Model and tool to clarify intentions and strategies in learning scenarios design

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Abstract. For several years some researches have concerned the process modelling of learning situations integrating digital technologies. Educational Modelling Languages (EML) aim at providing interoperable descriptions of learning scenarios. In order to generalize the use of EML, it is necessary to provide authoring environments allowing users to express their intentions and requirements. This paper presents the core concepts of one of these, called ISiS (Intentions, Strategies, and interactional Situations), a conceptual framework elaborated to structure the design of learning scenarios by teachers-designers. The framework is based on a goal-oriented approach and proposes a specific identification of the intentional, strategic, tactical and operational dimensions of a scenario. This paper also presents how these concepts have been implemented within ScenEdit, a specific authoring environment dedicated to teachers-designers based on the ISiS goal-oriented framework.

Keywords: technology enhanced learning, learning scenarios, authoring approach, requirements engineering, goal oriented approach.

1 Introduction

Since the beginning of the 2000s, certain research in the field of Technology Enhanced Learning has been concerned with Learning Design [1]: the process modelling of learning situations integrating digital technologies. Its purpose is to produce a description (called “learning scenario”) of the organization and the time scheduling of learning situations where many actors are involved (students, teachers, tutors, designers, etc.). At the international level, various Educational Modelling Languages (EMLs) have been proposed such as IMS-LD [2] or LDL [3] . The main challenge of EMLs is to propose a neutral and shared formalism, capable of expressing the widest range of learning situations and to be implemented more or less automatically towards specific Information Systems (called Learning Management Systems). An EML allows the definition of relationships between learning goals, the roles of staff and learners in the learning process, performed activities, the environment and resources necessary in a learning situation. Specific research works consist today of the analysis of the expressiveness of these languages (for example to express complex collaborative learning situations) or in the solution of the problems raised by the deployment of learning scenarios towards technical platforms [3].

As pointed out by IMS-LD authors themselves [4], an EML, which mainly aims at expressiveness and interoperability, is not intended for a direct manipulation by human users (teachers, engineers…). Specific authoring systems [5] must be provided [6] in order to help designers to design their own scenarios at a lower cost.

Two main authoring contexts can be identified. In the first case, a structured team is in charge of the requirements analysis, solution design, and the encoding of the solution into an EML language. In the following step, the EML code can be interpreted in a target LMS integrating an adapted "player". This first type of context can basically be found in an industrialization perspective of distance learning, handled by instructional engineering methods [6]. In this case, design strategies are based on a stage of requirements extraction, often proceeding from narrative texts written by teachers. Authoring tools proposed to this kind of designers are based on mastering conceptual models, which are very close to the targeted modelling languages.

In the second case, which we focus on in this paper, the teacher himself designs the scenario: he is potentially conducted to integrate digital resources and tools as part of the training he provides. Economic constraints do not allow a team of designers or developers to assist each teacher : it becomes necessary therefore to provide authoring tools [5] which allow teachers to express their requirements based on their own business-oriented languages and shared practices.

Two combined goals can be reached: to provide a "computable" description to be translated into an EML like IMS-LD or LDL and to be understood and shared by experts and practitioners sharing a common vocabulary, knowledge of the discipline and pedagogical know-how.

This authoring approach [5] aims to further consider learning scenario designers' requirements and the "business process" dimensions of learning scenario design, which are subjects of many works in Systems Engineering and Software Engineering. We have particularly focused our research on works concerning Goal-Oriented Requirements Engineering [7] where the elicitation of goals is considered as an entry point for the specification of software systems as in the Rolland and Prakash MAP model [8]. In this perspective, our purpose is to provide authoring tools allowing teachers-designers belonging to close communities of practice to design their scenarios expressing the intentions and strategies they adopt.

This paper is organized into 4 sections following this introduction. In section 2, we describe our context, our goals and the specificity of our typical audience in more detail. Section 3 describes, with an example of a scenario, our conceptual framework: the ISiS model (Intentions-Strategies-Interactional situations) which we propose to structure the design of learning scenarios. Before concluding, section 4 describes experimentations of tools we have developed upon the ISIS model and especially the implementation within ScenEdit, a specific authoring environment dedicated to teachers-designers.

