, requiring intensive effort.

For most students at university today, the reality is very different. Large lecture theatres, centre-staged with discipline experts, continue to transmit theoretical knowledge in bite-sized

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chunks for passive learners to receive and consume. Collaboration is not encouraged or required. If it occurs at all, it is sought subversively among students away from the formality of the lecture halls.

So, why is the second scenario the more probable one to encounter?

The approach taken by many teachers in universities today is simply a result of the way they were taught. They are perpetuating a tradition of formal university teaching that has ignored the substantial insights gained from more recent theory and research into the way people learn. Typically, university education has been a place to learn theoretical knowledge devoid of context. Essentially, for students, this has meant that their teachers transmit the facts and skills that they are required to absorb and regurgitate on exams. Textbooks and lecture notes are the main resources for study, with the practice of "cramming" for exams a common learning strategy. Retention and transfer of knowledge was assumed but rarely assessed. For many students a "surface" approach to learning (Marton & Säljö, 1976) assured success. It is not surprising that a growing proportion of graduates now choose to follow their university courses with practical courses at vocationally oriented institutions (Golding & Vallence, 1999).

In the wider community it has become increasingly clear to employers of university graduates and governments that fund universities that university learning outcomes are lacking, and no longer meet the needs of a dynamic and changing workforce. What employers, governments and nations require are graduates that display attributes necessary for knowledge building communities: graduates who can create, innovate, and communicate in their chosen profession.

If traditional approaches to university education do not result in appropriate learning outcomes, what then are the teaching and learning approaches that universities should adopt? The growing influence of constructivism as a philosophical approach

to learning, and a wide range of research studies and papers investigating alternative models of teaching and learning over the last decade, have prompted many teachers in universities to implement more "authentic" teaching and learning environments. The challenge they have faced is to align university teaching and learning more substantially with the way learning is achieved in real-life settings, and to base instructional methods on more authentic approaches, such as situated learning (Brown, Collins, & Duguid, 1989; Collins, Brown, & Newman, 1989; McLellan, 1996; Cobb & Bowers, 1999).

But what does it mean to be authentic? Some have argued that only real-problem contexts should be presented to ensure authenticity. For example, Savery and Duffy (1996) nominated two guidelines in developing problem-based scenarios for teaching and learning: firstly, that the problems must raise the concepts and principles relevant to the content domain, and secondly that the problems must be *real*. However, other research into the realism of learning environments has indicated that maximum fidelity, either in real situations or simulations, does not necessarily lead to maximum effectiveness in learning, particularly for novice learners (Alessi, 1988). Others argue, however, that in designing learning environments it is impossible to design truly "authentic" learning experiences. Petraglia (1998a, 1998b) contended that authenticity can be neither "predetermined nor preordained," and such attempts often result in little more than "pre-authentication," that is, "the attempt to make learning materials and environments correspond to the real world prior to the learner's interaction with them" (p. 53). Barab, Squire and Dueber (2000) have also argued that authenticity occurs "not in the learner, the task, or the environment, but in the dynamic interactions among these various components . . . authenticity is manifest in the flow itself, and is not an objective feature of any one component in isolation" (p. 38). Smith (1987) in his review of research related to simulations in

the classroom concluded that the “physical fidelity” of the simulation materials is less important than the extent to which the simulation promotes “realistic problem-solving processes” (p. 409), a process Smith (1986) describes as the “cognitive realism” of the task. Similarly, we would argue that it is the *cognitive authenticity* rather than the *physical authenticity* that is of prime importance in the design of authentic learning environments (Herrington, Oliver, & Reeves, 2003). Authenticity goes beyond mere relevance.

CHARACTERISTICS OF AUTHENTIC LEARNING

Recent research and learning theory provides a wealth of thought, ideas and strategies to inform the design and implementation of student-centered, realistic and effective learning environments. This chapter proposes guidelines for designing authentic learning environments in higher education based upon nine critical characteristics of authentic learning identified by Herrington and Oliver (2000) in their extensive review of literature and technology-based learning environments. The guidelines are based on constructivist philosophy and approaches, and specifically on situated learning theory.

