Children and Robotic Education

Children's Persistent Belief in Humanoid Robots, or, Why is your robot crying?

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Abstract. In society, the belief in the properties of robots is strongly influenced by their humanoid appearance and behavior as portrayed in the media – robots are regarded as "perfect" replicas of humans. This work describes children's understanding of robots, including their appearance, properties, and behaviors. This may influence their interaction with and their understanding of systems. When working with educational, non-humanoid robots in workshops with pupils, we observed that they tend not to see BeeBots or Ozobots, despite their name, as robots but tend to describe robots as human-like. After one of our robotics workshops with lower secondary school students who had no prior knowledge of robots, they were tasked with drawing a robot and doing a survey to describe this robot and robots in general. Unsurprisingly, most children drew robots that we would characterize as humanoids, but in the survey, they did not categorize them like this. On the one hand, they gave their robots names, human characteristics, properties, senses, and emotions; on the other hand, many pupils said their robots could not refuse or fail their commands and tasks.

Keywords: robotic education · secondary education · humanoid robots

1 Introduction

Robotics are an important topic in the educational field. They are not only a motivational factor when learning about computer science, but educational robots also help to understand different concepts and develop various skills that are relevant in STEM [7].

Our lab Informatik-Werkstatt[3] offers workshops on various topics for pupils of different ages. In recent years, there has been an increasing demand for robotics workshops to introduce pupils to the subject of programming in a playful way. Many teachers take the opportunity to work with material in our lab that is unavailable in schools. One of our offers is a workshop with different stations where

[3] https://www.rfdz-informatik.at/informatik-werkstatt/

you can learn about different educational robots and try their first programming steps. We select different robots to suit the age group. Our main target group for this topic is the 5th grade. According to their curriculum, they should work on the following content: the principle of input-processing-output and simple algorithms (sequences and loops). We work with BeeBots, ProBots, OzoBots, and Cubelets for this group. BeeBots and ProBots are used to design and try out the first simple algorithms (also with loops). When building simple robots with the Cubelets, the principle of input-processing-output is illustrated. OzoBots can be programmed using color codes to illustrate the cause-effect concept.

As an extra activity in the workshop, the students had to draw a robot. We observed that even though they are in the middle of a robot workshop that does not contain humanoid robots, the students are drawing humanoid robots and giving them human characteristics and behavior.

We ran additional similar workshops the following year to focus on this surprising result. Pupils attended the workshop and were then given the task of drawing a robot (without further instructions on what to draw). After finishing the drawing, they had to complete a questionnaire that included questions about their robot and robots in general. Our study aimed to answer the following questions about the students in our workshops:

- RQ 1: What ideas do children associate with the term 'robot'? What do they look like in their opinion?
- RQ 2: How do the children define a robot?
- RQ 3: What characteristics do the children associate with robots (senses, abilities, ...)? Are there any connections between these characteristics, their perception of robots, and their interests?

This paper is structured as follows: We begin by presenting related work and our methodology. Next, we describe our findings and results, starting with survey results about the pupils' drawings and then about the pupil's view of robots in general. Finally, we conclude with a discussion of selected results.

2 Related Work

Children often perceive these machines as having human-like characteristics when interacting with robots. For instance, they believe that robots can see, hear, and even consider them potential friends, though they also recognize that robots do not possess complete knowledge [3]. This perception is shaped by their direct interactions and the responses they receive from the robots.

However, as children become more informed about robots' inner workings and capabilities, their initial impression of robots as human-like beings diminishes. Their trust in robots declines once they understand their limitations and functions more. Despite this decrease in perceived human likeness and trust, children's social relationships with robots remain largely unaffected [6]. Additionally, when robots disclose information about themselves during interactions, children's perception of the robot's emotional understanding decreases, but their perception of the robots' social role does not change [5].

Anthropomorphism and behavior significantly influence children's attitudes toward robots. While robots must exhibit humanoid traits, they should not be indistinguishable from humans [9]. There is no substantial difference in attitudes among children aged 8 to 14, but gender differences are notable: girls prefer humanoid robots more than boys do [8].

In our study, we aim to describe the profile of robots from the pupils' perspectives. We include various characteristics that can be used to define an individual's identity (because the pupils often describe robots as human-like) and seek to observe the connections between different personality traits to better understand the pupil's point of view.

3 Methodology

We held five workshops, each with one class of school children aged 10 to 12, in the summer semester 2024. In each workshop, the students completed the same activities: BeeBot, ProBot, Cubelet, and Ozobot. Each activity contained a short introduction, a few tasks to get to know the robot, and some time to experiment. They had about 25-30 minutes for each activity. At the end of the workshops, 117 (male: 33, female: 82, no response to this question: 2) participating students had about 20 minutes to draw a robot and complete the online survey. The children had little or no knowledge about robots (according to their teachers) and only a little experience with block-based programming.

