Using Common Sense for Planning Learning Activities

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ABSTRACT
This paper discusses how common sense knowledge can be used by instructors for planning *Learning Activities*. Using common sense statements which were automatically collected, we are developing software that can be used to support the teaching and learning process, in a more contextualized form. When teachers consider the knowledge that learners already have, taking into account their common sense knowledge, they can devote their attention to correcting misconceptions, covering ignored topics and avoiding the obvious. A Learning Activity [12] is a task that can promote the process of learning in students, stimulating them to think and work on a new concept or topic presented by a teacher. Examples of Learning Activities are a chat about a certain subject, research to explore details about a topic presented in class, or a paper that students have to read and discuss. Through the experiment described here, we demonstrate that common sense can be useful to support the education process, helping teachers to develop learning activities which accomplish pedagogical goals and to identify relevant topics.

ACM Classification: K.3.1 Computer Uses in Education; J.3 Life and Medical Sciences; H.5 Information Interfaces and Presentation

General terms: Design, Experimentation, Human Factors, Languages, Theory

Keywords: common sense, e-learning, learning activity, pedagogical issues,

INTRODUCTION

This study shows that common sense knowledge can be used to support teachers to prepare learning activities by helping them to [3], [7]:

a) Reach pedagogical goals;

b) Identify topics of general interest to be taught;

c) Identify student misconceptions that are inappropriate in a certain context;

d) Fit the instructional material to the learner's previous knowledge;

e) Provide a suitable language to be used in the instructional material and

f) Minimize the time used to prepare it.

In this context, common sense can be defined as the knowledge that is shared by the vast majority of people who live in a particular culture [1],[2]. For example, simple statements as "ice is cold", knowledge about the world as "Brazil is in Latin America" and (possibly controversial) beliefs as "North Americans are the best soccer players in the world" are included. When it is said that some statement is common sense in a culture, it doesn't mean that it is scientifically true or even that it is also common sense in other cultures.

In order to show the potential of using Common Sense statements to help instructors in their work, we are developing a case study in the context of the Brazilian Open Mind Common Sense Project (Brazilian OMCS) [6], which has been developed by the Advanced Interaction Laboratory of the Computer Department of the Federal University of São Carlos (LIA-DC/UFSCar), in partnership with the Media Laboratory of the Massachusetts Institute of Technology (MIT Media Lab), since August 2005.

In that case study, the project's knowledge base is being used to support two professors of the Nursing Department of the same university (DEnf/UFSCar) to plan a learning activity about home care education.

This work, partially supported by TIDIA-Ae FAPESP project, proc no. 03/08276-3 and proc no. 05/60799-6, Programa Novas Fronteiras, proc no. 06/52412-7 and CAPES, presents some previous results of the case study. This paper is structured as follows: first we discuss how Common Sense statements can be used to help instructors prepare learning activities; then, we present results of the case study mentioned previously; finally, we outline some conclusions and future work.

USING COMMON SENSE TO PLAN A LEARNING ACTIVITY

For successful teaching, teachers should consider a variety of pedagogical issues during the planning of learning activities [7]. Here, we propose the use of common sense knowledge to aid teachers in planning learning activities, so that some issues presented in traditional Instructional Theories (such as Ausubel [5] and Gagné [8]), can be addressed. According to Ausubel, in order for effective learning to take place, the new piece of knowledge being taught should be related to other pieces of knowledge that are already in learners' cognitive structure. Figure 1 depicts the changes in learners' cognitive structure when meaningful learning occurs.

The picture illustrates how new knowledge is anchored to previous knowledge. For example, suppose that the dark blue dot means "banana is a nutritional fruit" and the red dots refer to the "fruit" and "nutritional" concepts. When the new knowledge is presented to the learner, he can connect it to those previous concepts, performing meaningful learning. It is important to point out that in the resultant learner's cognitive structure, the concepts "fruit" and "nutritional" becomes connected through the concept "banana".