2 Context of research

The research works presented in this paper were conducted in collaboration between the Laboratoire Informatique de Grenoble and the INRP[1]. This collaboration closely associates panels of teachers in charge to co-elaborate and experiment models we want to implement. This work led us to study existing practices of sharing scenarios. In parallel with the work concerning formalization based on EMLs presented above, some international initiatives aim to propose scenarios databases in order to favour sharing and reuse practices between teachers, such as the IDLD [9]. Their goal is to disseminate innovative practices using digital technologies in the field of education. These databases for teachers-designers, such as that proposed by the French Ministery of Education: EduBase and PrimTice, list scenarios indexed with different fields depending on the domain or subject. Their descriptions are very heterogeneous: from practice narrations to more structured formalizations. This diversity has led us to question the ability of these representations to be understood and shared between several practitioners.

Our research is at the intersection of the two approaches previously identified: proposing scenario databases in order to favour sharing practices for the integration of technology by practitioners and proposing computational interoperable formalisms *(like IMS-LD)* to describe scenarios. Based on empirical results obtained in previous research conducted with groups of teachers [10] our first hypothesis (H1) is: *a structuring formalism is more favourable to reuse than a narrative or a computational formalism* provided that it is in accordance with the vocabulary of the stakeholders concerned.

The research questions we address is to facilitate teachers' task in designing and implementing learning scenarios using Information and Communication Technology by providing them formalisms and tools satisfying criteria of understandability, adaptability and appropriability. In other words, provide a common formalism which elicitates intentions and strategies to give a better understanding and context adaptation of learning scenarios within a community of practice. In this context, we aim to provide models, methods and tools allowing teachers-designers belonging to communities of practice to design their scenarios expressing intentions and educational strategies they will adopt.

We exposed the context of our research previously in detail (the CAUSA project at INRP), with our typical audience: the specific type of designers we focused on are teachers who are called to integrate digital technologies in an academic context, more precisely in the French secondary educational system (pupils from 11 to 18 years), and our methodology [11]. We organized our work into four phases in order to propose adapted formalisms and tools. After a preliminary phase where we defined the targeted audience precisely, the first phase consisted of analyzing current uses of share and reuse of scenarios. It appeared that for a given scenario, it required a very precise analysis to identify the general objectives and the strategy or pedagogical approach although it would have been for them an important criterion of choice. After this work, teachers suggested that the design task could be facilitated by providing

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libraries of typical strategies, scenarios, or situations of various granularities. Each of these components were to be illustrated by concrete examples. These results allowed, in a second phase, to co-elaborate with teachers an intention-oriented model: ISiS which structures the design of a scenario. In a third phase we experimented the ISiS model with a pilot group of teachers by the means of textual forms and graphical representations. In a fourth phase integrating the evaluation of this experiment, we tested several tools implementing the ISiS model (paper forms, diagram designer, mind mapping software and a first dedicated tool) with audiences not yet involved in our research.. The purpose of this phase was to validate our assumptions and to evaluate our model and its first implementation before new developments. We set up an experiment to compare the perceptions of the three types of formalisms we are studying : narrative, computational and structural. This work led us to develop a new version of our graphical editor. We are presently experimenting our graphical web editor with teachers not yet involved in our research who will use it for their classes.

3 Proposition of a conceptual framework

Instead of proposing an alternative solution to EMLs, our observations [10, 11] led us to complete them by offering models, methods and tools to sustain design and reuse by non computer specialists of learning scenarios using digital technologies.

3.1. Theoretical background

Our research is concerned with teacher-designer activity and we base our approach on a set of complementary theoretical works concerning the theory of activity:

- the organization of activity, proposed by Russian psychologists such as Leontiev [12], defines hierarchical levels (activity, action, operation) which distinguishes intentional, strategic and tactical dimensions in activity;
- the importance of routines or schemata, which represents typical solutions given to recurrent problems in specific contexts. These features have been particularly studied by Schanck and Abelson in the context of teaching activity [13].

We also take into account the recent works in Business Process Engineering and Goal-Oriented Requirements Engineering [7] where the elicitation of goals is considered as an entry point of the specification of software systems as in the Rolland and Prakash MAP model [8] and set them in our particular context of learning scenario design. In a MAP Model, concepts of goal and intention are considered as equivalent. A MAP Model is described in these terms: “A map is a process model expressed in a goal driven perspective. It provides a process representation system based on a non-deterministic ordering of goals and strategies. A map is represented as a labeled directed graph with goals as nodes and strategies as edges between goals.”… “A Strategy is an approach, a manner to achieve a goal”.
It appeared to us that it was coherent to propose a specific business model for learning scenario design based on intentions and strategies. After a two-year project in close association with teachers-designers, we progressively co-elaborated a “goal-oriented” business model: ISiS (Intentions-Strategies-Interactional situations).

