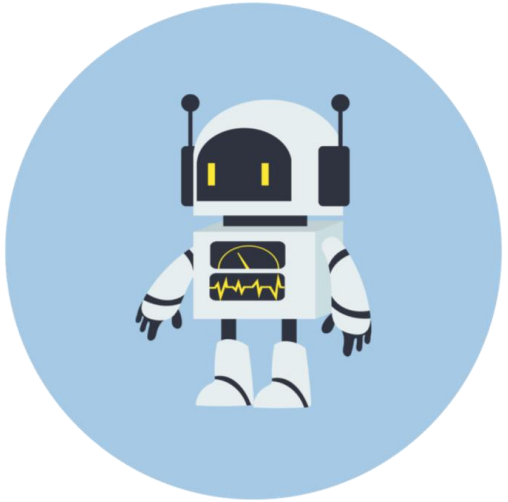
Examining Teachers' Opinions on the Potential for Using Social Robots in Philadelphia Public Schools



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Background: Social Robots

What are social robots?

- Robots designed to interact and communicate with people [1]

What are the advantages of social robots?

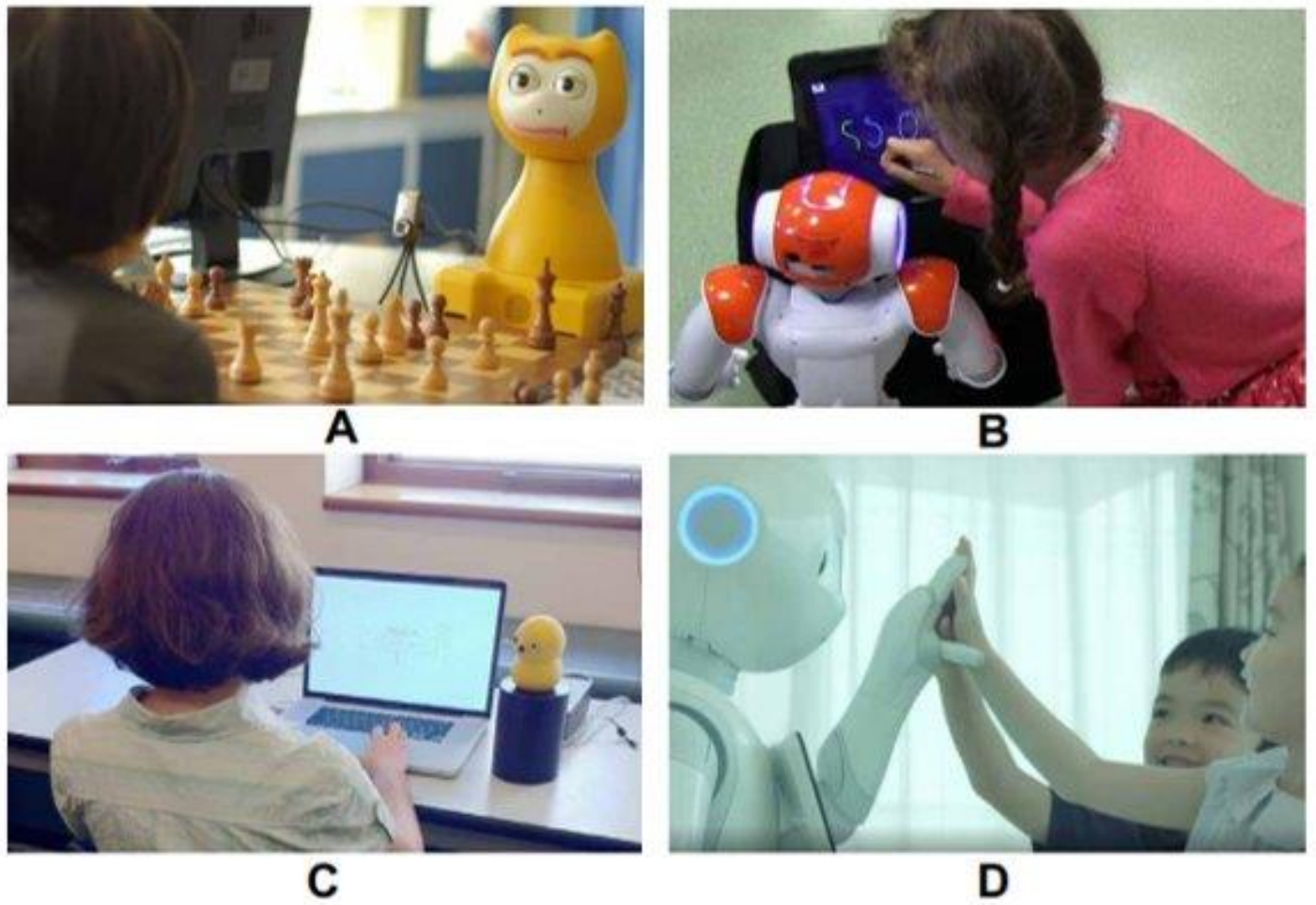
- Can act on their physical environment
- Allow naturalistic interactions[2]

Where are they used?

- Healthcare, therapy, **education**

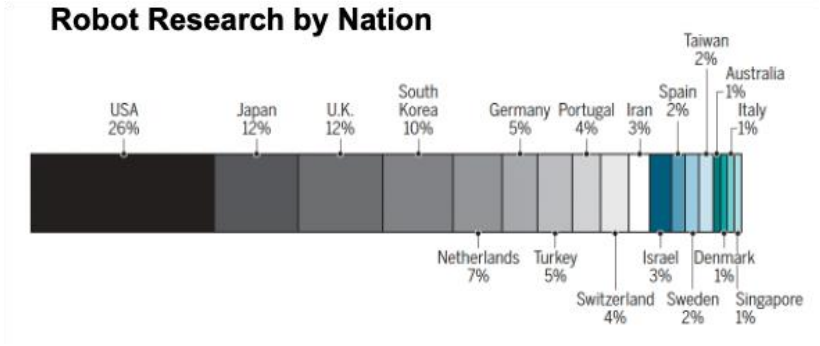
[1] Bartneck & Forlizzi, (2004). [2] Van den Berghe et al., (2018).