With the survey, we want to confirm our impression that students have humanoid robots in mind when we talk about robots. Some students draw detailed illustrations, but others leave much room for interpretation. This makes it difficult to categorize the drawings for further evaluation. Therefore, we added a questionnaire that helps the students describe their robot. We only use the drawings to confirm the results of the survey. The drawings are intended to help the students convey their ideas before they answer the questions.

The survey consisted of a questionnaire, most of which were Likert-scale or single/multiple choice. Our standard questionnaire in our workshops includes six questions for the general interests following Holland (RIASEC: Realistic, Investigative, Artistic, Social, Enterprising, Conventional) [4, 1] (we have adapted the questions to an age-appropriate form including a visualization). The robot-specific questions were divided into (a) about their robot and (b) about robots in general.

The dimensions of the questions on the robot are based on the model of the five pillars of identity, according to Hilarion Gottfried Petzold. This comprises the following aspects: Body and health (here in the sense of appearance, senses, feelings, and abilities), social relationships, work and performance, financial security (not relevant here), values and meaning [2]. The following questions (translated from German for the sake of readability) were used. We divided the question into two parts. The first part contains questions about the pupil's drawings:

- Performance: Where is your robot on the scale? (7-Likert, Toaster - human - superhero)
- Appearance: My robot looks like ... (a) a person, (b) an animal, (c) a technical device, (d) a work tool, (e) something else (single choice)
- Senses: What senses does your robot have? (a) see, (b) hear, (c) feel, (d) smell, (e) taste, (f) balance (multiple choice)
- Abilities: When I give my robot a task, it is easy because it ... (a) can recognize and see for himself what he should do, (b) can listen to me and understand what I say to him, (c) can be programmed by me via buttons (multiple choice)
- Values and meaning: My robot occasionally fails to perform a task because ... (a) he is sometimes stubborn, (b) he doesn't always understand what I want from him, (c) That can't happen (single choice)
- Feelings: If a task does not work out ... (a) my robot can cry because it is sad (b) it doesn't matter because a robot is just a machine (single choice)

The second part is about robots in general:

- What is a robot? (open question)
- Appearance: Which of these pictures represents a robot? (multiple choice, given 8 examples)
- Abilities: A robot can ... (a) solve a very specific task for which it was programmed (e.g., water the flowers on the windowsill every day at 8 a.m.), (b) work on a task all by himself (e.g., find all the flowers in the house and decide whether the robot has to water them or not), (c) independently solve all tasks that a human could also fulfill, (d) can solve tasks that a human could not fulfill (single choice)
- Social relationships: Robots are ... (a) friends, (b) strangers, (c) part of the family, (d) Robots can't have friends (single choice)

The closed questions of the questionnaire were analyzed using descriptive statistics. For the open questions, we categorized the answers using keywords. In general, all open questions were answered briefly so that categorization was straightforward.

Due to the relatively small number of drawings categorized as humanoid (contrary to our assumption), we repeated this categorization ourselves. Two people analyzed the drawings independently of each other and assigned the drawings to categories according to certain criteria. For example, the drawings were categorized as human-like if features such as the head, face, and arms were recognizable. Animals were identifiable. The remaining drawings were classified as either "other life form" (e.g., eyes but no human or animal shape) or "no life form."

4 Findings and Results

4.1 Children's Robot classification

To gather insight into the pupil's perception of their robot, we let them draw and name it and asked questions about it. The questions were about a general classification, the appearance of their robot, the senses, perception, self-will, and ability to feel.

When we asked the children to classify their robots on a seven-point Likert scale from toaster to human to superhero, we found that they don't see their robots generally as toasters or superheroes. It was a relatively even distribution (Fig. 7a), but only 10 out of 117, which is 9%, classified their robot explicitly as human. If we reduce the scale to three instead of 7, combining The lower two, the three in the middle, and the upper two, there are 24 of 117 (21%) with a tendency to toaster, 53 (45%) rather human, and 40 (34%) superheroes.