MAP and ISiS are both models dedicated to the design process in a goal oriented perspective. MAP is a more generic model defined to sustain the design process than ISiS which is dedicated to a specific learning "business-process" and aims to imply actors themselves in the design of the process. To reach that goal, it is necessary to provide users with sufficiently accessible conceptual terms. In our experimental context, we confronted French teachers-designers with the concepts of intentions and strategies. For those teachers, the concepts of "pedagogical intention", "learning strategy", and "learning situation" belong to common vocabulary. By linking them to their regular uses, they were able to define two different articulated levels: first a "didactical" level dealing with domain specific knowledge and second a "pedagogical" level dealing with organizing learning situations. For each level, they were able to define intentions and strategies. The concepts of intention and strategy in MAP and ISiS are quite close. When MAP considers a strategy as a way of linking two goals, ISiS proposes to sequence two intentions where the first intention is linked to the strategy. Implicitly the model assumes that the second intention will be invoked after that the first strategy has been implemented. Concerning intentions, ISiS proposes to gather two or more intentions of different kinds in the same group. This enables the same strategy to be linked with several intentions, which is an explicit demand of some teachers-designers. In ISiS, alternatives are represented by a specific *distribution strategy*, which allows one to distinguish several sub-strategies linked to sub-intentions which refines the main one. The concept of variability [15] with MAP may be declined in ISiS in two ways: by choosing different strategy or by associating different operational solutions to a same strategy. ISiS manages a "tactical level" refining the modelling of strategies by linking them to their typical solutions.
After evaluation of different authoring solutions in learning design [5, 6], we chose to develop a graphical environment ScenEdit [14] based upon the ISiS model.

3.2. Intentions and strategy in the context of learning scenarios

We illustrate our model with an example based on a collaborative learning scenario, the LearnElec Scenario [16] dedicated to the concept of "the power of a light bulb" in the domain of electricity at secondary school. In this scenario, the teachers' first didactical *intention* is "to destabilize" a frequently encountered "misconception" of students in electricity which is that "proximity of the battery has an influence on current intensity".
After having elicited his intention, the teacher-designer can choose the appropriate strategy he wants to use to reach the goal. In our example, the didactical intention is implemented with a specific didactical *strategy* called the "scientific inquiry strategy" composed of four *phases*: hypothesis elaboration, solution elaboration, hypothesis testing and conclusion as you can see in figure 1.

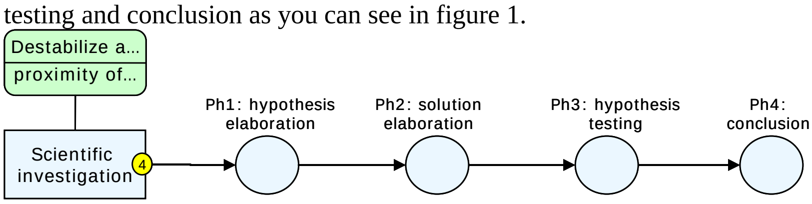

Fig. 1. An example of intentions and strategies elaborated by teachers in teaching electricity

Each phase can be performed through various pedagogical modes and can be refined by another intention according to the type of activity, the availability of computer services, etc. the teacher wants to use. In our example, the first didactical phase, the "hypothesis elaboration" is refined by a pedagogical intention called "increase the ability to work in a collaborative way" as shown in figure 2.

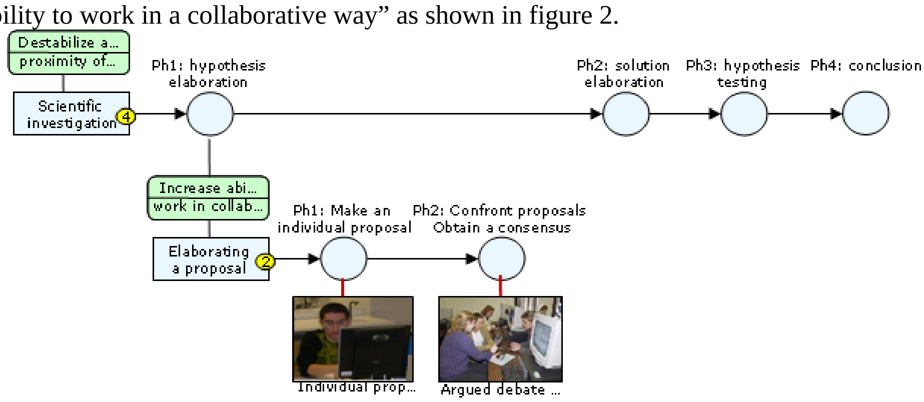

Fig. 2. An example of different levels of intentions and strategies in a scenario

