Developing Explicit Learning in Assisted Instruction

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In the twentieth century mankind has made sustained attempts to develop and apply "scientific method" to investigations in many areas of human knowledge. In each area, researchers have eventually had to change, adapt or recreate their own forms of "scientific methods" before their methods began to yield the quality of results and understanding that these researchers were seeking.
In the area of applied science, the use of the scientific method initially often seems to yield spectacular results. Innovations in atomic science, space research, medical practice, transport, management science, agriculture and biotechnology appeared to make rapid and groundbreaking progress. But each has suffered from more and more unexpected and sometimes disastrous side-effects.
One of these attempts has been completely successful becoming a "computer" and thirty years later a "personal computer" as a reflection of a social life in an inanimate physical world where it had to be storage.
In developing their chosen forms of knowledge, pure and applied scientists often isolate their subject matter from its natural context. Education is one of the obvious area in which this over-simplified approach has had scientifically unanticipated consequences in the twenty one century. It may well define a "stage 1" view of the scientific method. A more general systems-oriented approach was needed. The "stage 2" form of the scientific method takes the "default" system properties of the phenomena into account by investigating it in its context.
One purpose of this paper is to suggest that if the term "science" is to be applied across a wider range of studies in education, and we firmly believe that it should, then each of these areas of study needs to be re-construed, both in terms of how scientific knowledge in this area is recognised and defined, and in terms of how its particular forms of scientific method are made manifest and can be viewed one in relation to the other. These re-construals of the nature of the scientific endeavour are requiring and producing methodologies that go far beyond stage 2, to an over-arching framework for a new "stage 3" view. We call this "explicit learning" in assisted instruction.
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Metacognition and Learning to Learn

Metacognition as a concept described in a dictionary is defined as having knowledge or awareness of one's own cognitive processes. Metacognition as a concept thus describes the intellectual processes more commonly is referred to as "reflections". Metacognition has been associated with effective learning in educational contexts and the concept has been applied by educators seeking to design effective pedagogy. There is a general consensus that metacognition develops as the individual finds it necessary to describe, explain and justify their thinking about different aspects of the world to others. The progress student makes thus depends crucially upon their interactions with peers and adults; these interactions are based on the quality of their cultural environment.
In a world of constant and increasing rates of change, one of the most prevailing trends and traits is that of convergence. Concepts converge to form completely new concepts; people converge into new local, global and virtual communities (of practices, and finally of competence); professional skills converge to create new professions. Technology converges to create new technologies and prod-

ucts; why it was possible? Because a computer was included in a computer, and so it become tool, tutor, tutee and now is the real context in education. However, these convergences pale in comparison to the implosion of learning, working, and capturing knowledge and the management of their sum total. These previously disparate and relatively independent activities are converging to become one, and in so doing will create a completely new existence in the new economy.
Expertise used to demand constant improvement of one's ability to perform tasks or skills of a profession or trade. However, as multiple professions converge and fuse, as tasks and skills are constantly replaced with new ones at an even-increasing rate, expertise become a matter of steadily renewing one's knowledge base and extending it to new areas. Critical expertise has transformed into the continuous creation and acquisition of knowledge and skills. This lifelong cycle of learning is the new foundation of professional self-worth and that of all team and organizations. One's primary responsibility, and perhaps the only sustainable competitive advantage, is to improve one's ability to learn and apply the right things faster.

Situated Learning and Authentic Activity
Cognitive psychology suggests that a mental-model consists of two major components: knowledge structures (schema) and processes for using this knowledge (mental operations). Four elements describe a schema: ① general: a schema may be used in a wide variety of situations as a framework for understanding incoming information; ② knowledge: a schema exists in memory as something which a person knows; ③ structure: a schema is organised around some theme;④ comprehension: a schema contain slots which are filled in by specific information. A major concern of instructional design is the representation and organization of subject matter content to facilitate learning.
The careful analysis of subject matter content (knowledge) can facilitate both the external representation and use of knowledge for purposes of instruction (knowledge objects) and the internal representation and use of knowledge by learners (mental-models). If a student is taught a concise knowledge representation for different kinds of instructional outcomes (originally intended for use by a computer), can the student use this representation as a meta-mental-model to facilitate their acquisition of specific mental-models?
Situated learning refers to the fact that all learning takes place in a context which may or may not be familiar to the learner. Situated learning suggests that skills, knowledge and understanding which are learned, and even mastered, in one context may not necessarily be transferred successfully to another. Learning is situated in cultural settings, and if a learning activity falls beyond the cultural understanding of the learner, then learning is likely to be less successful than if had it been situated in a more familiar settings.
There is a link between situated learning and the need for authentic learning tasks. In this case, students can relate to their own experience inside and outside of classroom; authentic tasks are tasks which an experienced practitioner would undertake. These are likely to hold the attention and interest of the students and lead to a deeper level of engagement.
[Pritchard, 2004, pp. 36-38] outlines the distinction between deep and surface learning, see Table 1. Deep learning is most likely to take place when the learner becomes very involved in the task(s) in question, and it use the term 'engage' to illustrate this point of view. Surface learning comes about when the learner undertakes the minimum amount of work, or engagement, which is possible.