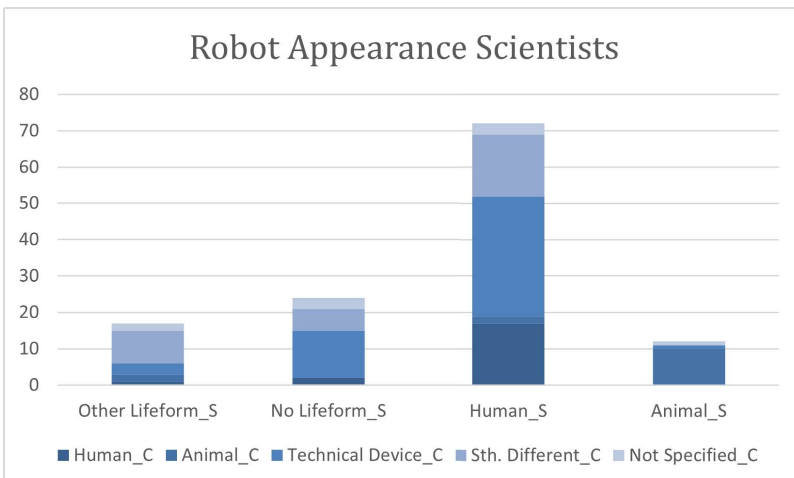


Fig. 1: Robot appearance classified by scientists (n=125). The categories marked with a C are the children's categories, the categories marked with S are the scientist's.

We then asked what their robot looked like. There were five options: Human, Animal, technical Device, Tool, or something completely different. 20 of 117 (17%) stated their robot has a human appearance, 14 (12%) said it looks like an animal, 50 of 117 (43%) said it was a technical device or tool, and 33 of 117 (28%) classified it as something completely different. So 29% of the students see their robot as a life-form, 43% as a tool, and 28% as something else (Fig. 7b), while more than 50% of the robots have human names. We also classified the drawings into four classes: Human, Animal, other lifeforms, and no lifeforms. Out of the 125 drawings, we found 72 Human-like robots (58%), 12 Animal robots (10%), 17 other lifeforms (14%), and 24 were no lifeforms at all (19%)(Fig. 1). So we found that a majority of the children's robots seem to have a human appearance and name but were not classified by them as such. In addition, we classified 33 of the 49 robots (67%), categorized as something else by the children, as humanoid and only 13 (27%) as no lifeforms.

When asked about their robots' senses, the students had six options. See, hear, feel, smell, taste, and keep balance. 94 of 117 (80%) said their robot could see, 86 Robots could hear (74%), 68 were able to feel (58%), 41 could smell (35%), 36 taste (31%), and 78 could keep their balance (67%) (Fig. 8a). The three most important senses for the robots are, therefore, to see, to hear, and to keep the balance, while it seems not to be necessary for a robot to smell or taste.

Another question was about the robot's perception. There were three possibilities: be able to recognize their task themselves, listen and understand, or be programmed via keys. 67 of 117 (57%) could recognize their task by themselves, and 84 of 117 (72%) could listen and understand the user's commands. This is unsurprising, as many students may be used to cleaning robots and voice assistants. Only 19 of 117 (16%) robots were programmable via keys. (Fig. 8b) On the other hand, this does not seem necessary for the students to command a robot.

We also asked the children about the robot's self-will. The first two options are the robot does not do a task because he is either self-willing or does not understand what the user wants. The third option is that it can't happen. We found 12 of 116 (10%) self-willed robots, 28 of 116 (24%) that don't always understand, and a majority of 76 of 116 (66%) where something like that could not happen. (Fig.9a)

Another item was about the robot's ability to feel. If the robot cannot do a task, he is either crying because he is sad, or it doesn't matter because he is a machine anyway. Interestingly, 68 of 116 (59%) stated their robot has feelings, while 48 of 116 (41%) said it can't because it's only a machine. (Fig.9b)

4.2 Children's Robots - Combined Items

We then combined the items regarding the children's robots. First, we found that 70% (14 of 20) of the robots classified with humanoid appearance by the children were in the middle of the toaster to superhero scale and therefore tending towards humanoid. This shows that our children do not see humanoid robots as super-powered, contrary to animal robots. Although the sample of robots classified as animals is pretty small, 50% (7 of 14) of the children say that their robot with an animal appearance is a superhero. In the children's perception, the 50 technical devices could be like toasters (32%), have human abilities (42%), or have superpowers (26%). The distribution there is nearly even, with a slight tendency to human abilities. Out of the 33 robots classified as something different, interestingly, 13 (39%) were classified as human, while 16 (41%) were defined as super-powered. So, 74% of these robots have at least human abilities.

