Applying Common Sense to Distance Learning: the Case of Home Care Education

Junia Coutinho Anacleto[1], Aparecido Fabiano Pinatti de Carvalho[1], Vânia Paula de Almeida Néris[1], Muriel de Souza Godoi[1], Silvia Zem-Mascarenhas[1], Américo Talarico Neto, Henry Lieberman[2]

[1] Advanced Interaction Laboratory – LIA
Computer Department – Federal University of São Carlos (UFSCar)
Rod. Washigton Luis KM 235 – São Carlos – SP – Brazil
{junia,fabiano,vania,muriel_godoi,americo}@dc.ufscar.br, silviazem@power.ufscar.br

[2] MIT Media Laboratory
20 Ames St., 384A - Cambridge - MA – 02139
lieber@media.mit.edu

ABSTRACT

One of the challenges of Distance Learning (DL) over the Web is that it imposes physical distance between teachers and students, and thus reduces opportunities for teachers to fully understand the state of student knowledge and adapt instructional material to their needs. While the knowledge to be taught is usually well expressed in the curriculum material, the knowledge of a typical student is harder to codify. In this paper, it is shown how a large knowledge base of common sense statements can be used to help model student knowledge and consequently to help teachers plan learning actions by

• Identifying topics that need coverage by the curriculum;

• Identifying what a student is already likely to know;

• Locating possible misconceptions that need to be corrected; and

• Assuring that the student understands the vocabulary needed to express relevant subject material.

Categories and Subject Descriptors

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

Brazilian Open Mind Common Sense, health care, home care, learning action, computer-aid education.

1. INTRODUCTION

Many projects in curriculum development for distance learning or Intelligent Tutoring Systems have good models of the knowledge that is to be taught; few have very good models of what the student knows. Usually, the student knowledge is modeled as a subset of the knowledge that an expert is supposed to have. But that knowledge is usually confined to a narrow area in the subject domain; and there has been no good way to model a student's knowledge of "life in general", which of course is brought to bear by the student in any attempt to understand specific subject matter.

The power of common sense knowledge is that it serves as a generic model of what an ordinary person could be expected to know. Teaching can then be viewed as an activity that explains the expert knowledge by relating it to general knowledge. Often, good ways to do that are by making analogies from the expert knowledge to everyday life, or teaching by example, where the examples are chosen so that the student can relate to them. This idea has been already explored in an on-line help assistant that automatically searches for such analogies and examples [2].

Here, it is considered that common sense can be used as a student knowledge model to guide a curriculum designer.

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], [7]. For example, simple statements such 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. For example the statement "*North Americans are the best soccer players in the world*" might be considered common sense in USA, but it is not possible to say that the same statement can be considered common sense in Argentina.

According to the common sense definition presented before, which considers as common sense the knowledge that most people agree with in a certain community at a certain period of time, the number of people in a culture who agree with the same statement is what defines whether the statement is common sense

or not in the considered culture. So, as the number of people who agree with the same statement increases, the possibility of that statement being considered as a common sense also increases.

It is believed that Common Sense statements can be used to:

1. Support instructors preparing the subject matter to teach, and
2. Promote active learning by students.

This work focuses on the first case. Specifically, instructors can be helped by

a) Identifying topics of general interest to be taught;
b) Identifying student conceptions that are inadequate in a certain context;
c) Fitting the instructional material content to the previous learner's knowledge;
d) Providing a suitable language to be used in the instructional material and
e) Minimizing the time used to prepare it.

In order to show the potential of using Common Sense statements to help instructors in their work, it is being developed 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 (Media Lab do MIT), since August 2005.

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

This work, partially supported by TIDIA-Ae FAPESP project, proc no. 03/08276-3, Programa Novas Fronteiras, proc no. 06/52412-7 and CAPES, presents some previous results of the case study. This paper is structured as follows: section 2 explain how Common Sense statements can be used to help instructors prepare learning material; section 3 presents an analysis of the Common Sense statements obtained from the Brazilian OMCS knowledge base that are related to health care; finally, section 4 points to some conclusions and future work.

2. USING COMMON SENSE TO AID THE LEARNING PROCESS

As previously mentioned, it is believed that Common Sense can be used to help learners and instructors in the learning process. Here it is explained some of the specific roles that Common Sense can play.

The first point is identifying topics of general interest to be taught. 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 taking Common Sense statements into account. For example, if in OMCS it is found 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.

Second, statements that are inadequate or incorrect can be identified in order to correct students' misconceptions. 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. It is important to point out that acting in this way the instructor is promoting active learning, since learners are supposed to be able to change incorrect or incomplete assumptions they may have. This is, according to Liebman [3] below, one of the main characteristics of active learning.

The third point is related to using Common Sense knowledge to fit instructional material 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 of spending 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.

