

# Planning Learning Activities Pedagogically Suitable by Using Common Sense Knowledge

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## Abstract

*This paper illustrates the use of common sense knowledge, acquired from volunteers through the web, to support teachers to plan learning activities, which fit to pedagogical issues presented in renowned Learning Theories, so that effective learning can take place. It is approached in this paper how common sense knowledge is related to four Learning Theories, proposed by authors who are aware in the pedagogical area – Freire, Freinet, Ausubel and Gagné – and how computational technologies can make viable the use of this kind of knowledge by professors.*

## 1. Introduction

To promote an effective learning it is important to consider pedagogical issues during the planning of learning activities so that the learning process can be successful. This paper discusses the use of common sense knowledge collected collaboratively through the web to support teachers to prepare learning activities in order to reach pedagogical issues addressed in the Learning Theories proposed by four renowned authors: Paulo Freire [11], Célestin Freinet [10], David Ausubel [6] and Robert Gagné [12].

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], [5]. For example, simple statements as “ice is cold”, knowledge about the world as “Brazil is in Latin America”, habits like “people take the shoes off when they arrive at home” 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 teachers in their work, it was developed a case study in the context of the Brazilian Open Mind Common Sense Project (Brazilian OMCS) [8], which has been developed by the Advanced Interaction Laboratory from the Federal University of São Carlos Computer Department (LIA-DC/UFSCar), in partnership with Massachusetts Institute of Technology Media Laboratory, since August 2005.

In the case study, the Brazilian OMCS knowledge base was used to support two Professors from the Nursing Department of the same university (DEnf/UFSCar) to plan a learning activity about home care education. Considering a specific community, the professors have to teach their students about how to orient caregivers in the community. For this purpose, it was used a collection of common sense statement which have been gathered from the community considered.

It is important to point out that the computational technology plays a very important role in the planning of learning activities supported by common sense knowledge, since it makes possible to build up the necessary common sense knowledge base and gives teachers tools to access and explore the knowledge stored. Without this technology it would be very difficult to construct a knowledge base that group together the common knowledge shared by people with the same profile of the target group and even to explore this knowledge, considering the vast amount of information with which it is necessary to deal.

In this way, it has been explored researchers developed by a field from the Artificial Intelligence which study how computers can be provided with common sense and how they can use this kind of knowledge in their applications. The Brazilian OMCS

project [5], as well as the *Cyc* [15] and *ThoughtTreasure* [16] projects, approaches this problem in three work fronts (i) the construction of a common sense knowledge base; (ii) the common sense knowledge representation; and (iii) the development of procedures which allows the retrieval of relevant information to a specific context and the use of this information in computer applications (see Anacleto et al [2] for details of the Brazilian OMCS approach to the work fronts previously mentioned).

Since (a) there is a common sense knowledge base, (b) the knowledge can be filtered according to parameters such as age, gender, geographical area, etc., and (c) it is possible to analyze only the knowledge which is relevant to a specific context, teachers can assess common sense knowledge collected from people with the same profile than their target groups and make decisions related to the learning activity planning.

This paper presents some results of the case study previous mentioned. It is structured as follows: first it is discussed how common sense statements can be used to help teachers prepare learning activities pedagogically suitable; then, it is presented results of the case study; finally, some conclusions and future work are outlined.

## 2. Using Common Sense to Accomplish Pedagogical Issues in Learning Activities' Planning

For successful learning, teachers should consider a variety of pedagogical issues during the planning of learning activities [9]. Here, it is proposed the use of common sense knowledge to aid teachers in planning learning activities, so that issues presented in four traditional Learning Theories (Freire [11], Freinet [10], Ausubel [6] and Gagné [12]) can be addressed. Table 1 summarizes the suggestions of using common sense during learning activities' planning, which are approached in this research. Each item in the Table 1 is explained in the following.

First of all, common sense knowledge can be used to contextualize the learning activity to the target group needs. Freire [11] affirms that teachers might present new knowledge to students contextualized to their daily life. According to the author, it is useless to teach someone without taking into account his/her context. For the purpose of learning to be successful, teachers should be concerned about the students' common sense in order to stimulate their capacity of creativeness [11].