When combining appearance and senses, we found, overall, independent from the robot's appearance, the most important senses are seeing, followed by hearing and holding the balance, while smelling and tasting are not that important. This is not true for those robots, defined as technical devices by the children, where 60% can feel, and 58% can hold their balance, and the robots defined as humanoid by our group, where feel and balance are equal at 61%. (Fig. 2) Interestingly, for Animal Robots, it is slightly more important to hear than to see (93% to 86%) and to smell than to feel (64% to 57%). The children mention the sense of smell more often than humanoid robots (64% to 40%). Also, according to them, holding their balance is more important for animals (79%) than for humanoid robots (75%).

When we combined the robot's appearance and perception, one result was that listening and understanding are always the most important. (Fig. 3) Even more important than recognizing tasks autonomously. The difference is greatest with Animal robots (93% to 50%). Even for humanoid robots, listening is more important than recognizing tasks. (75% to 65%) The option to be programmable via keys is unimportant for the children. With a maximum of 20%, technical devices are most programmable. When using our classification, the picture is more or less the same, but of the robots we classified as other lifeforms, 40% are programmable via keys.

Matching the Perception and Senses of the robots reveals that it doesn't matter if the robot can recognize tasks autonomously or is just listening and understanding. The sense distribution is more or less the same, but in comparison, for listening robots, to hear (80% to 76%) and interestingly hold their balance (70% to 64%) is slightly more important than for autonomous robots, whereas to see is more important for the autonomous ones (88% to 82%). If a robot is programmable, the percentage of every sense is higher than for the other two possibilities. (Fig. 4)

Another interesting combination is about the robot's feelings and their appearance. When considering the children's classification, 9 of 20 humanoid robots cry when they cannot fulfill a task, and for 11 of 20, it doesn't matter because they are machines anyway. So the children classified them as humanoid, and 55% cannot feel. On the other hand, there were 35 of 50, which are 70%, technical devices which are nevertheless able to feel. The categories of Animals and something different are more or less balanced regarding feelings. 8 of 14 animals and 16 of 32 different things can cry. (Fig. 5, upper table) The results differ slightly when combining our classification and the children's answers about their robot's feelings. Whereas the animals are more or less balanced (55% able to cry and 45% don't) here too, in our appearance classification, contrary to the children's version, 59% of the humanoid robots and 60% of the other lifeforms can cry, and 57% of the robots we classified as no lifeforms have feelings too. (Fig. 5, lower table)

4.3 Robots in general

To get some insight into the pupil's perceptions of robots in general, they were also asked to define a robot ("What is a robot?"). Their answers were categorized to get an impression of what is characteristic of a robot from the pupils' point of

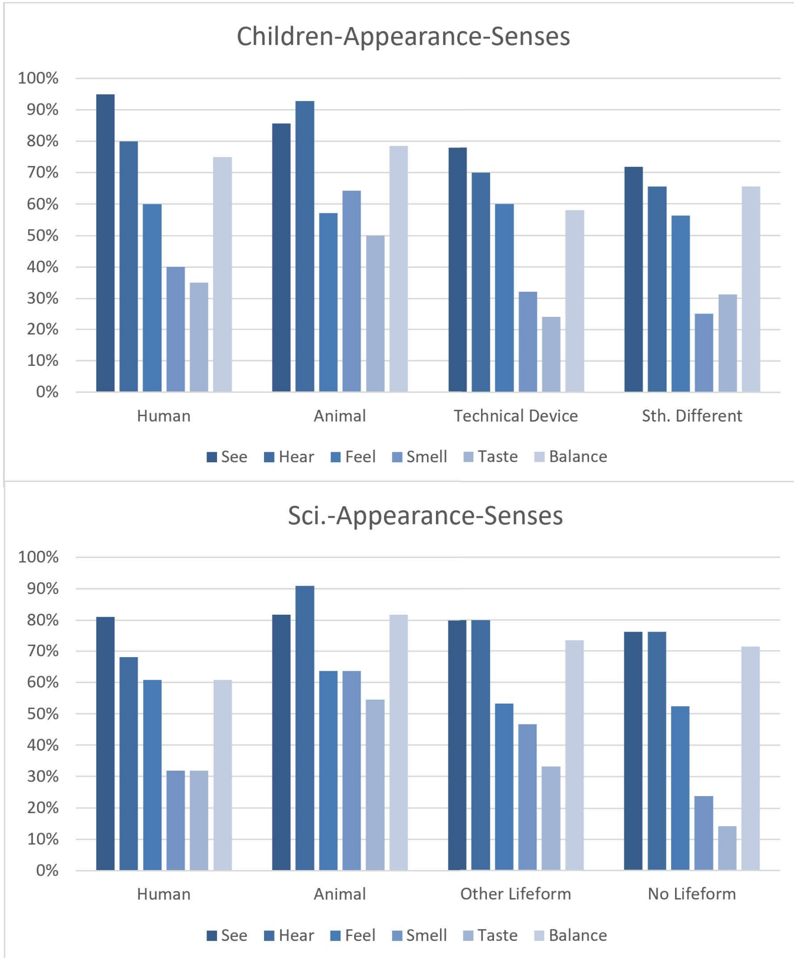


Fig. 2: Robot's appearance matched with the robot's senses. The upper diagram displays the senses and the classification of children's appearance; the lower is the scientist's version.

