COMMON SENSE KNOWLEDGE BASE EXPANDED BY AN ONLINE EDUCATIONAL ENVIRONMENT

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Abstract: The computers games use on educational field have been growing as a potential tool to facilitate the teaching-learning process. In the "What is it?" environment, presented in this article, the teacher can be co-author of a guess game based on cards, in which, the common sense knowledge support the teacher to be aware of students' culture and necessities. The environment also proposes a way to collect common sense statements, where engines on editor's module and player's module store all user interaction and combine this information to make new relations into Brazilian Open Mind Common Sense project (OMCS-Br) knowledge base. A study case was done by teachers and students from two different public schools, whose result point out the potential of this new way to collect common sense statements naturally through a web game.

1 INTRODUCTION

Nowadays many schools still have difficulty to use the potential of computers for education. In Brazil there are a lot of schools with computer laboratories but they use them only in computation class or they simply do not use them. Most of schools do not use the computers' capabilities for educational purpose, what could allow teachers to enrich their educational practice, join educational and entertainment aspects. Then, why not to take the computational benefits at education?

In this context this paper described a way to allow teachers to use the computer in their classes, through a game. There are many educational games available, such as: Word Puzzle (www.marista.org.br/arquivos/jogos/85/forca.swf), Secret Word (www.cubagames.com.br/), Crossword Compiler (www.crossword-compiler.com/?lang=en) but most of them have fixed issues, like content or story. Nevertheless if teachers want to use these games, they need to adapt their classes to the game rules. In the game proposed here teachers are co-authors because they can set up, adapt and evolve the game content, according to their educational goals. This game also supports teachers on teaching the transversal themes defined on the Brazilian curriculum: sexual education, ethics, healthcare, environment, cultural diversity, market and consumption (SEF, 1998).

Educational games are able to promote activities that combine fun (playful activity) and seriousness (well defined rules), once they are very popular among children and teenagers. Nevertheless according to Vygotsky (1987), Freire (1996) there are pedagogical issues that should be considered for stimulating the learning process. For example, culture sensitive and contextualized learning considering the student's reality. Then, this game proposes to consider the apprentices' common sense knowledge to promote their learning aiming at: adopting a vocabulary that is familiar to the students; instantiating content and clarifying myths, beliefs and taboos that are cultural heritage. Examples of this kind of knowledge related to sexual education are: teenagers believe that girls don't get pregnant during their first sexual relation, pill has to be taken on the day she is going to have a sexual relation, and AIDS is a homosexual disease. This kind of knowledge can be mapped into the commonsense knowledge and can be clarified by

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teachers during classes. The game called "What is it?" ("O que é, O que é?" in Portuguese) aims to help players to infer a certain secret word related to a certain transversal theme considering a set of clues presented one at a time. The clues are previously defined by the teacher having a common sense knowledge base as a support on reaching such goal.

This paper is structured as follow: section 2 explains the relation between commonsense knowledge and education; section 3 presents the "What is it?" game prototype; section 4 gives an introduction about a study case; section 5 presents some conclusions as well as some future works.

2 COMMON SENSE KNOWLEDGE & EDUCATION

The Brazilian Open Mind Common Sense Project (OMCS-Br) is a Portuguese version developed by Advanced Interaction Laboratory (LIA) at Federal University of Sao Carlos (UFSCar) from the original English project created by MediaLab of Massachusetts Institute of Technology (MIT) in 2000 (Anacleto et al., 2006).

Available over the Internet since August 2005 at *http://www.sensocomum.ufscar.br* the project aims to create a common sense knowledge base through volunteers' contribution. Any person can contribute with the project, after fulfil a small cadastre with information, such as:gender, day of birth, city and others.

In order to collect common sense knowledge, the volunteers have to complete some semi-structured statements in natural language, called templates. Each template is related to one activity and composed by three different parts: (I) a fixed part which is changed according to activity; (II) a dynamic part which is filled out by a feedback process that uses parts of the statements already stored; and (III) free field, where the user put their piece of knowledge creating a complete statement. Nowadays there are 20 activities about general topics and 6 specific themes (children's universe, colors and objects, colors and emotions, popular beliefs, sexuality and healthcare).

The whole knowledge typed by volunteers in natural language are processed to create a semantic network, in which, the knowledge is represented as binary relations. This representation, called ConceptNetBr, is formed by four text files which have the relation name, the two concepts, the frequency that this relation was created by an extraction rule, the frequency that this relation was created by an inference rule, and at least the identification of this relation in the table *entries*, where all statements are stored before have been processed.

