

# Introduction

## **THEORETICAL AND METHODOLOGICAL PREMISES FOR TEACHING AND LEARNING IN VIRTUAL LEARNING ENVIRONMENTS**

In this first section of the volume, after a general introduction, an overview is offered of the content of the book and of the present knowledge about teaching in Virtual Worlds, outlining the future prospects.

Next, general matters related to the main topic of the book are treated by experts as following:

- *Introduction to Virtual Learning Environment*, curated by Elena Favaron, introduces Virtual Learning Environments in general and the way they evolved over time.
- *Using collaborative methods in education. An evidence-informed approach*, curated by Giuliano Vivaret uses an evidence-informed approach to analyze the effectiveness of collaborative methods in education.
- *Virtual Worlds in education: Key aspects and open issues*, curated by Laura Fedeli deals with key aspects and open issues of synthetic worlds in education.

In addition a description of the importance of each of the chapter submissions is provided to analyze the quality of the various contributions, research papers and experiences documented in the book, according to some macro-criteria which have been considered crucial for the topic.

The following criteria have been chosen: meaning of Virtual Worlds and their relation with the physical world from a learning point of view, methodological guidance and best practices for teacher reflexivity and professionalism, self-knowledge through the metaphor of the avatar, value of the learning community and of the interpersonal relationships. The analysis then focuses on a collection of sound experiences and implemented projects that are part of the book.

A brief concluding paragraph ends the preface related to Virtual Worlds in classroom.

*Maria Guida*

*National Institute for Documentation, Innovation, and Educational Research, Italy*

*Gianni Panconesi*

*Esplica, Italy*

## **AN INTRODUCTION TO VIRTUAL LEARNING ENVIRONMENTS (VLE)**

### **Introduction**

There are many reasons for using the computer in learning: computers offer a non-competitive method for achieving results, they can help overcome a lack of imagination displayed by some pupils, and can often be the most economical way to perform instruction. Since William Higinbo than created a simple game of tennis using an oscilloscope screen (1958), educators have been interested in determining appropriate usages of computers within education. In order to understand the workings of Virtual Learning Systems, it is necessary to define the concept of Virtual Learning. This chapter is based on the study of existing literature. Here, the reader will find an introduction to Virtual Learning Environments and a presentation of those systems available today.

A learning environment is a “place where learning takes place.” When learning is done in virtual space, it is called a Virtual Learning Environment. Virtual space has no limits, categories, time or forms. In general, based on the existing literature, it can be said that the software systems that support teaching and learning are called Virtual Learning Environments (VLE). VLEs are also called Learning Content Management Systems (LCMS); VLE and LCMS are considered synonyms (Hughes 2009).

VLE is often integrated with a Learning Management System (LMS). LMS are software tools, usually web based, which help plan and enable learning events, and ‘manage’ learners by keeping track of their progress and their performance through various learning activities. LCMS is focused on the development, management and publishing of content, and offers tools for authors and designers to create e-learning content. LMS is often confused with LCMS; these two concepts are complementary, and it is normal to find software solutions that have the characteristics of both, i.e. providing tools that are used to develop the e-learning content and manage the learning process via the web.

Very often VLEs are web based, and in these cases ‘e-learning and virtual learning environment’ refers to software systems that institutions such as schools and universities use to create a virtual space for shared learning. Not all e-learning coincides with distance education, however, as there are forms of distance education that do not use this new technology.

E-learning is learning supported by web-based technologies, thus it is therefore incorrect to identify e-learning with any type of training provided by computer technology (CD-ROM, intranet, etc.). Literally ‘e-learning’ means electronic learning, but this expression is restrictive in concept and may cause misunderstanding. It is important to remember this distinction.

### **Development**

The traditional classroom lesson (where students and the teacher meet in person) has some clear advantages:

- Teachers can address mistakes and misunderstandings during the lesson thanks to the immediate reactions that reveal consciously or unconsciously, through gestures and expressions on the faces of the learners, any questions students may have;
- Learners can be placed together in groups and work together in the pursuit of educational goals.

The classroom, however, also has some disadvantages:

## **Introduction**

- The demands of the students are unmet for periods of time, as it is impossible to answer questions they may have after the lesson time has ended;
- The way lectures are set up does not favor the social constructivist approach. The teacher is the absolute actor, it is they who decides how much time to dedicate to dialogue with students, how much time to allow students to work etc. Students must adapt to this pace of learning and to accept the teaching style.

However, first and second generation distance learning courses (based on correspondence and media) do not use this approach. It has long been known that learning is an experiential process that must be conducted by the learner in an active and collaborative way, which is facilitated by relational multi environments where students learn from each other through the sharing of experiences; however, very often in teaching history, this knowledge have been neglected.

From the first correspondence courses with videoconference lectures and lecture notes downloadable from the Internet, to newsgroups and discussion forums, training concepts in person and at distance have evolved and are progressing every day. This progress depends on new technologies and their increasing capacity to virtually decrease the distances. Following from this, a new form of distance education called e-learning was born.

E-learning favors cooperation, the exchange of opinions, and seeking knowledge based on personal interests; thus, the freedom of choice increases. Students can make their own decisions about their learning, including how much they learn, for how long and to whom they go for information.

E-learning is not a substitute for traditional classroom teaching, it is not simply a new medium for delivering distance education. On the contrary, it is based on a highly interactive training model (“many-to-many”) and its history is marked by obvious methodological advances (Hjeltnes& Hansson 2005).

The first generation of e-learning was delivered through Web Based Training (WBT) and was supported by technology platforms distributing content (Content Delivery System), with very sophisticated methods of control; students used it individually and interacted very little with each other.

Web Based Training is represented by organically structured pages explicitly declared for the purposes of education found online. These pages use traditional methods of pragmatic teaching, namely: definition of the objectives, content communication strategies, assessment methods and input both in progress and final verification, use of hands-on activities ranging from traditional exercises to simulations, case studies and so on (Singh 2003).

This first-generation e-learning had two advantages:

- Flexibility in time management, allowing students the choice of how much time to devote to their studies;
- Adoption of a personal rate of learning.

The second generation of e-learning uses LMS. These systems can manage, in an integrated way, large amounts of data and allows analysis of the results and the management of skills. Therefore, through using LMS it is possible to carry out highly sophisticated evaluation (Mayer 2016).