Now, about the fourth point, instructors can use the OMCS corpus to provide a suitable vocabulary in the instructional material. Common Sense statements help instructors know using what terms the general public uses to think about and deal with the theme. Thus, instructors can compose the instructional material 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 presented previously. We believe that using Common Sense to guide the themes to be taught, examples, and language will improve the efficiency of production of educational material as well as its accuracy.

3. COMMON SENSE AND HOME CARE NURSING EDUCATION – A CASE STUDY

In order to show the potential use of Common Sense to support instructors in their tasks, a previous analysis of the data stored in the Brazilian Open Mind Common Sense knowledge base (http://www.sensocumum.ufscar.br), related to the health care domain, was performed.

The educational situation of interest is the one where instructors are preparing material for teaching nursing students how to advise home caregivers in taking care of patients. Thus there are three actors in this situation – an instructor who is preparing educational material to be used in distance learning; a student who is studying to be a professional nurse; and a caregiver who is a friend or family member of the patient, and who will care directly for the patient.

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 action 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, which has a different knowledge about home care procedures.

However, in this study it is defended that if instructors have a notion of what Common Sense is 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.

It is important to point out that in the Brazilian Open Mind Common Sense website there is an activity related to health with templates that are used to get statements about the procedures of home care of a sick person. Those templates were defined specifically for this domain, according to a health care expert, in order to make fast the collection of data about the home care theme. They have some specific words to the health domain and lacunas which should be filled out by contributors so that a commonsense statement is composed. Figure 1 shows a screen shot from the Brazilian OMCS site's with a template about health.

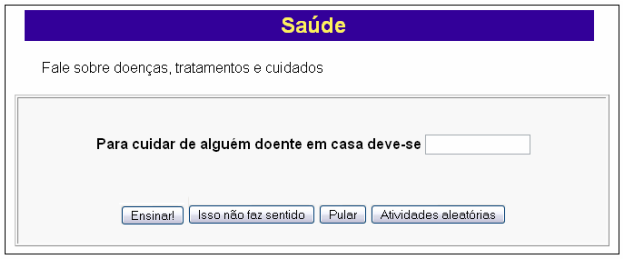

Figure 1. Screen shot of a health template of the Brazilian OMCS site

To this work, it was selected the statements from the Brazilian OMCS knowledge base, entered through the templates mentioned before. It was 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 statement repetition by the same contributor. Then the statements were grouped according to the expert criteria.

For example, considering the template presented in Figure 1 – "I*n order to take care of a sick person it is necessary to* _____" – it was found some statements like "*to know a little bit about health care*", "*to know how to administer medicines*", and others to compose the first category presented in Table 1: "*Having basic knowledge about home care of sick people*".

In the following, some tables are presented, each one related to one template of the Brazilian Open Mind Common Sense Health activities. It is shown three categories for which it was obtained good responses from contributors.

Table 1 expresses the collected in the Brazilian OMCS knowledge base about what is necessary to home care of a sick person.

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

Category	Percentage of related contributions
Having basic knowledge of home care of sick people	57.7%
Paying attention to the sick person	7.7%
Keeping the environment clear for people with restricted mobility	7.7%
Others	26.9%

The Brazilian OMCS statements collected through the template previously mentioned point out 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 2 shows the Brazilian OMCS knowledge base statements about caregiver abilities (e.g. know how to carry a sick person, how to feed a sick person), personal qualities (e.g., patience, tenderness, love), and other characteristics (e.g, to have friends, to be healthy, etc.) to take care of sick people.

Table 2. Template: *"In order to take care of a sick person someone has to be_____"*

Category	Percentage of related contributions
Concerned about the disease and procedures for home care of sick people	38.7%
Healthy	30.6%
Willing to take care of sick people	14.9%
Others	15.8%

Contributors commented that they are concerned about knowing how to administer medications properly, how to feed a sick person, or how to clean the sick person. They also want to know about the disease's symptoms and evolution. In this context, the importance of knowing basic aspects of the disease and the procedures to be done in order to attend the sick person's daily life needs must be emphasized to the students.

Table 3 expresses the Brazilian OMCS statements about the prerequisites for home care of a sick person.

Table 3. Template: *"Before starting home care of a sick person it is necessary to _____ "*

Category	Percentage of related contributions
Learn about how to take care of sick people	20.0%
Clean and arrange the environment	16.4%
Contact a doctor	14.5%
Others	49.1%

The difference between this template and the template presented in Table 1 is that here, the template focuses on what is necessary *before* care, e.g., it necessary to wash your hands before any home care procedure.

The most cited category related to this statement reveals that caregivers are often unsure that they have sufficient knowledge to care for the patient, alerting the instructor to make sure that students know where to find information and that they know how to determine if their knowledge is sufficient. Caregiving can often be a stressful situation for the caregiver. This information goes towards what has already been mentioned in [4] – that it is necessary to identify the characteristics of the caregivers to promote programs that can help mitigate any negative impact that

home care procedures can generate and can help to identify factors that can assist caregivers in their tasks.