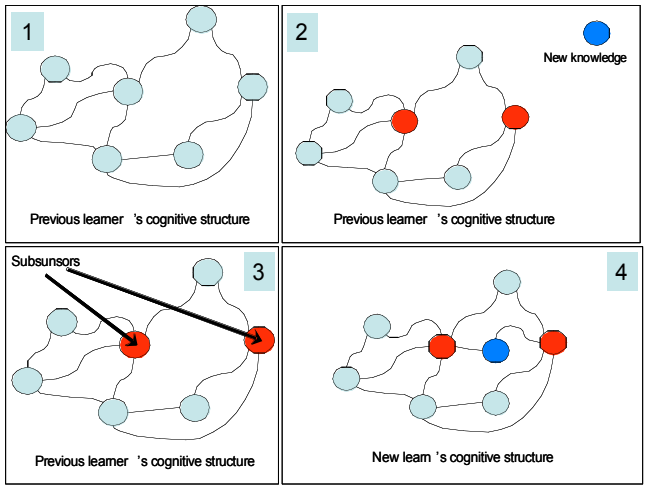

Figure 1. The meaningful learning process

Furthermore, it is possible to find metaphors and analogies in common sense knowledge bases, as previous demonstrated in [9] and, according to Liebman [10] and Neris et al.[11], these elements can be used as a stimulus to activate the use of cognitive strategies by the learner. According to Gagné [8], cognitive strategies are strategies that learners use to guide their processes of attention, learning, memory and thinking. The use of these cognitive strategies is very important to attach the knowledge to the learners' cognitive structure.

Besides the pedagogical issues, common sense knowledge could also be used to identify topics of general interest to be taught, identify student misconceptions that are inadequate in a certain context, fit the instructional material to the learner's previous knowledge, provide a suitable language to be used in the instructional material and minimize the time used to prepare it.

Considering that common sense consists of statements that most people agree with, the instructor can identify the students' needs, and prepare a class with topics of general interest. For example, if in the OMCS knowledge base we have the statement "To take care of sick people at home is cheaper than at a hospital" the instructor can decide to prepare a class explaining the cost-effectiveness of taking care of sick people at home.

Common sense statements that are incomplete or incorrect can be identified by teachers, who can correct them during the learning activity. Continuing with the previous example, if it turns out that there are studies which prove that taking care of sick people at home is not cheaper than paying for a hospital treatment in certain cases, instructors can prepare instructional material pointing to these studies.

Moreover, common sense knowledge can be used to fit the content to the learner's previous knowledge, so that instructors do not waste time rehashing material already known by the students. For example, if the instructor identifies procedures that a person who is taking care of a sick person should perform before administering medication, there is no need to spend a lot of time talking about it again. Filtering common sense by geographic location, age, educational level, etc. of the contributors, it is possible to customize presentations to the needs of specific kinds of students.

Likewise instructors can use the OMCS corpus to identify a suitable vocabulary to be used in the learning activity. Common sense statements help instructors know what terms the general public uses to think about and deal with the theme. Thus, instructors can compose the learning activity content using a vocabulary known by most people, and also take examples from the OMCS corpus to facilitate understanding of the stuff that is being taught.

Finally, the fifth point is a consequence of the ones previously presented. It is believed that using common sense to guide teachers to identify the themes which might be taught, examples, and the language to be used in the learning activity, will improve the efficiency of the learning activity planning as well as its accuracy.

THE HOMECARE EDUCATION CASE STUDY

In order to show the potential of using common sense knowledge to support instructors in their tasks, a learning activity was planned by two professors of DEnf/UFSCar, who have analyzed the knowledge stored in the Brazilian OMCS knowledge base, related to the health care domain,

during the planning of learning activities.

In this research, the educational situation of interest is the one where instructors are preparing a learning activity for teaching nursing students how to advise home caregivers in taking care of patients.

It is important to point out that in this situation the common sense stored in the Brazilian OMCS knowledge base is being used by instructors to prepare a learning activity to teach students about things they should consider when orienting a caregiver. Thus, the common sense knowledge is being used to identify the probable state of knowledge of a caregiver with whom the nurse will interact and not to model the previous knowledge of the nursing student, who may have different knowledge about home care procedures.

However, in this study we see that if instructors have a notion of what is common sense for caregivers when they talk about home care, they will be able to teach their students how to orient caregivers in home care more effectively.

For this research, we selected statements from the Brazilian OMCS knowledge base. Brazilian OMCS is being built with the contributions of people who tell the system about their everyday life, filling out templates presented on the project's site. We considered only one statement of each contributor, removing repetitions from the same contributor, following the health care expert advice for this analysis, because the number of different statements is more important than the repetition of statements by the same contributor. Then the statements were grouped according to the expert criteria.