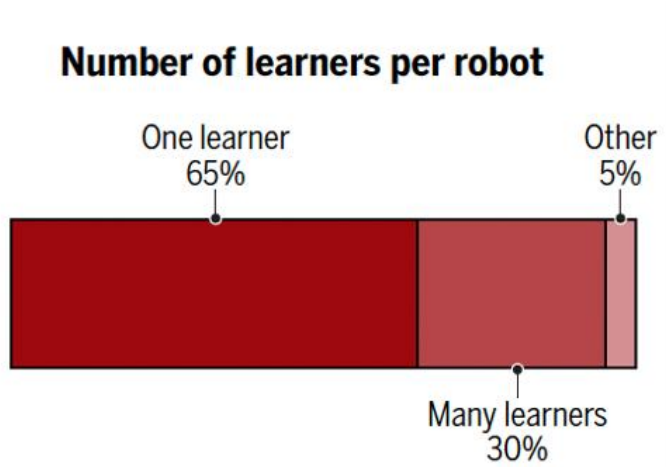
Social Robots in Education

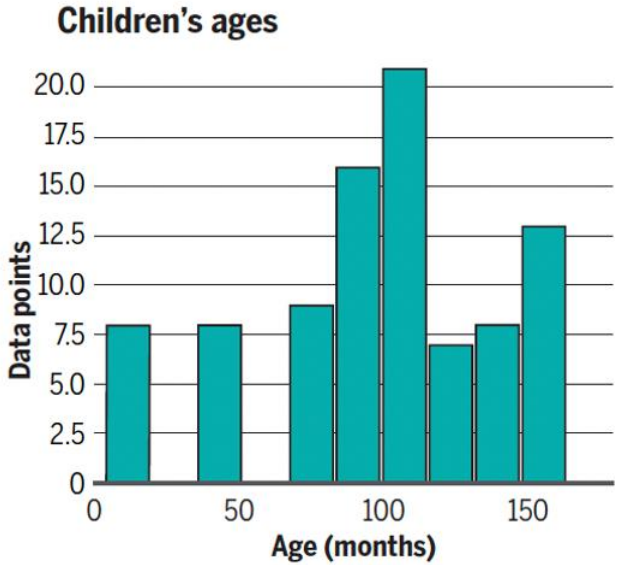


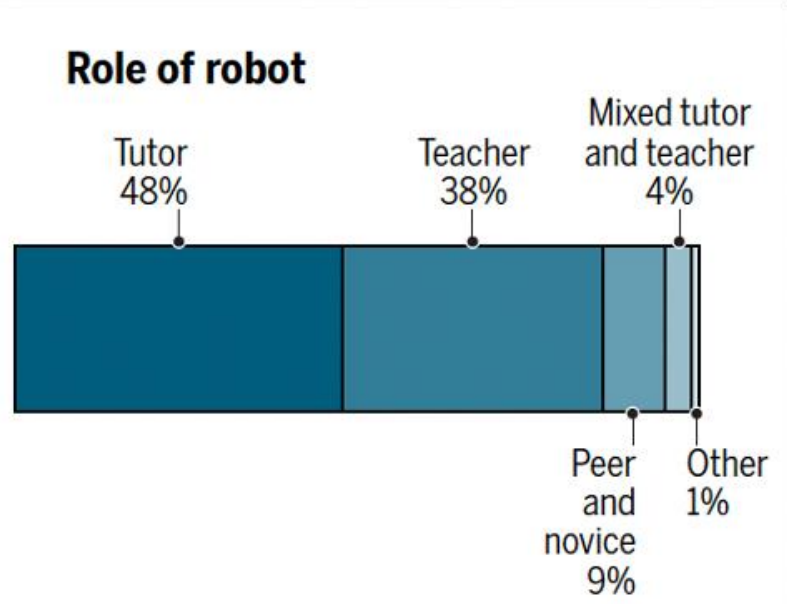
Belpaeme, et al. (2018)

Research on Social Robots in Education





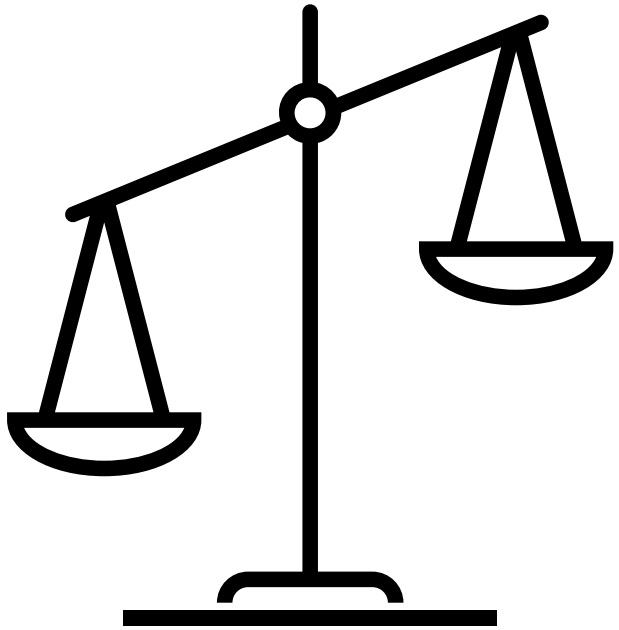




Belpaeme, et al. (2018) "Social robots for education: A review." *Science robotics.*

Research on Social Robots in Education

Impact of child robot use on social-emotional development



Efficacy of Robot

Preferences for Robot Characteristics

Social & Emotional Development
Why would robots have an effect?

- Predictions from other fields
  - Relations between “screen time” and poor performance on measures of social-personal developmental milestones[5]
  - Long-term influence of Alexa on children’s ability and desire to have face-to-face interactions[6]
- Children anthropomorphize robots[7]

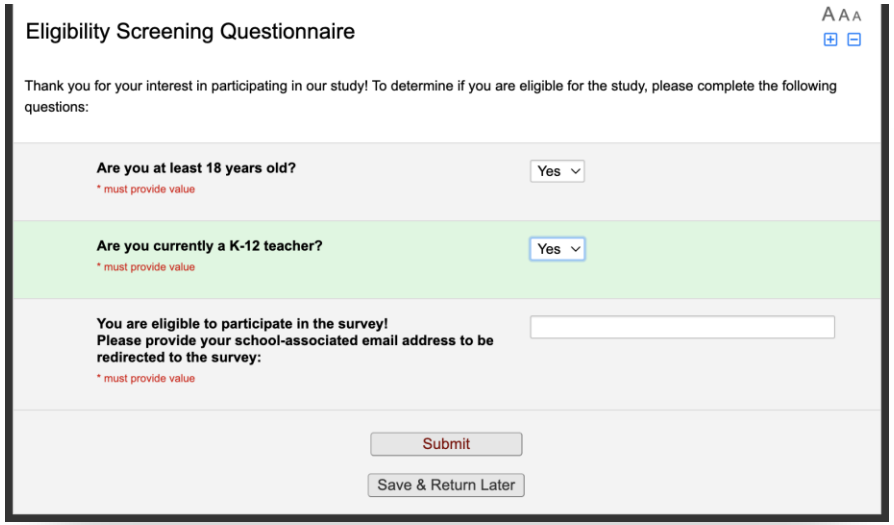
[3] Louie et al., (2021). [4] Reich-Stiebert & Eyssel, (2016). [5] Madigan et al., (2019). [6] Fairyington, (2018). [7] Beran et al., (2011).

