Analysis of Socratic Method in Computer Supported Dialog Games

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Abstract: In this paper we discuss the Socratic Method as a theoretical framework for a possible dialog game application in ICT. We assess if and if so to what extent the Socratic Method facilitates leaner motivation by highlighting key pedagogical aspects like facilitating self-regulated learning and high-level thinking in the learner.

Keywords: Socratic Method, Dialog Games, ICT supported Dialog Games, motivation, deep learning, knowledge building.

1. Introduction

Ravenscroft [1], amongst others, argues that dialogic interaction through dialog games is an essential part of information and communication technologies (ICT) based education. We discuss to what extent the Socratic Method can be integrated in dialog games. The focus here is on the potential of dialog games as an application of the Socratic Method. For a detailed research on the efficacy of ICT based dialogue game, one can refer to Ravenscroft & Cook [2].

2. Use of Socratic Method in Computer Supported Dialog Games

Our line of argument is thereby based on the relation between the Socratic Method and dialog games. The use of the Socratic Method in computer supported dialog games is effective because it may help to enhance the user's awareness of what is going on in the interaction regarding to reasoning [3] and it supports having a perspective of the other participants [4] which is essential for building social relationships [5] and for being more flexible on incorporating other's mental models [6].

The Socratic Method works in a dialectical and dialogical way where the teacher asks questions to help learners to examine their existing ideas and the validity of their statements. Learners are required to think about their own reasoning and their responses [7]. Teachers may thus use the Socratic Method to improve argumentation skills of learners and help them to be independent and critical thinkers. The teacher becomes a learning partner [8] with a goal to help the student to discover knowledge. Socratic interaction in a dialog may show knowledge gaps across students. While in the original version of the Method questions are always of a disjunctive yes or no type, a new version of the method should run along questions that make the learner find answers which go well beneath the surface of the subject matter.

So what kinds of questions should the teacher ask then? The pertinent literature suggests a number of different options. As space is limited, we cannot discuss all of them here but select Erdogan & Campbell's [8] taxonomy based on Graesser and Person's [10]

work in Table 1. Taking a look at this taxonomy, questions 6 to 12 are especially interesting for remodeling the original Socratic Method in terms of active knowledge building and deep reasoning. Questions for definitions, interpretations, or causal consequences, etc. activate the learner's reasoning in terms of larger cognitive patternings like cause and effect, general and specific, or the whole and its parts relations, amongst others.

Table 1: Question taxonomy based on Graesser & Person [10]

Question Type	Description	Example
Open Ended-Question		
(6) Definition	Determining meaning of a concept	What do you think that is ?
(7) Interpretation	A description of what can be inferred from a pattern of data	Now what is another thing that can happen ?
(8)Casual antecedent	Asks for an explanation of the consequences for an event of state	What happens to a balloon if you keep blowing it up?
(9) Casual consequence	Ask for an explanation of the consequences for an event of state	Molting… they slow down and they do not move very much if you have a lazy worm it probably preparing to molt or what else it might be preparing to do?
(10) Enablement	Asks for an explanation of the object or resource that allows an agent to perform an action	So what are we going to do with these potatoes? Where is the seed then?
(11) Expectation	Asks about expectations or predictions	So when do we take it back out ?
(12) Judgmental	Asks about value placed on an idea, advice or plan	

These question types lay the foundation for computer supported dialog games that are based on real-life teacher/learner interactions (Figure 1). For example, the teacher uses the questions in section [p] and [q] (underlined) to probe further into the learner's mindset, getting him to specify his knowledge about the problem at hand in more detail. The first question in line 275 is of the type 'enablement'. The learner is to explicate what kind of action a voltage reading is. He might therefore refer to its function, and prerequisites, for example.

275	*TUT: <u>what do you remember about makiing voltage readings?</u>	
276	*STU: you must make sure that the leads are connected to the	
	correct part	
277	of the circut and that you must make sure that the positive	[p]
	and	
278	negative ends are matched up correctly.	
279	*TUT: good, you correctly mentioned that you should observe	
	polarity,	
280	although technically that is not an issue in ac circuits since	
281	polarity alternates back and forth.	[q]
282	*TUT: <u>but what did you mean about connecting the leads to the</u>	
	<u>correct</u>	
283	<u>part of the circuit?</u>	
284	*STU: you have to make sure that the leads go onto the part of the	
	circut	
285	that the power flows through so that you can get an accurate	
286	measurement of the energy going through whatever it is you	[p]/[r]
	are	
287	measuring.	

Figure 1.A real-life teacher/learner interactions in a dialog [11]

In lines 282-83 the teacher requests clarification as to what the learner meant about connecting the leads to the correct part of the circuit in his answer to the initial question. This question is of the 'definition' type. Generating these sorts of questions and structuring the cognitive processing of the learner along these lines in a ICT based dialog game seems to be a promising step towards an effective ICT application for teaching and learning. Dialog

lines 282-83 in Figure 1 can be converted into a computer supported dialog game application as in Figure 2. The game provides a list of meta-cognitive moves (e.g. challenge, agree, etc.) from which the tutor can choose. The game then provides a set of questions and openers for the tutor's questions that lay the basis for Socratic questioning. The openers are pre-given expressions that indicate types of cognitive moves expected from the learner.

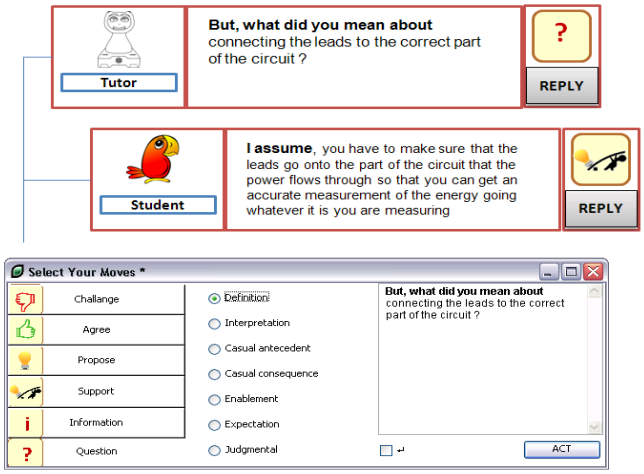

Figure 2. Dialog in Figure 1 can be converted into a computer supported dialog game application

3. Conclusion

Following recent research, we discussed the Socratic Method as a possible dialog game application in ICT. To conclude, we argued that the Socratic Method has potential to support learner motivation and deep learning. Moreover we consider dialog games suitable applications for integrating the Socratic Method into ICT based education.

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