For example, for the template presented in Figure 2 – "In order to take care of a sick person it is necessary to _____" – we received responses like "to know a little bit about health care", "to know how to administer medicines", and others to compose the category presented in Table 1: "Having basic knowledge about the care of sick people at home".

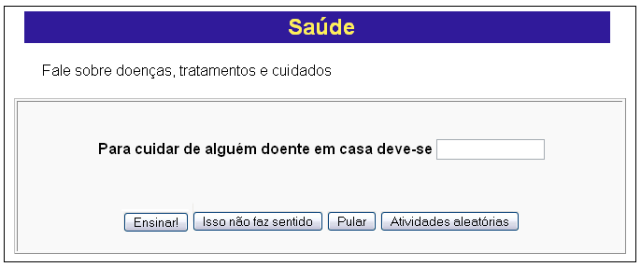

Figure 2. Screen shot of a health template of the Brazilian OMCS site

Table 1 is one example of the tables built from the analyses of the data stored in the Brazilian OMCS knowledge base. In that table it can be noted that caregivers want to know about health care procedures, medication procedures, and also about the diseases they are dealing with. It is also interesting to note that the contributors commented that they want to know how to care for a sick person in an emergency.

Table 1. Template: "In order to care for a sick person at home it is necessary to _____"

Category	Percentage of related contributions
Have basic knowledge of the care of sick people at home	57.7%
Pay attention to the sick person	7.7%
Keep the environment clear for people with restricted mobility	7.7%
Others	26.9%

It is interesting to point out that the analysis was done considering about 3000 statements which were gathered through the health activity templates of the Brazilian OMCS site. Those statements were supplied by more than 70 different users, of which 70% are male. We point out that all the contributors previously mentioned are older than 12 years – 65% are between 18-29 years old and 20% are between 30-45 years old. Statistical data about the users reveals that more than 70% of them are from São Paulo State, the most economically developed State of Brazil, about 4% of users are from the State of Santa Catarina and other 4% from the State of Minas Gerais, all of which are among the most economically developed regions in Brazil. It is also interesting to point out that the majority of those users (21%) are interested in computers, followed by 6% interested in health care and education, and 3% interested in arts.

Analyzing the data, professors involved in planning of learning activities have identified several specific topics to be covered.

To begin with, the professors realized that people often fail to mention resting, having fun and sharing responsibilities with another person when they have to take care of a sick person. According to the professors, caregivers might not fully realize the importance of their own leisure in order not to become sick themselves, and to be ready to devote themselves to care of the patient. In this manner, the professors decided to prepare a lesson to present this finding to their students and to orient them to remind the caregiver to care of himself.

Moreover, the professors identified that the respondents do not mention SUS, the Brazilian public health system. They pointed out that this might be either because the Brazilian population does not know about the services offered by SUS, or because they do not know how to get its benefits. Taking this into account, the professors prepared a lesson about SUS in order to prepare their students to orient the population about the benefits they can get from SUS and the procedures which they need to perform for this purpose.

The professors identified other essential topics which need to be covered in the learning activity, such as the importance of being concerned about the patient's dependence level, the necessity of information about basic procedures for home

care of a sick person manifested by the population and so on.

CONCLUSION AND FUTURE WORK

This work has discussed the possibility of using common sense knowledge in the Brazilian OMCS knowledge base to help instructors to plan learning activities.

We presented some situations in which common sense can be useful and previous results of a learning activity which was planned taking into account common sense knowledge which was automatically collected [1], [2].

Through this experiment, we have shown that common sense can be useful to support the education process, helping teachers to develop learning activities which address pedagogical issues and to identify relevant topics to be covered.

We believe that, considering common sense knowledge it is possible to prepare learning activities which better suited to the learners' needs so that they can be motivated and involved with the learning process.

As future work, we propose to finish the learning activity development and assess the students' opinion about the learning activity content. Also we intend to develop learning activities in other domains, considering other students' profiles. Furthermore we intend to perform experimental studies and analyze the impact of common sense knowledge in the learning process.

Finally, we are exploring the possibility of using OMCS to support learners in the learning process. We are going to explore the possibility of using Common Sense statements in order to allow Common Sense reasoning to (a) support the learner in searching for information related to a given subject; and (b) select kinds of material suited to the learner's profile.

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