The platform respects international standards (AICC, SCORM) and this is perhaps one of the most important innovations in the educational field, as international standards provide the ability to reuse learning content.

In 2014, the AICC organization was dissolved due to a drastic decrease in enrollments; MC-5 is the successor of the AICC standard, compliant to the latest standards Experience API (XAPI). After the AICC, the task of developing the MC-5 was passed to the Advanced Distributed Learning (ADL) standard, which still carries the project to provide access to any type of training content (Fallon & Brown 2016).

SCORM (Sharable Content Object Reference Model) specifies standards for reuse, tracking and cataloging of learning objects (video, podcasts, digital stories and cartoons, web pages, blogs and wikis are called “learning objects”). An object compatible with the SCORM standard has the following characteristics:

- It is traceable inside of the LMS;
- It logs learner activity data;
- It is reusable;
- It can be transported on any compatible platform without losing functionality.

A SCORM standard Learning Object (LO) is modular and reusable; The LO offers the ability to create adaptive learning materials “tailored” to the needs and learning styles of each student; The LO meets the requirements of sharing and reusing resources, and it is easy to update (Novacek 2016).

Second-generation e-learning promotes the distribution of content-sharing and facilitates cooperative learning. The system can handle a large population of users and the user is considered a producer and consumer of knowledge, as they participate in the process of creation of the same. Reusable Learning Objects (RLO) allow a high level of customization of the training program (Rahmani, 2016).

Since Linden Lab created a three-dimensional online Virtual World (2003), educators have been interested in determining appropriate usages of 3D environments within education (Klein et al. 2016). 3D VLEs users create virtual representations of themselves, called avatars, and are able to interact with places, objects, and other avatars. They can explore the virtual space, meet other students, socialize, participate in individual and group activities, build learning objects and exchange knowledge with one another. Today educators prefer a protected and specifically designed environment where the simulation allows to create many opportunities to exercise or acquire socio-emotional skills in challenging situations and play between users, by encouraging their involvement. Kognito 3D environment is an example (<https://www.kognito.com/>) enabling the use of role-playing simulations with virtual people to drive measurable physical, emotional and social changes. A 3D environment provides the following benefits: students can observe comrades work in real time. Feedback waiting times disappear, consequently the 3D virtual space creates the conditions for a genuine collaborative learning: avatars can work simultaneously, sharing not only the arguments but also the time and the design space. However, the use of 3D environments, for teaching and learning in general, and for collaborative learning in particular, has its problems and pitfalls. For example, in some cases, the characteristics and complexity of the environments or 3D worlds can put the educator at a disadvantage. Students can be absent-minded and despondent; they can find it difficult to carry out conceptual tasks of collaborative learning (Jacobson et al., 2008). The need to navigate, explore, manipulate objects, using specific types of interfaces and / or hardware equipment to complete these tasks could also impose an additional cognitive load to the learner (Dalgarno & Harper, 2004; Chen & Wan, 2008).

E-learning has been producing several specific teaching strategies based on new ways to design, deploy and manage distance education as well as new assessment techniques and results. The most used strategies in e-learning are Extended e-learning, Anchored instruction and Blended learning:

## **Introduction**

- Extended e-learning is an inductive method; learners face problems which lead them to discover new knowledge and to define new content.
- Anchored instruction is an educational model posing problems related to actual or plausible items. Sometimes the necessary data are introduced in narrative form and presented through a story and students may also face problems related to abstract contexts; Anchored instruction is often associated with simulated environments.
- Blended learning combines e-learning (provision of materials, content and training courses) with classroom training.

The transition to the third generation is taking place by using the Network and cooperative reevaluation. These two factors have been leading a profound reevaluation, not only on new cognitivist theories that lead to constructivism, but also on methodologies of learning that are focused on the learner's actual learning process.

For these reasons, during the learning history, the method has gradually moved from a learning society (as a group of people who learns, understood per a managerial model) into a learning organization that is organized into autonomous working groups able to communicate, exchange knowledge and create new groups per the logic of the network.

The World Wide Web can have strong innovative significance, but it is necessary to think of the learning path as programmed according to an organizational scheme that includes the integration of various types of activities: from incidental learning with free navigation into the cooperative production of a project (cooperative learning).

## **Contemplating the Virtual Approach**

Unlike traditional, classroom based learning environments, VLE provide the ability to insert a contribution to the class at the moment of inception. Students can express their views and deliver their work as soon as they are ready to do so, rather than having to wait for the next lesson period.

The lesson (as a moment of training and comparison) in a real classroom lasts from 1 to 3 hours; in comparison, a virtual classroom poses no limits of time or topic intervention. For this reason, a virtual learning environment helps people identify, document, assess and certify what they have also learned outside formal education and training: simply because there is more flexible time in which to do it.

In addition, compared to traditional environments where students are physically in the room, a VLE can encourage the participation of more timid pupils, promoting student interaction and decision-making autonomy. The collaborative exchange of content increases the availability of the same and therefore offers the possibility of learning through a peer-mediated language, which is often preferred as it is typically easier to understand and interact with than the language used by the teacher.

It is easier to create an authorized capital of increased knowledge in a VLE than in a conventional environments; this capital promotes the development of organizational skills and prepares students to enhance their competences (Dell'Olio 2004). Students who have access to virtual sharing sites can participate more and produce more creative and effective collective products (Gaggioli et al. 2013).

However, VLE is not always the best expression of a learning community, nor can it always promote participation. Some students do not possess adequate technological skills or awareness of their role within the system and can thus fall victim to a digital divide which limits their active and conscious participation.

Such risks and opportunities start with the construction of an online/offline personality (McDougall 1988):

*Whether we like it or not, our inner characters constantly seek a theater in which to play their comedies and their tragedies. Although we rarely take responsibility for our secret theater productions, the director is sitting right in our minds.*

A student interacting in this purely virtual space is given the opportunity to express their personality in different ways through different roles. There is a tendency to express or even magnify positive and desirable aspects of one's personality, while omitting or neglecting those aspects deemed negative or undesirable (Markus 1986). VLEs, due to their very makeup inherit many of the attributes of social media, thus promoting the above division of personality traits. Participation in the VLE could therefore slow down the development of personality, especially in younger students (Ellison 2013).

