

# Serious Games to Teach Ethics

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**Abstract.** In this paper, we are focusing on digital serious games (edugames) and how they can be utilized in teaching in the ethics and citizenship domain. Our aim is to combine narrative techniques with intelligent tutoring techniques in a single model that adopts and based on educational theories and classroom educational strategies. The model has been used to implement an adaptive educational interactive narrative system (AEINS). AEINS is an inquiry based edugame to support teaching ethics. The AEINS version presented in this paper targets students between the age of 8 and 11. The idea is centered around presenting and involving students in different moral dilemmas (called teaching moments) within which the Socratic Method is the used pedagogy in the teaching process. AEINS monitors and analyzes the students actions in order to provide an individualized story-path and an individualized learning process. The student is an active participant in the educational process and is able to interact with the edugame as a first person player. We claim that such interaction can help in developing new or deeper thoughts about different moral situations. Our aim is to contribute to the design of serious games and help raise awareness of ethics and citizenship in children.

## 1 Introduction

Computer game worlds have become more complex over the years as computer technology has evolved. Games are a very dynamic field, and they have moved on significantly since the simplicity of Pong with many improvements and expansions. Since the 1950s, computer and cognitive scientists have developed the idea that the computer can be used by a student to learn independently and that computer programs can teach a student. For example, McGrenere started investigating whether games could be utilized to assist learning [25] and others explored the appropriate game types and game elements to be used as educational tools [1]. Some researchers such as Klawe [34] consider these games only effective if the interaction is monitored and directed by teachers, or if the games are integrated with other more traditional activities such as pencil-and-paper exercises. Other researchers believe that effectiveness is related to the features, preferences and behavior of a particular user [25].

In the last few decades, Serious games (edugames) started to emerge. Studies on the use of games in education [1, 14, 15, 28, 29, 30, 32, 33, 41] have proven that games constitute a medium that motivates the learners to try to develop their knowledge while they put it into practice. Games became a strong supplement to teaching by virtue of their concrete experiences leading to learning. Instead of being taught about topics, students are engaged with these topics and play them out. Within such environments players can learn while being engaged in an entertainment activity [31] and thereby students

create their own experiences and get feedback on their specific actions in a safe environment [41].

As obvious, not all users share the same preferences or styles when interacting with a game and when solving game-problems. This leads to the importance of adaptation in the sense that behavior of each play-instance of a game depends on the actions of an individual player. The major aim for an adaptive game-based learning system is to support and encourage the learner by considering his needs, strengths and weaknesses. The telling of stories within these environments takes the role of engaging the player and/or transferring tacit knowledge to the learner. Simpson in her article emphasizes the importance of stories in our lives and their role in tightening human relationships [9]

”Stories are connections to the past and yet carry us into the future; they speak of relationships, of human connections, and to what gives a quality to our lives.”

Stories and interactive narrative (IN) have been used for long time now to entertain children and to teach them, for example in classrooms for primary and secondary school curricula, both on their own and as a support for other subjects [17, 43]. IN allows teachers to introduce sensitive issues in a safe and stimulating way. Interactive narrative has proven to be successful in creating enriching experiences for its users, sparking problem-solving skills, individual and group decision-making skills, and encouraging pupils to develop strategies to deal with different issues in different disciplines. In addition it has been shown that role playing and discussions can help students to transfer their knowledge and beliefs into actions and can help them to see that their decisions affect other people and things [24].

Interactive narrative has mainly been used as a common tool to teach in ill defined domains such as design, history and ethics. The Socratic Method is the most widely used pedagogy in telling these stories. Ethics and citizenship is one of the important ill-defined domains, where the development of skills of participation and responsible action is a fundamental part of the citizenship curriculum. According to [21], ”By teaching students how to make good choices, we are in effect, educating character.” Character education involves teaching children about basic human values including honesty, kindness, respect ...etc. In addition, according to Kohlberg, if children get engaged in enough independent thinking they will eventually begin to formulate conceptions of rights, values, and principles by which they evaluate existing social arrangements [16].

In such domains, like ethics, it is a generally accepted fact that knowing is different from doing, for example, as Watson clarifies [7]: ”getting high scores in an ethical course does not guarantee at all the actual behavior of that student”. Watsons view can be summarized as follows: 1- identify what is good and what is bad behavior. 2- Instruct people as to what these are. 3- Inspire people to behave in the right ways using examples to imitate. This view presents the

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classical view of moral education which is straight forward but unfortunately reality is much more complex. Watson also mentioned a very important point which is the desire for good:

”The trick lies not solely with knowing what is right and good but also in building a love for the good and the worthwhile.”

Watson points out that by giving the students the chance to see successful people do what’s right and good, chances are better that learners will be biased to follow suit themselves than they might otherwise.

Considering the importance and the challenges the ethics domain provides plus the theory behind serious games and interactive narrative, a hybrid architecture that combines interactive narrative and intelligent tutoring has been designed. Based on this architecture, an edugame called AEINS has been implemented. AEINS aims to use stories and interactive narrative as a source of inspiration and direction for moral conduct. We believe that by allowing the student to be involved in moral dilemmas helps them to express his character through the problem solving, decision making, and conflict resolution present in these dilemmas. These are important parts of developing moral character. In other words, we aim to have strong learning objectives underpinned by effective story telling. Although edugames now is a growing area of research, most educational games to date have been produced without any coherent theory of learning or underlying body of research [13]. In addition, very few formal evaluations have been conducted to evaluate the actual pedagogical values of these games [27].

