

Trends, Issues and Solutions in e-Book Pedagogy

Elena Railean

Academy of Science of Moldova, Information Society Development Institute

Abstract

This chapter presents the main issues, state of the art and solutions in e-book pedagogy. Born or reanimated digitally, e-books complete modern traditional and digital libraries and allow users to read (online/ offline), to construct their own learning through personalization, to preview or to hear the content. In all cases the e-book pedagogy proves Dale's Cone of Experience for complex global environments. E-book pedagogy for portable devices aims to achieve a metasystems model of thinking. The aim of metasystems thinking is to achieve learning outcomes with reference to environment that is real and virtual, local and global, dynamic and adaptive. The literature on components of metasystems learning theory is reviewed. The main focus is to provide an overview and details on how e-book pedagogy is to be constructed to meet five different scenarios: static e-books, multimedia e-books, hypermedia e-books, customized e-books and personalized e-books. It is concluded that integrated pedagogy is the current trends concept of metasystems learning design.

Keywords: metasystems approach, e-learning, m-learning, e-book, digital book

Introduction

Information and communication technologies change our vision about the principles, strategies, resources, tools, methods, procedures and techniques used for learning. The Digital Age has allowed rapid communications, networking and socialization. Education occurs in a variety of formal, informal and non-formal learning environments. Feedback is coming from

“local and real, global and virtual learner - centred environments” (Midoro, 2005, p. 32). Learning is guided by motivation, both intrinsic and extrinsic (Elliot & Dweck, 2005, p. 17). Many institutions and learners have been experimenting with alternatives to designed pedagogical strategies to enhance successful learning, such as flexible learning, blended learning, and online access to programs and/or to e-books, digital or electronic textbooks.

The e-book digital format started the Gutenberg Project. There are over 38,000 free ebooks and 600 of the “best” e-books online and for Kindle, Android, iPad, iPhone etc. Stored in digital libraries, e-books are available in plain text, HTML, PDF, EPUB, MOBI, and Plucker. There are many libraries with free access: LibriVox, Runivers and Aozora Bunko. Usually, e-books are stored online, for example: NOOK Kids Store, Children’s E-Books, and TumbleBooks. Many publishers have begun distributing e-books, such as Cambridge University Press, Oxford University Press, Springer, Elsevier, RSC Publishing, Wolters Kluwer/Ovid, Taylor and Francis etc.

The user reads e-books in online libraries or builds his/her own e-library, using desktop computers, laptops, e-readers, e-devices or some mobile phones. The most commonly used e-devices are Kindle, iPhone, iPad, Android devices, BlackBerry, Windows Phone7, Mac etc. The rationale for the diversity of e-devices used for education is in the different formats – EPUB, PDF, DOC, TXT, HTML, RTF, JPEG, GIF, PNG, BMP, and MP3 – that e-book technology adopts. Different formats give rise to broad e-book categories: free e-books; e-books for purchase and licensing; plain text; audiobooks, multimedia books, FlexBook, Flip Books, and Wiki Books etc. Each time a new format of e-books emerges, it is expected to be a new opportunity to gain new readers and a new audience.

E-book structure and functionality have much in common with the same features for e-textbooks, educational software and academic textbooks. The similarity between such technologies was reported by Porter (2011, p. 28): “The electronic textbooks, also known as

digital texts, e-texts, ebooks, e-books, electronic books, and hypertext books, represent a marriage of a hardcopy book within an electronic environment with software, such as Adobe Acrobat PDF, XML, SGML, HTML files, or hardware, such as a Palm Reader, E-Reader, Sony Reader, and Amazon's Kindle among others". E-books are expected to be more and more used in universities, colleges, non-formal learning environments or/and workplaces (Connaway & Wicht, 2012; Sedig, 2005). As was noted by Sachoff (2012) more than 18 percent of new textbook revenue in the higher education and career education markets will come from digital textbooks by 2014. As was noted by Nicholas et al. (2008) over 60 percent of students were using e-books for academic work, but preferred to read short sections from e-books, rather than the complete text (less than 6 percent of students had read the entire text) and almost 60 percent estimated that they read for less than 20 minutes in a session.

McFall, Dershem and Davis (2006) observed that e-textbooks have the potential to address some of the paper textbook's shortcomings, taking advantage of the digital context and new learning techniques. The technology allows sharing annotations with textual notes, building diagrams and engaging students with interactive online lectures. Coloured highlighters and shared bookmarks are an interesting way to create bookmarks in the text, share bookmarks with the class, point them to specific passages, or to other outside resources.

E-textbooks facilitate learning. Luika and Mikk (2008) note that the low-achieving students profited from clear instructions, familiar icons, examples, and answering from the keyboard. The high-achieving students benefited from key-combinations, menus with different levels, the Internet, analogies and lower density of terms in the content of the material. In electronic textbooks, not only the content, but also the design of the software, should be different for learners with a different achievement level.

E-book pedagogy generally refers to strategies of instruction rely to teaching and assessment both in online and blended learning. The definition can be analyzed as follows:

the word “pedagogy” comes from the ancient Greek *paidagogeō*, literally ‘to lead the child’. The word “electronic” concerned with or using devices that operates on principles governing the behaviour of electrons. The main example of using electronic in educational technology is electronic books/electronic textbooks/digital book. In some cases the electronic textbooks are viewed as digital textbooks. Digital textbooks refer to the way that an electronic item or some new technology has been made, for example special coding called “discrete signals”, e-ink or e-paper technology. Usually, digital textbooks are defined as core textbooks with which students can learn contents that are tailored to their abilities and interests. The pedagogical functions, incorporated in digital textbooks, provide the learner with a combination of textbooks, reference books, workbooks, dictionaries and multimedia content.