view. 100 pupils answered the question and described a robot in 1-2 sentences. In 58 answers, robots being machines or devices were mentioned, and 2 compared them to computers. 30 answers contained a description of "technical," and 12 mentioned them being "electric/electronic" (one of them contained both - due to the categorization of the mentioned aspects, multiple categories per answer are possible). 10 pupils mentioned that robots are programmable, and 6 that we can give them instructions. 3 pupils said robots are intelligent or have knowledge; 7 students even mentioned artificial intelligence. 30 students mentioned that robots are there to help us and do things for us. 7 students said they are human-like/humanoid, and many said they are friends. So, not many descriptions focus on the humanoid traits but more on technical or task-related.

We also presented the pupils with eight pictures. They had to decide whether the picture showed a robot or not. 104 of 116 pupils (90%) labeled the humanoid robot and 100 (86%) Robby, our lab logo, robots. More than half of the pupils also chose the BeeBot (73 of 116, 63%), ProBot (68 of 116, 59%), and robot

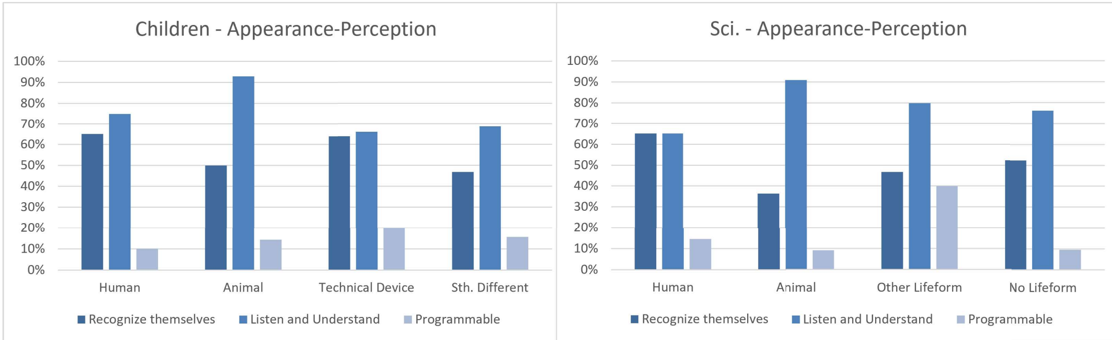


Fig. 3: Robot's appearance matched with the robot's perception. Left diagram is based on the children's appearance classification, the right one is the scientist's version. The bars in the diagram stand for "Recognize themselves", "Listen and Understand", and "Programmable". (n=116)

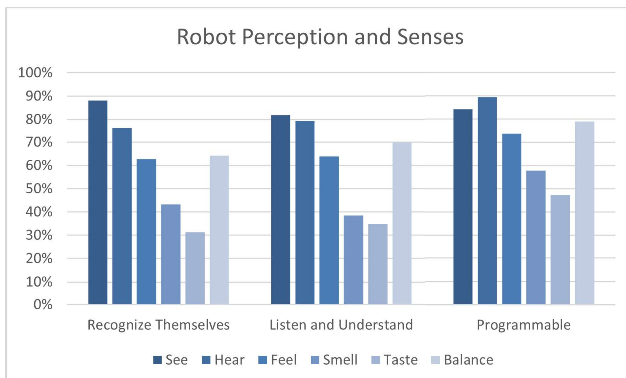


Fig. 4: Robot's perception matched with the robot's senses. It shows the distribution of the robot's senses, such as if they can recognize tasks themselves, listen and understand, or are programmable. The bars in the diagram stand for "See", "Hear","Feel", "Smell", "Taste", and "Balance". (n=116)

arm (61 of 116, 53%). Only a few chose the washing machine (29 of 116, 25%), the gantry system robot (24 of 116, 21%), and the toaster (31 of 116, 27%). 13 pupils (11%) labeled all of the pictures as robots.

The pupils were also asked to decide how robots know how to solve their tasks. They are provided the options "perform a specific task for which it has been programmed" (40%), "work on a task all by himself" (7%), "independently solve all tasks that a human could also fulfil" (22%) or "can solve tasks that a human could not fulfil" (31%).

