

LASAR Sample workshop design

Can a robot hear?

Developing students' appreciation of why some questions are more amenable to science than others.



1) Objectives

The objectives are for students to:

- Enhance their understanding of what it means to be human.
- Enrich their conceptualisations of careers in engineering and in the caring professions.
- Appreciate that some questions are more amenable to science than others.
- Become equipped with the attitudes and understanding that enables them to be wise and compassionate consumers, co-workers and inventors of new technologies.
- Appreciate that while some scientists and engineers are only interested in biological and mechanical questions – many others are motivated by multidisciplinary questions.

2) Session structure:

a) Introducing the terms: ‘bridging questions’ and ‘interdisciplinary questions’

The workshop starts with explaining that different subjects such as history, economics, science, philosophy, art and computer science, investigate different questions, and students may have particular interest in one or more of them. (*The facilitator may ask students, ‘Who likes history? Who likes science? Who likes engineering’ and so on*).

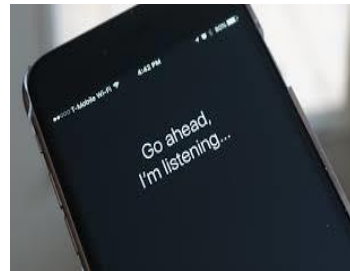
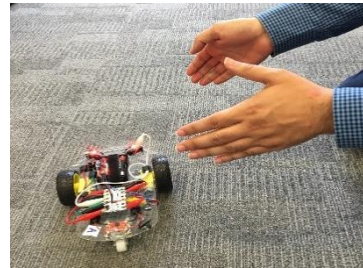
Then it is explained that there are some questions that students might be interested in, but that could not be investigated by any one of these disciplines alone. These are called bridging questions or interdisciplinary questions. (*The facilitator asks students if they could suggest some interdisciplinary questions.*). Then the facilitator explains that in the workshop they are going to think about some questions that robot engineers in particular are interested in, and that these questions are better understood and possibly better answered if we bring several disciplines into the discussion.

b) Can a robot hear?

The facilitator asks students to give their opinions about whether we can design and build a robot that can hear (*There is a work sheet with these two questions: 1) Suppose you were designing a robot that can hear – how would you address that challenge? 2) How would the robot demonstrate that it can hear (if it can hear?)*)



Then the facilitator demonstrates a robot that starts and stops moving on the sound of a clap and again asks the question, 'can this robot hear'? The aim is to help students consider whether there is a distinction between 'hearing' and 'responding to sound'. Students are asked whether there is a difference between a person hearing and a robot hearing. Pupils may suggest that 'understanding' or 'emotions' are involved in the person hearing. The list of the differences between a robot hearing and a person hearing is written on the board by the facilitator. (*Participants may suggest that hearing for a person is more complicated than just a responding to a clap. In that case the facilitator may ask what about a Siri, does Siri hear what the user says and if this is hearing how this is different from a person hearing*).



The aim of this discussion and activity is to help students consider that a term such as 'hearing' could be used in different disciplines where it might take on slightly different meanings.

c) The difference between a humanoid robot and a human being

The facilitator explains what a humanoid robot is (*perhaps showing some interesting photos or video clips*). She/he asks the group of students to do a simple task (such as raising their hands a couple of times). Then the facilitator asks the students to imagine that there is a group of humanoid robots in one room and a group of students in another room and that both groups have been asked to follow the same instruction (raising their hand). The facilitator asks, 'what are the similarities and what are the differences between these groups and what they are doing?'. The point is to discuss the difference of 'rule following' between programmed



humanoid robots and the human beings. These are the questions for thinking and discussion:

- Would the robot get tired if we asked them to do this repeatedly many, many times? Would that be a difference between a humanoid robot and a human being? (*If students say robots never get tired in the way that a human being gets tired, the facilitator may ask them to list the signs of tiredness in humans and say, 'how about if I give this list to an engineer and ask for a group of robots that show all these signs after repeating the job for a certain number of times. Does this reduce or even fill in the gap between the robots and the human beings?'*)
- Do you think that any of the humans or robots or both would start to get cross if they are asked to do this for several times? (*The facilitator can then say that the engineers will be asked to address this gap in their design.*)
- Do we expect any of them in either group to refuse to follow the instruction after a while? (*The facilitator can again say that this will be addressed in the design of the robots*)
- Does the Robot-group understand what they are doing?
- In general, can engineers fill the gap between humanoid robots and human beings?

d) Two questions for students who say 'no' to the last question?

- Why do you think even in the future engineers cannot fill the gap?
- What might be special about being human that cannot be produced by engineers and scientists?

e) Final questions:

The facilitator writes the following questions on the board and asks students to discuss if these two questions are different or not, and what they think their answer to each question is:

- Can we make a robot that cannot be distinguished from a human being?
- Can we make a robot that is the same as human being?

f) Conclusion

The facilitator sums up the workshop by highlighting the following points from the workshop:



1. In this workshop we discussed the meaning of the word 'hearing' and the importance of being clear about what we mean when we use it to describe what a robot and a person do when they respond to sound.
2. We also discussed terms such as 'knowing', 'understanding', 'learning', 'thinking', 'feeling', 'appreciating', 'resisting', 'getting tired' and how they might apply when thinking about human beings and robots.
3. We discussed whether it would be possible in the future for science and engineering to fill the gap between a humanoid and a human being. We also asked, if not, what might be special about being human that cannot be produced by science and engineering?
4. We noted that scientists and engineers can inform our thinking about the mechanical and biological processes involved in hearing, thinking, feeling and other human behaviours. There are other aspects of hearing – particularly subjective aspects – which are less amenable to science.
5. Finally it is worth noting that many scientists and engineers are themselves interested and engage in discussions that go beyond their specialisms – they are polymaths with many and diverse interests.