This intention is implemented with a strategy called "elaborating a proposal by making a consensus" composed of two phases: "Make an individual proposal" and "Confront proposals. Obtain a consensus". For each phase, an *interactional situation* can be defined: "Individual proposal on a MCQ" and "Argued debate on a forum with consensus". During these two phases the teacher is involved in an activity of "Group management" symbolized by an interactional situation called "Group management".
In the following section, we present the ISiS conceptual model more formally.

3.3. Our proposal: the ISiS model

From our first hypothesis (H1), we co-elaborated the ISiS model [11]: a conceptual framework elaborated to structure the design of learning scenarios by teachers and to favour sharing and reuse practices between designers. The ISiS model is based on three complementary hypotheses:

- (H2) *the elicitation of intentions and strategies and linking them to abstract situations of interaction* facilitates the understanding of the scenario;
- (H3) *the identification of the concept of abstract situation of interaction provides an overall description of the organization of a set of activities*, without necessarily specifying it in detail or restrictively;
- (H4) *the reuse of components* (Intentions, Strategies, interactional Situations) *or scenarios, in the form of templates or design patterns* allows the practitioners to design their scenarios more efficiently.

According to the ISiS model (cf. fig. 2), the organization and planning of a learning unit can be described with a high-level *structuring scenario* which reflects the designer's intentional and strategic dimensions. A structuring scenario organizes the scenario into different *phases* or *cases* by means of *intentions* and *strategies*. Each phase or case can be either recursively refined by a new intention or linked at a tactical level to a suitable *interactional situation*. An interactional situation can be itself described by a more low-level *interactional scenario* which defines, in an operational way, the precise organization of situations (in terms of activities, interactions, roles, tools, services, provided or produced resources, etc.). Interactional scenarios are the level typically illustrated with EML examples of implementation.

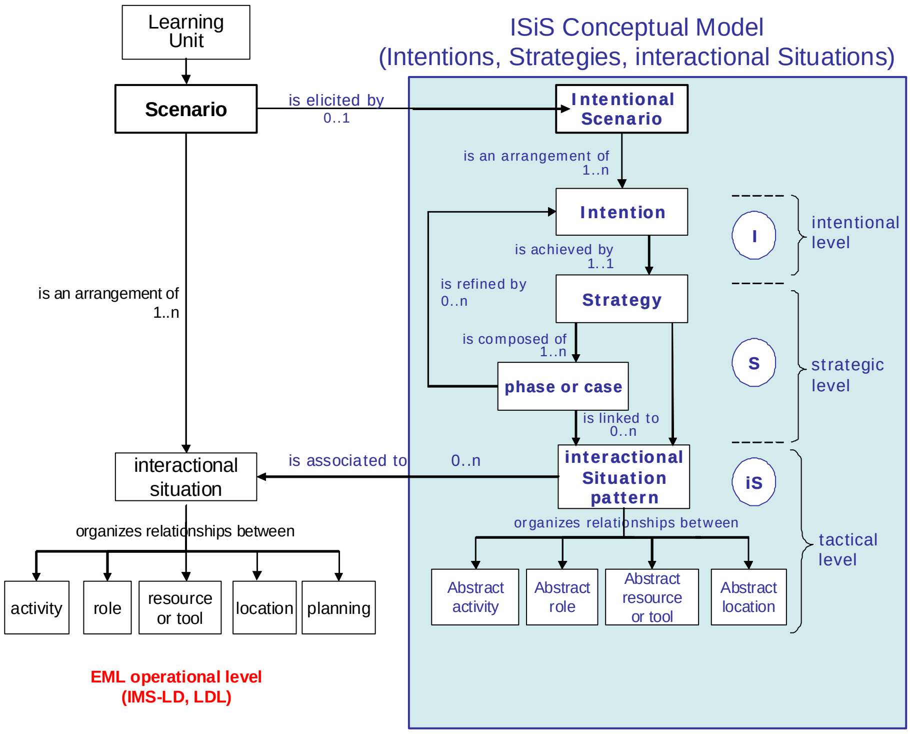

Fig. 3. An overview of the ISiS model

Figure 3 provides an overview of the ISiS model which proposes to structure the design of a scenario describing the organization and planned execution of a learning unit.