For the pupils, robots are friends (61%). Only 5 (4%) decided that they are strangers, part of the family (16%), or can not have any friends (19%). Regarding whether robots are friends, there are hardly any differences between girls (64%) and boys (58%), but 33%

Children	Human	Animal	Tool	sth. Different
Cry when task fails	45%	57%	70%	50%
is only a machine	55%	43%	30%	50%

Scientists	Human	Animal	other lifeform	no lifeform
Cry when task fails	59%	55%	60%	57%
is only a machine	41%	45%	40%	43%

Fig. 5: Robot's appearance matched with the ability to feel. The upper table displays the feelings combined with the children's appearance classification; the lower table is the scientist's version. (n=116)

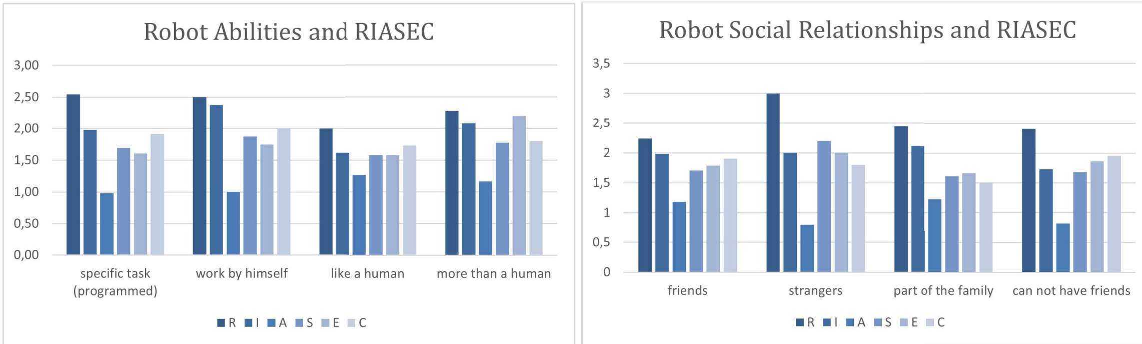
4.4 Robots in general - Combined Items

If we compare the results of the question about robot examples, the example of the BeeBot and the ProBot can be considered as one category. 57 % gave both as examples of robots. 35 % did not see either as a robot. This leaves only 8 % of responses that identified only one of the two as a robot. The situation is similar for the examples of the humanoid robot and the robot logo (78 % chose both, and 2 % chose neither). In comparison, there are different results for the examples of humanoid robot and robot arm: 39 % chose both, 8 % chose neither. 51 % identified the humanoid robot as the robot, not the robot arm. Only 3 % did the opposite (rounding errors). A toaster and washing machine were rarely selected and deliver comparable results.

The ascribed abilities differ slightly depending on the robot examples selected. Of the 104 children who recognized the humanoid robot, 40 % stated that they could perform certain tasks for which they were programmed. In the case of the BeeBot, 33 out of 73 children (45%) stated this. Similar results were achieved regarding relationships: Of the 104 children who recognized the humanoid robot, 57% stated that robots are friends. In the case of the BeeBot, 45 out of 73 children (61%) stated this. Major differences can be seen when we compare the examples differentiated by gender: 86% of the girls (70 out of 81) and nearly all the boys (32 out of 33) chose the humanoid robot. For the example of the BeeBot, the results of boys and girls are nearly the same (girls: 62%, boys: 64%).

When we categorized the definition of a robot, there can be seen some gender differences: 6 out of 33 boys (18%) mentioned "technical", but 30 of the 81 girls (37%). Similar results for "electric/electronic" (each 1%) can be observed. The term "machine or device" was used similarly (61%, 62%). Slight differences can be seen in the category "to help and do things": 7 of 33 boys (21%) and 24 of 81 girls (30%).

The pupils were asked about their General Interests following the RIASEC model at the beginning of the questionnaire. The mean values in the interests are as follows: Realistic - 2.34, Investigative - 1.96, Artistic - 1.10, Social - 1.71, Enterprising - 1.79, Conventional - 1.84. Differentiated by the chosen abilities, there can be seen some differences in the RIASEC profile of the pupils (Fig. 6a), e.g., pupils that have the opinion that robots can work by themselves on any task



(a) (b)

Fig. 6: Robot Abilities and Social Relationships combined with Children General Interests (n=116)

have higher results in the Investigative dimension (mean: 2.38). Even higher differences can be seen when the RIASEC dimensions are compared with the results of the questions about the social relation to robots (Fig. 6b). The highest results in the Realistic dimension are achieved by pupils who see robots as strangers (mean: 3).