In adolescents' virtual profiles "repeated identity recreation" is clearly manifested through continuous upgrading of their public profile, where they are almost always attentive to image searches and particular phrases; conversely adults pay more attention to the relational dynamics. This manifests itself in a greater use of comments on the profiles of their peers and in joining a large number of groups or circles.

A teacher who plans on using a VLE must closely monitor the evolution of their students' profiles, since the replacement of the physicality of the body with that of the virtual environment, just like in a real environment, can lead to dysfunctional behavior, such as stalking, cyberbullying and identity theft, that can be easily facilitated by the network.

In addition, while social technology can indeed help to find a new way of living together, it may also encourage users to develop an asocial aptitude in the context of real-world environments. The teacher must prevent such negative aspects by promoting feelings of trust, empathy and sharing which are the optimal characteristics of a creative network.

Such an environment is necessary for the creation of valuable cognitive artifacts as an active experience group where the sense of individual and social presence is reinforced. Each member should be encouraged to promote their ideas and to discuss opinions with their peers; each person should be able to hear their peers' points of view without negative feelings. When this goal is reached, Swarm Creativity can happen.

These virtuous virtual communities are privileged by a shared motivation, by subjects with common objectives, and users who thus assume roles of innovators, communicators and collaborators.

When VLE communities reach this point, they are known as Collaborative Innovation Networks, or COINS.

These communities are fueled by the positive and consistent feedback which in turn increases the level of welfare of the members and strengthens the process of knowledge construction. This kind of network promotes a sense of social responsibility towards the community, which drives users to make available to the other members something of their own: information, knowledge, content.

It is to be understood that the objective of the subject is not profit, which is equally divided among the members of the network, but the creation, maintenance and enlargement of the community: the interest of the subject is carried out together with that of the other (collective intent).

*Elena Favaron*

*Università Cattolica del Sacro Cuore, Italy*

## **USING COLLABORATIVE METHODS IN EDUCATION: AN EVIDENCE-INFORMED APPROACH**

### **Introduction**

Collaborative practice has a very long tradition in the history of education. Focusing our attention to the 20<sup>th</sup> century, its roots can be found in different learning theories, such as the Constructivist theory (Bruner, 1966; 1986; 1990) characterized by the idea that learners actively develop their knowledge in interaction with the environment and so redefining their mental structures; the Social development theory (Vygotsky, 1962; 1978) that emphasized the role of context and social interactions in learning processes; and the Social learning theory (Miller & Dollard, 1941; Bandura, 1977), based on the idea that people learn within a social context by means mechanisms such as modeling, observational learning and imitation.

The fundamental idea is that cognitive processes have their origins in social interactions and, as a consequence, can be interpreted as products of these latter.

In the last decades, we witnessed a growing interest in collaborative education. Different models have been proposed to support learning activities, also as a consequence of the development of web technologies supporting collaboration. Nevertheless, despite this interest, evidence about the efficacy of these strategies are not consistently positive. In this brief note, some elements that should be considered related to this topic are introduced and the need of an evidence-informed approach is emphasized.

### **Collaborative Learning and Evidence**

In the educational literature, different authors use terms such as collaboration, collaborative education, collaborative practice, collaborative teaching, collaborative learning, collaborative strategy with different meaning and there is no agreement about their definitions. As stated by Dillenbourg (1999, p.1),

*When a word becomes fashionable - as it is the case with 'collaboration' - it is often used abusively for more or less anything [...] it is nonsense to talk about the cognitive effects ('learning') of 'collaborative' situations if any situation can be labelled 'collaborative'.*

In other words, collaborative education has become a sort of “umbrella term” for a lot of educational practices.

The term collaboration derived from Latin *con-* ‘with’ + *labōrō* ‘work’, with the general meaning of “working together”. Hence, without pretending to provide a univocal definition, in this contribution, we will use the term collaboration in education by referring to a situation where learners (two or more) work together in order to reach a learning outcome.

Differences between “collaborative learning” and “cooperative learning” will not be discussed here (Bruffee, 1995; Panitz, 1999); in this contribution, these terms will be used interchangeably. However, generally speaking, it is possible to claim that “collaborative learning” refers to situations where learners work all together on a shared task while “cooperative learning” refers to situations where learners work on a joint task with a common overall outcome, but contributing independently to different aspects of the task. For instance, according to Roschelle & Teasley (1995, p.70) with reference to problem-solving activities,

*Cooperative work is accomplished by the division of labour among participants, as an activity where each person is responsible for a portion of the problem solving” while collaboration is intended as “the mutual engagement of participants in a coordinated effort to solve the problem together.*

That said, different models and methods based on collaboration have been advanced in the educational literature, such as group-investigation (Sharan & Sharan, 1976); student team learning (Slavin, 1978); reciprocal teaching (Palinscar & Brown, 1984); CO-OP CO-OP (Kagan, 1985); peer tutoring (Goodlad & Hirst, 1989); learning together (Johnson, & Johnson, 1994); jigsaw groups (Aronson, 1997).

They differ, for instance, on the basis of the number of learners working together (a pair, a small group, a whole class, a more extended community); the kind of work (e.g. text comprehension, classroom discussions, case studies, writing, problem solving, inquiry-based activities); the kind of interaction (face-to-face or computer-mediated, synchronous or asynchronous) (Dillenbourg, 1999). Then, it is really important - in any research about collaborative learning - to be very clear about the intended meaning of collaboration and the method that is used.

Furthermore, in the last fifteen years, we witnessed a growing interest on this kind of methods as a consequence of the development of educational technologies, such as digital tools and web-platform allowing teachers and learners to get in touch with each other and sharing experiences and resources. So that Computer-Supported Collaborative Learning (CSCL) has been proposed ten years ago as “an emerging branch of the learning sciences concerned with studying how people can learn together with the help of computers” (Stahl, Koschmann & Suthers, 2006, p. 409).

In this context, the development of new digital worlds, such as social networks, virtual 3D platforms, massively multiplayer online worlds, serious games, and augmented reality environments, has attracted the attention of researchers and school professionals, interested in their application for teaching and learning.

