

## LEARNING AND EDUCATION: BEYOND THE AGE OF DELIVERY

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**Abstract**  $\frac{3}{4}$  This paper argues that, although the mainstream vision on learning and education is still strongly based on the mechanistic models of the Industrial Society, we are at the dawn of the Knowledge Society, where the old premises are vanishing and completely different paradigms apply. We start by briefly analyzing the mechanistic heritage of education and the model of “delivery” of “content” it inspired. We then take stock of the representatives of educational thought that started breaking away from those mechanistic views into views where the contexts of learning are given the front stage. Following an analysis of the duality between content and context, we recall that valuable frameworks already exist in the literature to guide the design of learning contexts, and we briefly present, as an example, one such framework. We then close with some examples of simple learning activities that illustrate how improved learning contexts can be created, both online and face-to-face.

**Index Terms**  $\frac{3}{4}$  Communities, content, context, delivery, education, learning.

### INTRODUCTION

As the complexity of our socio-technical world increases by orders of magnitude, the eternal challenge to Humanity -- that of building its own education -- becomes more and more critical. However, in spite of massive technological progresses, the practices of education have remained almost unchanged for the last two centuries. The radically new approaches to education that set the Industrial Society apart from the previous era, contributing to unprecedented progress, seem to have fossilized. Inspired by the machine paradigm of the Industrial Society, those practices viewed education as an industrialized way of “transmitting” or “delivering” knowledge. Now, as learning and education extend into cyberspace, and the dawn of the Knowledge Society is announced, we seem to be unable to break way from those now outdated practices into practices that value community, interaction, context, organic processes, variable geometry, complexity, flux, change, and many other attributes that radically distinguish our era from that of our industrial age ancestors. We seem to be attempting to build the Knowledge Society by simply

adorning with technology -- masses of technology -- the increasingly obsolete educational practices that have been used, two centuries ago, to build the Industrial Society.

The negative consequence of this state of affairs is two fold. On one hand, our approaches to face-to-face education become increasingly out of tune with the challenges of the new era. On the other hand, the attempts to improve education at the distance through the use of technology, namely by promoting e-Learning, suffer, from the very beginning, from the absence of the sound educational paradigms that could, indeed, support genuine renewal.

This paper attempts to contribute to this renewal by pointing out that beyond the delivery of information, that is, of “content”, we need to take systematically into account interaction and activity, the learning “contexts”, the completely renewed social and cultural frameworks that our education is calling for and the technologies are pleading to offer us. In the next paragraph we comment on the mechanistic heritage of education and its influence on the creation of a worldview that sees education as the “delivery” of knowledge. We then provide a concise description of the literature that started breaking away from that heritage, stressing the importance of learning contexts where knowledge is constructed by the learners themselves, in appropriate contexts, rather than “delivered” to them. An analysis of the duality between content and context is then carried out, followed by the illustration of one of the frameworks available in the literature to help formalising the design of learning contexts. Finally, we illustrate the creation of simple learning environments that take into account the key importance of context.

### THE MECHANISTIC HERITAGE

Two hundred years ago, when mass schooling became established in response to the needs of the Industrial Society, the ideal of perfection was that of a mechanical world. To be perfect, in those days, was to operate like a machine. So, the factories became machines and the workers became parts of those machines. The same organisational principles applied to schools, the assembly-lines that mass-produced manpower for the Industrial Society. The bells ringing, the aligned rows of desks, the break up of knowledge into artificial disciplines, and of disciplines into disparate subjects, the

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instruction by telling and questioning, the memorisation and reproduction of texts, the "acquisition" of knowledge with no visible application, all resulted from this mechanistic drive. In the meantime, the metaphors of the ruling mechanistic language transformed knowledge into a material product, some kind of hydraulic fluid that could be mechanically "transferred" from the textbooks and the minds of the teachers into the heads of the learners. The sociable principles of apprenticeship-learning, which had pervaded for over one thousand years, had been replaced by something thought to be more "effective" -- knowledge "transfer". This was when knowledge started to be understood as "content", something of a material nature that could be contained in the minds of people and mechanically transferred from mind to mind.

Two centuries later, as the world becomes an enormous network of computing power and interconnected people, we seem to keep reasoning in exactly the same terms. Also, we seem inclined to ignore the last decades of research in learning and education, which could help us face such a radically new reality. Indeed, we seem to keep insisting on attempting to build a new era, that of the Knowledge Society, on exactly the same mechanistic principles of two hundred years ago. This happens as the machine metaphor, valuing individualistic learning, passivity, routine, and absence of context becomes more and more obsolete in a networked world that values community, interaction, context, organic processes, variable geometry, complexity, flux and change.