5 Discussion

When evaluating the first part of the questionnaire, it became evident that the students have very specific ideas about robots in certain areas (e.g., the ability to see, hear, and maintain balance). Surprisingly, our concept of humanoid robots does not align with the students' categorizations. Our assumptions (face, eyes, arms, etc.) are insufficient to classify a robot as a humanoid. Technical details (e.g., edges and mechanical joints) may be enough for the children not to associate the robots with a human appearance. Robots can still have human senses, feelings, will, and friends. Regardless of appearance, however, robots are attributed to human senses and qualities (e.g., emotions). In their general definition of robots, the children frequently mention technical details rather than human characteristics. When confronted with examples, children mainly classify humanoid robots as robots (but not, for example, robot arms).

6 Conclusio

The categorization of the appearance of the robots (RQ1) differs between the pupil's own categorization and ours. The pupils described fewer robots as humanoid than we did. However, when we examine the data in detail, we find that they associate robots more with a humanoid appearance, but they would not necessarily describe them as humanoid.

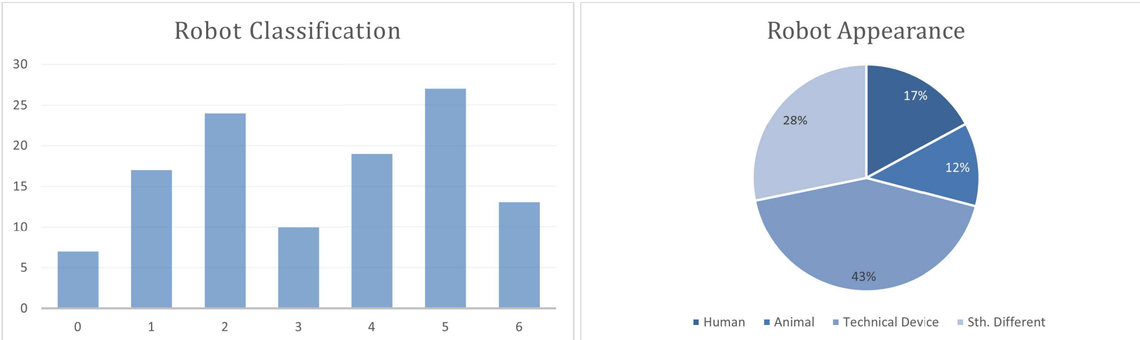
The pupil's general definition of robots (RQ2) focuses on technical details without mentioning their appearance or humanoid traits. In general, pupils view robots as individuals capable of forming friendships and experiencing emotions. When the data is stratified based on the pupils' self-reported interest levels (RQ3), some differences emerge regarding the robots' abilities. For instance, pupils who perceive the robots' abilities in doing specific tasks or being programmed tend to exhibit higher levels of interest in the Realistic domain and lower levels of interest in the Artistic domain. Furthermore, the questions about the relationships and the robot examples show that the results vary according to the participants' general interests. The profiles can be differentiated according to the pupils' interests.

The study results offer valuable insights that can improve workshops beyond our own. It's essential to refine materials to better meet the target audience's needs. Differences in terminology, such as "robot" and "humanoid robot," between students and instructors require a more focused approach. Targeted tasks are crucial for conveying concepts and correcting misunderstandings. Workshops focusing on non-humanoid robots may not fully achieve educational goals, highlighting the need for a more varied approach in robot-based learning activities.