Common sense is defined here as the knowledge that most people agree within a certain community at a certain period of time related to human experiences, knowledge about social, physical, space, time and psychological aspects of our daily life (Liu et al., 2004). Recent researches (Anacleto et al., 2008) have shown that automatically collected common sense knowledge can be used to culturally map a certain group of people. The importance of the common sense and cultural knowledge to support the learning process is referred by a number of pedagogy researchers. Vygotsky (1987) believes that the individual's mind model can be understood only if the social and cultural processes are considered in his/her context. Paulo Freire (1996) cites that it is necessary to respect the knowledge that students already reached when they start at school. This knowledge is acquired by the social relations they are participating in their community. According to Freire, the teacher should "*discuss with students the origin of some of this knowledge considering the content is being presented*". Such knowledge can help in contextualizing the learning process to the student's reality, what is extremely important for Freire. Besides, the use of common sense knowledge provides teachers an adequate vocabulary to contextualize and discuss subjects with learners from a certain community (Carvalho et al., 2007). Common sense knowledge also can be found when it is intended to teach the called transversal themes from the official school curriculum, defined by the Brazilian Education Secretary, considering that "*the commitment on constructing the feeling of citizenship demands a pedagogical approach to reach the comprehension on the social reality and the rights and responsibilities related to the personal and collective life, what leads to the political engagement*" (SEF, 1998).

3 THE "WHAT IS IT?" GAME

The ongoing research aims to make possible the use of common sense knowledge in web educational games, stimulating the introduction, reinforcement and the knowledge's construction in the learning process. It also intends to collect common sense knowledge from who use the game. The environment is divided in two main modules. The player's module is a quiz game where users should

find out a secret word considering common sense clues given in the game. The game editor's module is used to set up a new game.

"What is it?" has the differential in considering the players' profile, concerning the games presented in the previous section. Since the players have to subscribe themselves in the system before starting to use it, the new statements collected during the interaction can be related to their profile. In the registration the users provide information such as their age, gender, geographical location, interests and school degree. Taking into account the players' profile during the collection is especially important because of the culture sensitive approach, what makes necessary to develop applications for specific groups in a certain region and age, considering their context. In this case, the common sense knowledge can be filtered and the application's designer can consider only the knowledge collected from the desired profile in order to contextualize the design to the target group.

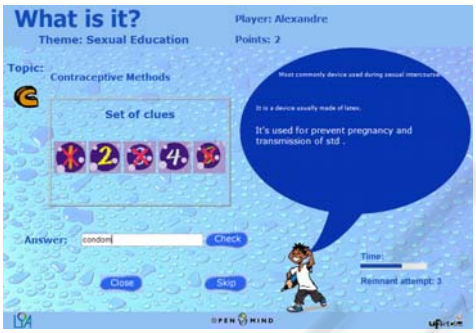

Figure 1: The player's module main interface.

Figure 1 presents the player's module main interface. To illustrate the game's use, it was developed a game's instance considering the theme "Sexual Education". In order to start the game the player has to click on the dice, represented by the orange letter "C", whose faces represent topics previously selected during the game edition. Each topic is associated to a letter (on figure 1, "C" is associated with the topic "Contraceptive Methods") and they are randomly presented, so the player can be in touch with the different topic at the same game. For each topic is defined a group of cards and each card has one or more secret words (synonyms). These cards are composed by up to ten clues, which can be extracted from common sense base according to the purpose considered by who has setting up the game. After selecting the topic, the players need to find out the secret word. To reach their goal, they can select clues clicking on the clue numbers in "Group of clues" and visualizing them at the "Clue balloon". After guessing the word, the player can continue, either select another topic clicking on the dice and continue playing, or close the game.

As the player tries to find out the secret word, the system collects common sense knowledge storing the relation between the word typed by the player and the clues that were already displayed. This collecting process is interesting (a) to teachers, who can identify possible misunderstanding by analyzing the answers, and therefore, approach those misunderstandings in classroom to clarify them; and (b) to the OMCS-Br knowledge base, which will increase the number of common sense statements. For example, when the player tries the word "condom" after he/she had clicked on three clues, as it is shown in Figure 1; three new relations are created by mapping each displayed clue with the word typed by the player through the relation *ConceptuallyRelatedTo*. Thus, one of these three relations is: (ConceptuallyRelatedTo, "it's used to prevent pregnancy and transmission of STD", "condom").

The game's editor module is a seven-step wizard which guides the teacher to create game's instances, which fit to their pedagogical goals. This module is supported by the common sense knowledge stored in the OMCS-Br knowledge base.

In this way, to create a new game's instance, the teacher must define three items: (1) the game's main theme, which should be chosen from the six transversal themes available; (2) the topics, which are specifics subjects related to the transversal theme chosen in order to compose the game's dice faces; (3) the cards, which have a secret word related to one of topics defined, an optional secret word's synonym list, and a group of clues.