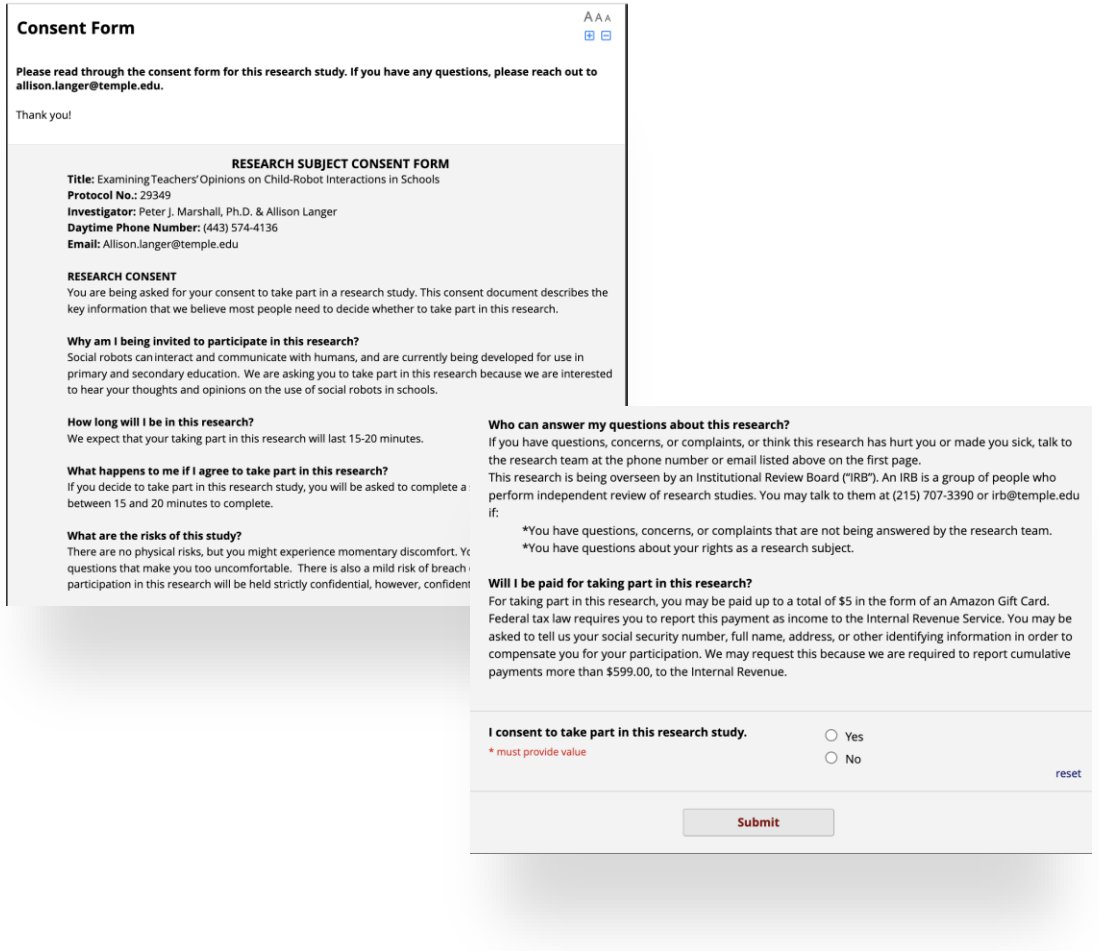
Social Robots & Socio-emotional Impact

Stakeholder Research

Examining Teachers' Opinions on the Potential for Using Social Robots in Philadelphia Public Schools