These and other sources concede that e-book pedagogy moved slowly to e-learning and m-learning. Murray and Perres (2011) demonstrate that the era of e-textbooks is coming. Are we ready for these radical challenges in e-book pedagogy? The problem is that e-book pedagogy cannot be view only as pedagogy. This domain needs to be analyzed with complex problems that arise from e-learning and m-learning. These domains are: philosophy of learning, educational psychology, cybernetics of open systems and knowledge management. E-learning aims to enrich learning by blending models, conceptualizing multimedia; standardizing interoperable content representation; personalizing learning experiences to custom learning devices; integrating administrative functionalities with other academic units; and not the least, ensuring expected quality of learning. On the other hand, m-Learning refers to the use of handheld devices such as PDAs, mobile phones, laptops and any other handheld information technology device that many be used in teaching and learning.

As argued by Cassagnol (2011), e-textbooks are the most complex type of e-book, with everything from pagination, notation, searching and indexing, copy/paste, the ability to post to social media, and also multimedia such as video, audio, pictures, and slideshow. Up

until now, e-books have not been much more than PDF versions of books, used by students for highlighting and making notes in the margins. However, with the change from hypertext to Web 2.0 technologies there is a need to re-conceptualise the pedagogy of learning. The new learner-centred environment consists of wikis, weblogs, social bookmarking services and RSS feeds. M-Learning adds new technologies like SMS, MMS, WAP, GPRS, Bluetooth, PDAs, 3G and 4G phones, MP3s and CAMs. So, it is concluded that e-book pedagogy integrated two main trends in educational technology: e-learning and m-learning. The pedagogical tools for e-pedagogy are: electronic books, electronic and/or digital textbooks.

The aim of this chapter is to identify and describe trends and issues in e-book pedagogy for the learner-centred environment, as well as strategies, procedures and methods for new learning. Such strategies include the provision of metasystems thinking capable to change our vision about linear and systems thinking. The research problems are: What are the cybernetic principles for the e-book pedagogy? What are the similarities and differences between cybernetic, philosophical, psychological and management principles? Could e-book pedagogy provide an environment for development the self –regulated learning capacity?

Beyond studying good practices to substantiate the e-book pedagogy, the objective of the chapter is to investigate the metasystems approach in order to develop a deeper understanding of how a knowledge graph increases intrinsic motivation to read and learn with e-books. The following section provides a review of the recent literature in order to explain good practices to substantiate the e-book pedagogy. The section after that outlines the approach of Instructional System Design. The subsequent section describes trends and issues in modern e-book pedagogy. Then the portable e-reader content and pedagogy is described, followed by the integrated pedagogy of competence in contrast with portable e-readers. The next section describes the approach of metasystems design of e-books. The final section concludes and offers insights for e-books pedagogy and future research.

Good Practices to Substantiate the e-Book Pedagogy

Good practices to substantiate the e-book pedagogy have their roots in philosophical, pedagogical, psychological, cybernetic and knowledge management theories. The pedagogical roots for e-books are traced from behavioural learning theory and stochastic learning. Berg (2003) emphasizes two main techniques for the use of media in the classroom: one concentrating on behaviour, and another focusing on process and holistic, experiential-based learning. These technologies use different principles and pedagogical strategies for learning design, but have common roots.

The first root, dated from the beginning of the last century, is called the *Visual Instruction Movement* (Reiser, 2001). This root aims to combat “verbalism” in the classroom, however, the books are focused on memorization and drill and practice techniques. The making of films for educational use in the early years was not explicitly guided by pedagogical theories. The studies of that time show that the instructional value of any media product is determined largely by how it is used and less by how well the films were designed. With all this, the strength of a new movement consists in successful efforts at thinking about learning design.

The second root, named *Audiovisual Instruction*, was famously predicted by Edison: books would be replaced by motion pictures (Cuban, 1986). So, for 20 years teachers used trigger films (short, problem-centred films) in order to engage students in learning through new methods, including silent films that added some scope for customization. Nonetheless, Reiser (2001) notes that practices were not greatly affected by research programmes as people either ignored, or were not made aware of, many of the research findings. During the early 1950s, leaders in the audiovisual instruction movement had become interested in theories of communication focused on process, involving a sender and a receiver of a message, and a channel, or medium, through which that message is sent. Moreover, during

the 1920s audiovisual instruction was completed by educational radio. New programmes were available for foreign languages, health, social studies, economics, science, music, art and assessment.

During World War II the audiovisual and educational radio tested hypotheses about various filmic techniques and their instructional effectiveness. As was noted by Molenda (2012) they tended to show procedural tasks from the performer's viewpoint rather than the viewer's and to use a first-person stream of consciousness narration to model the thought process of the performer. In the post-war period research was conducted on visual and auditory perception. The most relevant strand was Gestalt psychology, pioneered by Wertheimer and elaborated by Koffka and Köhler. The strength of Gestalt psychology, as a type of humanistic-existentialist psychology, is in the concept that perception of a whole differs from that of the individual stimuli that make up the whole.