## 2 Related Work

Because narrative plays such an important role in cognition and culture, narrative-centered learning environments have been the subject of increasing attention. Learning narrative environments can be viewed as rich generated stories that transfer some educational concept(s) or skill(s) to the student. From the environment designer point of view, he is intentionally placing educational materials in these environments in order to reach certain educational outcomes (hopefully!). On the other hand, from the student point of view, a kind of unintentional learning process happened through an engaging, appealing experience. The student is seen as an active participant in the construction of his own knowledge.

Since the narrative centered learning environments tend to have educational targets so the environments must exhibit certain educational properties, and contain one or more of the following educational components, for example the existence of tutorial planning, student model, learning objectives, domain and pedagogical models. Some environments also contains feedback/hint provider(s). Different ideas have been proposed on the kind of interaction between the tutoring modules and the narrative module. One way is to link the learning objective to the game narrative content as in ELECT BI-LAT, a game-based system to teach cultural awareness and negotiation skills for bilateral engagements [20]. Each game action is linked as positive or negative to a learning objective. The researchers believe that within an educational context, emergent narrative is not efficient enough as the experiences the learner ends up creating may not contribute to the intended or desired learning goals. A more scripted approach has been followed to achieve greater control of learner experiences. According to Riedl and Young [35], this kind of narrative is not as adaptive as a planned narrative as it limits the learner’s freedom in the environment.

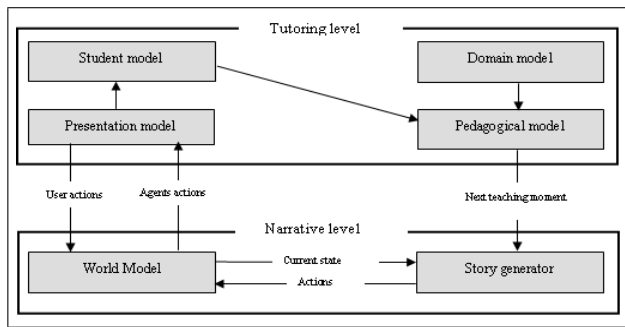
Another kind of interaction appears in Mimesis [26], Thomas and Young employ adaptive interactive narrative to guide discovery learning where learning tasks are represented in the interactive narrative plans. Mimesis uses the intervene strategy; a strategy that allows the user action to fail if it would change the world in a way that conflicts with the actual story plan. Actually, we think that if this kind of intervention persists in order to preserve the story unfold, this can lead to the user boredom and loss of interest. Also, this can override the educational goals.

The BAT ILE system is a binary arithmetic tutor that uses narrative to provide context of learning binary arithmetic and logic gates [2]. The narrative is different in this system where there is no evolving story line, and the environment is inhabited by one tutor agent where the communication with the student seems to be in one direction, the tutor student direction. In other words, the effect of the student actions are not obvious on the narrative, although it affects the choice of the subsequent problems and puzzles. It has been shown that students enjoy using BAT ILE, but it was not clear that the system’s design was the main reason although it can be considered an important factor.

More systems developed such as Storyteller in the literacy education domain [5] and Crystal Island in the microbiology domain [6, 42]. StoryTeller discusses the idea of helping children to customize stories, they go through iterative cycles of writing and review till their story comes to life. The narrative in Storyteller is pre-defined by the children before starting the game. Crystal Island investigates the incorporation of an automated story director and intelligent tutor into a narrative-based training simulation. The authors take the same approach as ours with respect to the way the tutoring and narrative components interact together, but Crystal Island does not contain a student model, which has proven its importance in providing adaptivity. Another story-based educational game developed for language learning is TLCTS [22], which helps people to acquire communicative skills in foreign languages and cultures. TLCTS combines game design principles and game development tools with learner modeling, pedagogical agents, and pedagogical dramas.

FearNot! is a character-driven learning environment developed for the anti-bullying domain [43]. Although the system does not include the student as a protagonist, the student is still able to affect the story through offering suggestions to the victimized virtual character. The environment emphasizes highly autonomous agents that promote empathic relationships with the student, it does not have any kind of student model and the learning environment is not able of handling more social educational subjects rather than anti-bullying one. Prada et al. (2000) allow the user to act as a protagonist in ”TEATRIX” [40], a learning environment designed to help children and their teachers in the whole process of collaborative story creation. Children start with a selection phase where they set up the scenes for the development of a play and design the characters, in addition to doing the whole performance. In TEATRIX, there is no pedagogical or student models, which helps in achieving the personalized learning. In addition, the story generation is limited to the scenes pre-selected by the children before the beginning of the play. this kind of interaction decreases the flexibility of the story generation and limits the users choices of having different unexpected events in the story which, we think, if considered can increase the immersion, dramatic and emotional effects that in turn may affect the educational outcome.