However, despite this great interest, research findings on the efficacy of technology-enhanced learning - based on socio-constructivist principles - are not univocally and consistently positive (Hattie, 2009; Tobias & Duffy, 2009; Vieluf et al., 2012). For this reason, when designing and implementing CSCL strategies, it should be justified on the basis of our professional wisdom, a careful analysis of specific educational needs in the real context, and the best available evidence about the likely effects of methods on expected learning outcomes. Actually, this is the meaning of an evidence-informed approach, as intended here.

As pointed out by Johnson, Johnson & Smith (2014),

*...educators should respond to issues of practice with theory and rigorous data. To do so, they have to ask the following questions: (i) is the instructional practice derived from a clearly formulated theory?; (ii) does the theory specify the conditions necessary to structure cooperation into existing situations [...]?; (iii) is the theory confirmed and validated by rigorous research that has high generalizability?; (iv) has the implementation of the practical procedures resulted in field research validating the effectiveness of the procedures in ways that guide the refinement and modification of the theory?*

On the basis of a huge amount of data, the Education Endowment Foundation (EEF, 2017) suggests to consider the following elements about collaborative learning:

- Students will need support and practice to learn how to collaborate, they cannot simply be left to work together because learning does not happen automatically as a consequence of collaboration;



## Introduction

- Activities should be well-structured and each tasks should be designed carefully in order to be effective and efficient, otherwise some pupils will try to work on their own;
- Sometimes competition between groups could be a good strategy to support students in working together more effectively within their group, however it should be used carefully because it can lead them to focus on the competition, rather than the learning outcome;
- Lower achieving students should be particularly supported and encouraged to talk and articulate their thinking in collaborative activities, otherwise they may contribute less and have not benefit from collaboration;
- Teachers should be well prepared to use this kind of methods in order to be really effective.

In a nutshell, we can say that it is not enough to just sitting pupils and asking them to work together using new technologies to foster student learning. Rather, well-structured approaches (based on a clear definition of learning goals) aimed at activating cognitive processes lead to the greatest learning gains, combining socio-constructivism and direct instruction (Vieluf et al., 2012; EEF, 2017).

Given the limits of this brief note, it is not possible here to analyse available evidence more in details. What it is emphasized here is that any educational innovation should be informed by existing reliable research. According to Davies (1999), evidence-based approach in education could be interpreted with reference to the following two main levels: (i) utilising available evidence and (ii) establishing new evidence where research findings lack or are not consistent.

Focusing our attention on the first one, Davies argues that school professionals need to be able (i) to define relevant and answerable question about their practices (e.g. *what kind of technology-enhanced collaborative strategy could be more effective to improve text comprehension skills in my students?*); (ii) to retrieve and competently read research findings (e.g. *where can I find good evidence about effective practice to improve text comprehension skills?*; *what should I consider on the basis of available evidence?*); (iii) to distinguish evidence on the basis of their strength (e.g. *how secure is the evidence?*); and (iv) to determine its relevance to their educational needs (e.g. *how can I translate evidence in more effective practices to improve text comprehension skills?*).

In this regard, it should be considered that, thanks to the development of Internet, nowadays scientific knowledge is accessible and available to an extent and in ways that were unimaginable just ten years ago.

Currently, there are different institutions and other organisations that systematically assess and synthesise educational research findings, in order to disseminate evidence about the efficacy of learning and teaching practices (some of the most active institutions in this field are shown in Table 1). Their mission is to close the traditional gap between classroom practice and educational research.

There are different methods that can be used to synthesize results, such as systematic reviews (SR) and meta-analyses (MA). The first one is a method of research that “attempts to collate all empirical evidence that fits pre-specified eligibility criteria in order to answer a specific research question” (Higgins & Green, 2001). Its main goal is to answer a well-defined question by means of an explicit, systematic and standardised procedure, also involving stakeholders (for instance, teachers, parents, educators) to ensure the relevance of findings.

With reference to second one, the term was coined by Glass (1976) to mean “the analysis of analyses [...] the statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the findings”. The main goal of a MA is to estimate the effect of an intervention (for instance, a teaching method) by means of an index that measure the magnitude of the effect (the effect size).

Table 1. Institutions that operate in the field of evidence-based education

Institution/Network	Description
Center for Research and Reform in Education (CRRE)	The CRRE is a research center within Johns Hopkins School of Education whose mission is to improve the quality of education for children by promoting high-quality research and disseminating evidence-based knowledge. URL: <a href="http://education.jhu.edu/research/crre/">http://education.jhu.edu/research/crre/</a>
Centre for Evaluation & Monitoring (CEM)	Based at the Durham University, it is an independent research group devoted to the improvement of educational practice by the introduction of evidence-based monitoring systems. URL: <a href="http://www.cem.org/">http://www.cem.org/</a>
Education Endowment Foundation (EEF)	It is founded by the education charity the Sutton Trust, with a founding grant from the UK Department for Education. The EEF promotes rigorous evaluations of innovative projects aiming to raise pupils' attainment (with focus on disadvantaged children) and disseminates findings about what's most likely to work effectively and cost-effectively. Findings are published in the Teaching and Learning Toolkit. URL: <a href="https://educationendowmentfoundation.org.uk/">https://educationendowmentfoundation.org.uk/</a>
Evidence Based Teachers Network (EBTN)	The EBTN is an independent teachers network that promote an evidence-based culture in teaching profession, disseminates evidence about the efficacy of teaching methods. URL: <a href="https://ebtn.org.uk/">https://ebtn.org.uk/</a>
Institute for Effective Education (IEE)	The IEE is an independent charity currently based at the University of York. It works to improve teaching and learning promoting evidence-based policy and practice. URL: <a href="https://the-iee.org.uk/">https://the-iee.org.uk/</a>
What Works Clearinghouse (WWC)	The WWC is founded by the Institute of Education Sciences (IES) within the U.S. Department of Education and it was established in 2002. It provides, collects and disseminate scientific evidence (based on studies that meet rigorous standards) on education programs, products, practices, and policies. Findings are published in the Find What Works database. URL: <a href="https://ies.ed.gov/ncee/WWC/">https://ies.ed.gov/ncee/WWC/</a>
Wing Institute	It is an independent non-profit foundation that operates by promoting evidence-based policies and practices in K-12 education. URL: <a href="http://winginstitute.org/">http://winginstitute.org/</a>

