
AN INSTRUCTIONAL MODEL TO DEVELOP COGNITIVE, METACOGNITIVE AND MOTIVATIONAL SKILLS IN PROBLEM-BASED LEARNING ENVIRONMENTS

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Background

The present study investigates the experience of a nation-wide training initiative addressed to administrative and technical school personnel, based on an instructional model developed by INDIRE and supported by a technology-rich, open, and flexible training environment.

This initiative was funded by the Italian Ministry of Education and supported by a national agreement between the Ministry and the main trade unions. The objective was the in-service re-qualification of administrative and technical school staff, including the different professional profiles (laboratory technicians, administrative assistant, director...). The plan of contents covered a wide range of topics related to the professional area and to the school system, depending on the target profile (i.e. safety, first aid, privacy, special needs support, computer and Internet literacy, accounting, communication, human resources management).

A committee - formed by national experts, professionals, school inspectors, university professors, representatives of the ministry - drew a national plan of learning objectives for each profile. INDIRE developed the blended instructional model and implemented the online training environment. Regional education authorities appointed course directors and e-tutors and decided the onsite meeting agenda.

INDIRE has been developing an instructional model addressed to Italian school teachers since 2001 and a model for school heads since 2003. The current model is the result of an intense educational research activity carried out by the institute since the year 2000, and focussing on instructional design and the effective use of ICT in the education and training of school personnel (Biondi, 2003).

The terms "Administrative and technical school staff" includes different profiles, with a range of different professional skills, educational background, and job tasks. The preliminary study of the instructional conditions took a long time and influenced the design process. It had to take into consideration all of the following elements: the skills, knowledge and competences that had to be developed, the different target audiences, the motivation of the trainees, the micro and macro context, the constraints ect...

Finally, a decision was reached: eight different versions of the model, based on different digital environments, one for each target group were needed.

In this paper we will describe the general aspects of the model, the main characteristics of the environment and the key findings which emerged from the training. Different solutions were adopted, especially in relation to the huge difference in educational needs between the highest professional level, director (*Direttore dei Servizi Generali e Amministrativi*), and the lowest level, caretaker (*Collaboratore Scolastico*). The different levels are established by a nation-wide collective agreement (*Contratto Collettivo Nazionale del Lavoro*) regulating the status of the school personnel and including levels from A (i.e. *Collaboratore Scolastico*) to D (*Direttore dei Servizi Generali e Amministrativi*) for administrative and technical personnel. The agreement defines the job description, the economical conditions and all other professional related aspects (Granello, 2005).

The challenge was to keep the trainee-centred approach, built on a constructivist training environment, but to enhance support and guidance, especially for those professional profiles that had poor, previous computer literacy skills and, often, no experience of e-learning training. Self-instruction materials and preliminary computer literacy courses have been provided by some local bodies, involved in the overall training initiative, and by INDIRE itself.

The project started in 2004 and the training activity following the implemented model started in 2005 and is ongoing.

Since 2006 the model has been used for a further training initiative, focused on the development of additional professional skills, that go with increasing levels of responsibility and autonomy.

So far 208.840 administrative and technical school staff trainees have been taking part in the experience, including all eight different professional profiles.

The instructional model

The model involves in a nation-wide learning system a community of thousands of schools. The school personnel is divided into virtual classes of about 20 trainees that come together in face-to-face meetings and that work together online, using forums, chat and collaborative learning tools. Each trainee has the opportunity to build his own personal training path, choosing the training activities and materials which are reputed most useful, and working together with the colleagues in virtual classes with the support of an e-tutor.

The training activity starts with an initial meeting with the e-tutor and the colleagues from the same or from other schools who are part of the same tutor group and proceeds through online individual and collaborative training activity and through further face-to-face meetings.

The training system is therefore based on a network of learning groups formed by colleagues belonging to the same professional profile that have the opportunity to work together online and in presence sharing problems and situations faced in their day-to-day work activities in schools.

The model promotes different levels of online aggregation: trainees work in smaller groups on the training activities included in the training plan and share problems, suggestions, and opinions in the peer forum spaces in the online learning environment. In the general community area they are part of a same discussion area together with the other school personnel profiles. In this way, 20 laboratory technicians work together on the training tasks and in face-to-face and online classrooms, but they share the online environment with the other laboratory technicians of all Italian schools and meet them in the peer forums, and they share the community area with thousands of colleagues of all professional profiles, from caretakers to directors.

The key-actor of the system is the e-tutor. E-tutors are selected on a regional level and attend initial training seminars. They introduce the trainees to the training initiative focusing on objectives, duration, organization and deadlines; they help the trainees in getting familiar with the learning environment, downloading documents, performing activities, participating in forums, taking part in the online collaborative events and using the online tools; they take care that all trainees have an adequate initial level of computer skills in order to approach the training; e-tutors support trainees in personalizing the individual training path, helping them choosing materials and activities; they moderate discussions and activities in the virtual classroom; they motivate and train the trainees in order to avoid drop-outs and help all individuals to successfully complete the training.