The interactive narrative learning environment, IN-TALE, developed for military training skills [36]. It integrates an automated story director and reactive autonomous agents in the context of a story-



**Figure 1.** An architecture for a narrative-based system that includes intelligent tutoring

based military leader training scenario. In the scenario, the user plays the role of a military leader in a foreign peacekeeping mission and the virtual characters play the roles of merchants in a volatile marketplace. In-TALE aims to expose the user to dramatic and pedagogical situations, with the use of the surrounded agents believable behavior, to help him to acquire the desired skills for such missions, but also the system lacks adaptivity to the educational process. A further interactive drama prototype is TIME that has been developed in the field of medicine [44]. The system portrays a situation in the life of a virtual patient. The system contains eight decision points that rely on a specific table of probability values to determine the outcome of the situation in question. Although TIME is able to assess the student work at the end of the presented scenario, it has no student model that guides the educational process during real time interaction with the system.

To the extent of our knowledge, no narrative-based educational game has included a student model in order to teach citizenship and ethics. Our goal is to provide an interactive narrative experience that merges the benefits of interactive narrative approach with the benefits of strong adaptive tutoring approach (designated in the presence of a pedagogical and student models) in order to teach in the citizenship and ethics domain.

### 3 Proposed Architecture

The main idea of the proposed work is to make use of narrative technique and intelligent tutoring in a single architecture. Interactive narrative allows interaction between the student and the story teller, it contains inspiring examples after which the students can model their own behavior. Intelligent tutoring usually infer a student model from student behaviors to adapt the instruction to the students needs. Each module in the system is fully separated from the other parts; all the parts can communicate through inference rules. As we aim to make use of the presented architecture in a learning environment, we believe in the necessity of having the narrative level work in favor of the tutoring level. In principle, the dynamically generated story bits are mainly generated to serve the tutorial goals, see Fig.1. As seen in figure, although tutoring and narrative are in separate levels, there are back and forth communications between the various modules present in both levels.

#### 3.1 Tutoring Level

The tutoring level consists of four components: domain model, student model, pedagogical model and presentation module. The domain model is a main component of tutoring systems, it is a dynamic

model where a set of rules are implemented by which the system can reason. The student model is a crucial component that mainly aims to provide adaptivity; it involves creating an individual model for every student. The pedagogical model adapts instruction (problem selection, problem difficulty, topic area, choice of activity, choice of help type, and availability of help) following a model of human tutoring expertise that balances motivational and cognitive goals. Finally, the presentation model handles the flow of information and monitors the interactions between the user and the system and vice versa.

#### 3.2 Narrative Level

The narrative level consists of two components: a world model and a story generator. The world model houses the objects and the AI characters' declarative models. Each AI character is implemented as a set of rules that describe the character personality and control the character behavior. All the characters share the same basic knowledge base to support interacting with the world and other characters. The story generator uses continuous planning for the dynamical generation of story beats in run-time.

### 4 AEINS

Based on the architecture presented, a prototype called AEINS (Adaptive Educational Interactive Narrative System) has been developed. AEINS is an inquiry-based learning environment, that helps 8-11 years old children to be engaged effectively in moral dilemmas. Our approach is to provide customized learning environment and personalized feedback to help to maintain immersion and engagement during the learning process in ethics and citizenship domain. This is achieved through presentation of new insights into combining interactivity with pedagogy for engaging students effectively in moral dilemmas. In AEINS, the student is able to act freely in the environment influencing the path of the story unfold, and at the same time be monitored and guided by the tutor.

AEINS proposes two types of agency. The first kind is complete free agency by which the student is able to influence and control the direction of the story (i.e., before reaching or after finishing a teaching moment). In this case, the story generator uses continuous planning for the dynamical generation of story beats in run-time to provide suitable actions and reactions in response to the student's actions. In other words, the narrative generated in the game through planning where for every possible way the user can violate the story plan, an alternative story is generated. The second type is restricted agency which exists in the entire interaction within a teaching moment; the teaching moments use simple branching planning approach designated by decision points where the student has to act. Restricting the agency in order to preserve the educational targets is acceptable because the teaching moments themselves are relaxed by varying the places and characters that can participate in their worlds; this part is illustrated in [39]. AEINS main aim is to allow students to move from the *making moral judgments state* to the *taking moral actions state*, from the knowing state to the doing state, which is considered a very important step in moral education. The following subsections introduce how the various architecture components are utilized in AEINS.

#### 4.1 Domain Model

The domain model describes the various concepts (values) in the ethics and citizenship domain and their relationships. One part of

the domain in model is defining the principles of character education [11] and represent their relationships and dependencies. A frame based representation has been used to demonstrate those relationships and dependencies as seen in Fig.2. The other part of the domain model is constructed in the form of a repertoire of moral dilemmas (teaching moments). An example of a branched graph structure dilemma is shown in Fig.3. Mapping the domain values to the teaching moments can be imagined as shown in Fig.4.