- the *I level* (Intention) describes the designer's intentions. In our field, intentions are closely linked to the *knowledge context* which defines targeted knowledge items (concepts, notions, competencies, know-how, abilities, conceptions or misconceptions, etc.). The intentions for the designer can be, for example, to reinforce a specific competence in electricity, to favour a notion discovery, to destabilize a frequent misconception, etc;

- the *S level* (Strategy) is related to strategic features. In order to reach goals related to the intentions formulated at *I* level, the designer opts for the strategy he considers to be the most appropriate. Two main kinds of strategies can be distinguished: *sequencing strategies* which organize the arrangement of logical phases (for example a scientific inquiry strategy can be modelled as a series of four phases), *distribution strategies* which plan different solutions for identified cases (for example, a differentiation strategy takes into account three possible levels of mastering). Strategies can be combined by successive refinements: for example, a sequencing strategy may specify one of the cases of a distribution strategy;

- the *iS level* (interactional Situation) represents the tactical level, i.e. the proposed solution to implement the formulated intentions and strategies. We consider that, for a new problem, a teacher-designer does not rebuild a new specific solution from scratch. As underlined in works on schemata and routines in teaching activities [14], the teacher bases his planning or his adjustments upon a library of mastered solutions, which are triggered by specific events. In the same way, we assume that a scenario designer selects situations which are appropriate for his intentions and strategies, from a library of components. Each component, an "*interactional situation*", is made up of a collection of interactions with a specific set of roles, tools, resources, according to the *situational context*. The situational context is characterized by a set of variables such as *resources* that can be manipulated to support the activities (document, tools, services), *locations* where activities can take place, *planning elements* in which activities must be scheduled or the number of learners, *roles* which can be distributed. For example, in order to specify the scenario for the "solution elaboration phase" in a collaborative way and for distant learners, a designer can choose a typical situation called "argued debate on a forum with consensus". In another context, as for example for pupils who have difficulties at school, a more personalized situation can be used, such as "choosing a solution between different possible proposals by using a MCQ tool";

- the *interactional scenario* (operational level) describes the details of the solution precisely, i.e. the organization and process of each interactional situation. Nowadays, EMLs focus essentially on the description of this operational level by organizing relationships between actors, activities and resources in a given language.

The ISiS model proposes to clarify the upper levels (I, S and iS) that are generally not defined precisely by current methods or tools.

4 Implementation of the ISiS model

4.1 Towards flexible and continued design processes

The ISiS framework is not properly a method as it does not propose a specific order to combine design steps. The ISiS is based on the hypothesis that all dimensions of a scenario (intentions, strategies, situations, activities, resources) must be elicited and interlinked in order to facilitate the design, appropriation, sharing and reuse . In our experimentations, we analyzed the tasks undertaken by teachers-designers [10]. Several design processes as shown by different studies involving teachers-designers were considered. Some teachers were able to choose a top-down approach by hierarchically defining their intentions, strategies, situations, etc., while others preferred to adopt a bottom-up approach by “rebuilding” a scenario from resources or patterns that they wanted to integrate. Consequently, one of our hypotheses is that the design of learning scenario cannot be modelled as a linear process without significantly reducing designers’ creativity. According to the designer type, according to the uses within a precise community of practice, several kinds of objects or methods are shared. As a result, resources, pedagogical methods and typical situations could constitute an entry point from which design steps will be combined. From this entry point (for example typical interactional situations), the designer may alternatively and recursively perform design tasks. On these principles, the ISiS model was implemented successively using different kinds of tools (diagram designing or mind mapping software). In a first step, we elaborated paper forms to express the different dimensions of the design (knowledge context, situational context, intentions, strategies, interactional situations, activities, etc.). We also adapted mind mapping software where each node represents a concept (e.g. strategies, phases, interactional situation) and can be edited with a specific electronic form. These first tools based on the ISiS model were experimented in a secondary school with a group of five teachers in technological subjects : these teachers were associated to the INRP institute. Each “teacher-designer” had one month to model a learning sequence that he had to implement during the school year, by using the tools provided. All teachers accomplished the required task in the prescribed time, and the different sequences which were produced had a duration varying between two and six hours. One teacher actually covered the complete process by (1) describing his scenario in paper form , (2) encoding the designed scenario with a specific editor (LAMS), (3) implementing the result automatically towards Moodle, a learning management system and (4) testing the scenario with his pupils. After this first experimentation, the teachers were questioned about their design activity. The answers given by the teachers-designers have shown the benefits of the model for the improvement of the quality of the scenarios created, for illustrating the importance of the elicitation of intentions and strategies by users themselves, for the better understanding of the scenarios created by others and for simplifying the design process by reducing the distance between users’ requirements and the effectively implemented system.