Freinet [10] also approach the need of contextualizing the learning to the students' life. For example, Freinet proposes that if teachers are going to teach students how to count, they should use elements, to which the students are familiar, i.e., if students are familiar with cities, teachers should use elements like cars, stores and buildings as the unit to the count process. However, if the students are familiar with farms, elements such as animals and plants would be more suitable to make them understand what is being explained.

**Table 1. Suggestion of using common sense to accomplish pedagogical issues addressed in Freire's [11], Freinet's [10], Ausubel's [6] and Gagné's [12] Learning Theories**

Purpose of use	Way of using	Learning Theories
To contextualize the learning activity to the target group needs	To identify topics of general interest	Freire and Freinet
	To fit the learning activity's content to the learner's previous knowledge	Freire, Freinet, Ausubel and Gagné
	To identify suitable vocabulary to be used in the learning activity	Freire, Freinet and Ausubel
To prepare learning activities which promote meaningful learning	To identify knowledge from the target group's domain to which new knowledge can be anchored.	Ausubel and Freire
To support the use of cognitive operator	To identify elements (metaphors and analogies) which can be used as cognitive operator [17].	Gagné
	To identify elements which can be used to compose cognitive operators. For example, concepts to compose a <i>Conceptual Map</i> [18], ideas to compose messages used as <i>Advance Organizers</i> [6], <i>Rehearsals</i> [7], etc.	Gagné and Ausubel

Concerning the learning activity contextualization, it is proposed here to use common sense knowledge in order to help teachers to (i) identify topics of the target group general interest; (ii) To fit the learning activity's content to the learner's previous knowledge and (iii) to identify suitable vocabulary to be used in the learning activity.

Considering that common sense consists of statements that most people agree with, teachers can think of analyzing the knowledge and finding topics of general interest, which can be approached during the learning activity. For example, if teachers find the statement "To take care of sick people at home is cheaper than at a hospital" in the Brazilian OMCS common sense knowledge base, they can decide to prepare a class explaining the cost-effectiveness of taking care of sick people at home.

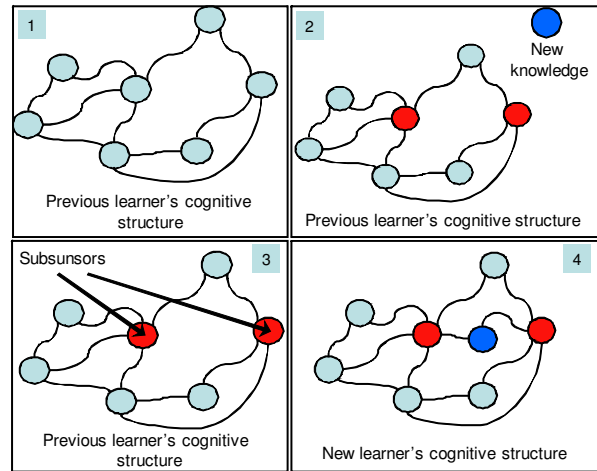
Moreover, teachers can fit the learning activity content to the learner's previous knowledge, so that they do not waste time rehashing material already known by the students. For instance, if the teacher identifies right procedures that a person who is taking care of a sick person should perform before administering medication, there is no need to spend a lot of time talking about it again in classroom.

On the contrary, teachers can devote more attention to themes that are found incomplete or incorrect in the common sense knowledge base. Continuing a previous example, if target group thinks that it is cheaper to take care of a sick person at home and teachers turn out that there are studies which prove the contrary in certain cases, thus they can prepare learning material pointing to these studies. In addition to that, if teachers miss in the knowledge base any information they think it was important to be mentioned, they can call the students' attention to that information during the learning activity, checking if people from the target group just forget mentioning the information or if they do not know it. 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.

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

The need of contextualizing the learning process is clearly addressed in Ausubel's Learning Theory [6].

According to Ausubel, in order for effective learning to take place, the new piece of knowledge being taught should be anchored 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. It illustrates how new knowledge is anchored to previous knowledge.