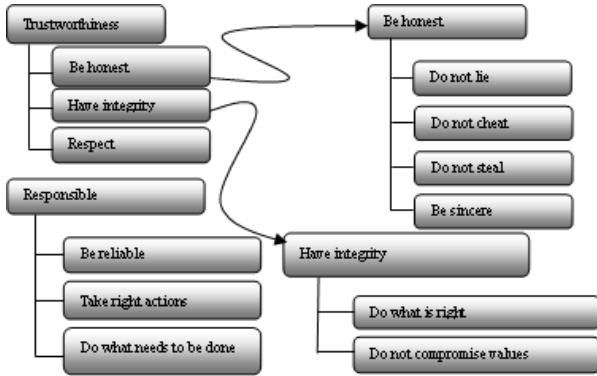


Figure 2. Frame based representation

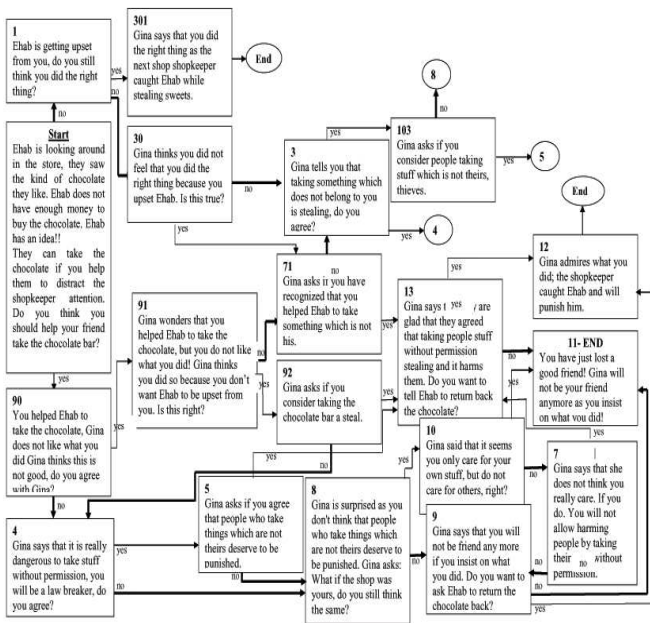


Figure 3. Graph structured dilemma

#### 4.1.1 Moral Dilemmas and Teaching Moments

The ethical argument as a whole is ill structured and it is hard to define the set of right answers or actions. But according to Simon and his explanation of the architects design process [18], "During any

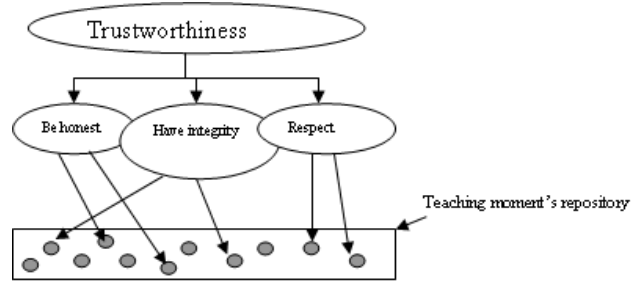


Figure 4. One to many relation between the moral values and the teaching moments

given short period of time, the architect will find himself working on a problem which, perhaps beginning in an ill structured state, soon converts itself through evocation from memory into well structured problem." Simon meant to say that a problem that is ill structured in large can be well structured in small. Upon this, we decided to make use of pre-analyzed moral dilemmas in a way that every analyzed part can act as a separate well defined problem on its own.

Moral dilemmas such as Kohlberg's moral dilemmas and other dilemmas designed specially for school children are used to construct teaching moments. Every teaching moment can be imagined as non-interactive story presentations interleaved with user decision points that allows the story to progress forward [39]. The teaching moment structure is in the form of a directed graph, where each node is a distinct situation of the world and the directed edges link decision points with each other or leads to an end [4].

This kind of representation allows the use of an intelligent tutor to follow the student's actions and assess them in the form of a step by step follow up. Ideally, each teaching moment path describes an inquiry based narrative, a story in which the protagonist is the user in the role of making moral decisions. These dilemmas allow students to pursue different procedures for solving the problem. These various procedures arise from allowing different perspectives based on students perceptions and interpretations of the nature of the problem. Through role playing and discussions, students can see that their decisions affect other people and things [24]. In addition, the students' understanding gained through this process is situated in their experience and can best be evaluated in terms relevant to their experience.

Although the different branches of every teaching moment are hand coded, each teaching moment exhibits variability through allowing different characters and places to present the teaching moment depending on the story world state. Each teaching moment represents a part of the whole story and focuses on a certain concept (value) in a way that the concept mastery is established within. Each teaching moment has certain prerequisites that must be fulfilled before the execution of the teaching moment takes place. Manipulating teaching moments priority are done through the represented rules as follows:

*Trigger: teaching moment  $X_1$  has not been presented and teaching moment  $X_2$  has not been presented and value  $Y$  is not held by the user and value  $X$  is held by the user*  
*Action: set priority to teaching moment  $X_2$*

The capital letters in the rules represents variables and the representation denotes that if (a) a specific pattern of teaching moments has

not been presented to the student yet and (b) user holds certain values and does not hold others, the action part of the rule executes (the next teaching moment priority is identified).