Home care patients often have restricted mobility, so measures like removing rugs that present a hazard of slipping, and making sure furniture does not block paths through the home are often required. The second most cited category shows that people are concerned about the importance of arrange the environment. However, the specialist has missed information about how people usually arrange the environment when they are going to home care a patient. Considering that, the specialist has mentioned that it is important for the instructor to emphasize to students that they have to tell caregivers relevant information about how to arrange things in an environment, so that it will be adequate for receiving a patient.

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. It is good to 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. Another statistical data related to the users is that *more than 70%* of them are from the *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 States placed on the most economically developed region in Brazil. It is also interesting to point out that the majority of those users (21%) are interested in the *computers area*, followed by 6% interested in the *health care and education areas* and 3% interested in *arts.*

4. CONCLUSIONS AND FUTURE WORK

This work discussed the possibility of using the Common Sense knowledge stored in the Open Mind Common Sense (OMCS) knowledge base to help instructors in the design of instructional material for DL.

It is believed that Common Sense knowledge can be used to help instructors to (a) identify topics of general interest to be taught, (b) identify facts that are inadequate in order to fill in gaps in knowledge, (c) fit the instructional material content to the learner's previous knowledge, (d) provide a suitable vocabulary to be used in the instructional material and also (e) minimize the time used to prepare lessons.

Here it was presented the first analysis over the OMCS statements related to the health care domain, which are being used by two Professors of the Nursing Department of the Federal University of São Carlos to prepare a learning action which will be applied to nursing students of that university.

With this preliminary analysis it was possible to realize that there is a potential for using the Brazilian OMCS knowledge base in supporting learning, considering the domain that was chosen.

It is important to point out that the health professionals that analyzed this data have commented that the use of these statements can really help in the development of instructional material for undergraduate nursing students. It is believed that this type of procedure of using OMCS statements can be useful for general instructors and applied in other knowledge domains.

As future work, it is proposed to finish planning the learning action and to execute it. It is also intended to make available the support that commonsense can give in Cognitor, an authoring tool, based on the e-learning Pattern Language Cog-Learn [7], whose main objective is to support the instructor during the design and editing of the instructional material to be delivered electronically to the students on networks, CD/DVD, and the Web.

Also it is going to be explored possibilities 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 theme; and (b) select kinds of material suited to the learner's profile.

We also intend to develop other case studies and explore different domains and also to develop OMCS based tools to support health professionals and teachers in the task of updating knowledge.

5. ACKNOWLEDGMENTS

We thank Professor Rosely Moralez de Figueiredo from de Nursing Department of the Federal University of São Carlos, which together with Professor Silvia Helena Zem-Mascarenhas, is playing the role of health specialists in the case study mentioned in this work.

We also thank everybody who has been contributing to increase the Brazilian Open Mind Commonsense Knowledge base.

6. REFERENCES

[1] Liu, H; Singh P. ConceptNet: A Practical Commonsense Reasoning Toolkit. BT Technology Journal, v. 22, n. 4, p. 211-226, 2004.

[2] Lieberman, H.; Kumar, A., Providing Expert Advice by Analogy for On-Line Help, IEEE/ACM Conference on Web Intelligence and Intelligent Agent Technology, Compiègne, France, September 2005.

[3] Liebman, J. *Teaching Operations Research: Lessons from Cognitive Psychology.* Interfaces, 28 (2), 1998, p.104-110

[4] Zarit, S. H. Interventions with family caregivers. In S. H. Zarit & B. G. Knight (Eds.), A guide to Psychotherapy and Aging (pp. 139-159). Washington, DC: American Psychological Association. 1997.

[5] Mendes, P.B.M.T. Anonymous Heroes Daily Caregivers [dissertation] São Paulo (SP): Pontifícia Universidade Católica de São Paulo; 1995. /in Portuguese/

[6] Brazilian Open Mind Common Sense Website. http://www.sensocomum.com.br. Visited in 31/Jul/2005.

[7] Anacleto, J. C. ; Lieberman, H. ; Tsutsumi, M. ; Neris, V. P. A. ; Carvalho, A. F. P. ; Espinosa, J. ; Zem-Mascarenhas, S. ; Godoi, M. S. . Can common sense uncover cultural differences in computer applications? (prelo). In: IFIP World Computer Conference (WCC2006), 2006, Santiago. Artificial Intelligence in Theory and Practice. New York : Springer-Verlag, 2006.

[8] Talarico Neto, A. ; Siva, J. C. A. ; Neris, V. P. A.. Design Patterns to Support Instructional Material Design for Distance Learning. In: Latin American Conference on Pattern Languages of Programming, 2005, Campos do Jordão, Brazil. Proceedings SugarLoafPLoP 2005, 2005. /in Portuguese/ /to be published/