Later, Dale's Cone of Experience was proposed (Lalley & Miller, 2007). The principles for learning, as well as for audio and visual media, could be arrayed in a spectrum from concrete to abstract. So, it was demonstrated that people generally remember 10% of what they read, 20% of what they hear, 30% of what they see, 50% of what they hear and see, 70% of what they say and write and 90% of what they do. The proposed principles were completed by educational television tending to emulate lectures, demonstrations, voice-over visualizations, interviews, panel discussions, dramatizations, field trips, or documentaries.

After Shannon and Weaver's information theory and Wiener's cybernetics, specialists in educational technology were viewing teaching/learning problems as a communication problem. The theory of operant conditioning was proposed by Skinner (1954). The programmed instruction, as *third root*, came with a new arrangement of stimuli, responses, and reinforcements and the teaching machines with programmed instruction lessons were expected to change the vision of learning. This methodology allows students to progress

through a unit of study at their own rate, to check answers immediately and to advance only after the answer is correct. The Skinner stimulus-response model was based on the principles that learning takes place through a series of small steps in which the learner must actively participate and with success in learning, the student is immediately rewarded. The realization of such plans depends on a number of factors, the priorities being feedback and reinforcement, which is indisputable, and the main strength of the programmed learning. The weakness is the teacher-centred environment. It is preferable, therefore, to focus on controlling through interaction with the instructional environment, where students were unable to ask questions and to develop self-regulated skills.

The alternative to programmed instruction was *Personalized System of Instruction*. This is a teaching–learning strategy, which was proposed by Keller (1968), who defined the concept as: “This is a course through which you may move, from start to finish, at your own pace. You will not be held back by other students or forced to go ahead until you are ready. At best, you may meet all the course requirements in less than one semester; at worst, you may not complete the job within that time. How fast you go is up to you. The work of this course will be divided into 30 units of content, which correspond roughly to a series of home-work assignments and laboratory exercises. These units will come in a definite numerical order, and you must show your mastery of each unit (by passing a “readiness” test or carrying out an experiment) before moving on to the next” (Keller, 1968, p. 81).

The methods of delivering the information (class, lecture or demonstration in traditional classroom) and the main actors include the teaching staff, which includes proctors, assistants, instructor and a graduate laboratory assistant. A proctor is an undergraduate who has been chosen for his mastery of the course content and orientation, maturity of judgment, understanding of the special problems that confront a beginner, and for his willingness to assist. The role of proctor is to provide students with all study materials except textbooks.

The work in the laboratory will be carried out under the direct supervision of a graduate laboratory assistant. The role of graduate classroom assistant is to provide the course materials and to keep up all progress. The role of instructor is to select the material, organize and to present the material, construct tests/examinations, provide lectures, demonstrations, act as a clearing-house for requests and complaints and to arbitrate in any case of disagreement between students and proctors or assistants.

The outcomes of personalized system of instruction are analyzed by final examination, in which the entire term's work will be represented. "With certain exceptions, this examination will come at the same time for all students, at the end of the term. The examination will consist of questions which, in large part, you have already answered on your readiness tests. Twenty-five percent of your course grade will be based on this examination; the remaining 75% will be based on the number of units of reading and laboratory work that you have successfully completed during the term" (Keller, 1968, p. 81).

Fourth is *Computer Aided Instruction (CAI)*. The principles of CAI are aimed at establishing more effective communication methods, both verbal and audiovisual. These methods use interactive questioning and appropriate feedback in order to improve retention. E-books, designed according to CAI principles, were mostly designed as interactive and intelligent tutors, known as *computer tutors*. Anderson and Krathwohl identify the following principles: use the production system model of the student, communicate the goal structure of the problem space, provide instruction on the problem-solving context, promote an abstract understanding of the problem-solving knowledge, minimize working memory load, provide immediate feedback on errors and adjust the grain size of instruction according to learning principles and enable the student to approach the target skills by successful approximation.

Computer aided instruction programme modes were drill-and-practice and tutorials with a strong control of author or instructor, rather than learner control. The strength of CAI

pedagogy is the strategy which allows designing interactive learning environments with immediate feedback, hypertext, simulations and animation. Moreover, the learning models incorporated in such instructional programs could provide consistency in presentation and adjust the difficulty of the context to the learning styles. CAI methods can improve instruction for students with disabilities. However, the weakness of this pedagogy is the minimal role of reality and social interconnections.

Instructional Design

One of the most interesting movements in educational technology is *Instructional Design* (Hakkinen, 2002; Kahle, 2007). This term is used in cases when “technology incorporates known and verified learning strategies into instructional experiences which make the acquisition of knowledge and skill more efficient, effective, and appealing” (Merrill et al., 1966, p. 2). Instructional design technology is based on System Approach to Training (SAT). As was noted by Molenda (2012) the essence of the systems approach is to subdivide the instructional planning process into steps, to arrange those steps in logical order, then to use the output of each step as the input of the next. “The systems approach represent a closed – loop, self – correcting process for proceeding from identified needs to predicable outcomes” (Lipsitz, 1973, p. 38).

While the systems approach was defined in 1956, as was noted by Fry, Bryan and Rigney (1958), it was recognized mostly after the ADDIE model, which means that the instructional programme can be developed in five phases: *analyze, design, develop, implement* and *evaluate*. Gustafson and Branch (2002, p. 19) explain that analysis often includes conducting a needs assessment and starting a goal. Design includes writing objectives in measurable terms, classifying learning as to type, specified learning activities and media. Development includes preparing student and instructional materials (both print

and non-print) as specified during design. Implementation includes delivering the instruction in the settings(s) as specified during design. Evaluation includes both formative and summative assessment as well as revision. Formative evaluation involves collecting data to identify needed revisions to the instruction; summative evaluation involves collection data to access the overall worth of the instruction, in either absolute or relative terms.