#### 4.1.2 Interaction with teaching moments

Within every teaching moment, the learning tasks are tightly coupled with the narrative where specific skills (goals) have to be acquired by the student. The interaction of the student with the teaching moments follows the following structure. Such interaction is monitored and evaluated by the cognitive tutor.

- The teaching moment begins with a specific theme to act as a starting point or trigger for learning.
- Generate possible problem solutions "ethically approved."
- Assess the viability of alternative solutions by constructing arguments and articulating beliefs.
- The student is asked about his opinions through series of questions
- Evaluate the students answers and construct arguments that lead the students to examine the validity of his opinion or belief.
- If the student agrees with a desired ethical choice, the teaching moment ends
- Else if the student sticks to an unethical decision, the system raises the ante (what if style questions).
- If the student keeps sticking to the unethical choice, choose another teaching moment and repeat the above steps.

## 4.2 Pedagogical Model

The pedagogical model is developed in the form of production rules. These rules are used to give the system specific cognitive operations to reason about the student and the teaching process. The model specifies how a student ideally would use the system and how the system reacts to his actions. According to the student's actions, the model is able to assess the student's skills and adjusts the student model accordingly. In order to design the pedagogical model, the problems structure and what exactly needed to be modeled has to be specified. With ill defined problems, development is a change in the way a person thinks not is the case of acquiring more knowledge. So to enable the student model to work effectively, we have specified skills needed to be acquired by the student and the actions that should be taken by the student in order to reflect these skills. The idea is based on analyzing moral dilemmas and transforming them to a story graph structure. The second step is to specify the decision points that reflect the specified skills.

Research suggested that students benefit from being encouraged to consider a collection of evidence and coordinate their theoretical ideas with supporting or contradictory evidence as they engage in argumentation [3, 37]. In addition, students must have opportunities to choose among different options and to reason which criteria lead to the option chosen [12]. AEINS follows these approaches in designing the pedagogical model and uses the Socratic Dialogue as it has been shown to be a highly effective approach [10] to help children develop new ideas and gain new insights. The Socratic Dialogue also helps the students to think critically, solve problems non-violently, and make choices based on what's right instead of what they can get away with. It also help learners to face evidence that what they believe to be true is, in fact, false and a misconception, this is such an efficient way as learners often are interested in resolving the discrepancy [8].

AEINS rephrases the question from the perspective of the learner to provide a meaningful context and facilitate the activation of prior

knowledge; this technique has shown its usefulness in the learning process as shown in [38]. For example, if we would like learners to realize the effects of stealing, we could pose the problem of shoplifting and raise the stakes, if necessary, in the form of: what if you (the student)is the owner of this shop.

## 4.3 Student Model

Student modeling is an important aspect of providing adaptivity. It is currently a simple form of the overlay model represented in the form of rules. AEINS builds a model of the students learning process by observing, analyzing and recording the students actions and choices from the generally accepted ethical views. The student model is represented by rules similar to those of the pedagogical model but associated with certainty confidence.

AEINS is capable of providing a summary at the end of the interaction with the learning environment. This summary is based on the student model, it displays the different positive and negative skills the student have. It also shows the teaching moments the student interacted with and the values the student exposed to associated with confidence factors.

## 4.4 Presentation Model

Based on Gagne, there are four stages in this model: awaken, explain, reinforce, and transfer, each of them is emphasized in the system as follows: At the awaken stage, the interface itself is designed in a way that captures the students attention, as discussed before in *Fig.2*. The playing characters personalities evolve over time, which make their reactions different every time with respect to their current personality. The variance of the narrative experience itself is engaging and helps in gaining the attention of the student and creates new experiences, based on Gagne and Keller [23]. At the explain stage, feedback and explanations are given to student. This helps the student to reflect on her own actions and their consequences. At the Reinforce and Transfer stages, the student has the freedom to see all the previous history of her actions and other playing characters actions. The student is involved in the moral dilemmas and the consequences depend on her choices and actions. This forces the student to make a conscious choice in terms of ethics.

To interact with the story, AEINS offers a GUI as shown in *Fig.5* where the student is able to open a list and chooses an action from it; actions include: move, invite, persuade etc. The student is then able to click on one of the characters' and places' pictures in the world. for example, the student chooses "invite" action from the list and then clicks on *Ziad's* and *house's* pictures. The end result will be "invite Ziad to pub2. Ziad has the freedom to accept or reject the users invitation according to specific set of rules and constraints describing the tactic the playing-characters can take.

The student gets engaged in a conversation that evolves depending on the students actions. The aim is to enable students to test their own intuitions about certain moral value and to perform arbitrary experiments, in so doing it is believed that students will better understand the nuances of the domain. In addition present the student with good models and examples, hopefully, after which they could model their own behavior.