Table 1 – Deep, surface and achieving learners

Deep Learner	Surface Learner	Achieving Learner
'I want to learn'	'I want to have fun'	'I want top marks'
Real involvement with the topic	Minimal amount of work	Cost-effective use of time
In-depth engagement with topic	Scratch the surface of the topic	Keen to make best use of time

Everything about the constructivist approach to learning, in a simple and practical way, points towards the importance of learners getting as close to the content of what they hope to learn as possible. This is possible in a wide range of different ways. This closeness to the material can be termed ‘engagement’.

The pointing start in designing situated learning through authentic activity is Bloom’s Taxonomy of educational objectives for the cognitive domain, which is predicated on the idea that cognitive operations can be ordered into six increasingly complex levels: knowledge, comprehension, application, analysis, synthesis and evaluation. What is taxonomic about the taxonomy is that each subsequent level depends upon the student’s ability to perform at the level or levels that precede it. This taxonomy assists the teacher in the preparation of evaluation materials, which in a spreadsheet could become an interactive instructional application.

Cognitive development requires social interaction, and learning is restricted to a certain range at any given age. As each level of learning is achieved, the teacher sets new targets within a new zone of estimated ability of the student. This process of helping is termed ‘scaffolding’.

Vygotsky takes Piaget’s notion that development leads learning, but approaches it from the opposite direction, arguing that, in fact, learning leads development. Vygotsky noticed that children’s levels of learning are more accurately reflected by what they can do with help, rather than what they can do on their own. This led him to develop the notion of a ‘zone of proximal development’ (ZPD), which represents an individual student’s potential level of learning if helped by teacher.

Social as digital reflection

Technology has changed the cultural context of our world, and every process around us relies, to some extent, upon technology. Using computer as cerebral extension, connecting computers and sharing resources, Information and Communication Technology have changed, and continue to change the learning process developed into the classical classrooms.

One of the most important impacts of technology to the social context was the possibility of developing and implementing standards, as general levels of knowledge, in the cognitive domain. First of all, there were developed hardware standards, which generated software standards and dataware standards, for data processing. In information technology, the most important impact was about standards for users. In education, the new conceptual framework that characterize teaching as a complex cognitive skill determined in part by the nature of a teacher’s knowledge system to explain patterns in participants’ planning, teaching and post-lessons reflections is based on assisted instruction for a personalized process.

A ‘schema’ is an abstract knowledge structure that summarizes information about many particular cases and the relationship among them. People store knowledge about objects and events in their experiences in schemata or knowledge structures representing these experiences.

‘Pedagogical reasoning’ is the process of transforming subject matter knowledge into forms that are pedagogically powerful and yet adaptive to the variations in ability and background presented by the students. Pedagogical reasoning includes the identification and selection of the strategies for representing key ideas in a lesson and the adaptation of these strategies to the characteristics of the learner. This form of thinking is unique to the profession of teaching and is relatively undeveloped in novice teachers.

‘Pedagogical content knowledge’, or knowledge of subject matter for teaching, is also specific to the teaching profession. This domain of knowledge consists of an understanding of how to represent specific subject matter topic and issues in ways that are appropriate to the diverse abilities and interests of learners.