In 1990, after the hypermedia revolution (Barker & Tucker, 1990), the e-pedagogy received a new tool: the *Learning Content Management System*. The e-book became a component of such a system, but the content can be divided into information and assessment. The learning content management system allows personalization, editing, and modifying content as well as site maintenance and teacher management from a central page. It provides a collection of procedures used to manage workflow in an individual and collaborative environment. The student can choose the format, read and distribute e-books as discrete units of text, items and a sequence of images etc. The good practice to substantiate the e-book pedagogy can be considered as the following: “separation of structure, content and presentation, an exactly defined workflow management and the management of content in the form of small units, so called assets. This leads to quality, better reusability and reduced costs”, as was noted by Bergstedt *et al.* (2003, p. 155).

After 2000, the learning design principles were changed again (Koulopoulos & Frappaolo, 2000; Bolhus, 2003; Kramarski & Gutman, 2006). With the digital wave the focus of learning is based on three main conditions: learning is a lifelong process, learning design is always evolving, and natural resources are limited. The new learning ideal was established as involving professionalism, planetary thinking and culture pluralism. The learning environments became as real as virtual. The learning design is focused on technology enhanced learning. The learning activities are placed in formal schooling and in centres for lifelong learning and provide learning for health, safety, security and new competence.

Moreover, the behaviourism principles were definitively changed to cognitivism multimedia and constructivism learner centred environments. From a cognitivist perspective learners use memory and thought to generate their own strategies as well as store and manipulate mental representations and ideas. The classic paradigm of constructivism, as it was to become, was examined, criticized and added to by specialists in knowledge management, cybernetic pedagogy, and quantum psychology. According to Huang (2002) the instructional principles, driven from constructivism, can guide the practice of teaching and design to interactive, collaborative, authentic and learner-centred learning. In order to do this, information needs to be well structured, rely to authentic learning objects, dynamic and flexible cognitive processes describing actions, events, and changes in the cognitive system.

Arguments furnished by science have reignited the debate about objectivist and constructivist design approaches. Objectivist design (Jonassen, 1991) revealed the learner's processing of information, and emphasized controlling the nature, sequence and frequency of learning activities in order to replicate the knowledge of an expert performer in the most efficient manner possible. Instead of this, a constructivist approach is based on the belief that people create their own understanding based upon their perceptions of stimuli in an environment. Objectivist conceptions of learning assume that knowledge can be transferred from teachers or by technologies and acquired by learners. This approach has put forward two main issues: 1) How to structure the information in e-books? and 2) what type of structure is the most appropriate for e-books and how the structure should be designed?

The most appropriate theory, which provides the answer of how to design structure and content in e-books pedagogy, seems to be Elaboration Theory (ET), proposed by Reigeluth (1983). The basic strategies of ET are: *organizing structure* (conceptual, procedural or theoretical); *simple-to-complex sequence* (the most important and the most representative remaining versions of the task first); *constructivist learning* (cognitive

flexibility theory and situated cognition theory) and *guidelines for designing constructivism learning* according to five principles proposed by Jacobson (1994). There are: multiple conceptual representations of knowledge, link and tailor abstract concepts to different case examples, reduce domain complexity early, stress the interrelated and web-like nature of knowledge and encourage knowledge assembly.

What was described by Vygotsky in 1978 seem to be widely implemented in e-book pedagogy. But, as was noted by Eun, Knotek and Heining-Boynton (2008) the concept of zones of proximal development needs to be conceptualized. The student's understanding is influenced by guidance, conceptual tools, socio-cultural norms, standards and curricula. Learning is an activity which involves both social and material resources. For these reasons the zone of proximal development could be extended, if e-book pedagogy will provide methods for learning that will take into account the student' cognitive structure (*a priori* knowledge) and prospective (the cognitive potential).

However, e-books pedagogy rely on acquiring new knowledge, skills and competence in complex, realistic, and relevant learner-centred environments. For this approach, the social negotiation constitutes an integral part of learning, supports multiple perspectives and use of multiple representations and nurtures self-awareness of the knowledge construction process. On the other hand, in a high globalized world requires that students will rapidly process information, will learn new knowledge and will demonstrate new skills. One of the most suitable theories is Merrill's first principles of learning that describe learning as activation of *a priori* experience, demonstration of skills, application of skills, and integration of these skills into real-world activities.

All these facts constitute the premise for e-book pedagogy. However the weakness of all the described premises is in principles of learning for e-book pedagogy. Could these principles be fully integrated in e-book structure and content? Yet in 1972, Landa wrote that

effective learning is possible only in those instances where special devices and equipment are designed and used. These devices will allow a flexible adaptation of teaching to the dynamics of assimilation of knowledge, skills, and habits by each student. They will assist and regulate automatically or semi-automatically the complex processes of teaching, learning and control.