## 4.5 Story generation in AEINS

According to [35] planning is efficient and able to generate different narratives for different users, and also different narratives for the single user on subsequent play turns. This technique enhances the user's

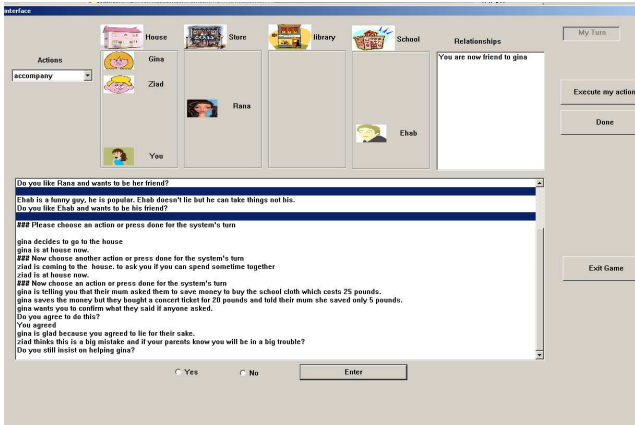


Figure 5. The developed system interface

sense of control in the narrative environment [35]. The main story in AEINS is generated using a STRIPS-like representation planning algorithm, similar to the work of Barber and Kudenko [19], a STRIPS-like representation planning algorithm is used that selects a story event to be executed based on a set of authored story actions. However, unlike the work of Barber and Kudenko, the planning algorithm is more like game-playing algorithm, forward-chaining from the current situation by trying all possible actions from there. The choice of action(s) depends on the nearest to satisfy the narrative goals (preconditions of the teaching moment). The effects indicate how the current situation changes as a result of applying the operator. For every possible way the student can violate the story plan, an alternative story plan is generated.

In a STRIPS-like representation planning algorithm, actions are instances of generic schemata called operators. An operator has preconditions and effects. The preconditions indicate the conditions that must be valid for the operator to be applicable. The effects indicate how the current situation changes as a result of applying the operator. Given a narrative goal (i.e. the pre-condition of the next teaching moment) and the current world state, the story engine selects a story action to execute from the produced plan. Fig.1. presents an example of two action operators, represented with variable argument(s) for which different instances can be substituted.

**STRIPS-Like Planning** In the STRIPS representation, a problem definition has the following components:

- A finite, nonempty set I of instances.
- A finite, nonempty set P of propositions, which are partial functions of one or more instances. Each application of a proposition to a specific set of instances is called a positive literal. A logically negated positive literal is called a negative literal.
- A finite, nonempty set O of operators, each of which has: 1) preconditions, which are positive or negative literals that must hold for the operator to apply, and 2) effects, which are positive or negative literals that are the result of applying the operator.
- An initial set S which is expressed as a set of literals.
- A goal set G which is expressed as a set of literals.

Although this kind of narrative is used to generate the stories connecting different teaching moments together in a one continuous coherent story, it was practical not to follow the same technique in designing the teaching moments, where it is very important to conserve

action name	preconditions	postconditions
move(Y,Z)	place(Y), charat(student,Y)	place(Z), charat(student,Z)
invite(X,Y,Z)	char(X), place(Y), charat(X,Y)	place(Z), charat(X,Z)

Figure 6. example of the story world operators

the educational targets. Branching narrative is used to develop stories within the teaching moments as discussed previously in this paper.

## 4.6 Story World

The story world contains all the information about the characters and the objects, such as their description, location and their state in the game world. The story world is mainly the world current state, and its role is to track and save all the current actions of the student and the agents to be used later by the planner. The world current state is updated after every executed action either done by the student or by one of the agents. The main advantage of having more than one non-playing character is to have the freedom to portray agents who do not share the learner's goals, they can be used to provide negative examples [26]. On the other hand, they can also act according to the moral goals and can give positive examples or help the student to stay on the right track. The story is in effect a narrative describing the story world, the characters' actions and the actions the student is taking and the effect of these actions on the story world.

## 5 How does AEINS work?

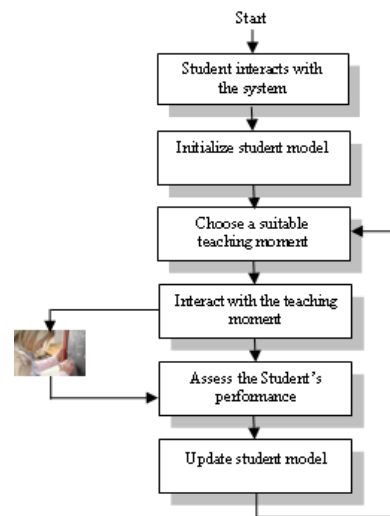


Figure 7. The game model

A model of the game is presented in Fig.7. The game starts by presenting the game world to the student. The game gives a brief introduction about the world. The game allows the student to choose his friends to initialize the student model. The pedagogical model chooses the next teaching moment to present. The student is free to act and the game generates the appropriate narrative according to the student's actions and the specified goals (teaching moment preconditions). Once the preconditions are satisfied, the teaching moment

starts and the student starts interacting with it. After finishing the teaching moment the student model is updated, the student regains his freedom to act, and the system generates the narrative accordingly. The cycle continues as shown in the figure.

## 6 Evaluation

### 6.1 Analytical Evaluation

AEINS has worked on the drawbacks mentioned in the related work. AEINS succeeded in mixing continuous planning and branching planning approaches. The former was used to generate the outer story that links the teaching moments together and forms coherent continuous story. The latter has been used in structuring the teaching moments that accommodate the Socratic Dialogue. The dynamically generated narrative sustains the freedom of the player and allows him to affect the story and feel control over the environment. The branched narrative helps in preserving the educational goals and allows the cognitive tutor to follow and assess the learner. AEINS succeeded in combining both techniques in a seamless way, where moving from one technique to another is done smoothly and without affecting the learner's experience.