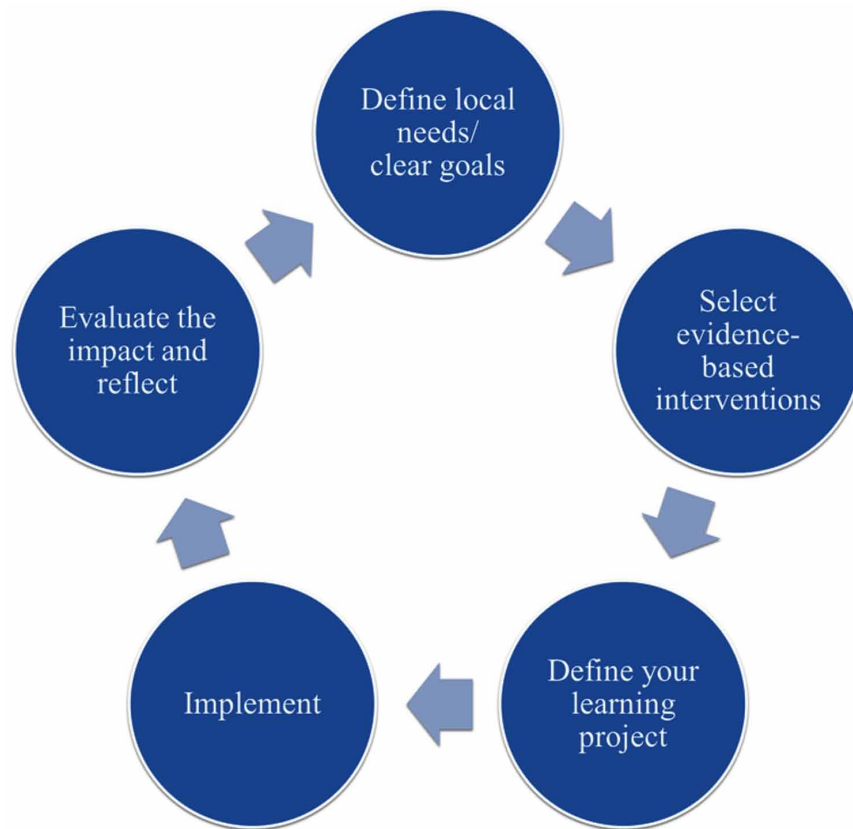
Typically, each of these methods comprise the following steps: (i) to define a well-framed question that should be clear and unambiguous; (ii) to define selection criteria of studies; (iii) to retrieve relevant studies about the question to be answered; (iv) to evaluate and select the studies on the basis of selection criteria; (v) to analyse and compare data from the selected studies; (v) to summarize and interpret the evidence for generating inferences and recommendations; (vi) to disseminate results in an easily understandable way.

Evidence produced in this way can be adopted to inform our decision in education. With this goal in mind, a cycle for evidence-informed decision making is proposed here (Figure 1). It is an adaptation of the guidance proposed by the U.S. Department of Education (2016) with reference to the *Every Student Succeeds Act* (ESSA) of 2015.

- **Define Local Needs and Clear Goals:** Firstly, instructional designers and/or teachers should have a good knowledge about their students and their prior knowledge, and define clearly the expected learning goals (also by consulting stakeholders, parents, students, colleagues and examining available data);

## Introduction

Figure 1. A cycle for evidence-informed decision (adapted by US DoE, 2016)



- **Select Evidence-Based Interventions:** On the basis of their knowledge about the context (including the learners' needs and the expected goals), instructional designers and/or teachers should select the best available evidence about interventions that are more likely to improve learning;
- **Define Your Learning Project:** Instructional designers and/or teachers should plan well-structured collaborative activities (clear tasks, roles, resources, technologies, and timing) strictly related to well-defined measurable goals and success criteria, according to local circumstances and the selected evidence;
- **Implement:** activities are guided by teachers, data about the process are collected in order to give feedback to learners and to make changes along the way if necessary;
- **Evaluate the Impact and Reflect:** The impact of activities should be evaluated with reference to the expected learning goals and analysed in order to improve next activities.

## Conclusion

As a consequence of the emphasis on constructivist and socio-constructivist theories of learning and of the development of digital tools supporting interactivity and collaboration, there has been a growing

interest in the field of Computer-Supported Collaborative Learning. Numerous instructional models have been proposed, but evidence about the impact of these models are not consistently positive.

In his work, Trinchero (2017) discusses some of the findings that scientific research has provided in this field and summarizes them as follows: it is not the technology itself that enhances learning, but its pedagogical use (see also Calvani & Vivanet, 2014), especially by supporting meaningful interactions, promoting feedback, cognitive processing and metacognition; technologies and multimedia enhance learning only if they are used consistently with human cognitive functioning (and keeping under control cognitive overload); collaboration in education requires well-structured activities to be effective.

Hence, the need of an evidence-informed approach to guide the design and implementation of collaborative practice has been suggested and a cycle for evidence-informed decision making has been introduced, consistently with the idea of *visible learning* advanced by Hattie (2015, p. 90):

*The fundamental premise of Visible Learning is that when educators focus on defining evaluating, and understanding their impact this leads to maximizing student learning and achievement.*

Giuliano Vivanet  
University of Cagliari, Italy

## VIRTUAL WORLDS IN EDUCATION: KEY ASPECTS AND OPEN ISSUES

The phrase “Virtual World” immediately brings us back to the dichotomy *real-virtual* that reached a precise connotation in the Seventies with the beginning of “artificial reality” experimentations where the perception of the body (and related actions) immersion was possible thanks to the computer graphic effects on the environment and, consequently, on involved actors (e.g. the VIDEOPLACE project by Krueger, 1977). The impact of technology on the body level as to cancel the border between the physical boundaries and the virtual ones has been clear since the first attempt.

Similarly, in the following decades, but with different objectives and ways, the so-called “virtual reality” and “cyberspace” scenarios, according to the three-level categorization made by Krueger (1992) in early Nineties in his *Artificial Reality II* (the updated version of his former book published in 1983), demonstrated the impact of technology on the real-virtual conceptualization making the deep twine between world clearer.

The current development of MUVES (Multi-User-Virtual Environments) shows that the connection between real and virtual human and *bodily* expressions, reified in daily leisure and professional life activities, cannot be encapsulated in a marked dimension (either real or virtual), but instead is the result of a mixed mutual relation.