Locked up in the old machine metaphor, many "virtual schools" and "virtual universities" of the present seem to be reviving in cyberspace the much criticised bureaucracies of the mechanistic classrooms. On the same key, the allusion to the "delivery" or "transfer" of "content", of "learning" or of "knowledge" shows that learning and knowledge keep being looked as commodities that may be mechanistically transferred across networks into the heads of the learners, rather than constructed by the learners themselves, through their own activity, in learning contexts that can now be put together out of technologies that were unthinkable some years ago.

In a mechanistic environment, the students, acting as a machine parts, learned mostly in isolation. Although in classrooms, together with masses of other students, they were dissolved in those masses. The construction of their knowledge was mostly a solitary exercise. And in solitude they were assessed, within artificial environments where fellowship and team spirit were interpreted as cheating. They tended to become individualistic because the system forced their selfishness and punished the lack of it. In a networked world, the students, acting as network nodes, members of multiple communities, find out that the construction of their knowledge is a collective adventure -- an adventure where they build up their own knowledge while simultaneously contributing to the construction of the knowledge of the others. And as this process is renewed, they acknowledge

that they are not valuable just for what they know, individually, but for how they relate with the others that may hold quite complementary knowledge. They also recognize that, together, they may attain levels of knowledge that would have been unattainable in isolation. Finally, they become aware of the advantages of their simultaneous membership of multiple communities, which lets them bring to a community the knowledge they have gained in many others.

### BREAKING AWAY

Although mechanistic education quickly gained the favour of Industrial Society, it did not stay unchallenged for long. As soon as 1906, John Dewey clearly opposed mechanistic schooling, advocating the values of inquiry, participation and collaboration, and writing that school work should be a mode of activity "which reproduces, or runs parallel to, some form of work carried on in social life" [1]. In 1929, Alfred North Whitehead, in *The Aims of Education*, called for the suppression of the "fatal disconnection of subjects", criticizing an education that was built upon "inert ideas" and maintaining that the key problem of education was that of "keeping knowledge alive" [2]. Still Dewey, with Childs, insisted that education had the responsibility for preparing individuals "to share (...), instead of merely equipping them with an ability to make their private way in isolation and competition" and claimed that "the ability and desire to think collectively, to engage in social planning (...), is a requirement of good citizenship (...)" [3]. In the late 1930s and early 1940s, Kurt Lewin stressed the significance of learners playing an active role in discovering knowledge for themselves and the powerful influence of the social environment of the learner in promoting change [4]. Between 1930 and 1935, the Russian psychologist Lev Vygotsky produced a series of essays that, following their translation into English [5], strongly influenced educational thought worldwide by asserting that knowledge results, not from a transmission process, but from the internalisation of social interactions.

If we accept that technology-supported environments are, above all, new tools for creating communities; if we agree that the tools we use for intellectual mediation profoundly influence the sense we make of the world [5]; if we share, with Kuhn, the belief that the conceptualisation of knowledge is a social artefact that is maintained through communities of peers [6], then we must recognise that a completely different outlook must be taken if we are to face the challenge of creating learning contexts.

### CONTENT VS CONTEXT

In our current vision of a world inspired by networks, part of the future of learning and education will certainly be found in the production of "content", that is, of chunks of structured information that can be stored and transferred across networks. This is the reason why so many e-learning

enthusiasts claim that the future of learning and education is to be found on content. We will not deny, either, that part of that future will also have to do with the “delivery” of content. We believe, however, that a significant part of the future of learning and education -- may be the most important part of it -- is not to be found on content, but rather on “context”, that is, on making learning happen within activity rich, interaction rich, and culturally rich social environments that never existed, that the intelligent use of technology is making possible, and where completely different paradigms apply.

We do not claim any dominance of context over content, or vice-versa. What we claim is that, if we wish to achieve effective learning experiences, the tensions in the interaction between content and context (Figure 1) must be intelligently managed.

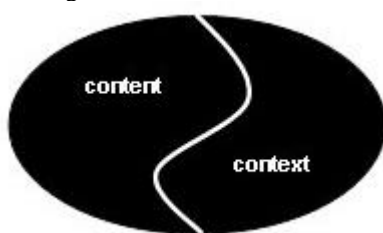


FIGURE. 1  
THE DUALITY OF CONTENT AND CONTEXT.