AEINS used the Socratic Dialogue as its teaching pedagogy. In every dilemma, the voice of 'Socrates' comes from one of the involved characters who exhibit certain personality according to their role in this moral situation. This voice usually comes from the learner's friend, this raises conflict moral situations and makes the learner think harder to solve the discrepancy. Since, AEINS contains a student model, the feedback provided to the learner is tailored to his history and his current choices.

### 6.2 Empirical Evaluation

A preliminary evaluation of the AEINS system has been performed: four students aged 8 to 11 years tried the system. The students were of different origins and had different cultural backgrounds, and thus formed a good sample. Responses to the usefulness of AEINS were positive with one exception: "The environment will be more engaging if it contains more animation". The four students felt that AEINS is interesting and the dilemmas were engaging. Verbal statements during and after the session were overwhelmingly positive. One student comments during using the system: "I did not mean to upset my friend, I felt as if it really happened and I had lost my friend who will not talk to me ever again. I think I will be careful next time." Another student comments after the session has ended: "I think this can help me solving school problems".

One of the children asked for password at the very beginning so that no body can access their files and see their actions. This reflects the importance of having such private environment that students can freely act and even purposely did mistakes. All children praised the idea of having the whole experience saved where they can return later and revise it, so they can see what had happened according to their choices and actions. Presently, although these are really encouraging results, the next goal is to develop more substantial evaluation strategies to evaluate AEINS usability and validity.

## 7 CONCLUSION

This paper presents a framework for using serious games to teach ethics. An educational adaptive system, AEINS, has been implemented. Real life dilemmas and Kohlberg's moral dilemmas are part of the domain and were used to construct the teaching moments.

AEINS combines two types of generated narrative; continuous narrative planning and branched narrative. Interactive narrative allows the presentation of ill defined problems, like ethics and citizenship problems and is used to engage the student in the game and allow the student to experiment with various actions in a safe environment. Such interaction aims to provide new thoughts and add new experiences to the student that can be used later or transferred to real life actions.

AEINS incorporates an intelligent tutor that allows monitoring the student and provide personalized learning process and feedback. Two types of student agencies were considered: a high-level agency outside the teaching moments and semi-controlled agency inside the teaching moments. The preliminary evaluation of AEINS showed promising results and we are currently working on a full evaluation with a larger group of children.

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## Appendix

This appendix shows an example of a complete run. The system introduction and the teaching moments are written in normal font. The student's actions are in bold. The planner actions are in italic. My illustration to some actions will be in capital letters

**THIS IS A BRIEF INTRODUCTION ABOUT THE GAME WORLD.**

This is your world, please have a look around! You have four places to go to: the house, the shop, the library and the school. There are four characters from whom you can make friends. You have a list of actions to choose your actions from. You are free to act whenever you wish You will be involved in some situations during your play time, **TRY TO BE YOURSELF!**

Now, it is time to choose your friends.....

Gina is a nice girl, she is sincere. Gina does not accept taking things without permission but she can lie Do you like Gina and wants to be her friend?

**yes**

You agreed

Ziad is a beloved boy, he is a good and sincere boy but sometimes he can cheat. Do you like Ziad and wants to be his friend?

**yes**

You agreed

Rana is a beautiful girl, she does not accept lying or taking things without permission. Rana is not sincere to her friends. Do you like Rana and wants to be her friend?

**no**

You disagreed

Ehab is a funny guy, he is popular. Ehab does not lie but he can take things not his. Do you like Ehab and wants to be his friend?

**yes**

You agreed

Please choose an action or press done for the system's turn

**THE STUDENT'S CHOOSES TO PRESS THE SYSTEM'S TURN BUTTON**

*gina decides to go to the store*

gina is at store now.

Now choose another action or press done for the system's turn

**THE SYSTEM CHOOSES THE ACTION FRIEND, AND CHARACTER RANA.**

**You want to be rana's friend.**

*rana likes you and wants to be your friend too.*

*rana is calling you to come and meet them at the store. Do you like to go?*

**yes**

You agreed to join rana.

Now choose another action or press done for the system's turn

**THE STUDENT'S CHOOSES TO PRESS THE SYSTEM'S TURN BUTTON**

**THE PRECONDITIONS OF THE FOLLOWING TEACHING MOMENT HAVE BEEN SATISFIED, SO THE TEACHING MOMENT STARTS.**

gina is looking around in the store, they saw the kind of chocolate they like. gina has no enough money to buy the chocolate gina has an idea!! they can take the chocolate if you helped them to distract the shop keeper attention Do you think you should help your friend

to take the chocolate bar?

**yes**

You agreed

You helped gina to take the chocolate. rana does not like what you did rana thinks this is not good. Do you agree??

**no**

You disagreed

rana says that it is really dangerous to take stuff without permission, you will be a law breaker, do you agree??