Schemata for pedagogical content knowledge seem to be virtually nonexistent in novices’ knowledge systems. Developing these knowledge structures and learning pedagogi-

cal reasoning skills are major components of learning to teach.
Research on cognitive skills in domain others than teaching has demonstrated that there are qualitative differences in the knowledge, thinking and actions of experts and novices. For examples, experts and novices differ in the way they represent problems and in the strategies they employ to solve them. Schema, pedagogical reasoning and pedagogical content knowledge – three concepts central to the characterization of teaching as a complex cognitive skill – provide a framework for interpreting differences between expert and novice teachers.
Based on the classic structure of levels in producing education (Pre-Assistant Lecturer, Assistant Lecturer, Lecturer, Senior Lecturer and Professor), we add new specific competencies (information literacy, computer literacy, technologic literacy and education literacy), and now, the teacher processes data, structures information, systematizes knowledge, developing educational objects.
We use Bloom Taxonomy for detailing learning process for student: knowledge, comprehension (internalizing), application (externalizing), analysis (processing), synthesis (structuring) and evaluation (systematize). This learning process develops specific competencies, in reverse order: educational, technological, computer and information literacy.
Finally, we define levels of evaluation in the results of the educational process: novice, advanced, competent, analyst and expert (see Fig.1).

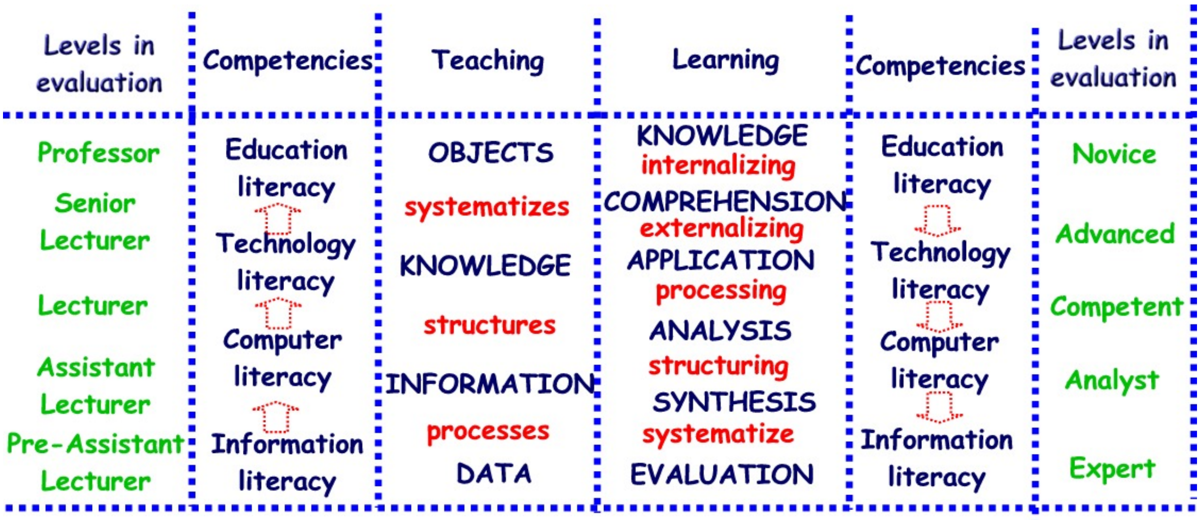

Fig.1 – Levels of competencies in explicit learning

Modelling, coaching and scaffolding are all types of support in education.
Modelling can be part of a scaffolding process. Modelling provides an example of the required performance, whereby the most important steps and decisions are stressed. The goal is imitation of the performance of an expert by the learner. When the model is faded, which means that students should follow their own thoughts instead of following an example, modelling is a part of scaffolding process.
Coaching can also be part of a scaffolding process. In coaching learners performs the required performance by themselves. A coach can give hints, prompts, and provides feedback to a learner. A good coach will be a scaffolder of students learning. This means that the coach will be receptive to the current level of performance of students, and will realize that the students should become self-reliant in performance of a task. Therefore this coach will fade the support that is given. So, in the case where coaching is faded, coaching is a part of the scaffolding process. But fading is not an explicitly mentioned part of the coaching process.
Scaffolding can use modelling and coaching as a way of providing support, but others types of support can also be given, such as

contextual support, support by asking 'leading questions' or support by giving away parts of the solution. But always this support is faded, so that the learner will become self-reliant.
Modelling focuses on imitation of the performance of an expert, coaching focuses on the performance of the learner. Scaffolding can use these two and adds the aspect of fading. The support that is given by modelling performance, the support that is given by coaching, or others types of support given are faded so that the learner become self-reliant.

Learning Support Units in Assisted Instruction

One of the most important differences between traditional education and assisted instruction is the type of interaction: a sequential one between teachers and students in a classical environment, and a personalized one between student and complex software, result of a work team teachers, managers, developers, coach, and mentors. At lest, e-learning support environment consists of two complementary activities:
- development of the educational context;
- student's interaction with this environment.