Finally, the following points can be raised:

- the elicitation of intentions and strategies allowed the teacher-designer to better understand a scenario designed by a peer;
- teachers expressed the need to be provided with reusable components allowing (a) a significant decrease in the design duration and (b) an exploration of solutions, proposed by peers, for a renewal of practices;
- the complete implementation on a LMS by one of the teachers was considered to be facilitated by using the ISiS model;
- the provided tools (paper forms and mind mapping tools) were considered as too costly to be integrated into regular professional use.

These first results show the capabilities of the ISiS model to encourage an efficient authoring approach. The main restriction formulated by users refers to the provision of adapted graphical tools.

4.2 A step towards graphical tools: ScenEdit prototype

As a solution to this restriction, we have developed a specific graphical authoring environment named ScenEdit [14] based on the ISiS Model. This environment proposes three workspaces to edit a structuring scenario. Figure 4 shows the main screen of the web version which was co-elaborated with panels of users.

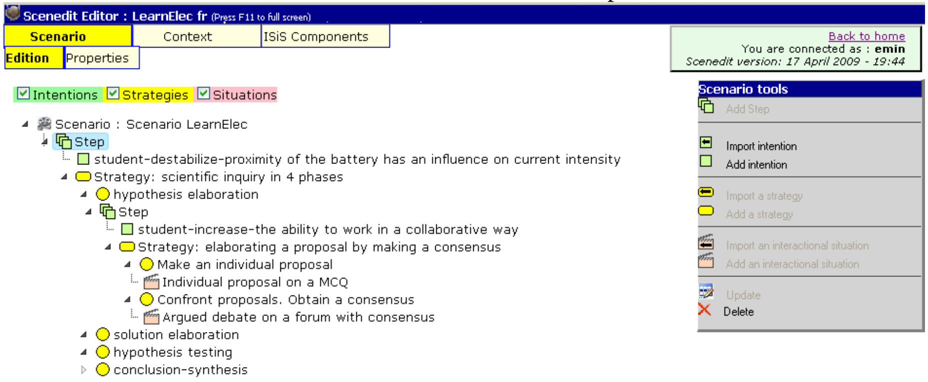

Fig. 4. ScenEdit main screen

The first *Scenario Edition* workspace structures the scenario by logically linking elements previously defined in the components workspace or directly defined in the Edition window to compose a graphical representation of the scenario. The *Context* workspace defines the two different types of context in which a learning unit can be executed: the *knowledge context* and the *situational context*. The *Components* workspace is dedicated to manage the three main components of the ISiS model: (a) Intentions, (b) Strategies and (c) interactional Situations. For each type of component, the author can either create a new element or import and adapt an existing element from a library. The choice of a component depends on the characteristics defined in the *Context* workspace. For example an intention is considered as an operation to be conducted by a certain type of actor (previously defined in the situational context) for an item of knowledge (previously defined in the knowledge context). Each type of component is shown with a different symbol: a rounded rectangle for an intention, a rectangle for a strategy, a circle for a phase and a picture for a situation. The graphical representation shown on figure 4 is a classical hierarchical tree quite useful to produce a scenario but not very clear to understand a new scenario because of the different levels of imbrications. The future graphical representation we are implementing in the online version is a tree where the horizontal dimension represents time evolution and the vertical dimension represents the hierarchy of the ISiS concepts like the one shown on figure 1 and 2.

As the structured scenario can be encoded as an XML file, different outputs can be produced and several possibilities of transformation are offered: a printable picture of the edition views, a printable text or form for the teacher. A future work will be to provide an EML-compliant version for editing with another tool or for being executed on a LMS. ScenEdit offers patterns of different levels (intentions, strategies, interactional situations) elaborated from best-practices found in the literature or within communities of practice. We have worked with teachers to formalize and design patterns of learning scenarios, pedagogical approaches and recurrent interactional situations. With this environment, users will be able to feed databases by exporting fragments of their own scenario, in order to share them with others or reuse them further in similar or different contexts.