Recently the *iPad* paradigm has been recognized. Instructional design paradigm has been change to learning design. Moreover, the e-learning and m-earning pedagogy paradigm was shifted again in order to address more ambitious goals. Its aim is to support the cognitive, affective and psychomotor mechanisms for adaptation and accommodation to rapidly changing conditions in the real learning environment (Mayer, 2005; Midoro, 2006; Kalantzi & Cope, 2008; Railean, 2010a). In order to make this idea a reality the educational technology is viewed like a *product* (pedagogical resource) and a *process* (authoring tools for constructivist learning). The first technology, in addition to high resolution text, images and animation, allows discover of new methods for understanding. Instead of this, the second technology is an intention to write collaboratively or to personalize e-book content, using, for example, FlexBook or Wiki, add a chapter, link pages, uploads files or provide feedback.

What are the trends and issues in modern e-book pedagogy? Are there any differences in pedagogy of e-books written for networking computers and e-books written for portable e-readers or mobile devices with e-readers?

Trends and Issues in Modern e-Book Pedagogy

The scientific literature has increasingly articulated the links between “new learning as element of a science of education” (Kalantzis & Cope, 2008); “digital natives” (Prensky, 2001), a “learner-centered environment” (Midoro, 2005) and a “more open educational system” (Frick, 1996). As was defined by The New London Group in 1997 the pedagogy is a teaching and learning relationship that creates the potential for building learning conditions

leading to full and equitable social participation. However, in many cases the pedagogy is concerned about the transmission of knowledge, which could be translated as *linear, systems and metasystems thinking*. The linear thinking is usually associated with the works of Skinner (1954), while the systems thinking are based on the works of Gagne (1985). Metasystems thinking relies on constructivism. This approach can be proved by the theory of optimized directed graph (or knowledge graph), theory of probabilities and statistics. The first results, noted by Railean and Cataranciuc (2012), refer to a case study in teaching informatics and statistical analysis of two independent variables: values gained from oral self-assessment and values gained from computerized assessment, with high values of correlation.

In the context of portable e-reader pedagogy the major discussions rely on m-learning theory, which needs to be focused on meta-philosophy, metasystem, meta-theory, meta-language, meta-variables, metacognition, metadata, etc. Theoretically, the linear mathematical learning theories described research in statistical theory and probability, cellular automata, neural networks etc. The systems mathematical learning theories rejects the linear cause-effect, rely on cognitivism and, instead of it, try to explain the behaviour of the learning objects through producer-product relations, connectionism, dynamic stochastic systems, social media and multimedia in learning.

Starting from a meta-philosophic point of view, the linear thinking is a process of thought following known cycles or a step-by-step progression where a response to a step must be elicited before another step is taken. In other words, linear thinking represent rational thinking, when if $a = b$, and $b = c$, then $a = c$. The early programmed textbooks are the best example. So, in programmed learning, the student is forced firstly to answer and then to reinforce the answer before moving on to the next. Instead of this, e-book pedagogy aimed to develop linear thinking treats a student's brain as an empty vessel to be filled with knowledge. The most used pedagogical strategy is step-by-step sequencing common to

cognitive tutors. Moreover, the new methods of learning with technology are designed to introduce new concepts in step-by-step fashion and practice it under well-defined conditions (computer aided instruction).

Systems thinking is a process of understanding how things influence one another within a whole and refers to an orderly, logical method of identifying, developing and evaluating a set of strategies aimed at attaining a particular instructional goal. As was noted by Mora et al. (2003) the systems approach is a scientific paradigm that emerged in the early 1940s as an alternative to the classic positivist scientific paradigm dominant in the natural sciences research and what was developed in biology, psychology, sociology, politics, economics, operational research, management science and information systems. The strategy comes in two varieties with procedural or conceptual models. The procedural models apply cognitive taxonomy aimed to teach a rule, to form a skill or an attitude. Conversely, the conceptual models incorporate specific strategies to teach well-defined logical content. The idea claims that sequences should progress from simple to complex. Searching and browsing are the more common interaction styles with information. Objectivism and constructivism are the most used pedagogical strategies. The weakness of this approach consists in the idea that truth is absolute and cannot be investigated rather than being reinforced.

Metasystems thinking is like “human thought characterized by expansion in multiple directions, rather than in one direction, and based on the concept that there are multiple starting points from which one can apply logic to problem” (Hauge, 2012). The expression “meta X ” denotes that X is more than a system or “a system of systems” (Baranova, 2000; 2006) and X results in meta-system transition. As was noted by Klir (1990) the term meta X is used as a name for things or systems, which are bigger than X in the sense of more organized, having higher logical structure or analyzed in a more general sense. In contrast to the previous model, the new model is one of dynamism, flexibility and self-regulation. Current

advances are associated with metasystems, which are not unified, and not totalities, but a environment that a system needs in order to exist either inside or outside the system. In other words, the metasystem mediates between a system and its parts just as well as it mediate between the super-system (system of systems) and its subsystems. The metasystem is the glue that holds the various systems together, but its nature is not like the system (Palmer, 2002). The metasystems represent an “integration of systems which is carried out by a parameter set regardless of whether these systems have one set of variables or not” (Kapra, 2004).

The e-book pedagogy, according to the metasystems approach, aimed to develop meta- competence with new knowledge architecture characterized by dynamic functionality and more interconnected logical content deposited in long-term memory. It must be admitted that e-books, unlike other pedagogical resources and/or instructional tools, are not merely e-text representations of objectives, but are also processing systems. E-books are like generators of knowledge, skills and competence that provide sources for a metacognition mechanism. Furthermore, through the iPod and iPhone paradigm, teachers sought to harmonize the interdependences between cognitive, affective and psychomotor objectives (in order to engage students in active learning and to improve learning outcomes). Only in extreme cases do they use cognitive objectives.

