Robots for Groups with Teenagers: Co-Design and Group-Robot Activities and Materials

I. Introduction

This document collates all co-design activities and group-robot activities utilised in a summer school-research project undertaken at KTH, Royal Institute of Technology Summer 2021. We make these activities available for other researchers interested in co-design and/or the study of group-robot interactions, in which case researchers can cite our ROMAN 2022 publication:

Gillet, S., Winkle, K, Belgiovine, G., Leite, I, "Ice-Breakers, Turn-Takers and Fun-Makers: Exploring Robots for Groups with Teenagers" *IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)*. IEEE, 2022.

These activities are also well suited for use in e.g. robotics extracurricular activities or university outreach, for which we make these materials available unreservedly. Some of these activities build on elements of the MIT ethics curriculum citation. An Ethics of Artificial Intelligence Curriculum for Middle School Students was created by Blakeley H. Payne with support from the MIT Media Lab Personal Robots Group, directed by Cynthia Breazeal.

List of Tables

List of Figures

TABLE I: Co-design activities used to get participants thinking about multimodal group behaviours and how they influence group discussions ahead of co-designing the action space for a group assistant robot given with a brief description and resources for replication.

Activity	Description	Resources for Replication
Focus Groups	Reflections on teenagers' expert knowledge with respect to groups and exploring initial ideas of how social robots could support and improve group working.	Topic guides in Figures 1 and 2
Telephone Game Activity	Adapted version of the telephone game where participants had to pass a message (in this specific case, an emotion) between themselves using only specific communication modalities.	Communication modalities: movement, facial expression, sound (no words)
Group Discussion Activity	Timed group discussions where one participant took a constraint and/or a prompt which the other group members had to identify while reflecting on how that impacted on the group experience	Modality Constraints cards provided in Figures 4 Discussion cards provided in [anon. for review] Prompt cards provided in Figures 5
'Robot Programming' Activity	Adapted version of the Group Discussion Activity where participants had to 'program a robot' (the first - third authors across their allocated groups) by instructing us how to deliver on that prompt, whilst we made sure to only act out explicit instructions given	Group assistant cards provided in Figures 5 Discussion Cards provided in [anon. for review]

TABLE II: Discussion based group activities used during our Robot Training sessions, which we suggest represent useful tasks/activities for investigating group and/or group-robot behaviour, alongside a brief description and links to resources required for replication.

Activity	Description	Resources for Replication
Designing Furhat	The group are tasked with designing a Furhat robot (its appearance, personality and dialogue) whose job is to talk to young people like them about studying robotics at university.	https://miro.com/app/board/o9J_l6kVEtI=/
Smart Your City	Pretending to be urban planners with the goal of renovating their city to be a leader in cutting-edge technology, smart solutions, and sustainability, the group will have to discuss and decide how to spend their resources to present the best project and be hired by the city-council.	https://miro.com/app/board/o9J_l5w6r9w=/
Interviewing Cozmo	The group will have to discuss and decide how cozmo should respond (utterances + displayed emotions) to the interview of a TV presenter, who will ask him (sometimes uncomfortable) questions about robots.	Interview pipeline provided in Figure 7
Re-Designing Youtube	Adapted from the MIT AI Ethics Curriculum: students must identify the different algorithms in use on YouTube, complete ethical matrices for these algorithms and based on their findings and conclusions re-design YouTube to provide a better user experience	https://miro.com/app/board/o9J_l5PMsoI=/
Speculative Futures	Adapted from the MIT AI Ethics Curriculum: students must examine the provided examples of technology and consider how they could be used for good or ill	Technology examplesgoogle doc and answer sheet google doc
Which Robot for the Job?	The group had to discuss and decide which social robot, from a list of provided ones, was the best candidate to be hired for a certain job (e.g. teacher, health care assistant, etc.). They then had to rank the remaining robots based on their suitability for the job.	https://miro.com/app/board/o9J_l3g5Z8Q=/
The Empathy Robot	Adapted version of the Empathy Monster by Todd Rice from MIROVERSE.	https://miro.com/miroverse/empathy-monster/
A Robot Story	The group can take 3 different paths to follow, each of which will lead them through a different story centred on social robots. At each step of the story, the group will have to decide what the robot can realistically do in that situation (given its actual capabilities), and what the robot could ideally do in the near future, if provided with improved technologies and higher social intelligence.	https://miro.com/app/board/o9J_l3V9EC0=/

TABLE III: List of post-session experimental measures to capture participants experiences of working with (or without) the robot during the robot training/group activity sessions.