Study Participation – Eligibility & Consent





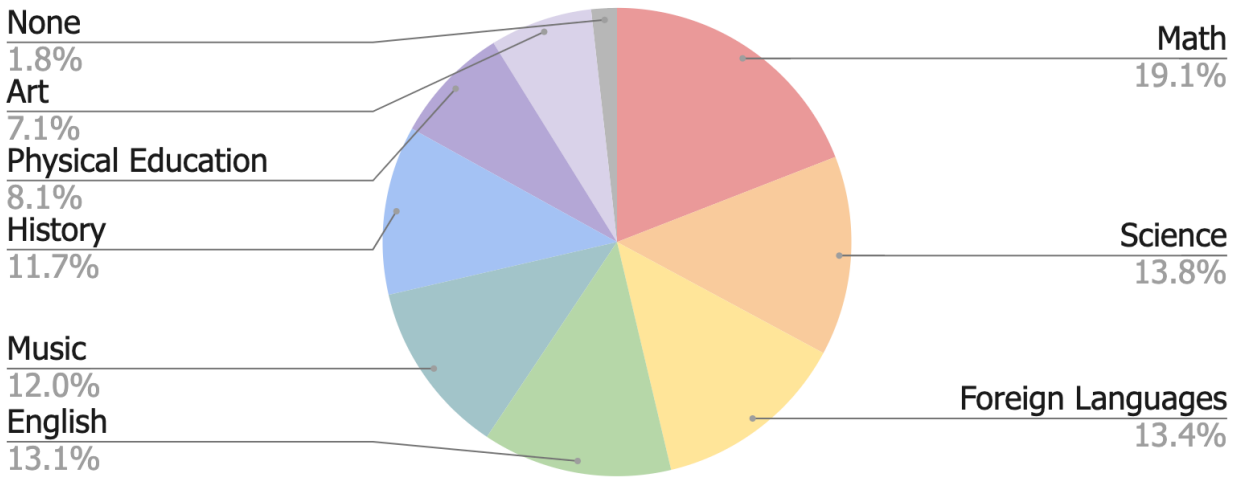
Methods

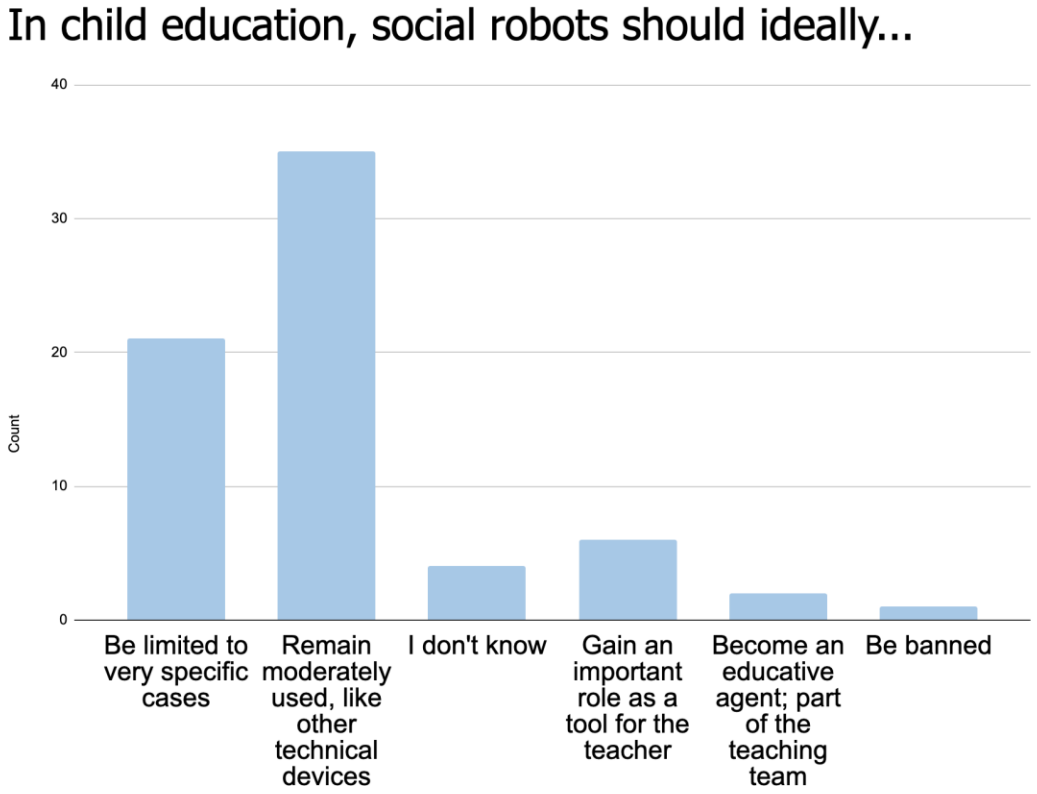
- Participants:
  - Teachers (n=69) in the School District of Philadelphia
- Measures:
  - Negative Attitudes Towards Robots (Nomura, 2006)
  - Social Robot Survey (adapted from Kennedy et al., 2016)
    - Robot's role in the classroom
    - Acceptability
    - Socio-emotional impact

Social robots, such as the one pictured below, can interact and communicate with humans. Such robots are being explored for use in primary and secondary education, given the increasing need for technology to support the efforts of educators in providing individualized, adaptive learning environments for children. Social robots can act autonomously to speak, move, use body language, and understand speech commands from humans.

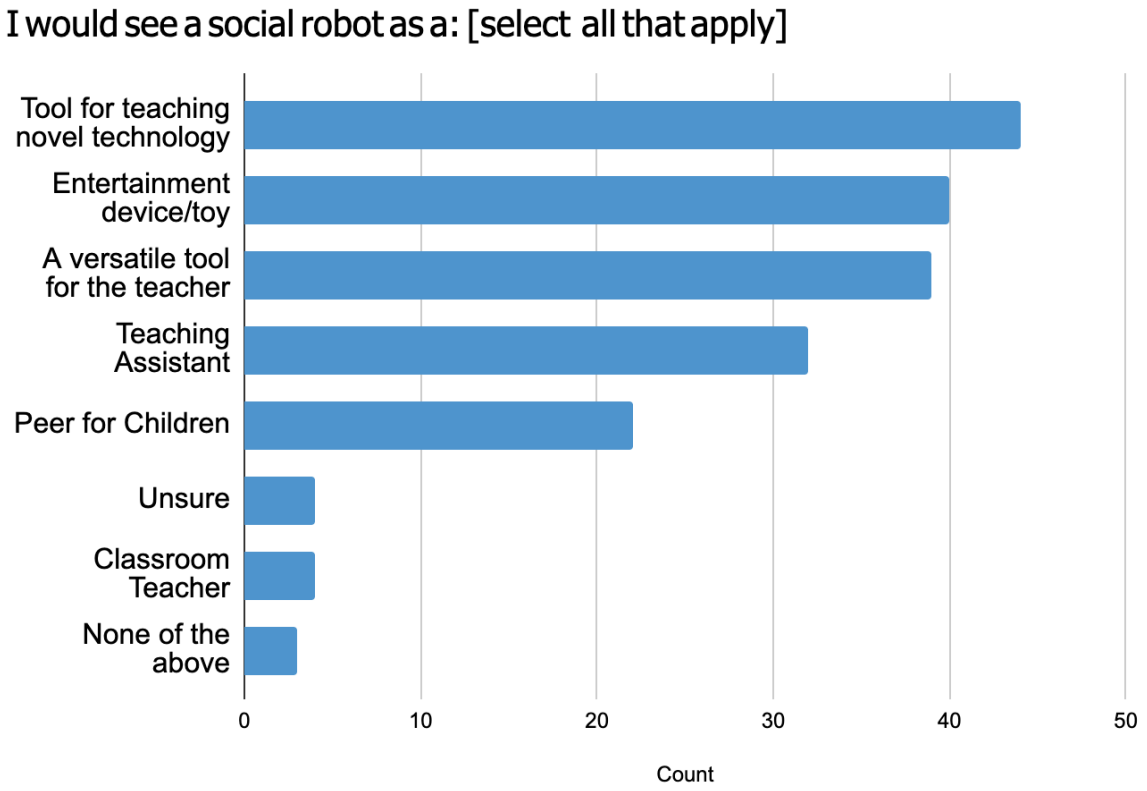
In classroom settings, social robots can use their capabilities to help children learn new words, complete math or reading tasks, and play interactive games involving imitation. Social robots are designed to interact with students on a frequent basis and could be implemented in the classroom for the entirety of the school year.