As was noted by Kazak et al. (2010) the key components of the metasystem for children with emotional or behavioural needs include families, cultural norms, values and services. This is important because improving outcomes for children and adolescents with mental health needs demands a broad meta-systemic orientation to overcome persistent problems in current service systems. Improving outcomes necessitates the inclusion of current and emerging evidence about effective practices for the diverse population of youth and their families. In the case of widely used e-book pedagogical design, the core theory can be Bronfenbrenner’s ecological system theory. The rationale of this choice is learning, which,

like a complex metasystem, is designed for formal schooling, but in reality is affected by increasing influences of distance non-formal and informal education. Dib (1987) notes that non-formal education is when educative processes are endowed with flexible curricula and methodology, capable of adapting to the needs and interests of students, for which time is not a pre-established factor but is contingent upon the student's work pace, and certainly do not correspond to those of formal education. Informal education is quite different from non-formal education and comprises the following activities: visits to museums or to scientific and other fairs and exhibits, etc.; listening to radio broadcasting or watching TV programs on educational or scientific themes; reading texts on sciences, education, technology, etc. in journals and magazines; participating in scientific contests, etc.; and attending lectures and conferences. The reality emphasizes that stimulus-response-reinforcement is not a unique learning method and that is not any way to ignore the impact of global events. "The effects of larger principles defined by the macrosystem have a cascading influence throughout the interactions of all other layers" (Paquette & Ryan, 2001). But, what are the principles of e-books elaboration? Can classical principles of didactics be used in e-books learning design?

The e-book is the core concept for e-learning and m-learning. E-learning is just-in-time education which is delivered as individualized, comprehensive, dynamic learning content in real time, aiding the development of communities of knowledge, and linking learners and practitioners with experts. M-learning relies on a device with anywhere, anytime wireless access. Rosen (2010) has emphasized the key concepts:

- information is available anywhere there is Internet access
- information is available anytime
- information is available through devices that are becoming commonplace and will soon be affordable for most people

- information can be pushed from the environment to the learners and pulled by the learners from the environment
- the learning environment is fluid and adapts as the learner learns.

M-learning is not normally part of formal schooling and its aim is not to develop new knowledge, behaviours, skills, values or competences. Clark (2011) notes that m-learning is more about performance support and complementing learning and is conducted asynchronously. The students can read materials, complete and submit exercises or quizzes, participate in online discussion forums, and complete the project or end-of-course evaluation. The communication model is more learner-context than learner-learner or learner-expert. Due to the small screen it is more common to listen to an audio device or to interact for 3-10 minutes with animated content, and view digital photos or videos or disseminate them. The strength of this pedagogy is in audiovisual content. In order to achieve this aim, teachers need to teach knowledge, skills and competences. Is it possible to do this using the current state of the art in educational technology?

The open architecture of e-readers and e-devices provides access to nonlinear digital content, allowing open access to data, information and knowledge. The learning is more continuous than discrete, unlike the content representing a digital version of printed books or academic monographs. These are the weaknesses of m-learning pedagogy, but if the content is commensurate with the user's needs and preferences one can see that e-books have done more good than harm to modern education.

The strength of e-book pedagogy is in interactive frameworks. The affordances of these technologies include reduced storage demands, ease of back-up and the ability to construct meaning with graphic communication. If interactive frameworks are included in the electronic portfolio, the student obtains a powerful didactical tool for hypothesizing, designing and constructing the meaning of real learning objects and to form their own

coherent whole in order to reorganize elements into a new functional cognitive structure. Moreover, as Wang and Turner (2008) mention, the process of creating electronic portfolios provides students with the responsibility of reflecting on their learning. The assemblage of an electronic portfolio is a classic example of a constructivist activity because the students can construct and revise their knowledge, skills and competences. The most important benefit of an e-portfolio is retaining the intrinsic motivation.

One of the possible educational technologies is an “electronic textbook in an electronic portfolio” (Railean, 2009). The key factor that affects this technology is that the instructional context cannot be pre-specified, the student cannot construct his/her own understanding based only on his/her real-life experience, *a priori* structure is strongly individual and the key concepts are the most important figures. The basic premise of learning with e-books is that performance is reflexively aware of adaptation and accommodation to real life and not a reproductive activity based on similarity between presented and required knowledge. The second premise is e-reader and e-device tools, which allow intrinsic motivation to be maintained through global socialization. The power of e-devices strengthens socio-constructivist pedagogy.

On the other hand, the knowledge management requirements emphasize the role of the core structure of competence. As was noted by Gerard and Rogiers (2009) the structure of competence is a complex construct formed by *savoir-reproduire*, *savoir-faire* and *savoir-être*. The *savoir-reproduire* (which is equivalent to *savoir* or *savoir-dire*) represents theoretical and verbal knowledge; *savoir-faire* represents methods, techniques, procedures, and learning strategies; and *savoir-être* represents wishes, affectivity, emotions, and motivations (Railean, 2012a). Such a structure of e-book pedagogy integrates cognitive, psychomotor and socio-emotional domains into integrated pedagogy. In spite of this, e-book pedagogies are very different. While a highly effective alternative learning environment with interactive

strategies, the lack of essential online qualities creates problems for the designer in of offline and online instruction, who must have knowledge of online and offline methodologies and the skills to manage digital dialogue.