Measure	Resources for Replication
No Robot Pre-Training Sessions	Provided in Figure 8
Group Observer Post-Training Sessions	Provided in Figure 9
Group Member Post-Training Sessions	Provided in Figure 10
Robot Teacher Post-Training Sessions	Provided in Figure 11
Robot Member No Robot Post-Session	Provided in Figure 12
Robot Member No Robot Post-Session	Provided in Figure 13
Final Evaluations about the Summer School	Provided in Figures 14 and 15

Setup	Name labels (including yourself!) Audio recording device
Part 1	**Welcome & introductions [5-10 mins]** *Remember this is the first time we will be in our groups! Take time to do around the group introductions. Perhaps everyone can introduce themselves and their favourite robots (sci-fi or otherwise) as we did when we introduced ourselves.* **Re-introducing focus group topic:** *"As [researcher] said earlier, one of the things we will be doing during the summer school is exploring how robots might be used to assist groups of young people, but to do that, we first need to better understand what it's like to be in groups of people your age. We are hoping you can teach us a bit about what kind of group experiences you have, and share with me what you know about groups. We're also interested in what you think about robots, before we tell you too much about our ideas."* **> Turn on and check audio recording device before moving on <** **Expert establishment + initial robot ideas [20 mins]** ● [Expert establishment] *"Can you tell me the last time you worked with others in a group (before today?). Maybe at school but what about other places like clubs or in sports perhaps? What sorts of activities do you do in that group?"* ● [Collage of robot images] *"Robots come in all shapes and sizes but we work specifically with what are called social robots. Social robots are those which are designed to be a bit more human or animal like, for example they can express emotions and seem to have some personality. They are normally designed to be friendly, fun and easy to interact with/understand".* ● [Naive thoughts] *"What do you think about using robots like this as group assistants? Do you think robots can be used to make your group experiences better? How could they do that?"* **Insight into groups [20 mins+]** ● [Understanding groups] *"If you see a group of people your age, can you tell whether they are working well and enjoying themselves? How can you tell? What about the opposite case, when something's not going so well perhaps?"* ● [Being in groups] *"What about when you're in a group, what does it*

Fig. 1: Topic guide for Focus Group 1 on (robots for) teen groups, utilising a mutual shaping approach: Page 1

	look, sound and feel like when you're in a group that is working well or enjoying being together? Again, what about the opposite case when it's not going so well? What does that look, sound and feel like?" ● [Improving groups] *"In that case where the group isn't working so well for some reason, how can you improve things?"* **Groups present back some reflections [10 mins]** **> Turn off audio recording and take a quick break! <**
Part 2	**Presentation on social robots for groups [10 mins]**
	Re-introducing focus group topic: *"Now that you've heard a bit about research on robots for groups, let's talk again about what we think a robot group assistant could do and how it could help."* **> Turn on and check audio recording device before moving on <** **Feedback on 'demos' [10 mins]** ● [Feedback on presentation examples] With reference to a copy of [researcher]'s slides depicting each robot/application/result: *"Firstly let's talk about those robots and applications we saw in* [researcher]*'s presentation, what did you think? Which one did you find most impressive? Could any of them have been made better?"* **Revisit robot ideas [30 mins]** ● [Revisit of robots for groups] *"Now that you've seen some robots in action, what do you think about robot group assistants? Do you think robots can be used to make your group experiences better? How could they do that?"* ○ tbc on the day based on time: drawing activity: *Can you maybe draw how this would look?* **Robot perception [10 mins]** ● [Towards co-design] *"In order to help, what sort of things do you think the robot need to look for in the group? What does it need to notice and respond to? How can it tell what to do and when?"* **> Turn off audio recording <**

Fig. 2: Topic guide for Focus Group 1: Page 2

On Robots for Groups

At the beginning of the summer school we asked what you thought about robots being used as group assistants, to make group experiences better. Do you remember what your thoughts and expectations were then?

What about now, after some time spent working with the robot? What do you think about using robots like this as group assistants? Do you think robots can be used to make your group experiences better?