Provide an Authentic Context That Reflects the Way the Knowledge Will be Used in Real Life

The context needs to be all-embracing, to provide the purpose and motivation for learning, and to provide a sustained and complex learning environment that can be explored at length. It is not sufficient to simply provide suitable examples from real-world situations to illustrate the concept or issue being taught. It needs to encompass a physical environment which reflects the way the knowledge will be used, and a large number of resources to enable sustained examination from

different perspectives (Brown et al., 1989; Hill & Hannafin, 2001; Honebein, Duffy, & Fishman, 1993; Reeves & Reeves, 1997).

Many courses ignore the rich potential of an authentic context by disembedding course materials from ordinary experience (Sternberg, Wagner, & Okagaki, 1993). Generalised, theoretical principles and skills are taught rather than the situation-specific capabilities, and textbooks often guide curriculum and context rather than the genuine practices of professionals. Such courses are often characterised by subject matter divided into weekly sections (reflecting textbook chapters), and usually presented in lectures/tutorial format.

By contrast, a course with a more authentic context is presented as a realistic problem preserving the complexity of the real-life setting. Students are able to access information resources as required, rather than have topics presented in a linear manner through weekly lectures and tutorials. Web-based courses might use an interface that comprises a metaphor representing the elements of the subject matter. For example, a course on marine biology might be represented by an image of a marina, or one on occupational health and safety by an image of a workplace, a teaching course by a classroom, a nursing course by a hospital ward, and so on. In any of its delivery forms, the context provides a realistic and authentic rationale for the study of a complex problem.

Authentic Activities

The tasks that students perform are arguably the most crucial aspect of the design of any learning environment. Ideally such tasks should comprise ill-defined activities that have real-world relevance, and which present complex tasks to be completed over a sustained period of time, rather than a series of shorter disconnected examples (Bransford, Vye, Kinzer, & Risko, 1990; Brown et al., 1989; Lebow & Wager, 1994; Reeves & Reeves, 1997).

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University courses often require students to complete tasks and activities that are largely abstract and decontextualised (Lebow & Wager, 1994). They are formulated by others, well-defined and complete in scope (Sternberg et al., 1993), and often lead simply to an enculturation into the practices of universities and classrooms rather than real-world transfer (Clayden, Desforges, Mills, & Rawson, 1994). Such activities bear little resemblance to those of real practitioners (Brown et al., 1989).

In contrast to this fragmented and decontextualised approach, a situated learning approach promotes authentic activities that can create the focus for the whole course of study—the activity does not necessarily supplement the course, it can *be* the course (Herrington, Reeves, Oliver, & Woo, 2004). Lave and Wenger (1991) cautioned that the conception of situated learning was substantially “more encompassing in intent than conventional notions of ‘learning in situ’ or ‘learning by doing’ for which it was used as a rough equivalent” (p. 31). Instead, activities can be complex and ill-defined, and echo the same complexity found in real-world tasks.

Access to Expert Performances and the Modelling of Processes

To expose students to expert performance is to give them a model of how a real practitioner behaves in a real situation. Access to such modelling of processes has its origins in the apprenticeship system of learning, where students and craftspeople learned new skills under the guidance of an expert (Collins et al., 1989). Important elements of expert performances are found in modern applications of the apprenticeship model such as internship, and case-based learning (Riesbeck, 1996).

In many university courses, students are given no examples of experts performing tasks, or of expert comment, to enable them to model real-

world practice. In order to provide such expert performance, the required skill or performance could be modelled within a real-life context. For example, if a scientific report is the required product, a similar report could be available to students. Video excerpts could show interviews with experts, or short clips of experts performing within their real environments. These allow students to observe the “social periphery” of relevant tasks as they are performed in the real world. Encouraging students to seek out expert opinion on the Internet and to subscribe to listservs gives them access to the ideas of experts and others at varying levels of expertise. The facility of the World Wide Web to create global communities of learners who can interact readily via e-mail, also enables opportunities for the sharing of narratives and stories.

Multiple Roles and Perspectives

In a more authentic learning environment, it is important to enable and encourage students to explore different perspectives, and to “criss cross” the learning environment repeatedly (Collins et al., 1989; Spiro, Feltovich, Jacobson, & Coulson, 1991a). Instruction which puts forward a single, “correct” interpretation, is according to Spiro, Feltovich, Jacobson and Coulson (1991b) not false, but inadequate.