If communication through the Web applications, even in the most flexible environments and channels developed in the 2.0 wave, seemed to have removed the need of a bodily involvement in a physical space and, thus the use of proxemics and kinesics to externalize yourself and interact, the MUVES brought the body back into the social dimension of communication. The process of embodiment in those environments is multifaceted. The user’s identity is tied to his/her avatar, a graphic 3D representation that embodies a life cycle and a potential of action/expression in a geometrical space that is being possibly and continuously modified by the avatar.

## Introduction

The embodiment in MUVES goes far beyond the communication through “emoticons”, the written strategy adopted in Web chats, forums and social networks to convey the user’s feelings commonly spread through postures, gestures and facial expressions. Communication and collaboration among avatars in MUVES are not just performed through written texts or are voice/video enabled, they are, in fact, embodied. Users can watch/touch each other avatars’ and share a common space where they move, use bodily distances to select different relationships with different avatars. But, it is not just a matter of communication/interaction, it is the collaborative dynamics that mostly affects the international interest in the use of MUVES in the educational context.

Both students and educators live their experience virtually *in-world*, they don’t perceive to be engaged in a teaching/learning context run at a distance. Emotions and feelings, tied to the social interactions taking place in such worlds, are affected, just like in the physical world, by cultural dynamics and by the value of the community. Comprehension processes are connected to the embodiment of the users into avatars with a life cycle, of the objects they use to give shape to concepts, and of the actions they perform in a flexible space.

Embodiment, immersion, presence and co-presence are key words that can orientate us in the understanding of the value of collaboration in the teaching/learning processes activated in MUVES specifically the “social” ones like Second Life.

Online collaboration is, nowadays, a common didactical strategy that takes advantage of a variety of Web tools such as wikis, discussion forums and environments that let students and teachers share both their ideas and artefacts. What is the added value of MUVES? Why collaboration should be more effective in such environments than in e-learning platforms (e.g. Moodle) or previously mentioned Web-based tools? Proper reasons to promote collaborative learning in Virtual Worlds lie in the wide international literature that shows empirical evidence in the research results focused on the impact of having (or better “being”) a “virtual body” and the connection among identity, interaction and didactics (Fedeli, 2016), on authentic learning (Cram *et al.* 2011; Farley, 2016) (real-life problems addressed by using role-plays, simulations and scenario-based tasks), and on the development of empathy during the teaching/learning process (Fedeli, 2014a).

Recent researches (Fedeli, 2013) highlighted that the connotation of a perceived augmented presence in MUVES has a strict connection with the POV (Point of View) functionality. By changing the perspective, the avatar fully exploits the collaborative dimension of activities taking place in the didactical situation he/she is living (in a specific place within a group of others). The POV enriches the interaction between the world and the avatar, but it also facilitates the building process and the management of objects/spaces, which contributes to give shape to the collaboration among avatars. The use of different points of view seems to positively affect the management of the interpersonal space making the virtual experience a so-called “empathetic embodiment” as Gee (2003) defined it in his work, *What video games have to teach us about learning and literacy*.

For all these successful features MUVES are widely used in different contexts (school, VET centres, university, etc.), but mostly in higher education where there is no restriction of age access and the security issues can be more easily managed by the teacher. An example of the use of Virtual Worlds in education is visible in the Second Life official wiki, where a directory of academic organizations with a location in Second Life is published. The list is very rich both in terms of number of institutions and countries, URL: [http://wiki.secondlife.com/wiki/Second\\_Life\\_Education\\_Directory](http://wiki.secondlife.com/wiki/Second_Life_Education_Directory). Teaching activities are designed to be implemented both in distance courses and as a virtual integration in face-to-face contexts in the so-called *blended* solutions. What appears as a relevant interest is that the same aspects

motivating teachers, educators and educational managers to use MUVES, simultaneously open serious challenges to be further discussed.

We can summarize the challenges into three macro areas: (a) the teaching/learning process and the communication/interaction channels as interface options and modalities in terms of teachers' management of those options; (b) the identity and professional avatar's management across MUVES and physical world; (c) the research methodology when the object of the investigation is the MUVE itself and its inhabitants, the avatars.

The first issue is somehow related to the concept of cognitive load and the risk that using a complex interface where communication functionalities are based on a synchronous management of text chats, voice chats and extra linguistic channels (avatar's gestures and movement in the space) can cause an information overload for the user. All those channels increase both the sense of presence and co-presence, but the effects caused by their simultaneous use (auditory and visual mode) are still an object of research dealing with attention, working memory and retention.

As for the concept of professionalism and teacher's identity in such Virtual Worlds it is undeniable that being embodied in an avatar and "living" a virtual life being fully involved in the environment's social dynamics (groups, subcultures, etc.) is much more demanding than accessing a learning platform to develop one's teaching activities. Social MUVES (except single experimentations of dedicated worlds for school projects) are not specifically designed for educational/pedagogical purposes and teachers are, first of all, residents of the worlds, before being teachers. That means their virtual identity can be wholly exposed to students who are no longer closed in a learning space/time dispositive with clear "rules". It comes from Foucault's theoretical approach and it is used in different domains. In Pedagogy "dispositif" is used to refer to both the whole teaching/learning environment as a space-time structure, the strategies and methods that are activated in there, and to the involved actors in such a process. The risk that teachers may face is mixing the private aspects of their virtual life with the public educational role they play. This is true for all informal online environments (e.g. social networks) where students and teachers can share pieces of their lives, but the deep immersion and the embodiment power in MUVES can compromise a balanced relationship between the different actors of the teaching/learning process.

The last issue addresses the use of MUVES as a research object. Researchers who runs investigations on the educational use of those environments need to take into account not only a set of ethical aspects tied to the avatars' identity and the need to protect their privacy (also in their visual representations), but also the methodological procedures for gathering data (Boellstorff *et al.* 2012; Fedeli, 2014b). Being a researcher in a Virtual World means being recognized as an expert resident of that world and, thus, being considered reliable by the sample. Just in this case the researcher will be able to collect the data (e.g. running a participant's observation or managing an effective interview).

The research on MUVES in the educational context is highly fertile, but there is still the need of building protocols to be implemented. Just developing interdisciplinary research and applying the proper research paradigms to satisfy the different dimensions of the teaching/learning process, the research efforts can offer useful inputs to enhance the effectiveness of MUVES in education.