Do you think there are other ways, different to our setup, how such a robot could help?
e.g. a common one was about reducing awkwardness in a new group specifically

On Our Training Setup

Remember we did all that stuff at the beginning about the importance of non-verbal communication - did you enjoy that or was it boring?

What about co-designing the robot's actions? Do you think it matters that the robot is using the actions you designed? Would it be the same if the robot was using actions designed by another group of students, or even adults/researchers like Sarah and I?

What about the training sessions themselves?

How does it feel that one of your group members is ultimately controlling the robot? Do you think about that when you're interacting with the robot?

How much do you think it matters who is teaching/controlling the robot? Do you think it would have been better if me or [researcher2] or [researcher3] would have done that instead?

On Child-in-the-Loop Machine Learning More Generally

Do you think it's important that researchers like us involve users like you this much during design and development?

Would you want to be involved in other ways? With other types of studies?

Fig. 3: Topic guide for Focus Group 2 towards the end of the study

Modality Constraints

no speaking (sound is ok, but no words)	no gesturing (sit on your hands!)	no head movements	no eye contact	no facial expressions (wear the mask!)
no speaking (sound is ok, but no words)	no gesturing (sit on your hands!)	no head movements	no eye contact	no facial expressions (wear the mask!)
no speaking (sound is ok, but no words)	no gesturing (sit on your hands!)	no head movements	no eye contact	no facial expressions (wear the mask!)
no sound (sound is ok, but no words)	no gesturing (sit on your hands!)	no sound and no speaking	no sound and no speaking	no sound and no speaking

Fig. 4: Communication modalities constraints cards

Group Prompts

Be super interested in what everyone is saying	Be super bored and uninterested	Disagree with everything the person to your left says	You think the person to your right is clever and amazing	Try to make sure everyone gets a chance to speak
Try to change the mind of the person to your left	You think the person opposite you has the best idea	You are really shy and would prefer not to say anything	You are really confident that your idea is the best one	You want everyone to take this question very seriously
Be super interested in what everyone is saying	Try to make sure everyone says something and gives an idea	Try to avoid any long silences	Try to provide some conversation starters	Tell some jokes/have some fun from time to time
Try to ask follow up questions to get people to speak more	Try to make sure everyone stays focussed on the question	Try to make sure everyone feels confident to speak (not judged)	Try to make everyone feel like they are part of a good team	Remind group there is no clear ‘right’ or ‘wrong’ answer
Make sure that everyone understands each other	Figure out who wants to speak and try to make it happen	Compare different answers		

Fig. 5: Prompts cards / Group Assistant cards

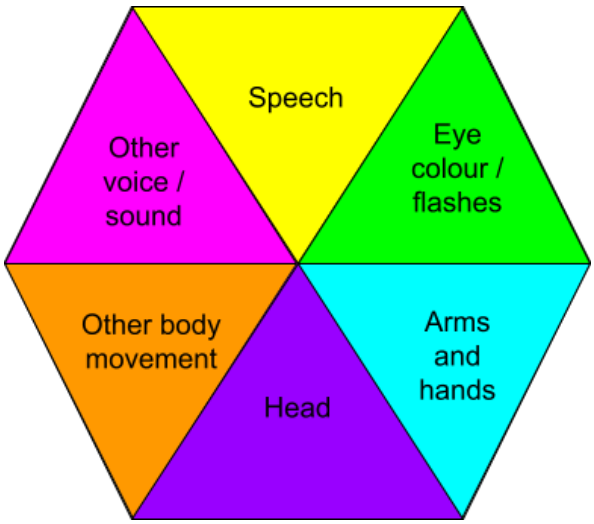
Action Name:
What is the aim of this action?
Is this action aimed at one person in the group, or at everyone/no-one?
When should this action happen?