It should be stressed, on the other hand, that the role of context is far from new in learning and education. Just the opposite! It has just been relegated to a very secondary role in the last two centuries by the whirlpool of the mechanistic paradigm. The age old practice of apprenticeship, which lies at the very heart of the engineering profession, is the obvious example of an approach to learning and education that strongly capitalizes on context. Present day educational theory also includes a wide range of strategies for the creation of learning contexts: simulations, role plays, Socratic dialogs, directed dialogues, debates, discussion panels, story telling, case studies, projects, problem solving. Also in theory, many learning philosophies support the use of such strategies: constructivism, above all, but also many well known practices, such as action learning, reflexive learning, situated learning, accidental learning, or project based learning. Their use in the systematic construction of learning contexts is, however, quite poor. This is the reason why it is becoming so important to find out ways of systematically designing the learning contexts.

### DESIGNING LEARNING CONTEXTS

Many theories, applicable both to face-to-face and to online education, can be explored today to design learning contexts. Some rest upon sophisticated theoretical frameworks, such as Activity Theory [7] and Actor-Network Theory [8], and largely transcend education and the scope of this paper. Others, still supported by sound theory, but more readily applicable to education, are now beginning to catch the

interest of a wider audience concerned with the renewal of education. One quite inspiring such framework, which seems worth describing here to illustrate our points, is offered by Wenger in his proposal of a social theory of learning centred on the concept of community of practice [9]. First, he identifies four key components in a social theory of learning:

- **Practice:** we learn, individually and collectively, by doing.
- **Meaning:** we learn by trying to find, individually and collectively, a meaning for our action.
- **Community:** we learn as we try, individually and collectively, to build a sense of belonging to the communities where our activity takes place.
- **Identity:** we learn as we try to build our (individual and collective) identity.

Those four components, which are closely interlinked and mutually defining, are then analyzed in their pairing into three relationships: practice vs meaning, practice vs community, and practice vs identity. With those relationships in mind, Wenger proposes four basic dimensions for the creation of learning contexts, each one expressed by a duality:

- The dimension for the creation of meaning, expressed by the duality **participation/reification**, calls for a careful balance between the amount of learner participation and the amount of pre-coded explicit information (in traditional schools, student participation is often kept to a minimum, while reification, in the form of pre-structured lectures and textbook reading, is predominant).
- The dimension of time management in the learning process, expressed by the duality **design/emergence**, which describes the balance between the amount of time allocated to planned learning and the time given to spontaneous learner activity (recognising that it is important to plan in advance the unfolding of the learning activities but that excess planning may kill any opportunities for novelty in the learning process).
- The dimension of scope in the learning experience, expressed by the duality **locality/globality**, which strikes a balance between depth and breadth (so that the learner can see the tree from the forest, and vice-versa).
- The dimension of locus of control, expressed by the duality **identification/negotiability**, which describes the extent to which each learner can affirm personal identity in the negotiation process that lets the other learners in the community affirm their own (which is closely related to the management of power within the community).

In this simplified description of Wenger’s proposals -- where, for the sake of space, we exclude some of his more elaborate notions, like the concept of boundary -- it seems useful to notice that to let the learner develop a sense of

belonging to the community, Wenger identifies three components that need to be fostered [9]:

- **engagement**, in the sense that opportunities and mechanisms must be established to stimulate the engagement of the learners, namely in activities that generate reciprocity, exercise competence and encourage continuity,
- **imagination**, leaving space for the exercise of imagination, bearing in mind that imagination is often the first stage of experimentation and an early step in the making of strategy, and
- **alignment**, noticing that the diversity of experiences and feelings in a community calls for mechanisms that warrant convergence, coordination and arbitration.

### LEARNING IN CONTEXT

To illustrate the creation of simple learning environments consistent with the previous analysis, we reproduce here some examples of learning activities described by Afonso and Figueiredo [10-12]. Departing from the principles of distributed constructionism introduced by Resnick [13] and proposals by Wilson on constructivist models for instructional design [14], they distinguish three types of learning strategies for web-based environments: interaction strategies (discussing constructions), action strategies (collaborating on constructions), and presentation strategies (sharing constructions).

- **Interaction strategies** include brainstorming sessions, forums, committees, and storytelling. They promote debate and idea exchange, and call for higher order cognitive competencies. They turn the learning processes into transactional encounters, letting the learners build alternative visions and reflection mechanisms that help distinguishing the essential from the superfluous and get the most from each learning experience. They transfer the locus of control clearly towards the learner, but they put much responsibility upon the instructor in what regards the planning of learning objectives, contents and activities.
- **Action strategies** include simulations, role-playing exercises, and case studies. They involve the collaborative construction of knowledge and they engage the learners very strongly in the learning process, handing over to them even higher degrees of control. They clearly shift the emphasis of the learning process from product to process. However, they must be carefully prepared to make sure that they are highly relevant for all the participants, that resources, social interactions and timings are properly managed, and that plans exist to comply with unexpected developments.
- **Presentation strategies** include dialogs, symposia, and demonstrations. Though they are closer to more traditional, transfer-based, approaches to learning, they are particularly suited to attract interest to a given topic, stimulate controversy, and present subjects in a

structured fashion. A significant part of control is handed over to whoever takes the floor at each moment, strengthening the abilities to manage time and information flow in collaborative environments. Presentation strategies can be made to combine very nicely with the other two kinds of strategy.