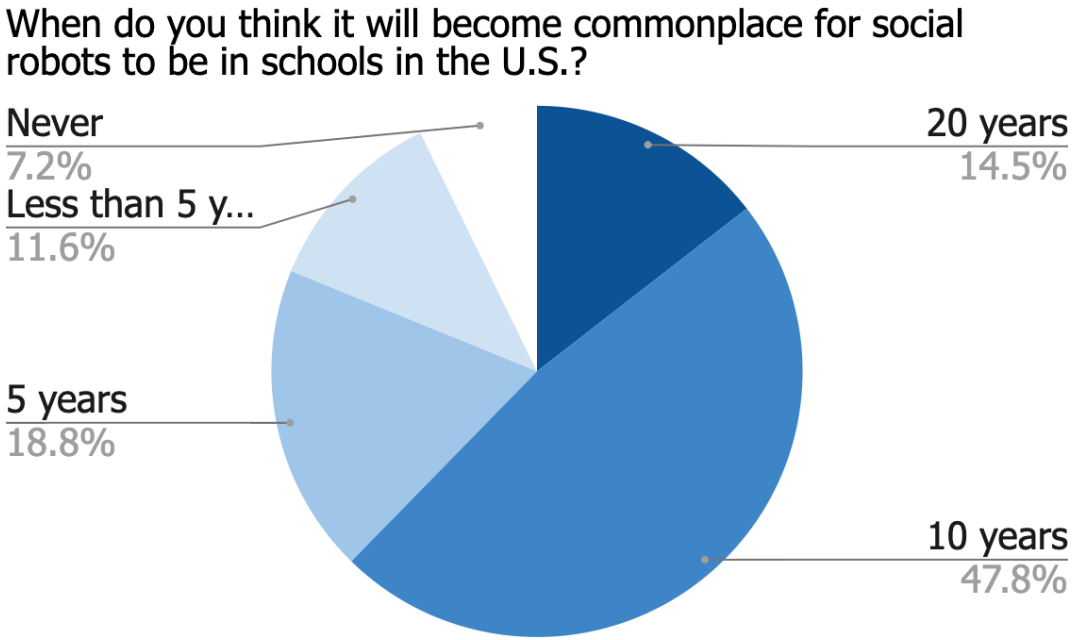
Results: A Robot's Role



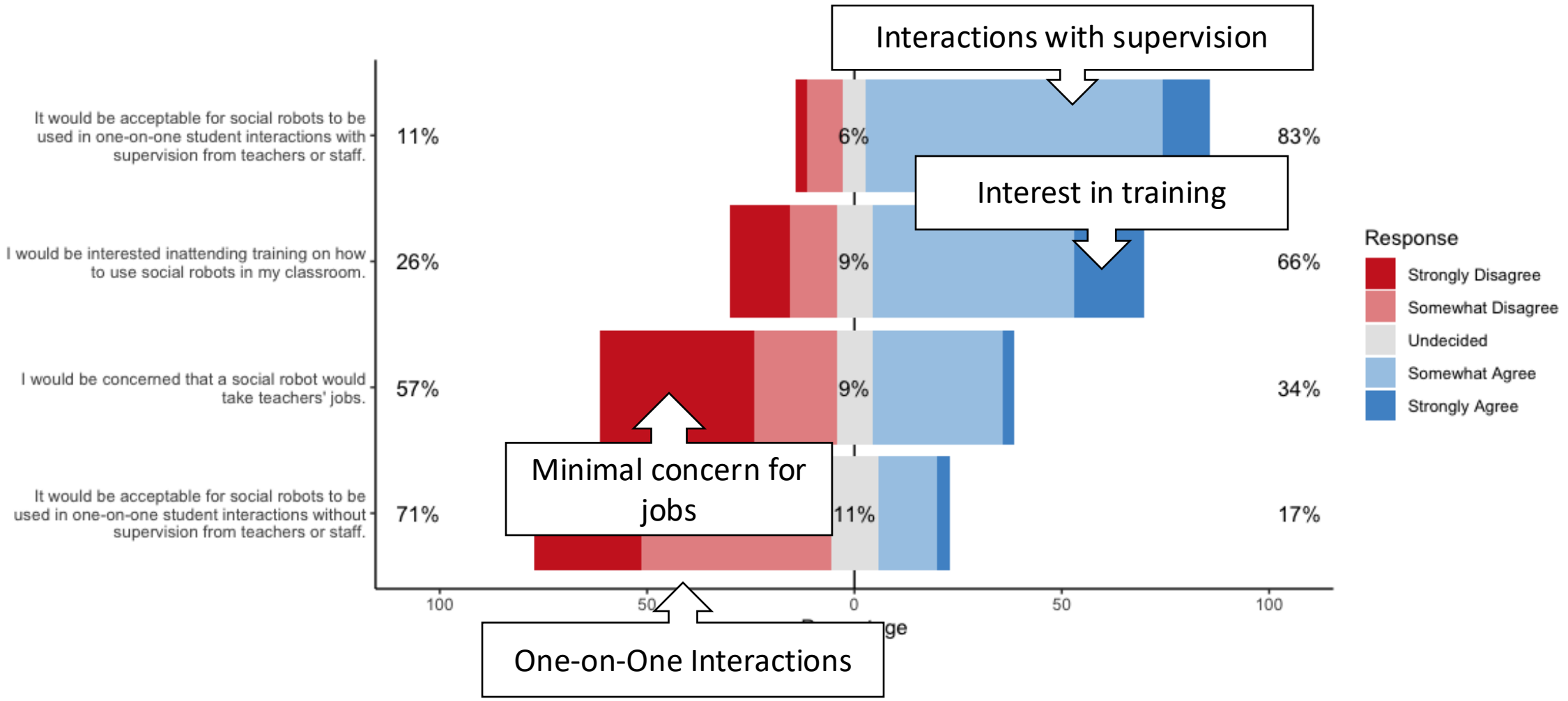


Results: A Robot's Role, Continued



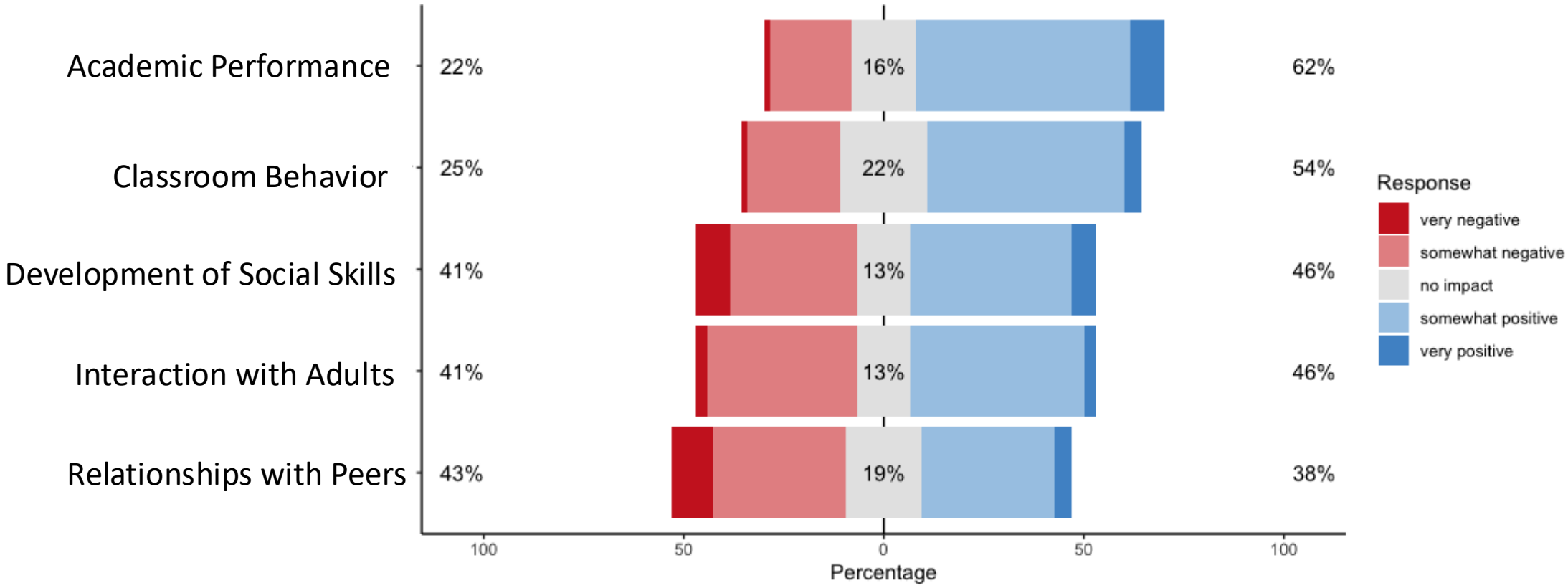


Results: Acceptability



Results: Socio-emotional Impact

In the long term, the use of social robots in schools would have the following impact on children's…



Results: Negative Attitudes Towards Robots

Table 2. Correlations of Survey Items and NARS Scores

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9
1. It would be acceptable for social robots to be used in one-on-one student interactions with supervision from teachers or staff.	3.81	0.91									
2. It would be acceptable for social robots to be used in one-on-one student interactions without supervision from teachers or staff.	2.20	1.11	.40**								
3. In the long run, the use of social robots in schools would have the following impact on children's academic performance	3.48	0.96	.56**	.31*							
4. In the long run, the use of social robots in school would have the following impact on children's classroom behavior	3.32	0.93	.56**	.28*	.68**						