Fig. 6: Action Design Template for the Robot Nao

The Interview

Decide what Cozmo should say and which emotion(s) it should display! (P: presenter, C: Cozmo)

P: Hello Cozmo and welcome! It's a pleasure to have you here with us! Thank you for accepting our invitation.
C:

P: You know, we asked your colleague Pepper to come here and talk to us about robots, but unfortunately, he was busy, so we called you.
C:

P: Let's get to know each other better. What do you like to do in your free time?
C:

P: Cozmo, but can you dance? Because you don't look like you can.
C:

P: Now let's talk about robots! The first question for you is: how will robots help us in our everyday lives?
C:

P: I have heard that robots are unfriendly and want to replace humans in all their jobs. Is this true?
C:

P: Can robots be dangerous and harm humans?
C:

P: Do you robots have emotions? And can you understand the emotions of humans?
C:

P: I think you are a very nice robot! I would like to have you as a friend!
C:

P: Can a robot and a human be friends?
C:

P: Thank you for taking part in this interview! It was a pleasure to have you here!
C:

Fig. 7: Cozmo interview questions for the *Interviewing Cozmo* Activity. Participants had to choose Cozmo's answer utterances and emotions to display by selecting them from the Code Lab of the Anki Cozmo app. After the training session, participants could replicate the designed scene on the real robot if they wanted to. With this activity, we wanted to make teens think about how robots can express emotions in different ways and how these can be interpreted differently by humans.