Frequently, university courses promote learning compartmentalised and constrained by strict discipline boundaries (Relan & Gillani, 1997). Content is often discipline-specific, and presented in modules and sections, with little to offer students seeking alternative viewpoints. By contrast, providing a multitude of perspectives to enable students to examine problems from the point of view of a variety of stakeholders is more conducive to sustained and deep exploration of any issue or problem.

Collaborative Construction of Knowledge

The opportunity for users to collaborate is an important design element, particularly for students who may be learning at a distance (Brown et al., 1989; Collins et al., 1989; Hooper, 1992; Reeves & Reeves, 1997). Collaboration has been defined as “the mutual engagement of participants in a coordinated effort to solve a problem together” (Roschelle & Behrend, 1993, cited in Katz & Lesgold, 1993, p. 289). Forman and Cazden (1985) have suggested that true collaboration is not simply working together but also “solving a problem or creating a product which could not have been completed independently” (p. 329).

However, many university courses promote individual endeavour and cognition rather than collaboration, and students’ activities are largely solitary. Students are given little opportunity to collaborate, despite the affordances of physical proximity and technology to enable it. In order to promote collaboration, group work can be facilitated with an appropriate incentive structure for whole group achievement. For example, activities and problems can be addressed to a group such as a board of directors, committee, interest group, department, and so forth. Collaboration can be encouraged through appropriate tasks and communication technology. For example, discussion boards and chat rooms can be used to encourage sharing and joint problem solving within and among groups.

Reflection

In order to provide opportunities for students to reflect on their learning, the learning environment needs to provide an authentic context and task, as described earlier, to enable meaningful reflection. Many theorists see reflection as both a *process* and a *product* (Collen, 1996), and that it is action-oriented (Kemmis, 1985). Knights

(1985) contends that reflection is not the kind of activity that its name suggests—a solitary, internal activity—but a two-way process with the “aware attention” of another person. This view is strongly supported in the literature by others who point out that reflection is a social process (Kemmis, 1985), and that collaboration on tasks enables the reflective process to become apparent (von Wright, 1992).

In many learning environments, there are few opportunities to reflect because of an emphasis on pre-determined content that needs to be learned, and few opportunities to collaborate means students cannot reflect socially. In order to promote reflection, authentic and meaningful activities can be provided, together with access to expert performance and opinion to enable students to compare themselves to experts. Collaborative groupings enable students to reflect socially, and to engage in meaningful discussions on issues presented. Journals, portfolios and Web logs can provide a tangible outcome of students’ reflections.

Articulation

In order to produce a learning environment capable of providing opportunities for articulation, courses need to incorporate inherent opportunities to articulate, and in particular the public presentation of argument to enable defence of the position (Edelson, Pea, & Gomez, 1996; Lave & Wenger, 1991). Bakhtin (1986) contends that “any true understanding is dialogic in nature” (Brown & Campione, 1994, p. 267). The implication is that the very process of articulating enables formation, awareness, development, and refinement of thought. Vygotsky has influenced the way educators see the role of articulation in learning (cf., Davydov, 1995). Vygotsky believed that speech is not merely the vehicle for the expression of the learner’s beliefs, but that the act of creating the speech profoundly influences the learning process: “Thought undergoes many changes as it

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turns into speech. It does not merely find expression in speech; it finds reality and form" (cited in Lee, 1985, p. 79).

In many higher education courses, students are not required to articulate and justify their work to their peers. By contrast, more authentic tasks require articulation of ideas in one form or another. Students are required to present and defend their arguments in appropriate forums, such as in face-to-face classes, conferences and seminars, or by publishing on the Internet or on Web-based bulletin boards and listservs.

Coaching and Scaffolding

In order to accommodate a coaching and scaffolding role principally by the teacher (but also provided by other students), an authentic learning environment needs to provide collaborative learning, where more able partners can assist with scaffolding and coaching, as well as the means for the teacher to support learning, for example, via appropriate communication technologies (Collins et al., 1989; Greenfield, 1984). Coaching in a situated learning environment requires "powerful, but different roles for teachers" (Choi & Hannafin, 1995, p. 67), where the interactions with students occur mainly at the metacognitive level (Savery & Duffy, 1996).