4.3 Results of recent experimentations

We have conducted several experiments since the beginning of our research work in order to adopt a user-oriented or authoring approach.

Context and methodology

The experimentation took place in November 2008 during a training session to design scenarios using ICT. The 18 participants were teachers, pedagogical engineers, trainers and had the common characteristics that they were not familiar in learning scenario design and techniques and not involved in our researches. The complete results of this experiment were presented in a francophone conference on TEL : EIAH 2009 in Le Mans June 2009 [17].

The experimentation consisted in confronting individually each of the 18 subjects with a same scenario expressed with a formalism chosen among the three types we wanted to compare: narrative, computational and structuring. We formed 3 experimental groups of 6 subjects, where the members of one group assessed a particular formalism. We made sure we had an homogeneous representation of each profiles within each group.

The chosen scenario was LearnElec Scenario [16] we presented above. It describes collaborative situations, alternating questionnaires, votes, synthesis and debate. The three different descriptions of the scenario were produced in 2006 and 2007 regardless of this experiment. The narrative description was developed by teachers and researchers at the beginning of the project. The computational description, expressed with activity diagrams (by actors) proposed by IMS-LD, represents graphically the course (unfolding) of the scenario in play, actions, partitions, structured activities and basic activities. The structuring description, based on ISiS concepts, proposes a graphical arrangement of intentions implemented through strategies divided into phases, each phase being associated with one or more interactional situations. IMS-LD and ISiS descriptions were produced by researchers with a high degree of expertise in the field. The results of each formalization were given to subjects as paper prints.

During a 45-minute session, each subject had to read the scenario expressed in one formalism and then to evaluate it using an online questionnaire. The latter had two sets of questions, one concerning the notion of pedagogical scenario in general (Q1 to Q5) and the other specifically relating to the given formalism Q6 to Q9). The questions were either multiple choice or open-ended questions to gather precise information from the subject and compensate for the relatively small sample of subjects.

Results and interpretation

The analysis of collected data was done as follows: frequency table for questions dealing with the concept of pedagogical scenario in general, and cross tabulation for the questions specific to one of the 3 formalisms in a way so as to isolate possible variations of answers. A series of 5 general questions were asked, and each question could give rise to five different types of answer (cf. table 1).

Table 1. Breakdown of the answers to questions Q1 to Q5

General questions on scenarios "For the comprehension of the scenario,…"	*No answer*	Not important at all	less impor-tant	Impor-tant	Indispen-sable	Total
Q1 : the description of the different phases is…	0	0	0	2	16	18
Q2 : the precise description of the actors' activities is…	0	0	2	6	10	18
Q3 : the explanation of the underlying pedagogical approach is…	1	0	1	8	8	18
Q4 : the explanation of the notions, knowledge, competencies, know-how aimed at by the scenario is…	0	0	4	5	9	18
Q5 : the explanation of the articulation between aimed knowledge or competencies, and proposed activities is…	0	3	2	4	9	18
Total	1	3	9	25	52	90

From this first series of questions, we can draw the following lessons:

- as expected, it is essential for the scenario to describe the major phases of the learning situation. However, the precise description of the activities seems essential to a small majority of respondents (10 over 18). This could be an indication as to the fear of over-scripting [18] which may be detrimental to the effectiveness of the situations to be established;

- the answers to questions Q3 to Q5 show that some elements, absent today from computational formalisms, are of significant importance in the eyes of the respondents: at least two thirds of them consider it as important or essential to explain the pedagogical approach, the notions of the program and the articulation between knowledge and activities.

A second series of questions Q6 to Q9 were in relation to the given formalism and allowed a first comparison of the three formalisms. We totalize the number of "rank 1-answers" to questions Q6 to Q9, corresponding to a « yes absolutely» or a « yes partially » answer to questions about "the capacity to determine the main steps of the scenario", "to give details to explain the scenario to another teacher", "to express the pedagogical approach" and "the links with the knowledge context". The totalization of answers scores 7 for the narrative formalism, 4 for IMS-LD scores and 10 for ISiS.