The first one means a collaborative authoring, necessary in developing the content, and the second one means a high level of personalization and a low level of collaboration.
In computer-based learning environments that are built on multimedia database is used the concept of Units of Learning Material. Such of unit refers raw data objects: text, audio fragment and video fragment. In the same time, such a unit could have a relation 're-hearses' with another unit.

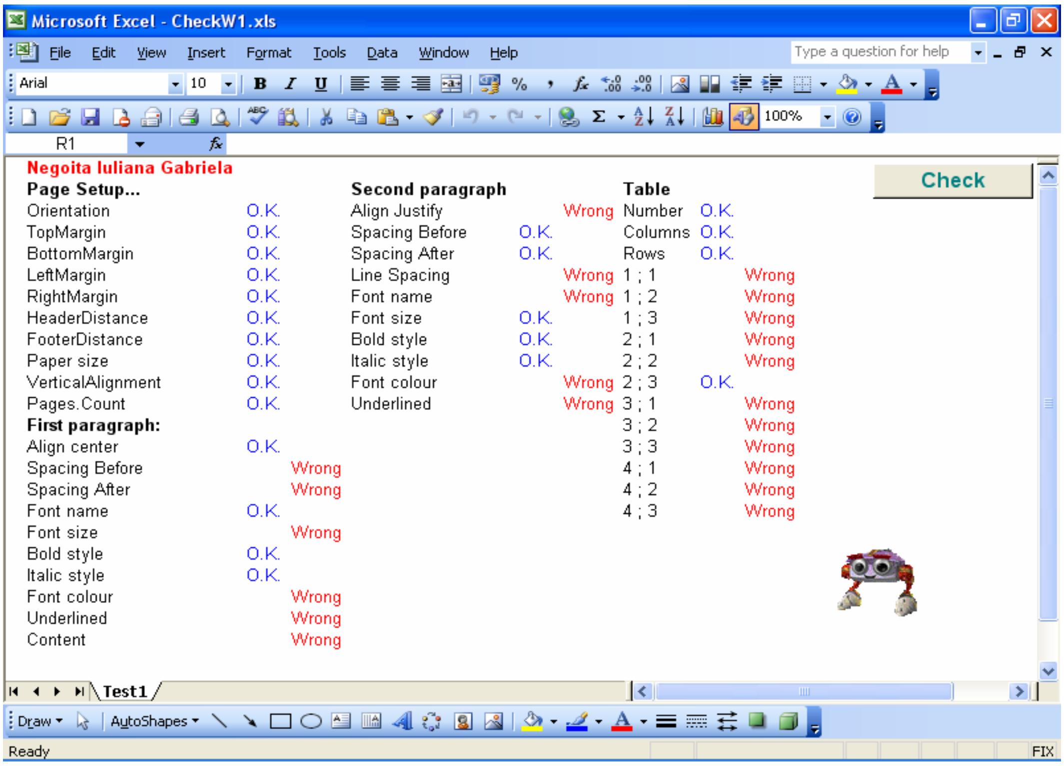

Fig.2 – Student checking-application

Categorization, as a central topic in cognitive psychology, in linguistics, and in philosophy, it is crucial precisely in learning. Concepts categorization enables the student to classify (or to recognize the classification of) objects or concepts that belong to a group. This characteristic accelerates the thinking process, favours the immediate selective perception (it is a graphic or better "multimodal", representation) and facilitates generalization and learning.
Conceptual categories are higher order concepts, and they express the specific role of concepts in their contexts, and in concept

mapping they are visual elements relevant to analysis, even with a subliminal effect. Given a category, which are the characteristics and attributes of all objects it comprises?
Categorization, together with processing and analogical reasoning, has a special role in the inference of non-explicit information that the learner can infer from what he/she has seen and/or heard.
Knowing how to learn has become a need in this modern age in which continuous update is an unavoidable necessity for all, from workers to professionals, from students to teachers, because science and technology evolve at a speed that renders obsolete, in a short time, whichever cycle of activity or study.
The shift in information transmission media (from printed to electronic) has made it necessary to educate in the interpretation of images and visual representations, to visual learning (even though this is usually instinctive), but to follow the rhythm of modern evolution, more than transferring information, it is necessary to stimulate creativity and the ability of autonomous orientation, personal thinking abilities, but also the ability of collaborating with others.
In this context, we identify learning support unit for assisted instruction, in a syntactic approach and in a semantic one, in order to transfer knowledge, designed for understanding, approved thru application. These three levels in Bloom's taxonomy consists the default standard for assisted instruction in computer literacy.