In many university courses, the teacher's role is a didactic one, "telling" students what they need to know rather than a coaching role (Harley, 1993). The teacher controls the learning situation (Berge, Collins, & Dougherty, 2000; Jonassen, 1993) organising the order of content, activities, and assessment. A common approach used to present tasks and problems is to simplify the topic by breaking it down into its component parts. However, Perkins (1991) has suggested that oversimplification should be resisted, and instead teachers should search for new ways to provide appropriate scaffolding and support. A more authentic environment provides for coaching at

critical times, and scaffolding of support, where the teacher and/or student peer mentors provide the skills, strategies and links that the students are unable to provide to complete the task.

Authentic Assessment

In order to provide authentic assessment of student learning, the learning environment needs to ensure the assessment is seamlessly integrated with the activity and provide the opportunity for students to be effective performers with acquired knowledge, and to craft products or performances in collaboration with others (Duchastel, 1997; Reeves & Okey, 1996; Herrington & Herrington, 1998).

Arguably, the majority of university learning continues to involve competitive relations and individual assessment. Particularly in online courses, students are frequently assessed with multiple choice or other tests that are easily marked, often revealing only whether students can recognise, recall or "plug in" what was learned out of context (Wiggins, 1990). An alternative approach is to provide for integrated assessment of learning within the tasks, where students present polished products.

APPLYING AUTHENTIC PRINCIPLES TO THE DESIGN OF LEARNING FOR HIGHER EDUCATION

Authentic learning has found a place in the education agenda, as greater accountability in higher education grows. As technology continues to open up possibilities for innovative and effective teaching and learning opportunities, students and teachers are no longer happy to accept familiar classroom-based pedagogies that rely on content delivery and little else. While many teachers instinctively find the authentic approach appealing, many have difficulty envisaging how these

principles could be applied across the disciplines, and how they might work both in face-to-face classes and Web-based environments.

As the title suggests, this book is made up of a collection of peer-reviewed chapters that reflect the construct of *authenticity* in teaching and learning as it is reflected in higher education institutions throughout the world. The book is divided into three sections. Section I provides guidelines to designing authentic learning environments and encompasses the theoretical notions on which these environments are based. Section II contains chapters that describe how authentic activities are instantiated in a range of discipline areas commonly found in university settings. These authors relate the practical designs of their learning environments to both discipline-based theories and situated-learning theories described in part one. Section III chapters discuss generally how authentic environments can be implemented and sustained more widely across an institution.

The elements of authenticity presented above comprise one framework for the design of effective and immersive learning environments that are appropriate for both face-to-face and technology-mediated courses, such as online subjects. However, not all the authors of the chapters presented here universally adopt these ideas. Different viewpoints and interpretations of authenticity are presented throughout, adding to a rich and diverse collection of perspectives and consequent learning designs. All the learning environments described in this volume do, however, have one characteristic in common: they universally depict the work of dedicated and innovative teachers with a passion for excellence, and a desire to create inspirational learning experiences for their students.

The concept of authentic learning is not new. However, its practice is arbitrary and undefined. The purpose of this book is to define the approach through examples of good practice. We hope that the rich variety of examples of good practice found in this book will provide the reader with

the inspiration to teach their own subjects and courses in ways that reflect authenticity.

REFERENCES

- Alessi, S. (1988). Fidelity in the design of instructional simulations. *Journal of Computer-Based Instruction, 15*(2), 40-47.
- Barab, S.A., Squire, K.D., & Dueber, W. (2000). A co-evolutionary model for supporting the emergence of authenticity. *Educational Technology Research and Development, 48*(2), 37-62.
- Berge, Z.L., Collins, M., & Dougherty, K. (2000). Design guidelines for web-based courses. In B. Abbey (Ed.), *Instructional and cognitive impacts of web-based education* (pp. 32-40). Hershey, PA: Idea Group Publishing.
- Bransford, J.D., Vye, N., Kinzer, C., & Risko, V. (1990). Teaching thinking and content knowledge: Toward an integrated approach. In B. F. Jones & L. Idol (Eds.), *Dimensions of thinking and cognitive instruction* (pp. 381-413). Hillsdale, NJ: Lawrence Erlbaum.
- Brown, A.L., & Campione, J.C. (1994). Guided discovery in a community of learners. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 229-270). Cambridge, MA: MIT Press.
- Brown, J.S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32-42.
- Choi, J., & Hannafin, M. (1995). Situated cognition and learning environments: Roles, structures and implications for design. *Educational Technology Research and Development, 43*(2), 53-69.
- Clayden, E., Desforges, C., Mills, C., & Rawson, W. (1994). Authentic activity and learning. *British Journal of Educational Studies, 42*(2), 163-173.