**Figure 1. The meaningful learning process**

For example, suppose that the new statement "parkinsonians are dependent and need special care" is going to be presented to learners, who already know about other things that need special care. The *new knowledge* dot presented in the second frame of Figure 1 means "parkinsonian" and the dots indicated as subsensors in the third frame of Figure 1 refer to the concepts "dependent" and "special care". When the new knowledge "parkinsonians are dependent and need special care" is presented to learners, they can connect it to those previous concepts, performing a meaningful learning. It is important to point out that in the new learner's cognitive structure, the concepts "dependent" and "special care" becomes connected through the concept "parkinsonian". Considering that common sense is part of the learner's cognitive structure, teachers can analyze the common sense knowledge base in order to find interesting knowledge to which the new knowledge they are going to present can be related.

Furthermore, it is possible to find metaphors and analogies in common sense knowledge bases, as previously demonstrated in [4] and [13]. According to Liebman [14] and Neris et al. [17], these elements can be used as a stimulus to activate the use of cognitive strategies by the learner. According to Gagné [12], 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 metaphors and analogies, teachers can use common sense to help them to use other cognitive operators such as *Conceptual Map* [18], *Advance Organizers* [6], *Rehearsals* [7], etc (See Carvalho [9] for details).

It is worthy to point out that this research's proposal is not to use common sense knowledge as learning material, but give the opportunity for teachers to analyze common sense statements gotten from people who have the same profile from their target group, so that they can have some idea about how they talk about specific themes, and direct the learning activity to the learners needs.

### 3. The Homecare Education Case Study

To test the use common sense knowledge to support teachers 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 it can be noticed that if teachers 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.

It is worthy to call attention to the fact that there are three groups in our study: instructors (Nursing course teachers), expert learners (nursing students) and community (caregivers). So, the common sense-based approach adopted here is to support teachers from Nursing Course to use common sense knowledge to teach nursing students, but the common sense which was considered is the common sense from a certain community (the caregivers' knowledge, not the nursing students' knowledge). It gives teachers and students

information about the community they are going to work with, the context, and the caregivers' profile that the experts are going to interact with. Instructors have the common sense knowledge base support to know the caregivers' practices on home care and, knowing about their context, will be more prepared to teach their students on how to approach the caregivers from that community.

For this research, it was selected statements from the Brazilian OMCS knowledge base. Brazilian OMCS is being built with the contributions of people who tell about their everyday life, filling out templates presented on the project's site. It was considered only one statement of each contributor, removing repetitions from the same contributor, following the health care expert's (Nursing Professors) 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 experts' criteria. It was adopted a process with three steps:

1. From the Brazilian OMCS it was extracted 12 tables – one for each template related to healthcare domain which were provided on the Brazilian OMCS project's site;
2. These tables were presented to the teachers;
3. The teachers used these tables to identify topics to cover in their course.

For example, for the template “In order to take care of a sick person it is necessary to \_\_\_\_\_” it was 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 2: “To have basic knowledge about the care of sick people at home”.

**Table 2. Template: “In order to care for a sick person at home it is necessary to \_\_\_\_\_”**

Category	Percentage of related contributions
To have basic knowledge of the care of sick people at home	57.7%
To pay attention to the sick person	7.7%
To keep the environment clear for people with restricted mobility	7.7%
Others	26.9%

In Table 2 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.

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, and compiled in twelve tables which were provided to teachers. Those statements were supplied by more than 70 different users, of which 70% are male. It is pointed 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 about the context of the community their students would interact, 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. All of them can be found in Carvalho [9].

#### **4. Conclusion and Future Work**

This work has discussed the possibility of using common sense knowledge in the Brazilian OMCS knowledge base to help teachers to plan learning activities which fit to pedagogical issues presented by Learning Theories such as the proposed by Freire, Freinet, Ausubel and Gagné.

It was presented some situations in which common sense can be useful and results of a learning activity which was planned taking into account common sense knowledge which was automatically collected [2],[3].

The idea here is that common sense knowledge can give information about the context of a certain community in order to help professionals to know in advance how to approach and act in that community. In the experiment presented here, Nursing Course Professors teach their nursing students about how to orient caregivers in a certain community to improve their home care.

Through this experiment, it was 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.

It is defended 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, it is proposed to develop learning activities in other domains, considering other students' profiles. Furthermore it is intended to perform experimental studies and analyze the impact of common sense knowledge in the learning process.

Finally, it has been explored the possibility of using the Brazilian OMCS to support learners in the learning process. It is going to be explored 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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