*Laura Fedeli*  
*University of Macerata, Italy*

## **VIRTUAL WORLDS IN THE CLASSROOM**

In recent years, several researches have suggested that virtual simulations and serious games can be considered effective tools to support teaching and learning, especially in accordance with a constructivist approach, but also with the Evidence Based Education.

In this context, even Virtual Worlds have become valuable as they allow the activation of specific tasks in special settings aimed at learning goals, built by teachers and students together.

The students of a class, but also of geographically distant classes, accompanied by their teacher, can access virtual places equipped for operational practices. Students can practice on various subjects, such as mathematics, art, history, technology, science, foreign languages, thus enhancing transversal competences and abilities that can be used in different areas.

They can share skills, collaborate and exchange experiences, building virtual learning objects.

They can search on the Internet to study programming techniques and learn how to do graphic design, audio and video.

All these ways of learning underlie the value of pedagogical approaches and thusly applied models of knowledge building. Cognitive and constructivist theories are now recognized as necessary cultural background for teachers to work professionally. Teachers nowadays must acquire an awareness of young students' languages in order to fight social problems such as school dropping-out or to avoid dangers inherent in the use of Web tools.

Teachers can reach this awareness by using 3D Virtual Worlds and in activities of gamification or Augmented Reality (AR)

In addition, with the use of new tools like gloves and visors, users act in their physical reality increasing their perception by using extra-sensory virtual elements, such as maps, images or movies to implement his knowledge.

For these innovations to be successfully applied in education, adequate pedagogical strategies are needed as have been described in the previous paragraphs.

*Maria Guida*

*National Institute for Documentation, Innovation, and Educational Research, Italy*

*Gianni Panconesi*

*Esplica, Italy*

## **REFERENCES**

Aronson, E. (1997). *The jigsaw classroom: Building cooperation in the classroom*. Glenview, IL: Scott Foresman & Company.

Bandura, A. (1977). *Social Learning Theory*. New York: General Learning Press.

Boellstorff, T., Nardi, B., Pearce, C., & Taylor, T.L. (2012). *Ethnography and virtual worlds. A handbook of method*. Princeton, NJ: Princeton University Press.

- Bruffee, K. A. (1995). Sharing our toys: Cooperative learning versus collaborative learning. *Change: The Magazine of Higher Learning*, 27(1), 12–18. doi:10.1080/00091383.1995.9937722
- Bruner, J. (1966). *Toward a Theory of Instruction*. Cambridge, MA: Harvard University Press.
- Bruner, J. (1986). *Actual Minds, Possible Worlds*. Cambridge, MA: Harvard University Press.
- Bruner, J. (1990). *Acts of Meaning*. Cambridge, MA: Harvard University Press.
- Calvani, A., & Vivanet, G. (2014). Tecnologie per apprendere: quale il ruolo dell’Evidence Based Education? *Journal of Educational, Cultural and Psychological Studies (ECPS Journal)*, (10), 83-112.
- Chen, C. J., & Wan, F. (2008). Guiding exploration through three-dimensional virtual environments: A cognitive load reduction approach. *Journal of Interactive Learning Research*, 19(4), 579–596.
- Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning*. Hoboken, NJ: John Wiley & Sons. doi:10.1002/9781119239086
- Cram, A., Hedberg, J. G., Gosper, M., & Dick, G. (2011). Situated, embodied and social problem-solving in virtual worlds. *Research in Learning Technology*, 19(3), 259–271. doi:10.1080/21567069.2011.624172
- Dalgarno, B., & Harper, B. (2004). User control and task authenticity for spatial learning in 3D environments. *Australasian Journal of Educational Technology*, 20(1), 1–17. doi:10.14742/ajet.1364
- Davies, P. (1999). What is evidence based education? *British Journal of Educational Studies*, 47(2), 108–121. doi:10.1111/1467-8527.00106
- Dell’Olio, C. (2004). Istituzioni formative e pratiche di coordinamento organizzativo: modelli di pensiero e schemi d’azione del networking nei contesti scolastici. In *Pedagogia delle risorse umane e delle organizzazioni*. Milano, Italy: Guerini e Associati.
- Dillenbourg, P. (1999). What do you mean by collaborative learning? In P. Dillenbourg (Ed.), *Collaborative-learning: Cognitive and Computational Approaches* (pp. 1–19). Oxford, UK: Elsevier.
- EEF Education Endowment Foundation. (2017). Collaborative learning. In *The Teaching & Learning Toolkit*. Retrieved March, 8, 2017 from <https://educationendowmentfoundation.org.uk/resources/teaching-learning-toolkit/collaborative-learning/>
- Ellison, N. (2013). *Future Identities: Changing identities in the UK - the next 10 years*. Retrieved online March, 8, 2017 from [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/273966/13-523-future-identities-changing-identities-report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/273966/13-523-future-identities-changing-identities-report.pdf)
- Fallon, C., & Brown, S. (2016). *E-learning standards: a guide to purchasing, developing, and deploying standards-conformant e-learning*. CRC Press.
- Farley, H. S. (2016). The Reality of Authentic Learning in Virtual Worlds. In S. Gregory, M. J. W. Lee, B. Dalgarno, & B. Tynan (Eds.), *Learning in Virtual Worlds: Research and Applications* (pp. 129–149). Edmonton, Canada: Athabasca University Press.
- Fedeli, L. (2013). *Embodiment e mondi virtuali. Implicazioni didattiche* [Embodiment and virtual worlds. Didactical implications]. Milano: FrancoAngeli.



## **Introduction**

Fedeli, L. (2014a). Ricerca qualitativa nei mondi virtuali: considerazioni di carattere metodologico [Qualitative research in virtual worlds: methodological considerations]. *TD Tecnologie didattiche*, 62(2), 88-94.

Fedeli, L. (2014b). Aspetti ludici e dimensione empatica nei mondi virtuali: uno studio di caso in Second Life [Ludic aspects and empathetic dimension in virtual worlds: a case-study in Second Life]. *Form@Re - Open Journal Per La Formazione In Rete*, 14(3), 62-73.