The lack of physical presence of a teacher and classmates and the lack of support from classmates is replaced by a two-way interactive model of transmitting the data (information, knowledge) with relevant pedagogical scenarios and suitable didactical schemes. However, although a teacher would be able to create pedagogical scenarios for e-readers or for e-devices, usually school administrators ignore this. Nonetheless, well-designed scenarios create a high synergy between author and learners as proved by hermeneutic dialogue.

E-book pedagogy can be viewed as an interdisciplinary science which provides new principles for cognitive activities through new methods of teaching, learning and assessment that affect knowledge, skills and competence development instead of a scholastic view of learning. What should be taught and what should not be taught through e-book pedagogy when portable e-readers or mobile devices are used? Are there any differences between methods of learning for portable or/and mobile devices? The first idea is that learning objects need to reflect the specific nature of the digital dialogue: a new form of sharing information on the Internet through Skype, Twitter, iTunes, Facebook, Wiki Books etc. Yet e-book pedagogy of the highest quality can and will occur in a programme provided beyond the traditional curricula, developed or converted in order to educate the digitally competent.

E-book pedagogy provides a learner-centred environment and new opportunities for lifelong learning. The global culture with its variety of methodologies, forms, formats and modalities of knowledge delivering; the special needs and psycho-pedagogical characteristics of digital learners; the controversies between digital natives and digital immigrants; and the interest in studying new technologies place e-book pedagogy ahead of the fact to accept a metasystems approach for learning design. To be successful the curricula, the network, the

context, the learning environment, the technology, the teacher and the students must be carefully balanced in order to take full advantage of the strengths of the new era and avoid pitfalls that could result from its weaknesses.

However, many domains cannot be taught with e-books alone. This means that new pedagogy cannot ignore traditional face-to-face learning or hybrid learning methods. Just because it may be technologically possible to simulate a real learning object, it is not necessarily best to teach through e-learning or m-learning. Before going on, we should draw attention to the differences between reading online and reading offline, and between their two respective sciences of design: instructional system design and learning design. Instructional systems design specialists do not like to be confused with learning design specialists.

While learning design specialists are concerned with learning theories and models, e-book pedagogy provides pedagogical strategies which improve memory and increase thinking speed through fun and interactive didactical activities. Young children apply and disseminate interactive didactical games, step-by-step animations or animated shops, digital videos and audio files in order to develop their own network, both real and virtual. In some cases professional storytellers teach children the joys of reading in a format they will love and native speakers “redirect” children to think in a foreign language. The didactical activities are like a goldmine of new methods and models for new learning. Such activities focus traditional curricula to follow more contemporary practices and perspectives: hermeneutic dialogue, group conversation, peer, group and cooperative assessment. The digital content can be adapted to “slow”, “unorganized” or “smart” and struggle to teach and assist with active engagement in learning.

The hermeneutic dialogue initiates intrinsic motivation. The aim of dialogue, for Gadamer, is to reach an understanding that centres less on asserting one’s point of view and more on individual transformation. In the case of e-books this aim can be reached more

easily. Many technologies allow annotating the text, bookmarking the pages, saving notes, listening to audio files and setting up a wireless connection. Their affordance is proved by hypermedia, interactive visuals, hypertext and/or backing up the personal online or offline library. Therefore, the author of personalized digital content has neither the intention to reproduce provided content nor does he/she want to purely capture what someone has said in order to find the meaning, but instead, seeks to explore opportunities for the production of new meaning generated in dialogue with the initial author.

Another definition was proposed by Lau (2011, p. 1): “e-textbooks can also be in CD-ROM, DVD-ROM, or portable document format (PDF) file. They can also be downloaded from websites”. Moreover, textbooks that offer the instructor assistance in the form of a CD-ROM, test bank, lecture outlines, PowerPoint slides, or Website material give added support in creating an online course. Some textbooks offer these licensed resources free of charge should the instructor adopt the text. Other textbooks offer course cartridges of content that import directly into courseware management systems like Blackboard or WebCT.

The Portable e-Reader Content and Pedagogy

According to the *Oxford Dictionary*, an e-book is an electronic version of a printed book which can be read on a computer or a specifically designed handheld device. The main advantages of portable e-book readers are better readability of their screens (especially in bright sunlight) and longer battery life. This is achieved by using electronic paper technology to display content to readers. The best and the most expensive of the portable e-book readers are the first category. These products have big screens, wireless or 3G connectivity and ample storage space. The additional functionalities include colours, touch screens, visually stunning works, web browsing capability, fast interface, easy navigation etc.

Mid-range e-readers are versatile enough to suit a wide range of users' needs. They are smaller, easier to carry, with longer battery life, usually with a high contrast e-ink screen and wireless connectivity. In contrast, a cheaper e-reader is a portable e-device, usually without wireless connectivity, but with the features to play music and/or to store files in an extensive storage capacity. While it has no wireless connectivity or audio player, as an e-book reader it works fine.

The portable e-book readers use e-paper technology and e-ink on their screens. Despite the fact that the more compact display may not make for a great e-book reader, what these devices lack in screen measurement they make up for in portability and value. With e-paper technology the user can easily insert or delete new pages, fill pages with drawings and hand-written notes and turn the pages like a book. It offers interactive features: hyperlinks, keyword search, and annotations that provide tool for an effective learning.