5. In the long run, the use of social robots in school would have the following impact on children's interactions with adults	3.06	1.03	.62**	.39**	.68**	.64**					
6. In the long run, the use of social robots in school would have the following impact on children's social relationships with peers	2.88	1.12	.57**	.26*	.60**	.60**	.71**				
7. In the long run, the use of social robots in class would have the following impact on children's development of social skills	3.03	1.15	.57**	.38**	.66**	.66**	.84**	.77**			
8. I would be interested in attending training on how to use social robots in my classroom.	3.41	1.38	.46**	.15	.39**	.29*	.40**	.49**	.45**		
9. I would be concerned that a social robot would take teachers' jobs.	2.43	1.39	-.13	-.02	-.29*	-.12	-.22	-.27*	-.23	-.12	
10. .NARS Score	42.71	9.29	-.34**	-.24*	-.32**	-.35**	-.32**	-.44**	-.46**	-.42**	.36**

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. * indicates $p < .05$. ** indicates $p < .01$.

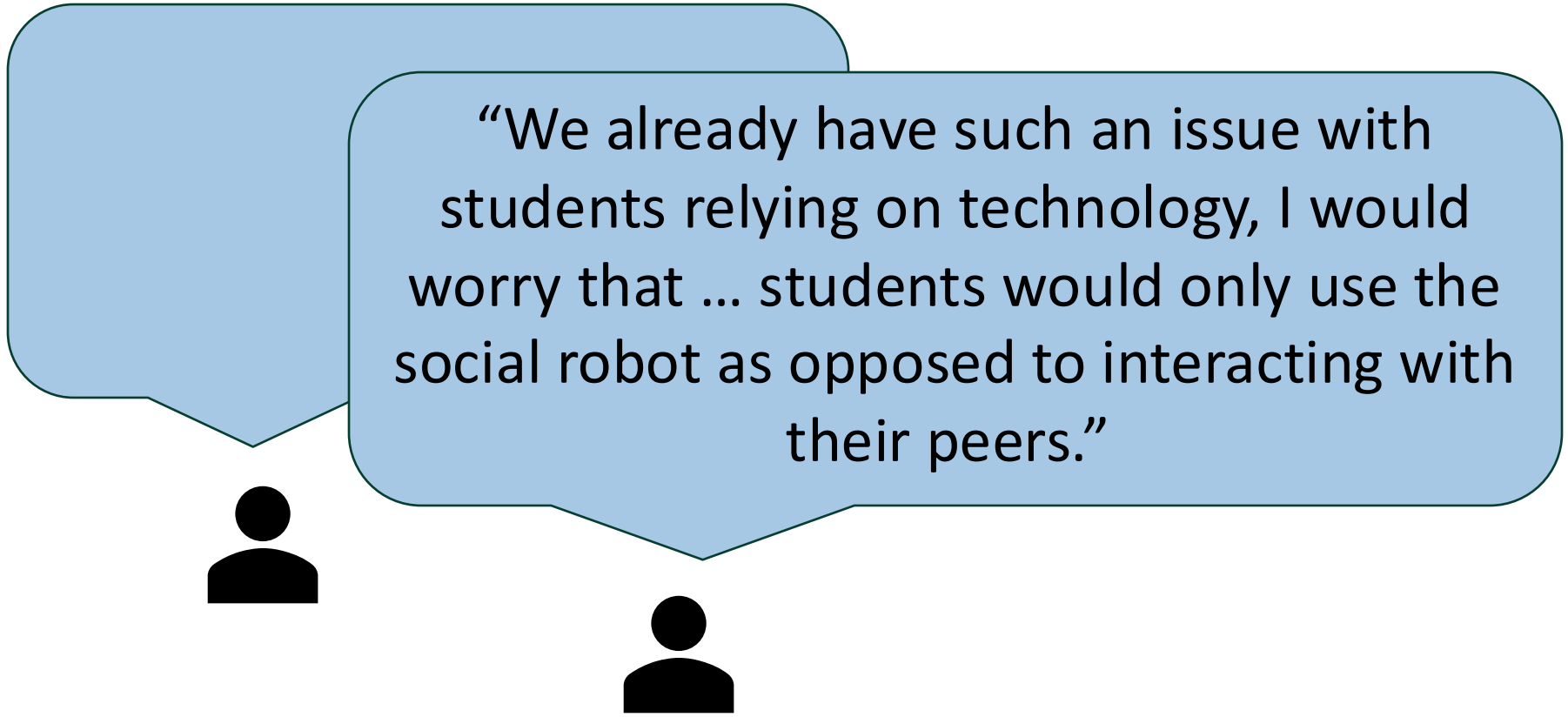
Results – Open Ended

“Please give your opinion on the possible advantages or disadvantages of having social robots in your classroom.”