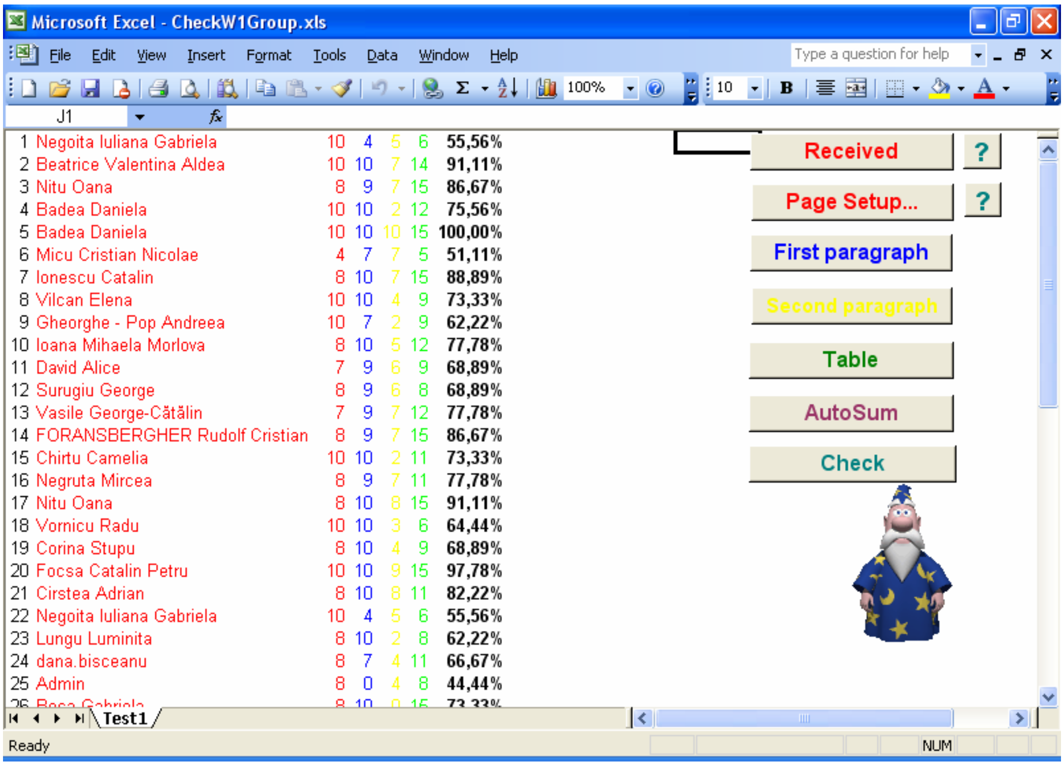

Fig.3 – Teacher checking-application

Example: ① Create a file named W1, format Word document, consisting in one page, format Letter, with top, left, right and bottom margins, each of one inch, and vertical alignment: Top; ② Edit file properties: Title W1, Subject: Understanding, Author: Your name; ③ Edit the first paragraph (Testul I), with font Arial, size 16, red colour, bold, italic, and underlined. This first paragraph will be spacing before and after with 6 pt. ④ Create a second paragraph, spacing before and after with 0 pt, and 1,5 Line spacing, font Times New Roman, size 12, blue colour, italic *The Louvre was originally a medieval fortress, built in 1200 during Philippe Auguste's reign, on a location at which Paris's* *defenses were the weakest. The site was called Lupara, which became Louvre in French.* ⑤ Create a table, with 3 columns and four rows, AutoFormat: Table Normal, referring to the blue paragraph for editing the values:

No.	**Properties**	**Values**
1.	Words	
2.	Characters (no spaces)	
3.	Characters (with spaces)	

Students create the application, send it to the teacher and receive the checking-application (CheckW1, see Fig.1). Finally, they send a version reflecting what they had understood.
Teacher uses a global-checking application, reflecting the concepts in the community of students (see Fig.3).
Our society had developed as a knowledge one, and each activity is integrated in a global process. Education is concerning about developing intellectual ability, the computer had become an extension on the individual intellect and internet had integrated in each activity. Electronic storage reflects the past tense, even for yesterday and personal computer had integrated in a continuing development process. Explicit learning is designed for integrating the learner in the knowledge context, because the context is more and more complex with each version of the logical resources. By default, explicit learning produces education for teaching the teachers, in our environment.

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