What is an Authentic Learning Environment?

- Cobb, P., & Bowers, J. (1999). Cognitive and situated learning perspectives in theory and practice. *Educational Researcher*, 28(2), 4-15.
- Collen, A. (1996). Reflection and metaphor in conversation. *Educational Technology*, 36(1), 54-55.
- Collins, A., Brown, J.S., & Newman, S.E. (1989). Cognitive apprenticeship: Teaching the crafts of reading, writing, and mathematics. In L. B. Resnick (Ed.), *Knowing, learning and instruction: Essays in honour of Robert Glaser* (pp. 453-494). Hillsdale, NJ: LEA.
- Davydov, V.V. (1995). The influence of L.S. Vygotsky on education theory, research and practice. *Educational Researcher*, 24(3), 12-21.
- Duchastel, P.C. (1997). A Web-based model for university instruction. *Journal of educational technology systems*, 25(3), 221-228.
- Edelson, D.C., Pea, R.D., & Gomez, L. (1996). Constructivism in the collaboratory. In B.G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design* (pp. 151-164). Englewood Cliffs, NJ: Educational Technology.
- Forman, E.A., & Cazden, C.B. (1985). Exploring Vygotskian perspectives in education: The cognitive value of peer interaction. In J.V. Wertsch (Ed.), *Culture, communication and cognition: Vygotskian perspectives* (pp. 323-347). Cambridge: Cambridge University.
- Golding, B., & Vallenge, K. (1999). *The university — VET transition*. RCVET Working Paper, UTS Research Centre for Vocational Education and Training, Sydney.
- Greenfield, P.M. (1984). A theory of the teacher in the learning activities of everyday life. In B. Rogoff & J. Lave (Eds.), *Everyday cognition: Its development in social context* (pp. 117-138). Cambridge, MA: Harvard University.
- Harley, S. (1993). Situated learning and classroom instruction. *Educational Technology*, 33(3), 46-51.
- Herrington, J., & Herrington, A. (1998). Authentic assessment and multimedia: How university students respond to a model of authentic assessment. *Higher Education Research & Development*, 17(3), 305-322.
- Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology Research and Development*, 48, 23-48.
- Herrington, J., Oliver, R., & Reeves, T.C. (2003). 'Cognitive realism' in online authentic learning environments. In D. Lassner & C. McNaught (Eds.), *EdMedia World Conference on Educational Multimedia, Hypermedia and Telecommunications* (pp. 2115-2121). Norfolk, VA: AACE.
- Herrington, J., Reeves, T.C., Oliver, R., & Woo, Y. (2004). Designing authentic activities in web-based courses. *Journal of Computing in Higher Education*, 16(1), 3-29.
- Hill, J.R., & Hannafin, M.J. (2001). Teaching and learning in digital environments: The resurgence of resource-based learning environments. *Educational Technology Research and Development*, 49(3), 37-52.
- Honebein, P.C., Duffy, T.M., & Fishman, B.J. (1993). Constructivism and the design of learning environments: Context and authentic activities for learning. In T.M. Duffy, J. Lowyck & D.H. Jonassen (Eds.), *Designing environments for constructive learning* (pp. 87-108). Heidelberg: Springer-Verlag.
- Hooper, S. (1992). Cooperative learning and computer-based design. *Educational Technology Research and Development*, 40(3), 21-38.
- Jonassen, D. (1993). The trouble with learning environments. *Educational Technology*, 33(1), 35-37.