This experiment has provided indications on how our formalism has been perceived by practitioners who are not involved in our research work: the original hypotheses have been proved to be partially valid. First of all for a non-trained public, a structuring formalism contributes to a clearer indication than a narration about the organization of a scenario (H1). Secondly, among the structuring formalisms, preference was given to ISiS which favours relating the scenario to elements such as intentions, adopted strategies or the knowledge at stake (H2). Finally, a too precise definition of a scenario is questioned, especially if this impedes the re-use of the scenario in other contexts (H3). As for the last hypothesis (H4) concerning the re-use of components, the first answers have not allowed to draw clear indications.

Experimentation of the ScenEdit environment

A new experimentation of our graphical online tool ScenEdit has been done in April 2009 during two days in a French secondary school. The subjects were a group of five teachers in Industrial Sciences and Techniques fields (electronics, mechanics and physics). Two teachers had worked with us before on the definition of reusable components inside our tool ScenEdit and the three others had never heard about ISiS model or learning scenario design before this experiment. This study is qualitative and is used So as to help us improve the model and tools we are developing. We are only presenting here the main results, and especially the ones where Hypothesis H4 has being tested through.

The preliminary analysis of this experiment shows the interest of having reusable components in the context of designing for the teachers' own ordinary work in their classroom or for a collaborative work with other teachers. Table 2 shows their answers as regards collaborative work with other teachers

Table 2. Breakdown of the answers to questions about re-use for collaborative work between teachers

As regards collaborative work with other teachers, evaluate the fact of having components / patterns,	*No answer*	totally useless	quite useless	quite useful	absolutely useful	Total
implemented previously by the designers of ScenEdit is…	0	0	0	3	2	5
implemented previously by other teachers is…	0	0	0	3	2	5
implemented previously by yourself is…	0	0	0	3	2	5
Total	0	0	0	9	6	15

More precisely the elements provided with ScenEdit (knowledge items, intentions, strategies, interactional situation patterns…) are useful as can be seen in table3.

To the question "*Would you say that the presence of components and patterns is…*" (two possible choices), the associated terms were "advantage"(4 answers), "help" (4 answers). One of the experimented teachers said, it was an "advantage" and a "constraint", and he explained that "at first sight I found the choices were not wide enough, I was a little embarrassed to be unable to put whatever I wanted… and finally it's another advantage of ISiS thinking of words that everybody can accept and then speak the same language" so he was convinced of the necessity to have a definite number of possibilities in the list if the vocabulary chosen is relevant for their users.

Table 3. Breakdown of the answers to questions about the presence of suggestions

Evaluate the presence of suggestions	*No answer*	totally useless	quite useless	quite useful	absolutely useful	Total
knowledge items	0	0	0	4	1	5
intentions	0	0	0	4	1	5
strategies	0	0	0	4	1	5
interactional situations	0	0	0	3	2	5
Total	0	0	0	15	5	20

Some of the comments suggested improvements of the visual representation of the model ISIS: in particular more precision is required for the temporal dimension which is not represented on the actual simple tree version, as mentioned before. Moreover they pointed out that making the phases and the activities more explicit helped them as « the scenario can be appropriated more rapidly ».

Finally, the issue of the complementarity of the formalisms was raised. Practitioners probably prefer having several complementary formalisms at their disposal with each one contributing to the precision and the removal of eventual ambiguities existing in the others. This hypothesis could be one of the subjects of further experimentations. Moreover we are aware that many factors could refrain teachers from designing or reusing scenarios, but this is not the subject of this paper.

5 Conclusion

In this paper, we have presented an overview of the ISiS Model, a "goal-oriented" business process model whose purpose is to assist teachers in the design of learning scenarios and to favour sharing and re-use practices. The model, co-elaborated with a panel of users, appears efficient, according to our experimentations. These experimentations with teachers-designers have shown the benefits of the model (1) to improvement the quality of the scenarios created, (2) to illustrate the importance of the elicitation of intentions and strategies by users themselves, (3) to better understand the scenarios created by others and (4) to simplify the design process by reducing the distance between users' requirements and the effectively implemented system. Our priority now is to develop a new online version of ScenEdit and experiment it more thoroughly, with a wider audience which not necessarily has a great familiarity with ICT and scenario design softwares and methods. Essentially, this experimentation will essentially aim at consolidating the validation of the visual representations of the scenario that we propose (with the levels of ISiS and the timeline on a single tree representation) and to enhance the system with databases of patterns or components allowing new effective practices of sharing and reuse. With this environment, users will be able to feed databases by exporting fragments of their own scenario, in order to share them with others or reuse them further in related or different contexts.

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