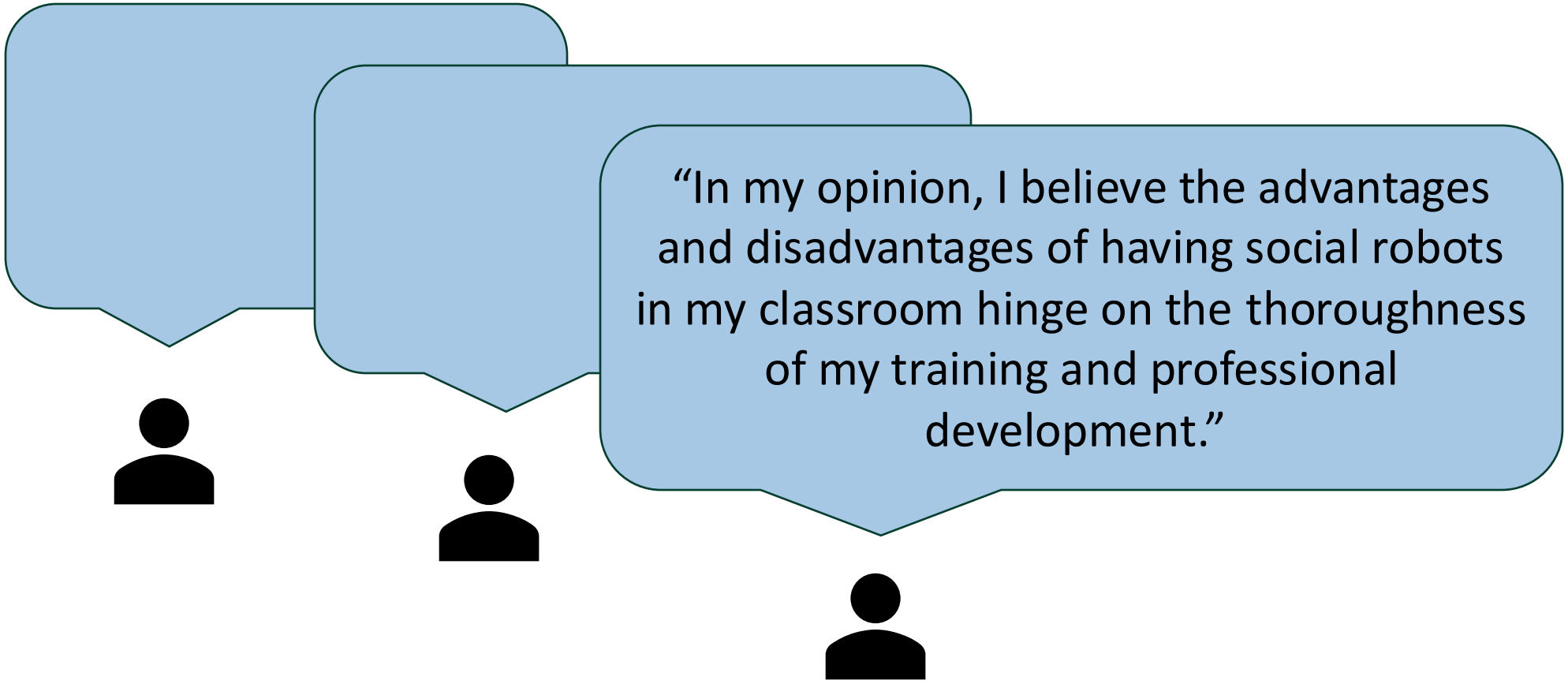
Theme I: Individualized & Adaptive Learning

"It may be an advantage to be able to give students more individualized attention, where applicable."