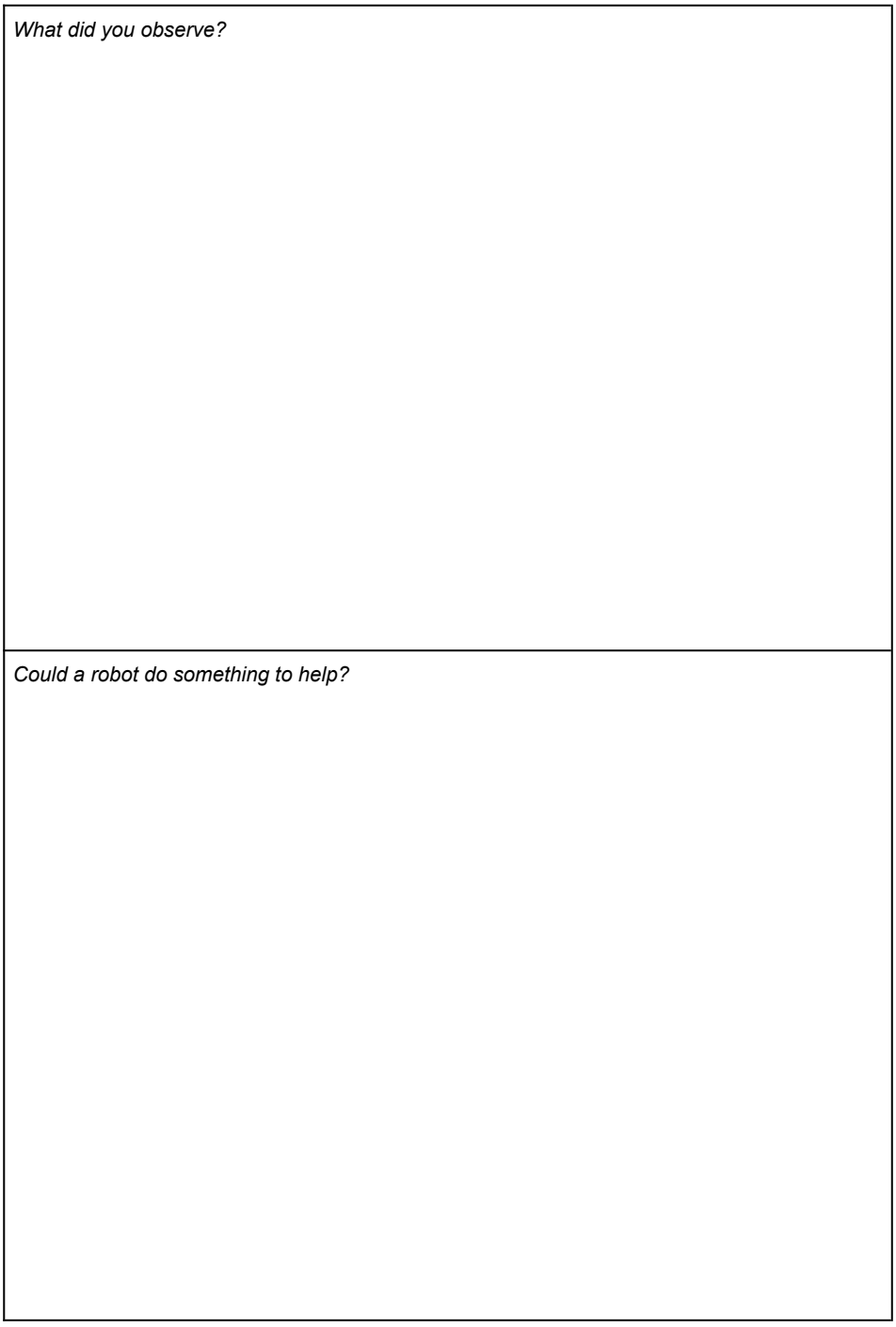


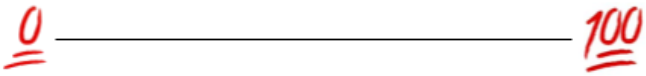
Fig. 8: Pre-training sessions with no Robot present, for group observers to observe group dynamics before robot introduction

Post-Activity Questionnaire for Robot Teachers: Group Understanding

Everyone in the group seemed to like the way they worked together:

Can you explain more - what did you observe?

I think the robot helped the group work well together:



Can you describe any specific moments where the robot seemed to have an impact on the group (good or bad)?

Fig. 9: Questionnaire to be filled in by the group observer, after the training session

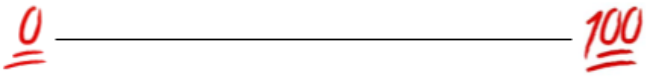
Post-Activity Questionnaire for Group Members

How much did you enjoy the activity?

We all liked the way we worked together.

Can you give some more details? How was the activity, how well do you feel the group worked together and why?

I think the robot helped the group work well together:



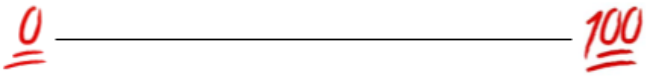
Can you describe any specific moments where the robot seemed to have an impact on the group (good or bad)?

Fig. 10: Questionnaire to be filled in by the group member, after the training session

Post-Activity Questionnaire for Robot Teachers: Actions

Everyone in the group seemed to like the way they worked together:

I think the robot helped the group work well together:



How did you try to have the robot assist the group? Do you think it worked?

Fig. 11: Questionnaire to be filled in by the robot teacher, after the training session

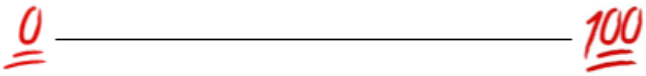
Post-Activity Questionnaire for Group Members

How much did you enjoy the activity?

We all liked the way we worked together.

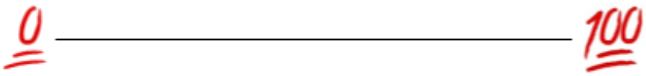
Can you give some more details? How was the activity, how well do you feel the group worked together and why?

I think the robot would have helped the group work well together:



Can you explain your answer:

I would have preferred it if the robot was here:



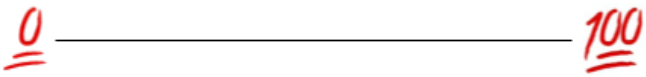
Can you explain your answer:

Fig. 12: Questionnaire to be filled in by the group member, after the NO ROBOT session

Everyone in the group seemed to like the way they worked together:

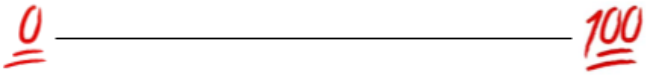
Can you explain more - what did you observe?

I think the robot would have helped the group work well together:



Can you explain your answer:

I think the group would have preferred it if the robot was here:



Can you explain your answer:

Fig. 13: Questionnaire to be filled in by the observers, after the NO ROBOT session

Name:	

Overall, how much did you enjoy the summer school?

Can you describe a few things you did/did not enjoy the most?

Overall, how much do you feel you learned during the summer school?

Can you describe a few things you learned?

Is there something extra you would have liked to learn, or something you would have liked to learn more about?

Fig. 14: Final general evaluations regarding the Summer School: Page 1

For the robot training sessions, who do you think was the best robot trainer/controller for teaching the robot how to help the group, and why?

Can you write three key words to describe the NAO robot you have designed and been testing?

1.

2.

3.

If you could invite two people from your group to your next birthday party, who would it be?

Fig. 15: Final general evaluations regarding the Summer School: Page 2