In order to receive the adequate support of the common sense knowledge, the teacher must define the profile which should be considered in the search for related statements in the knowledge base in order to guarantee that statements were gathered from people who share the desired profile, fitting the game's instance to his/her pedagogical goals, i.e., the statements are contextualized to the target group.

After the teacher has defined the secret word and the synonyms, he/she must define some clues – at least one clue for each card. A list of suggested clues is shown came from the common sense knowledge base. To create these clues the game editor uses some API functions, available to communicate with the ConceptNet.

Even as the player's module, the editor's module also has some engines to collect common sense statements from teachers to OMCS-Br Project. There are seventeen rules to map the user interaction

into new statements, and then, new relations in the ConceptNet. For instance, when a teacher include the word "Johnny" as a synonym for "condom" one new statement will be created "An other way to say condom is Johnny", which will be at ConceptNet, the relation (*DefinedAs*, "Johnny", "condom"). It is still important to points to the *fail-soft* approach adopted in the game, which means that the statements suggested to teachers can be valid or not (Lieberman et al., 2007).

4 STUDY CASE

In order to validate the "What is it?" environment with real students and real teachers, a study case was done within two Brazilian public schools. It was analyzed information about use and collect knowledge process, use facilities and some information regarding to use of computer educational games in schools. We got in touch with schools from two cities, one in São Carlos/SP and another in Foz do Iguaçu/PR. Some characteristics of the participants are depicted in table 1. Both schools provided computer laboratories, but the São Carlos' lab was under reform, then laptops from our lab were taken to there. The teachers' rule was to configure a new game instance and the students played it. In Foz do Iguaçu the study case was performed at the school's lab, but with internet access restrictions regarding to the word "sex". Teachers couldn't configure a game about sexual education and they even couldn't register themselves because of the gender/sex field (male/female). To solve the login problem, a generic login and password were given to them.

Table 1: Study case participants.

	SÃO CARLOS	FOZ DO IGUAÇU
TEACHERS	2	4
STUDENTS	4	5
AGE	UNTIL 11	BETWEEN 12 TO 15
GRADE	FIFTH	SEVENTH

Detailed information about how the study case in both schools was conducted, the results obtained, as well as a discussion about them will be presented in further articles.

5 CONCLUSIONS\FUTURE WORK

The "What is it?" educational game environment aims to allow teachers to configure and/or adapt the game according to their pedagogical goals. Through this game teachers can work on the transversal themes proposed by the Brazilian Secretary of Education, concerning the students' context and culture through common sense knowledge usage, and promoting a way of learning with fun. As it was discussed in section 2, the adoption of common sense based approaches for education is defended by educators like Freire (1996) and Freinet (1993). As the design of the interaction considers their culture, it can motivate learners to play since the information present has a meaning to their context, becoming them more interested and engaged to play. This research also explores a new way to collect common sense statements to enrich the OMCS-Br knowledge base. Exploring the web feature, this environment can also be incorporated into a Learning Management System that promotes e-learning, like Tidia-Ae, Sakai, Moodle or ATutor.

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REFERENCES

Anacleto, J.C., Carvalho, A.F.P. de, Neris, V.P.A., Godoi, M.S., Zem-Mascarenhas, S., Talarico Neto, A., 2006. How Can Common Sense Support Instructors with Distance Education? In: *SBIE 2006*, Brasília.

Anacleto, J.C., Carlos, A.J. F., Dias, A. L., 2008. Bridging the gap among cultures: the challenge faced by teachers on producing content for computer-aided education. In *Proc. SIGDOC 2008*, Lisbon.

Carvalho, A.F.P. de, Anacleto, J.C., Lieberman, H., Godoi, M.S., Zem-Mascarenhas, S., 2007. Using Common Sense for Planning Learning Activities. In *Proc. CSIUI 2007*, Honolulu.

Freinet, C., 1993. *Education through work: A model for child centered learning*. Edwin Mellen Press, NY.

Freire, P., 1996. *Pedagogia da autonomia: saberes necessários à prática educativa.* 31ed. RJ: Paz e Terra.

Lieberman, H., Smith, D., Teeters, A., 2007. Common Consensus: a web-based game for collecting commonsense goals. In *Proc. IUI´07*, Hawaii, USA.

Liu, H., Singh P., 2004. ConceptNet: A Pratical Commonsense Reasoning Toolkit. BT T J, v.22, n.4.

Secretaria de Educação Fundamental, 1998. *Parâmetros curriculares nacionais: terceiro e quarto ciclos: temas transversais.* Brasília: SEF/MEC.

Vygotsky, L., 1987. *A formação social da mente.* São Paulo: Martins Fontes.