References

1. Bergmann, C., Eder, F.: AIST-R. Allgemeiner Interessen-Struktur-Test mit Umwelt-Struktur-Test (UST-R) – Revision. Manual. Hogrefe, 1 edn. (2005)
2. Eremit, B., Weber, K.F., Eremit, B., Weber, K.F.: Die fünf säulen der identität. Individuelle Persönlichkeitsentwicklung: Growing by Transformation: Quick Finder—Die wichtigsten Tools im Business Coaching pp. 47–52 (2016)
3. Escobar-Planas, M., Charisi, V., Gomez, E.: "that robot played with us!" children's perceptions of a robot after a child-robot group interaction. Proceedings of the ACM on Human-Computer Interaction **6**(CSCW2), 1–23 (2022)
4. Holland, J.: Exploring careers with a typology - what we have learned and some new directions; am. psychol. American Psych., Vol.51(4), pp.397-406 (1996)
5. van Straten, C.L., Peter, J., Kühne, R., Barco, A.: On sharing and caring: Investigating the effects of a robot's self-disclosure and question-asking on children's robot perceptions and child-robot relationship formation. Computers in Human Behavior **129**, 107135 (2022)
6. Straten, C.L.v., Peter, J., Kühne, R., Barco, A.: Transparency about a robot's lack of human psychological capacities: effects on child-robot perception and relationship formation. ACM Transactions on Human-Robot Interaction (THRI) **9**(2), 1–22 (2020)
7. Toh, L.P.E., Causo, A., Tzuo, P.W., Chen, I.M., Yeo, S.H.: A review on the use of robots in education and young children. Journal of Educational Technology & Society **19**(2), 148–163 (2016)
8. Tung, F.W.: Influence of gender and age on the attitudes of children towards humanoid robots. In: Human-Computer Interaction. Users and Applications: 14th International Conference, HCI International 2011, Orlando, FL, USA, July 9-14, 2011, Proceedings, Part IV 14. pp. 637–646. Springer (2011)
9. Tung, F.W.: Child perception of humanoid robot appearance and behavior. International Journal of Human-Computer Interaction **32**(6), 493–502 (2016)

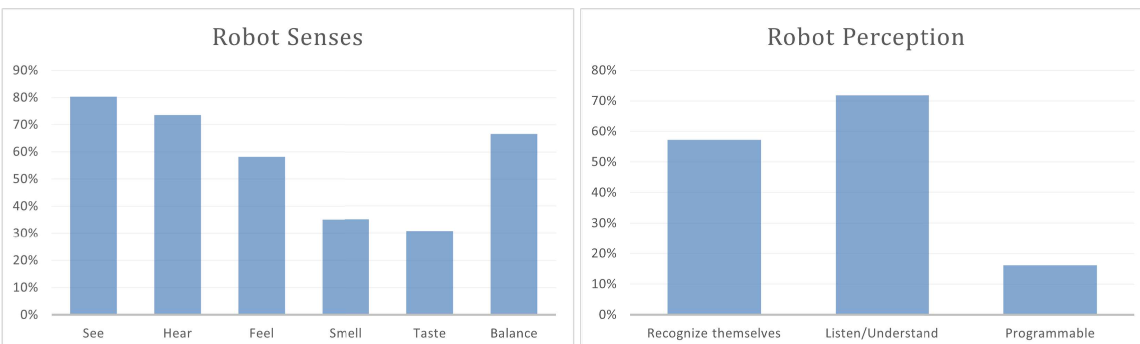
A Additional Diagrams



(a) Classification: The scale runs from 0 (toaster) via 3 (human) to 6 (superhero)

(b) Appearance: 17% human, 12% animal, 43% tool, 28% something different

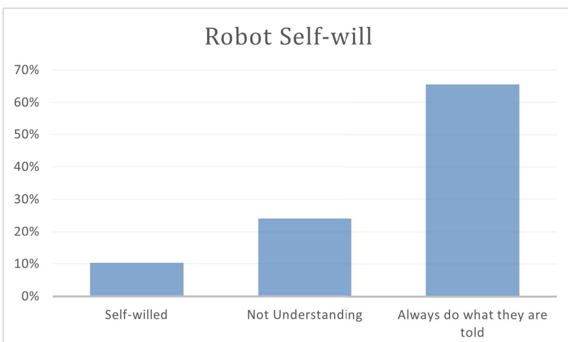
Fig. 7: Classification and appearance of the student's own robots (n=117)



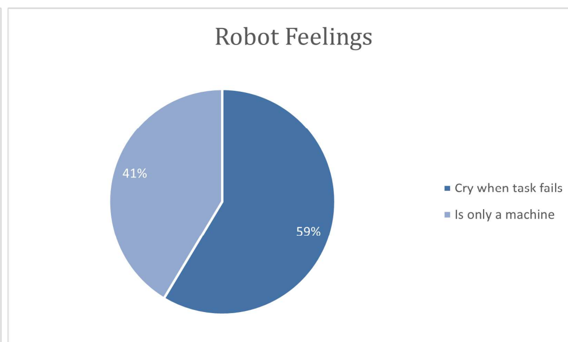
(a) The percentage of robots able to see, hear, feel, smell, taste and hold the balance (multiple answers possible)

(b) Perception: recognize themselves, listen and understand, programmable (multiple answers possible)

Fig. 8: Senses and perception of the children's robots (n=117)



(a) Self-will: The grade of self-will the children's robots have, from self-willed to always do what they are told



(b) Feelings: The robot is crying if a task is not working out or it doesn't matter, because it is just a machine

Fig. 9: Self-will and feelings of the children's robots (n=116)