The Punteoedu e-tutor should fully satisfy at least four of the five qualities/characteristics of an e-moderator: understanding of online process, technical skills, online communication skills, personal characteristics (being able and motivated to establish an online identity as e-moderator) and content expertise (Salmon, 2003).

The fifth characteristic - advanced content knowledge - is the main quality of the expert who participates in the classroom face-to-face lessons together with the e-tutor. The expert's intervention refers to the training contents: he knows the training contents and follows the online activity of the trainees in the virtual classroom; he provides his contribution taking into account the problems and the needs emerging in the online activity. In this perspective the e-tutor knows the overall contents but he is mainly a training facilitator who knows the professional context of the trainees.

The training offer provides a wide range of different alternatives and is based on different tools and strategies: study materials, online activities, collaborative online laboratories, discussions with experts. The different alternatives are based on a common background, and a learning by doing approach. Even theoretical materials are strictly related to proposed activities and can be used as an introductory overview or as preliminary information or as downloadable resources related to issues that need to be studied more in depth.

The trainees' training path is constantly monitored by a system which keeps track of the activities carried out. Each trainee has a personal portfolio, where submitted messages, performed activities, downloaded materials, sent files are tracked and collected, which is updated in real-time and that can be displayed and printed.

A register is provided to the e-tutor where the performed activities are tracked. He can control the portfolios of the trainees of his classroom and at the end of the training he prints the final certificate that will be signed by the course director and delivered to the trainee.

The training environment

The training environment is designed as a **social system** that focuses on the development of knowledge and abilities and subsequent certification: the activities, and not the materials, are the core of the system. The activities are based on different computer-based learning strategies and are built on a problem-solving approach.

The learning environment reflects a constructivist philosophy and can be considered *a place where learners may work together and support each other as they use a variety of tools and information resources in their pursuit of learning goals and problem-solving activities* (Wilson, 1996).

Case-based and problem-based activities are the core of the environment. The presented study cases are strictly linked to school related authentic contexts; trainees learn to face complexity; problem-based situations requiring to direct their learning while solving problems. The online environment provides a wide range of relevant cases, sharing areas, collaboration tools, information sources, digital resources, and supporting services. Referring to Jonassen's constructivist learning environment model (CLE) we could say that *related cases and information resources support understanding of the problem and suggest possible solutions; cognitive tools help learners to interpret and manipulate aspects of the problem; conversation/collaboration tools enable communities of learners to negotiate and construct meaning for the problem; and social/contextual support systems help users to implement the CLE* (Jonassen, 1999).

In a top-down perspective the training offer is divided in training objectives. Each training objective includes a range of online activities based on study cases or problem solving situations. In a bottom-up perspective the environment is built around each problem or case.

The training environment includes the online platform but also the real working school context. Trainees meet together in the school building and work online from home or from school using the computers made available and the school internet access. Case-based and problem-based online activities require trainees to involve the real work context linking the training proposals to concrete working means, tasks and actors situating knowledge in the work place. The extended concept of environment includes a quite complex training setting where online activities break through the digital dimension and where the online platform integrates the real work live context.

Multimedia and interaction have been considered as a main issue in the development of appealing **digital contents** including online simulations, interactive gaming, webquests, multimedia storytelling, videos. For some activities cartoon characters have been created and cases have been developed with multimedia scenarios, providing manipulation spaces and interaction possibilities for the trainee. Some activities have been developed as online games and some have been presented using video streaming or animation.

Group laboratories on specific topics, mainly related to communication and human resources management, were provided to profiles with the most advanced computer skills. Labs consist in groups of 12 trainees working together in online, real-time, shared cooperation areas, following a common work plan defined by an expert. The cooperative work is led by a moderator and includes two online synchronous sessions with a period of two weeks of asynchronous work in dedicated forums in between the two sessions. The small virtual lab environments are equipped with many interaction and communication tools, such as: chat, video and audio conferencing tools, shared whiteboard, computer screen sharing.

According to the distinction between two main types of **interests** that can be referred to the interaction of a trainee with the environment (Renninger, Hidi, Krapp, 1992), the model aimed at stimulating both situational interest (a characteristic of the person) and individual interest (a characteristic of the environment) considering the motivational aspects of learning as a main issue for the final success of the training. Different ways have been undertaken to improve those aspects: providing appealing multimedia learning activities, fostering motivating tutoring, moderating and assistance support, and developing of discussion areas where professional but also emotional experience could be shared.

The digital environment offers trainees and e-tutors of each group a **virtual classroom** to help them communicating and interacting: to exchange information and to share files, to interact and to develop a common space to discuss and help each other in facing the training activities. A virtual classroom is the principal tool to build up real working communities. Virtual classrooms are equipped with many interaction and communication opportunities, such as web forum, textual chat, file sharing, calendar features.

The online platform has been implemented as a **community**-oriented environment. The provided web forums can be grouped into three main categories: general forums, peer forums, subject forums. They aim at stimulating trainees' critical thinking on professional issues, sharing and exchanging experiences and professional problems and solutions, discussing with experts.