Fedeli, L. (2016). Virtual Body: Implications for Identity, Interaction and Didactics. In S. Gregory, M. J. W. Lee, B. Dalgarno, & B. Tynan (Eds.), *Learning in Virtual Worlds: Research and Applications* (pp. 129–149). Edmonton, Canada: Athabasca University Press.

Gaggioli, A., Mazzoni, E., Milani, L., & Riva, G. (2013). The creative link: Investigating the relationship between social network indices. Creative performance and flow in blended teams. *Computers in Human Behavior*, 12, 3.

Gee, J. P. (2003). *What video games have to teach us about learning and literacy*. New York: Palgrave/St. Martin's.

Glass, G. V. (1976). Primary, Secondary, and Meta-Analysis of Research. *Educational Researcher*, 5(10), 3–8. doi:10.3102/0013189X005010003

Goodlad, S., & Hirst, B. (1989). *Peer Tutoring. A Guide to Learning by Teaching*. Nichols Publishing.

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Oxon, UK: Routledge.

Hattie, J. (2015). The applicability of Visible Learning to higher education. *Scholarship of Teaching and Learning in Psychology*, 1(1), 79–91. doi:10.1037/stl0000021

Higgins, J. P., & Green, S. (Eds.). (2011). *Cochrane handbook for systematic reviews of interventions* (Vol. 4). Hoboken, NJ: John Wiley & Sons.

Hjeltnes, T. A., & Hansson, B. (2005). Cost effectiveness and cost efficiency in e-learning. QUIS-Quality, Interoperability and Standards in e-learning, Norway.

Hughes, J. (Ed.). (2009). *TACCLE. Teachers' Aids on Creating Content for Learning Environments. The E-learning Handbook for Classroom Teachers*. Brussels: Onderwijs van de Vlaamse Gemeenschap.

Jacobson, M. J., Kim, B., Lee, J., Lim, S. H., & Low, S. H. (2008). *An intelligent agent augmented multi-user virtual environment for learning science inquiry: preliminary research findings*. Paper presented at the 2008 Annual Meeting of the American Education Research Association (AERA), New York, NY.

Johnson, D. W., & Johnson, R. T. (1994). *Learning together and alone. Cooperative, competitive, and individualistic learning*. Needham Heights, MA: Allyn and Bacon.

Johnson, D. W., Johnson, R. T., & Smith, K. A. (2014). Cooperative learning: Improving university instruction by basing practice on validated theory. *Journal on Excellence in University Teaching*, 25(4), 1–26.

Kagan, S. (1985). Co-op Co-op. A Flexible Cooperative Learning Technique. In *Learning to Cooperate, Cooperating to Learn* (pp. 437-452). Springer.

- Klein, A. Z., de Freitas, A. S., Machado, L., da Silva Freitas Jr, J. C., Graziola Jr, P. G., & Schlemmer, E. (2016). Virtual Worlds Applications for Management Education. In L. Tomei (Ed.), *Exploring the New Era of Technology-Infused Education*. IGI-Global.
- Krueger, M. W. (1977). Responsive environments. In *Proceedings AFIPS 1977 June 13-16 National Computer Conference* (pp. 423-433). New York: ACM. doi:10.1145/1499402.1499476
- Krueger, M. W. (1992). *Realtà artificiale*. Milan, Italy: Addison-Wesley.
- Markus, H. P. S. (1986). Nurius, Possible selves. *American Psychologist*, 41(9), 954-969.
- McDougall, J. (1988). *Teatri dell'io. Illusione e verità sulla scena psicanalitica*. Milano: Raffaello Cortina Editore.
- Miller, N., & Dollard, J. (1941). *Social Learning and Imitation*. New Haven, CT: Yale University Press.
- Novacek, P. F. (2016). Adherence to Standards in the Development of E-Learning Programs. *Adult Learning*, 27(1), 38–40. doi:10.1177/1045159515594151
- Palinscar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction*, 1(2), 117–175. doi:10.1207/s1532690xci0102\_1
- Panitz, T. (1999). *Collaborative versus Cooperative Learning: A Comparison of the Two Concepts Which Will Help Us Understand the Underlying Nature of Interactive Learning*. Retrieved March, 8, 2017 from: <http://files.eric.ed.gov/fulltext/ED448443.pdf>
- Rahmani, R. (2016). Toward developing and validating a model for implementation of learning objects. *The Online Journal of New Horizons in Education*, 6(4).
- Roschelle, J., & Teasley, S. D. (1995). The construction of shared knowledge in collaborative problem solving. In *Computer supported collaborative learning* (pp. 69-97). Berlin, Germany: Springer. doi:10.1007/978-3-642-85098-1\_5
- Sharan, S., & Sharan, Y. (1976). *Small Group Teaching*. Englewood Cliffs, NJ: Educational Technology Publications.
- Singh, H. (2003). Building effective blended learning programs. Englewood Cliffs, NJ. *Educational Technology-Saddle Brook Then*, 43(6), 51–54.
- Slavin, R. E. (1978). *Using Student Team Learning*. The Johns Hopkins Team Learning Project.
- Stahl, G., Koschmann, T., & Suthers, D. (2006). Computer-supported collaborative learning: An historical perspective. In *Cambridge handbook of the learning sciences* (pp. 409-426). Cambridge, UK: Cambridge University Press.
- Tobias, S., & Duffy, T. M. (Eds.). (2009). *Constructivist instruction: Success or failure?* Routledge.
- Trincherò, R. (2017). *Handbook of Research on Collaborative Teaching Practice in Virtual Learning Environments* (G. Panconesi & M. Guida, Eds.). IGI Global.

## **Introduction**

US DoE - Department of Education. (2016). *Using Evidence to Strengthen Education Investments* [Non-Regulatory Guidance] Retrieved March, 8, 2017 from <https://www2.ed.gov/policy/elsec/leg/essa/guidanceuseinvestment.pdf>

Vieluf, S., Kaplan, D., Klieme, E., & Bayer, S. (2012). *Teaching Practices and Pedagogical Innovation: Evidence from TALIS*. OECD Publishing. doi:10.1787/9789264123540-en

Vygotsky, L. S. (1962). *Thought and Language*. Cambridge, MA: MIT Press. doi:10.1037/11193-000

Vygotsky, L. S. (1978). *Mind in Society*. Cambridge, MA: Harvard University Press.