- Katz, S., & Lesgold, A. (1993). The role of the tutor in computer-based collaborative learning situations. In S.P. Lajoie & S.J. Derry (Eds.), *Computers as cognitive tools* (pp. 289-317). Hillsdale, NJ: Lawrence Erlbaum.
- Kemmis, S. (1985). Action research and the politics of reflection. In D. Boud, R. Keogh & D. Walker (Eds.), *Reflection: Turning experience into learning* (pp. 139-163). London: Kogan Page.
- Knights, S. (1985). Reflection and learning: The importance of a listener. In D. Boud, R. Keogh & D. Walker (Eds.), *Reflection: Turning experience into learning* (pp. 85-90). London: Kogan Page.
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University.
- Lebow, D., & Wager, W.W. (1994). Authentic activity as a model for appropriate learning activity: Implications for emerging instructional technologies. *Canadian Journal of Educational Communication*, 23(3), 231-144.
- Lee, B. (1985). Intellectual origins of Vygotsky's semiotic analysis. In J.V. Wertsch (Ed.), *Culture, communication and cognition: Vygotskian perspectives* (pp. 66-93). Cambridge: Cambridge University.
- Marton, F., & Säljö, R. (1976). On qualitative differences in learning. I: Outcome and process. *British Journal of Educational Psychology*, 46, 115-27.
- McLellan, H. (Ed.). (1996). *Situated learning perspectives*. Englewood Cliffs, NJ: Educational Technology.
- Perkins, D.N. (1991). What constructivism demands of the learner. *Educational Technology*, 31(8), 19-21.
- Petraglia, J. (1998a). The real world on a short leash: The (mis)application of constructivism to the design of educational technology. *Educational Technology Research and Development*, 46(3), 53-65.
- Petraglia, J. (1998b). *Reality by design: The rhetoric and technology of authenticity in education*. Mahwah, NJ: Lawrence Erlbaum.
- Reeves, T.C., & Okey, J.R. (1996). Alternative assessment for constructivist learning environments. In B.G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design* (pp. 191-202). Englewood Cliffs, NJ: Educational Technology.
- Reeves, T.C., & Reeves, P.M. (1997). Effective dimensions of interactive learning on the World Wide Web. In B.H. Khan (Ed.), *Web-based instruction* (pp. 59-66). Englewood Cliffs, NJ: Educational Technology.
- Relan, A., & Gillani, B.B. (1997). Web-based instruction and the traditional classroom: Similarities and differences. In B.H. Khan (Ed.), *Web-based instruction* (pp. 41-46). Englewood Cliffs, NJ: Educational Technology.
- Riesbeck, C.K. (1996). Case-based teaching and constructivism: Carpenters and tools. In B.G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design* (pp. 49-61). Englewood Cliffs, NJ: Educational Technology.
- Savery, J.R., & Duffy, T.M. (1996). Problem based learning: An instructional model and its constructivist framework. In B.G. Wilson (Ed.), *Constructivist learning environments: Case studies in instructional design* (pp. 135-148). Englewood Cliffs, NJ: Educational Technology.
- Smith, P.E. (1986). *Instructional simulation: Research, theory and a case study* (ED No. 267 793).
- Smith, P.E. (1987). Simulating the classroom with media and computers. *Simulation and Games*, 18(3), 395-413.

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Spiro, R.J., Feltovich, P.J., Jacobson, M.J., & Coulson, R.L. (1991a). Cognitive flexibility, constructivism, and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. *Educational Technology*, 31(5), 24-33.

Spiro, R.J., Feltovich, P.J., Jacobson, M.J., & Coulson, R.L. (1991b). Knowledge representation, content specification, and the development of skill in situation-specific knowledge assembly: Some constructivist issues as they relate to cognitive flexibility theory and hypertext. *Educational Technology*, 31(9), 22-25.

Sternberg, R.J., Wagner, R.K., & Okagaki, L. (1993). Practical intelligence: The nature and role of tacit knowledge in work and at school. In J.M. Puckett & H.W. Reese (Eds.), *Mechanisms of everyday cognition* (pp. 205-227). Hillsdale, NJ: Lawrence Erlbaum.

von Wright, J. (1992). Reflections on reflection. *Learning and Instruction*, 2, 59-68.

Wiggins, G. (1990). *The case for authentic assessment*. Washington, DC: ERIC Clearinghouse on Tests, Measurement, and Evaluation.