To exemplify the use of those three categories of strategies, Afonso [10] proposes a few web-based learning activities based on case studies, committees, question posing, storytelling, symposia, and brainstorming:

- "Each case is a case" is an activity that engages multiple learners in the selection of case studies, involves the instructor in scaffolding the process, creates teams for the solution (and, in some cases, role-playing) of the cases, and finally creates a repository of cases for future reference and discussion.
- "Committees" assigns to small groups the responsibility to act on behalf of a larger group, with the aim of solving a complex common problem. Five teams are organised, one committed to ask questions, one to take notes, one to look for consensus, one to explore divergence, and a fifth one to delve into practical relevance. The groups are to end up producing a final document in the form of a web page that is discussed and made available in a repository of "committees", for future use.
- "Inquiry" brings into play the principles of question posing. A number of themes are proposed for discussion. The learners study the themes for a given period and then split into two groups: the "inquiring group", that asks questions, and the "inquired" group, that answers them. A web page is created with the questions and answers, for discussion and constitution of a repository of "questions & answers" that becomes available for future use.
- "The three concepts" explores storytelling. From a repository of narratives and concepts that make a "cyberspace umbrella", each learner selects the three concepts that (s)he values most, creates a story that creates a problematic situation around those concepts, and sends it to a "stories web page". The stories are randomly distributed back to the learners (avoiding sending them back to their authors) to be completed with solutions to the problematic situation. Various cycles of interaction with the instructor may now take place, until the final stories are put up on a web page repository called "once upon a time", for future use and forum discussion.
- "Presentation-question" reproduces a symposium where two to five recognised experts are asked to produce web presentations on a number of selected topics and to answer, for a period of time, to questions and requests for comments raised by the learners. The learners are them organised into teams that synthesise the presentations, stress their most relevant points, and re-

interpret them in light of the answers received to the questions and comments. The resulting synthesis is then put up on a web page repository called "symposia".

- "Idea maker" is an on-line application of the principles of brainstorming. A topic related to the subject to be learned is presented, and the learners, grouped in small teams, will send to a common web page their ideas about how the given topic should be further developed. With the instructor playing a scaffolding role, the global group will now discuss in a common forum which ideas are the best ones and should be retained. The topics and related winning ideas will be put up on a web page repository called the "idea corner". Many variations of this activity can be explored.

Some of those techniques have already been used -- both face-to-face and online -- with most encouraging results. Face-to-face, the activity "each case is a case" has been extensively explored in the academic year 2001/2002 to teach Strategic Planning of Information Systems in the 4th year of the five-year undergraduate course in Informatics Engineering of the University of Coimbra, Portugal [15]. They have also been explored in a similar manner, also to teach Information Systems, in the Masters degree in Informatics Engineering of the same university. Online, a combination of the various activities has been tried out on an experimental course in Information Systems specifically set up to support the post-graduate research project that led to the proposal of those activities [10]. The results were also most encouraging and led to significant refinements in the detailed exploration of the activities.

### CONCLUSION

The world has become an enormous network of computing power and interconnected people. As we witness -- and contribute to -- the dawn of the Knowledge Society, the paradigms for learning and education inherited from the Industrial Society cease to make sense. The ruling paradigm of the Industrial Society followed an ideal of perfection inspired by the machine. This has led to a mechanistic vision of education that sees knowledge, not as something that has to be built by the learners, themselves, in appropriate contexts, but as some kind of mechanistic fluid that can be "transferred" or "delivered" from the heads of the teachers -- and now from databases and across networks -- into the minds of the learners. The concept is so strongly ingrained in our language that knowledge keeps being understood as "content" that can be "delivered". One of the dramatic consequences of this worldview is that it creates the illusion that the use of technology in education, namely e-Learning, can be explored by simply organizing huge repositories of "content" and mechanistically "delivering" (or piping) selected portions of it across networks.

This paper claims that content makes little sense in the absence of well designed contexts. With this in mind, it has

attempted to show that the duality between content and context can be successfully explored if one carefully concentrates on the design of learning contexts. To illustrate this point, an inspiring framework for the design of learning contexts, proposed by Wenger [9], has been briefly described. Finally, a model put forward by Afonso [10] for the exploration of activities that take into account the key importance of context has been concisely presented. This model has already been used, both face-to-face and online, with most encouraging results. Also, it is currently being the object of a major research project aimed at its extensive exploration in web-based learning.

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