**yes**

You agreed

rana asks if you agree that people who take things which are not theirs deserve to be punished

**yes**

You agreed

rana says that they are glad that you agreed that taking people stuff without permission stealing and it harms them Do you want to tell gina to return back the chocolate

**yes**

You agreed

rana admires what you did, the shopkeeper caught gina and will punish him for what they did.

Please choose an action to perform or press done for the system's turn

**THE STUDENT'S CHOOSES TO PRESS THE SYSTEM'S TURN BUTTON**

*gina is telling about the big teddy bear they saw.*

*rana is telling about the big teddy bear they saw.*

*Your friends says you are too late and have to hurry to the school.*

*Your friends say that the football match is about to start.*

*You are at the school*

Now choose an action or press done for the system's turn

**THE STUDENT'S CHOOSES TO PRESS THE SYSTEM'S TURN BUTTON**

*gina decides to go to the school*

gina is at school now.

Now choose another action or press done for the system's turn

*rana is going to school. to attend the school assembly's training*

rana is at school now.

Now choose an action or press done for the system's turn

**THE STUDENT'S CHOOSES TO PRESS THE SYSTEM'S TURN BUTTON**

**THE PRECONDITIONS OF THE FOLLOWING TEACHING MOMENT HAVE BEEN SATISFIED, SO THE TEACHING MOMENT STARTS.**

gina is telling you that their mum asked them to save money to buy the school cloth which costs 25 pounds. gina saves the money but they bought a concert ticket for 20 pounds and told their mum she saved only 5 pounds. gina wants you to confirm what they said if anyone asked. Do you agree to do this?

**yes**

You agreed

gina is glad because you agreed to lie for their sake. rana thinks this is a big mistake and if your parents know you will be in a big trouble?

Do you still insist on helping gina?

**yes** You disagreed

rana is glad and said that you did the right thing. rana agrees with you in that friendship does not mean to accept to lie for your friend's sake! gina is feeling shy of themselves and left the place.

Please choose an action to perform or press done for the system's

turn

THE STUDENT'S CHOOSES TO PRESS THE SYSTEM'S TURN BUTTON

*gina is at school. They are moving to their class now rana is at school. They are moving to their class now*

Please choose an action to perform or press done for the system's turn

THE STUDENT'S CHOOSES TO PRESS THE SYSTEM'S TURN BUTTON

THE PRECONDITIONS OF THE FOLLOWING TEACHING MOMENT HAVE BEEN SATISFIED, SO THE TEACHING MOMENT STARTS.

Math is your difficult subject, Your teacher will be announcing last exam's grades today. You know that even after adding your half term scores, your grade will be 'C' at the end. The teacher announces the grades and you got 'A'. You are very excited about this, WOW, looks like you will have a present from your parents. The teacher now announces your colleague's grade, who is really good at Math. The announced grade is 'C'. Your colleague is surprised and very upset. You went home and thought of what had happened. Suddenly, you realized that it should be that the teacher has swapped the results unintentionally between you and your colleague You called your friends to talk about what happened gina is saying that this a good opportunity, you should not tell anyone about this mistake. Do you agree with gina?

**yes**

You agreed not to tell the truth

rana thinks this is cheat, and does not like your behavior rana thinks this is unfair for your colleague Do you think rana is right?

**no**

You disagreed

rana is very surprised because you don't want to tell the truth rana asks: what if this happens to you and someone else took your good grade Will you sill think the same way?

**no**

You disagreed

So you think rana is right. Are you going to tell your teacher about the confusion happened?

**yes**

You agreed

You decided to tell your teacher the truth.

Your teacher is very proud of you, and your colleague is appreciating what you have done. Your teacher told your parents and they are also very proud of you, as a result of your honesty They will allow you to travel in the summer holiday rana is happy for you and is telling you that good behavior is much more important than grades It relieves the conscious and make you beloved by everyone.

Please choose an action to perform or press done for the system's turn

*rana is at school. They are moving to their class now.*

*gina is at school. They are moving to their class now.*

*gina is asking you to move to the class now.*

Now choose an action or press done for the system's turn

THE STUDENT'S CHOOSES TO PRESS THE SYSTEM'S TURN BUTTON

*rana is at school. They are moving to their class now*

Now choose an action or press done for the system's turn

THE STUDENT'S CHOOSES TO PRESS THE SYSTEM'S TURN BUTTON

THE PRECONDITIONS OF THE FOLLOWING TEACHING MOMENT HAVE BEEN SATISFIED, SO THE TEACHING MOMENT STARTS.

rana wants to go and get their snack, they asked you to keep an eye on their comic book gina seems to like rana's comic book, they asked you to give them the book Do you agree to give gina the comic book?

**yes**

You agreed

gina took the book. rana comes back and asks for their comic book. rana is very upset and said you were not keen enough on their stuff. Do you want to go and ask gina to return the book now?

**no**

You disagreed

rana is really getting more and more upset. rana asks you to buy them another comic book, Do you agree?

**yes**

You agreed

rana is really glad now because you agree to get them another comic book. rana hopes that you are going to be keener on other's things from now on.

You did a good job in this level. Please press the save button to save the whole experience.