General forums were open to all professional profiles including free discussion forums, forums focused on technical support, on the training model, on tutoring issues. Peer forums were dedicated to each of the eight professional profiles involved in the training in order to discuss on common training and professional issues. Subject forums were moderated by experts and the participating in discussions was tracked by the system as the discussion with the expert on the training main topics is included in the training path saved in the trainees' portfolio.

Summary

A first **monitoring** activity carried out by a number of regional education authorities has been performed even if it was not built on a shared technical and scientific approach. A national monitoring and assessment of the training experience is being performed by the University of Genova and is focusing on some key aspects such as the level of satisfaction regarding both the training model and its supporting learning environment and the outline trainees and tutors profiles, as well as trainees' level of achievement and tutors' role in training. The final report will be ready in 2007 midyear.

Some **key findings** and **critical points** can already be highlighted.

Technical difficulty to **access the online training environment** and to use the online tools results from the first regional monitoring reports. The difficulties seem to be linked to two main factors: **lack of computers and internet access** and **low level of ICT literacy**. Difficulty in accessing a computer and the internet in schools has been a serious obstacle to participation, and many trainees' do not have a computer and a connection at home. A part of trainees' did not have basic ICT skills and although preliminary ICT literacy courseware was provided, this was not enough to guarantee a shared initial ICT literacy skill base.

E-tutor training and selection. E-tutors have a fundamental role in the training model. They represent the link between the onsite and the online components of the model. In this case, they were selected on a

regional level, according to local criteria of selection and this seems to be the weakest factor of the training system.

The wide range of proposed training strategies and the rich plan of contents have sometimes been perceived as confusing and disorienting, especially when the role of the e-tutor was perceived as particularly weak.

Considering the feedback received from the regional monitoring reports, and interviews to trainees and e-tutors involved in the initiative, the e-learning approach was new for many trainees but after a first period the course was perceived as effective when trainees could concretely collaborate, share professional and emotional experiences and help each other to face problems.

E-tutors able to show **an understanding of online relationship and communication** and able to motivate trainees seemed to make a difference in many of the classrooms. In the interviews and online community messages many trainees expressed a very positive opinion referring to the e-tutor and evaluated positively the training itself; just a few showed conflicting opinions on e-tutors and the overall training initiative.

It seems that where the e-tutor succeeded in supporting an **integrated, continuous, and shared training path**, the trainees easily managed to overcome difficulties related to the low level of ICT literacy.

Interactive activities and **multimedia contents** were particularly appreciated especially by trainees with less or no online training experience.

The decision of implementing different online environments with different functions and tools relating to the characteristics and attitudes of the specific professional profile seems to point out that **there is no ready-made platform on the market**, capable to personalize training paths for different targets, catering for large numbers of trainees, and maintaining the quality possible with a small number of users. INDIRE's approach is to design and implement an customised platform using open-source software.

Conclusions

The experience described above can be considered positively, especially considering that it was almost an absolute "premiere", for the many reasons described in the body of the article. Both the instructional model and the supporting learning environment will probably be improved in the light of the results emerging from the forthcoming general monitoring report and the nation-wide users' survey. Analysing critical points in depth, and trying to cope with them will contribute to improve future training addressed to adult non-teaching professionals working in the school system.

Recent researches demonstrate (Woodill, 2004) that most of the e-learning training initiatives fail when they are focused only on software driven solutions, or when they are not based on instructional models. E-learning platforms providing learning materials to be downloaded and printed off line are often not able to provide effective alternatives to traditional training and the continuous research and instructional design activity accompanying and supporting the improvement of the instructional model (to be considered as work in progress) and the development of its supporting learning environment demonstrate that *there are really no models of e-learning per se but only e-enhancements of models of learning*. (Mayers, De Freitas, 2004).

Referring to pedagogical aspects of instructional models addressed to adult learners the work of Knowles¹ needs to be mentioned. *Pedagogy literally means the art and science of educating children and often is used as a synonym for teaching. More accurately, pedagogy embodies teacher-focus education* (Connor, 1996). For Knowles an alternative *andragogic* approach should be based on specific assumptions about the characteristics of adult learners, that are different from the assumption on which traditional pedagogy is based.

In that sense we could consider the andragogic model and its assertions as a starting point to design instructional models and implement training environments that are anchored in the characteristics of adult learners and that necessarily need to be considered as works in progress to be implemented by the results of

¹ Knowles is well known as the creator of the theory of Andragogy and he is credited with being a fundamental influence in the development of the Humanist Learning Theory. Details about the theory can be found in: Knowles, M. S. (1980). *The modern practice of adult education: From pedagogy to andragogy*. Englewood Cliffs: Prentice Hall/Cambridge.

the educational research and a continuous assessment activity.

Considering that *a model of e-learning needs to demonstrate on what pedagogic principles the added value of the “e” is operating* (Connor, 1996), two main consequences could be highlighted. If an e-learning approach can be distinguished from an e-teaching or e-training approach, then the *adoption* of a technological platform providing downloadable documents and tests or tasks to be completed could be distinguished from the *instructional design* of an electronic environment providing personalized and collaborative activities designed on the learners needs and characteristics.

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