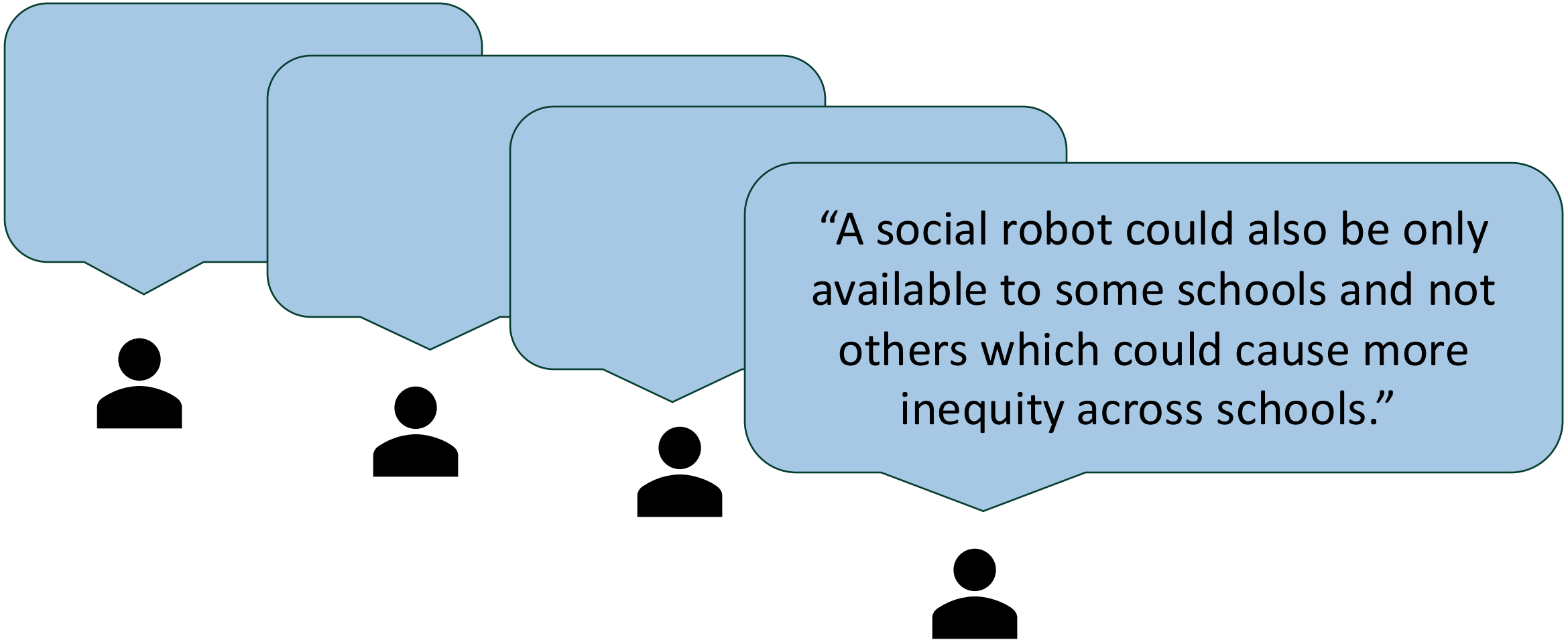
Theme II: Socio-Emotional Development



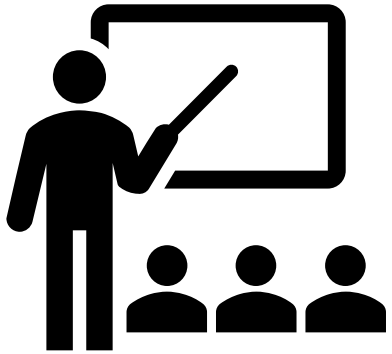
Theme III: Teacher's Role & Training



Theme IV: Equity & Accessibility



Discussion



Teachers saw robots as...

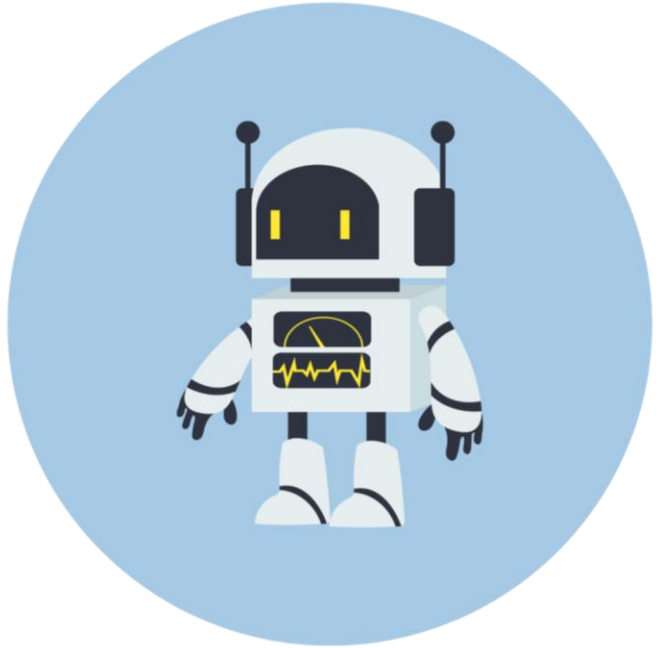
- an individualized educational use to supplement teacher instruction

Teachers acknowledged potential...

- inequitable distribution of the technology
- privacy risks
- **harmful effects on students' social development**

Implications & Future Directions

- Long-term studies of robots in classrooms with participatory design
  - Focus on socio-emotional ***and*** learning outcomes
- Research that focuses on user's individual differences
- Understand how robots compare to other forms of technology (screens, voice assistants, etc.)

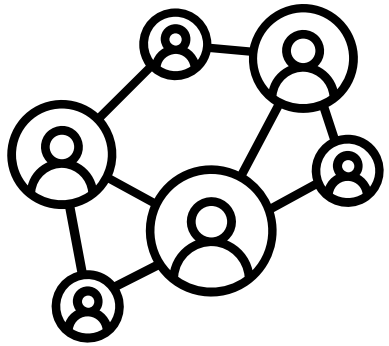


Thank you

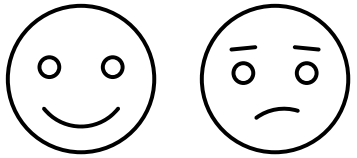
- School District of Philadelphia
- Advisor: Peter Marshall, PhD
- Funding agencies
- You all!

What is “socio-emotional development”?

Social development refers to a child’s ability to **create** and **sustain** meaningful relationships with adults and other children.



Emotional development is a child’s ability to **express, recognize, and manage** his or her emotions, as well as **respond** appropriately to others’ emotions.



https://eclkc.ohs.acf.hhs.gov/school-readiness/effective-practice-guides/social-emotional-development

Appendix – Sample Descriptives

Continuous Variable	***n***	***M***	***SD***
Years of Teaching Experience	69	14.65	10.29
Categorical	***n***	***%***	
Age Range			
18-24	2	2.9%	
25-34	17	24.6%	
35-44	27	39.1%	
45-54	16	23.2%	
55-64	7	10.1%	
Gender			
Female	46	68.7%	
Male	21	31.%	
Missing data	2	2.9%	
All other gender categories	0		
Education Level			
Some college (two years or fewer)	1	1.4%	
Associate degree	1	1.4%	
Bachelor's Degree	4	5.8%	
Master's degree	62	89.9%	
Master's degree & JD	1	1.4%	
Type of School			
Magnet School	14	20.3%	
Public School	54	76.8%	
CTE High School	1		

NARS (Nomura, 2006)

Item No.	Questionnaire Item	Sub-Scale
1	I would feel uneasy if robots really had emotions.	S2
2	Something bad might happen if robots developed into living beings.	S2
3	I would feel relaxed talking with robots*	S3
4	I would feel uneasy if I was given a job where I had to use robots.	S1
5	If robots had emotions I would be able to make friends with them.*	S3
6	I feel comforted being with robots that have emotions.*	S3
7	The word "robot" means nothing to me.	S1
8	I would feel nervous operating a robot in front of other people.	S1
9	I would hate the idea that robots or artificial intelligences were making judgements about things.	S1
10	I would feel very nervous just standing in front of a robot.	S1
11	I feel that if I depend on robots too much, something bad might happen.	S2
12	I would feel paranoid talking with a robot.	S1
13	I am concerned that robots would be a bad influence on children.	S2
14	I feel that int the future society will be dominated by robots.	S2

(*inverse item)