Usually, e-paper technology relies on e-ink technology. E-paper is a display technology designed to mimic the appearance of real ink on paper. Basically, light is reflected on the display, and no power is used to display a page since the electronic ink is bi-stable. The latest innovation is E-Ink Triton Imaging Film, which enables thousands of colours e-paper displays, high contrast, sunlight readable and low power performance. This innovation closes the digital divide between paper and electronic displays. Triton's crisp text and detailed colour graphics are fully viewable in direct sunlight. This technology is 20% faster than previous equivalents and allows users to turn a page, select a menu, take notes, or view animation or dynamic content for signage, advertising, or browsing the Internet.

The portable e-readers for education are more sophisticated. Trachtenberg (2012) notes that Inkling-based e-books make full use of the iPad's colour, video and touch screen. A biology text, for example, offers 3-D views of molecules such as DNA, as well as video lectures and interactive quizzes. Users can highlight text, take notes and share them in real

time with other users, such as fellow students. Along the way, students can jump outside the text to Google or Wikipedia. Litton (2008) observed that students indicate note they are leaving, which could be included in social networking, creating groups, sales etc.

One interesting example is iBook (a line of laptop computers targeting the consumer and education markets with lower specifications and prices than the PowerBook). Users can receive ePub from the iBookstore, add their own ePub and PDF files via data synchronization with iTunes, display e-books with multimedia and use VoiceOver. At the beginning of 2012, Apple announced the free release of iBooks 2, which can operate in landscape mode and allows for interactive reading. In addition, a new application, iBooks Author, was announced for the App Store, allowing anyone to create interactive e-textbooks for reading and reinforcing learning, and the iBookstore was expanded to include a textbook category.

Many schools around the world have deployed iPads and iPad devices in education, including iPads, iPod Touches, Android Tablets, netbooks, laptops and even specialized devices for students with special needs. One of the main problems is mobile device management (how to effectively deploy and manage mobile devices on a network while providing flexibility for teachers to update content). This problem can be solved through identifying the processes which rely on real didactical processes. In our point of view the main processes can be considered: “information/communication, cognitive and assessment” (Railean, 2010b). Each of the processes can be defined based on procedural implementations for future structuring actions and tools. The portable e-readers need to be able to set authentication policies, to filter browsing on devices, to install apps, to lock down in some special cases, and to configure settings.

On the other hand, the pedagogy is the art or science of teaching, education and instructional methods. The pedagogy relies on educational ideals; but learning involves thinking, writing, communicating, metacognition, learning objectives, assessment, knowledge gaps

etc. and is guided by intrinsic and extrinsic motivation. Self-regulated learners are the most productive because they can set goals for themselves and plan actions to achieve them. In order to be effective for learning, e-books pedagogy should provide methods that will allow user to create concept maps or structured drawings, summarize a page with a drawing linked to that page and provide a space for making conclusions about what was read or constructed cognitively. The processes should be witnessed in collaboration through sharing the annotations, content, or learning objects observed in nature and stored in digital forms. Such processes need to be supported by affordance of e-content, e-ink and e-paper technologies. The incorporated assessment model should provide immediate and/or delayed feedback, but more intelligent and adaptive than ever before.

Many educators agree that digital texts and mobile reading platforms have vast potential both for students and schools. Scientists have reported that portable e-readers improve the reading experience for students, if students have “anytime, anywhere” access to their course content; ensure that teachers have the ability to provide diverse resources quickly and economically; and that the reading and annotation experience is the equivalent of or an improvement over traditional books and textbooks. However, if students are required to find a learning object in a real non-formal environment, to take digital pictures or a short video and store it in a digital portfolio, the instructional objectives are more likely to be achieved. For example, if the K-12 students are going to learn about redox processes, they need to investigate the learning objects like malachite, baking soda etc.

E-books can be designed according to different educational models and scenarios. In the case of the open educational resources model the CK12 FlexBook can be used. The teacher will select or write chapters, customize the content or put his or her course pack of supplemental readings into a digital format readable by many portable e-readers. Many tools are available to encourage students to draft, edit, and then publish their works digitally, and to

put them up for sale in one of many bookshops for independent, self-published authors. This programme would be most effective with a creative writing class or club; a group of interested student-writers could form a group with a teacher-mentor to explore this burgeoning form of self-publishing. The programme explores the advantages of hypertext by enabling students to publish work in a way not previously available.

There are some academic problems which need to be taken into consideration for the portable e-reader paradigm. How does the portable e-reader align with the curriculum? Who will be responsible for its management? How do we hold teachers accountable for using the devices? Are there planning/collaboration times to share best practices in using mobile devices? Is there a curriculum vision for the iPods and iPads? Does it align with the school's mission? How will parents and/or the community be involved if students are bringing the devices home? Are the educational apps sufficiently available to support the curriculum? Are there enough content creation tools to replace the traditional computer desktop/laptop? There are some concerns about privacy and copyright issues. Teachers and students can create their own content, compose their own textbook using relevant tools, or teach students how to publish work in a public format.

The Integrative Pedagogy of Competence and Portable e-Readers

The idea of integrative pedagogy was provided by Gerard and Roegiers (2009). Such a structure represents the base of a dynamic and flexible strategy that can be used in the metasystem to manage knowledge through: *theoretical methods* (obtained through the integration of psycho-pedagogical principles into the functional structure of the competency) and *practical methods* (used by complying with the stages of the elaboration theory development process). The dynamic and flexible educational strategy for enabling competence employs: