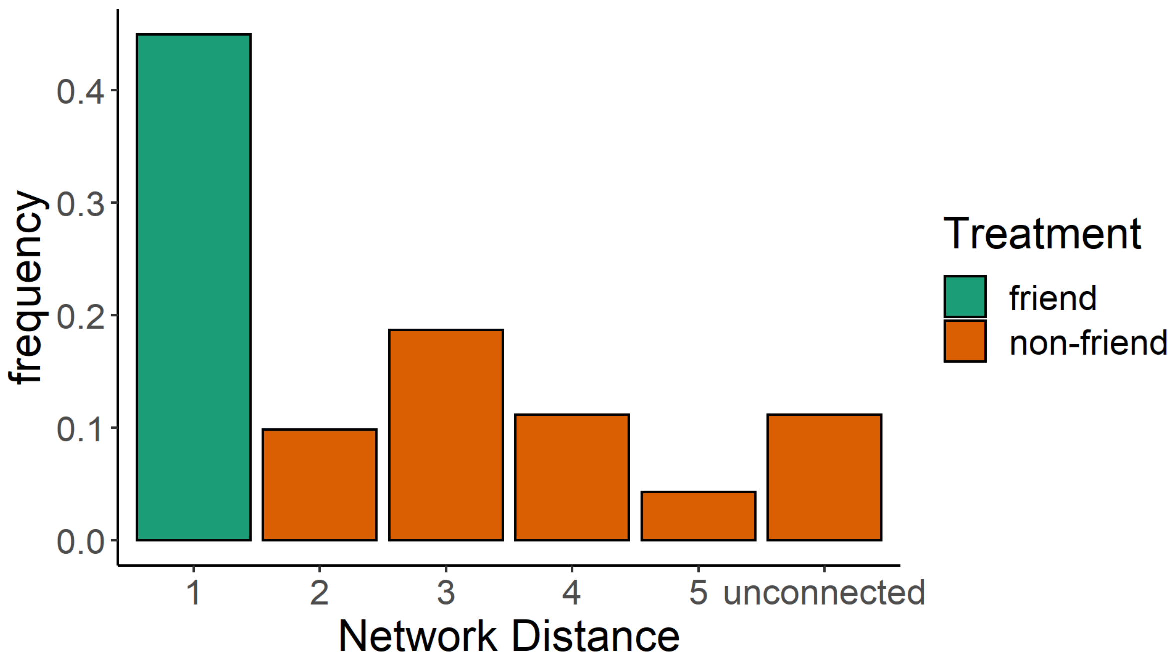
Supplementary Materials

Section 1: Additional Figures

Figure S1

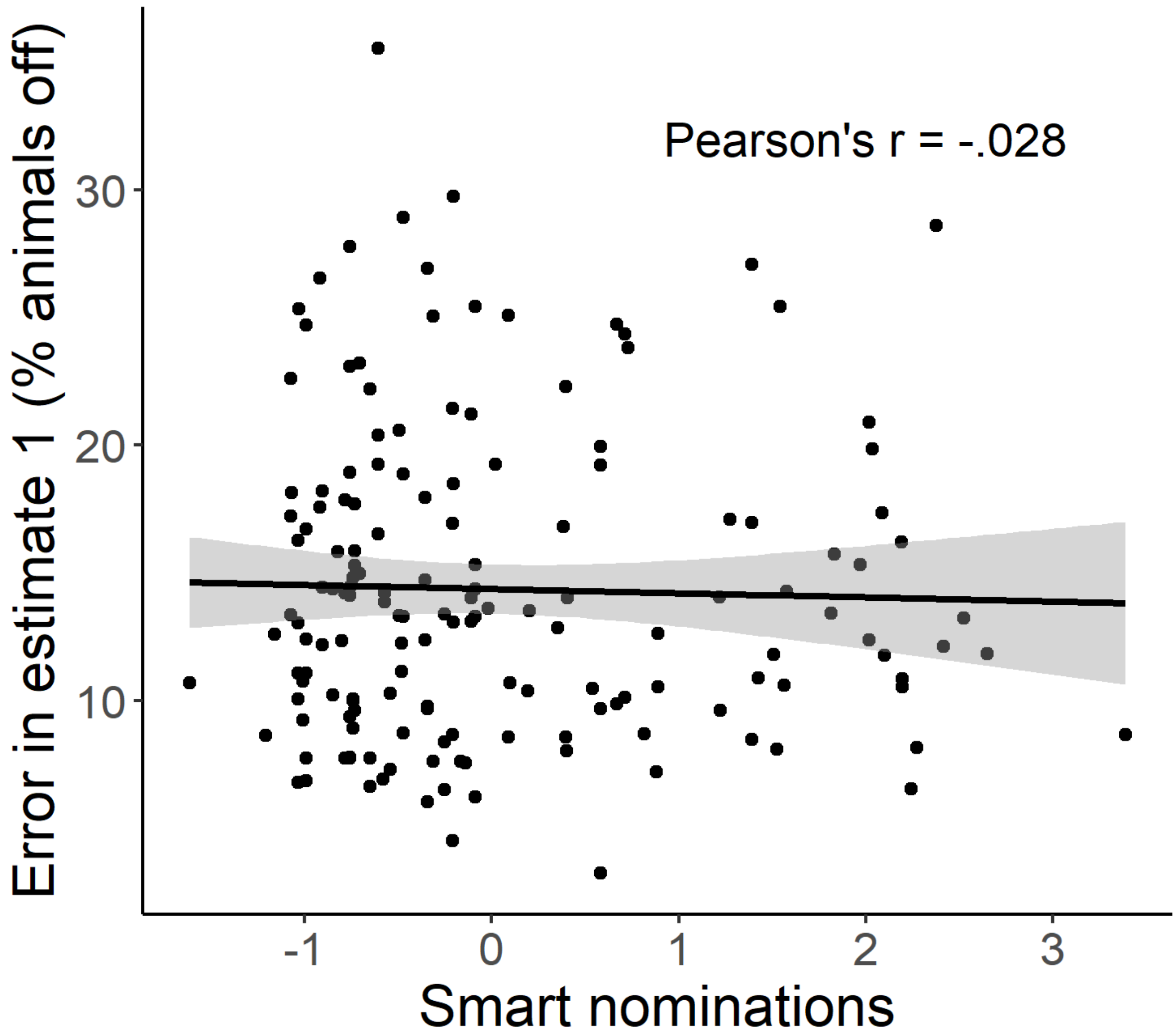
Frequency of Experimental Blocks Across Distance in the Social Network



*Note***.** In the experimental task, each participant completed two blocks of five rounds each. Blocks differed in the identity of the demonstrator. Demonstrators were classmates, selected to have either minimal (=direct friend) or maximum path length to the participant. This criterion resulted in non-friends being widely distributed across different path lengths. Out of three demonstrator estimates for a given stimulus recorded in Wave 1, we selected the closest to 20% distance to the participant's first estimate to display as social information (cf. Fig. 1 in the main text).

Figure S2

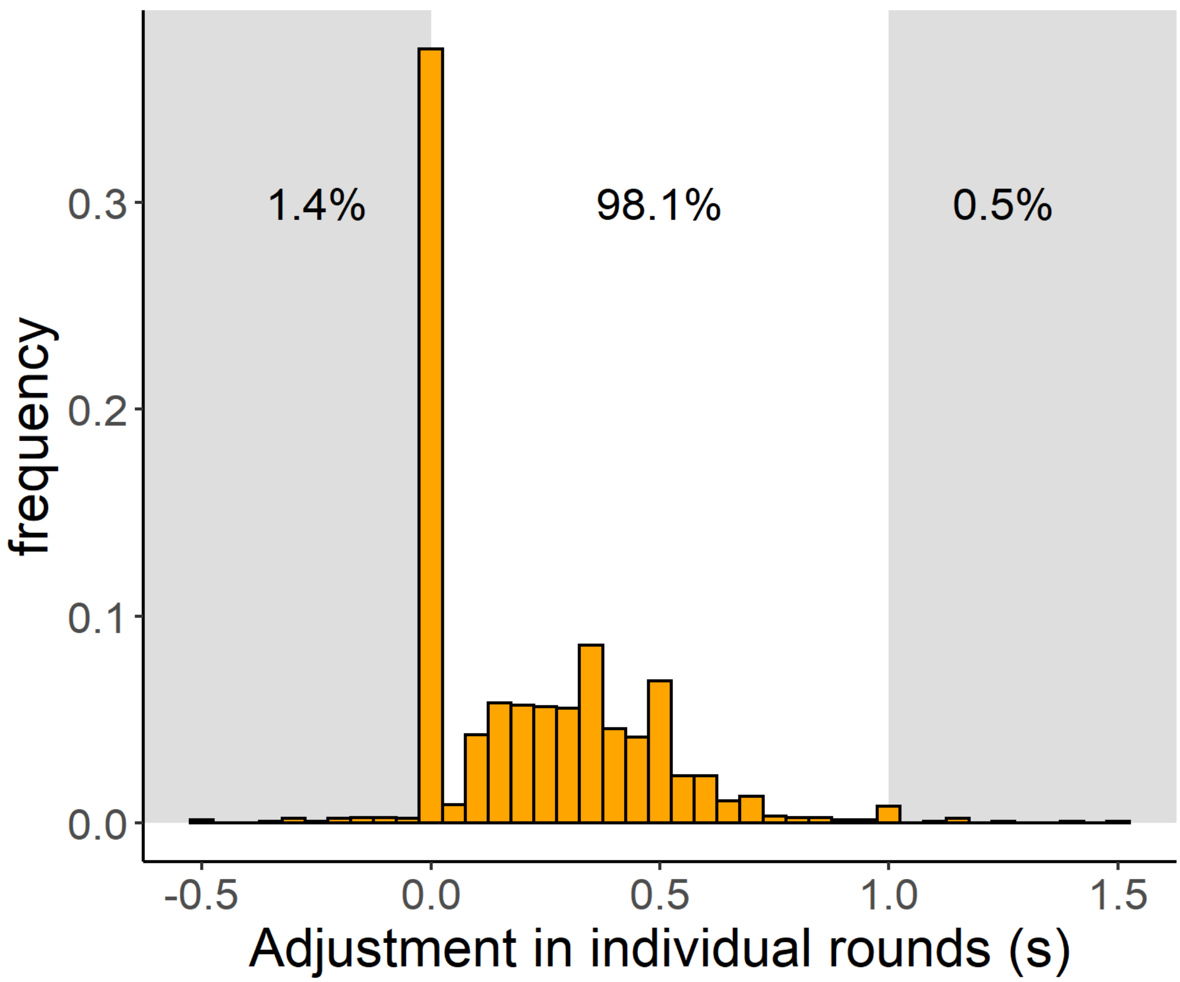
Mean error in E1 as a function of smartness nominations



Note. participants who were perceived as smarter did not provide more accurate estimates than pupils who received fewer nominations. Smart nominations here are z-scores of raw nominations computed for each classroom separately.

Figure S3

Adjustments in individual rounds



Note. Frequency distribution of *s*. *s* specifies the extent of adjustment towards social information in each experimental round and is calculated as $s = (E2 - E1) / (X - E1)$ (for details, see Methods in the main text). Values of $s = 0$ indicate that participants did not adjust their first estimate; values $0 < s < 1$ indicate that participants moved towards the estimate of the demonstrator; values of $s = 1$ indicate that participants copied the estimate of the demonstrator. In the vast majority of trials we observe $0 <= s <= 1$. This means that second estimates were a weighted average of participant's and demonstrator's estimates. In rare cases, participants moved away from the social information (1.4%), or moved beyond it (0.5%).

Section 2: Questionnaire

Table S1

Social network questionnaire

Question	Type
1. Which classmates do you like in your class?	Unlimited nominations from a checklist with all class members.
2. Which classmates do you not like within your class?	Unlimited nominations from a checklist with all class members.
3. Which classmates are most popular in your class?	Unlimited nominations from a checklist with all class members.
4. Which classmates do you consider smart?	Unlimited nominations from a checklist with all class members.
5. Which classmates are your friends?	Unlimited nominations from a checklist with all class members.
6. Who are the friends of [X]? (X = 3 randomly selected nominations from question 5)	Unlimited nominations from a checklist with all class members.
7. How often do you hang out with friends that are not from your class (e.g. from sport clubs, music class, language class)?	Scale from 0 (Less than once a week) up to 7 (7 times a week)
8. Which classmates can give good advice to others ?	Unlimited nominations from a checklist with all class members.

9. Which classmates helps you with problems (e.g. homework, fixing your bike, cheer you up)?	Unlimited nominations from a checklist with all class members.
10. With whom would you share a secret?	Unlimited nominations from a checklist with all class members.
11. Which classmates influence others to do what they want?	Unlimited nominations from a checklist with all class members.
12. Which classmates would more often take the lead of the class?	Unlimited nominations from a checklist with all class members.
13. Which classmates are bullying others?	Unlimited nominations from a checklist with all class members.
14. Which classmates are being bullied?	Unlimited nominations from a checklist with all class members.

Section 3: Additional Text

Section 3.1 Exploratory analyses

In our main analyses we took a social network perspective on social status. In the school context, however, social status is often measured in multiple, complementary ways. One traditional metric is based on peer nominations of perceived popularity, another is based on nominations of being a friend (‘in-degree’). These metrics gauge overlapping constructs related to social status, but also have unique aspects (Gest et al., 2008; Van den Bos et al., 2018). For example, participants who are generally perceived as ‘popular’ often have central positions in the network, but they are not always most central given that popular children do not always have the most friends, or are liked by most of their peers (Snijders et al., 2017). The number of friendships, on the other hand, is similar to sociometric popularity, an index of a person’s likeability calculated by combined ‘like’ and ‘dislike’ nominations (Cillessen, 2009; A. H. Cillessen & Rose, 2005). In a set of exploratory analyses, we replaced eigenvector centrality with either popularity or number of friends. This allowed us to gain insight in the relative predictive value of these complementary constructs of social status (Table S2). Finally, we also constructed a model based on the individual’s perspective, in contrast with the group or network perspective. That is, we entered as variables in the model whether the learner selected the demonstrator as either popular or smart (Table S3).

Table S2

Alternative Measures of Social Status (Popularity and In-Degree)

	Popularity		In-degree	
	Estimate (SE)	**p**	**Estimate (SE)**	**p**
Paths				
a	-.807 (.080)	<.001	-.786 (.079)	<.001
b	.013 (.005)	.007*	.015 (.005)	.003
c'	.002 (.007)	.735	.004 (.007)	.525
Indirect	-.011 (.004)	.008*	-.012 (.004)	.004
Covariates other				
Social Status	.028 (.029)	.942	-.063 (.064)	.333
Betweenness centrality	-.018 (.054)	.739	.011 (.056))	.85
Smartness	.083 (.034)	.001	.081 (.033)	.016
Intercept	.199 (.015)	<.001	.219 (.021)	<.001
BIC	739.958		734.475	

Note. Estimates of linear mixed mediation models fitted to mean adjustment (*S*), with ‘participant’ as random intercept. Coefficients are unstandardized across models. a indicates the pathway from the independent variable to the mediating variable. b indicates the pathway from the mediating variable to the dependent variable (S). c’ indicates the direct pathway from the independent variable to the dependent variable after accounting for the mediating variable. Indirect refers to the pathway from the independent variable to the dependent variable, passing through the mediator. In the first model Popularity is used as an additional covariate for social status, instead of Eigenvector Centrality used in the main analysis. In the second model In-degree is used as an additional covariate for social status, instead of Eigenvector Centrality used in the main analysis.

Table S3

Additional Measures of Relation Between Learner and Demonstrator

	Popularity and smartness	
	Estimate (SE)	**p**
Paths		
a	-. 816 (.080)	<.001
b	.012 (.005)	.013
c'	.002 (.007)	.776
Indirect	-.010 (.004)	.015
Covariates		
Other as Popular	.018 (.016)	.262
Betweenness centrality	-.020 (.054)	.710
Other as Smart	.034 (.016)	.040
Intercept	.207 (.023)	<.001
BIC	767.506	

Note. Estimates of linear mixed mediation models fitted to mean adjustment (*S*), with ‘participant’ as random intercept. Coefficients are unstandardized across models. a indicates the pathway from the independent variable to the mediating variable. b indicates the pathway from the mediating variable to the dependent variable (S). c’ indicates the direct pathway from the independent variable to the dependent variable after accounting for the mediating variable. Indirect refers to the pathway from the independent variable to the dependent variable, passing through the mediator. In this model, we entered as additional covariates in whether the learner selected the demonstrator as either popular or smart.

Table S4

Linear mixed regression with random intercept for participants fitted to % errors

	Dependent variable:
	% error
estimate 2	-1.488*** (-2.152, -.824)
Constant	14.336*** (13.380, 15.292)
Observations	2,942
Log Likelihood	-10,852.55
Akaike Inf. Crit.	21,713.11
Bayesian Inf. Crit.	21,737.05

Note. *p<0.05; **p<0.01; ***p<0.001 We fitted a linear mixed regression with a random intercept for participants to participants % error to test whether participants' error became smaller from their first estimate to their second estimate (or in other words, whether their estimates were more accurate). We find that participants on average are 1.5% closer to the real number of animals, meaning that they accurately use social information to improve their estimate.

Section 3.2 Demographics and characteristics of the excluded sample

High School system in the Netherlands

In the Netherlands, adolescents move from elementary to high-school after the age of 11–12. Based on test scores and teacher judgements pupils receive a binding advice for different school systems. These school systems can be broadly divided in pre-vocational (VMBO) and pre-university education (HAVO,VWO). Selection is based mainly on cognitive ability, and as a result it is generally true that pre-university systems include adolescents with average to above average IQ [105-115+], whereas pre-vocational adolescents' IQ score are mostly average or lower [80-105]. The adolescents in our sample were recruited from both school systems but mainly from the pre-university system. Furthermore, within most schools, including the ones where we tested, the class as a group stays a consistent unit, where the whole group follows the same roster. Both schools were located in postal code regions that are associated with modal levels of social economics status (source CBS: https://www.cbs.nl/en-gb). We did not (and could not) generate hypothesis regarding IQ, or social economic variables, in relation to social learning and thus did not gather more information about these (in accordance to data collection ethics as spelled out by the GDPR that discourages excessive personal data collection).

Demographics of the classrooms

Table S5

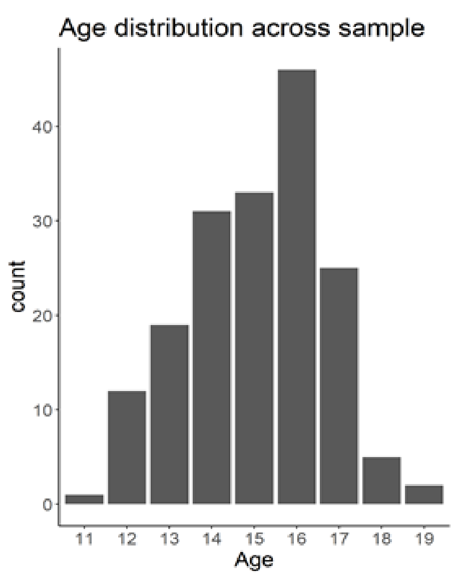
Demographics characteristics of classrooms

Year	Age (SD)	Participants (Class Size)	% females
1st	12.65 0.59)	20 (28)	0.50
1st	12.53(0.66)	13 (17)	0.69
3rd	14.73 0.73)	19 (28)	0.37
3rd	14.76 (0.60)	13 (25)	0.15
3rd	14.63 (0.67)	11 (19)	0.74
3rd	14.60 (0.66)	23 (28)	0.70
3rd	14.56 (0.51)	18 (29)	0.94
5th	16.48 (0.69)	29 (31)	0.59
5th	16.55 (0.70)	27 (29)	0.59
5th	16.76 (0.83)	21 (23)	0.48

Note. Demographic information of each classroom.

Figure S4

Age distribution across sample



Note. Histogram of the distribution of age in the full sample (n = 192).

Excluded participants

36 pupils were excluded from the analysis of the behavioral data, because for them one or both treatment conditions could not be established. Overall, pupils who were excluded from the final sample had similar age (Welch's t-test, t = 1.37, df = 172, p = .17) , gender proportion (χ^2 = 0.45, df = 1, p-value = 0.49), and smartness nominations (Welch's t-test, t = .08, df = 172, p = .94) than pupils in the final sample. However, excluded pupils had on average significantly lower popularity (in-sample mean: 4.19, s.d = 5.31; out-sample mean = 2.17, s.d. = 3.53; Welch's t-test: t = 2.76, df = 92.44, p-value = 0.006) and friendship nominations (in-sample mean: 6.37, s.d. = 2.53; out-sample mean = 4.02, s.d. = 2.90; Welch's t-test, t = 4.92, df = 172, p-value < 0.001), indicating that these pupils were generally less frequently nominated than the ones in the final sample.

The impossibility to create an experimental treatment already suggested that these students had lower connectivity to start with. However, as shown by model 4, individual characteristics of the learner, such as perceived smartness or network centrality, did not predict social information use (Main text Table 2; Supplementary Table S2). Furthermore, despite a significant difference in mean values, the variation in both samples was quite large, and the sample size quite different (135 vs 36), thus weakening the implications of differences in average received nominations. For these reasons, we believe that these differences did not affect the generalizability of our results.

Section 3.3 Social networks from second order nominations

192 participants out of 249 total potential participants (77%) completed the social network questionnaires which we used to construct social networks. Since we decided to consider only reciprocated friendships as real ties (i.e. where both participants nominated each other as a friend), our method potentially fails to identify some of the existing links due to one of the participants not participating in the study. This may in turn affect the network-based measures of centrality, namely eigenvector and betweenness centrality. To further inspect the validity of the network, we therefore performed an additional analysis based on a set of questions which we included as robustness checks to handle participants' drop-out. In these questions participants were asked to list all the friends for three randomly selected out their own friends (second-order friendships). This method is conceptually similar to snowball sampling, a method in which participants provide information about their contact in the network, which then turn are surveyed (Goodman, 1961), except that in our case information about which nodes are connected to the neighborhood of the original node, are still provided by the original node . By combining these second-order nominations with the original set of nominations, we were able to reconstruct an alternative version of the undirected friendship networks, which now also included participants who did not complete the questionnaires.

We calculated eigenvectors and between centrality, as well as in-degree based on these new networks, and we report here the correlation with the same measures derived from the reciprocate friendship networks, which we used in the main analyses.

We find strong correlations across networks between both eigenvector centrality (Pearson's R = 85 , 95 % C.I. (.80, .88), $p < .001$) and in-degree (Pearson's R = .75, 95 % C.I. (.68, .81), $p <.001$). indicating that drop-out of participants did not particularly affect the overall validity of those measures. Betweenness centrality on the other hand, is very weakly correlated across networks (Pearson's $r = .12$, 95% C.I. (-.02, .26), $p = .102$) suggesting that the measurement used in the main analysis is sensitive to drop out of participants. This reflects the nature of betweenness centrality, which measures the number of shortest paths passing through each node. If links in the network are missing, certain nodes might suddenly become the only connections between different clusters of the network, thus inflating the betweenness centrality value for that node.

Overall, these results suggest that the findings regarding eigenvector centrality as a significant predictor of social learning are not strongly influenced by missing network ties, whereas the null finding on the role of betweenness centrality should be interpreted more carefully, as the measure is very sensitive to missing network ties.

Section 4: Screenshots from the Experimental Task

Participants played the BEAST game (named Animal Game for them) in both Waves. Here we present a set of screenshots (translated from Dutch) with the instructions and the stimuli of the game that participants played in Wave 2 (with social information). The game in Wave 1 was virtually identical, except there was no social information displayed. In other words, once participants made their first estimate, they moved directly to the next round.

Welcome!

Welcome to the Animal Game!

During this task you can you can earn Points. The number of Points you earn will depend on your responses.

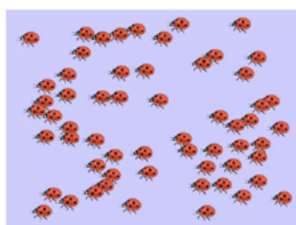
Click below to proceed to the instructions.

Please read these instructions carefully!

Continue

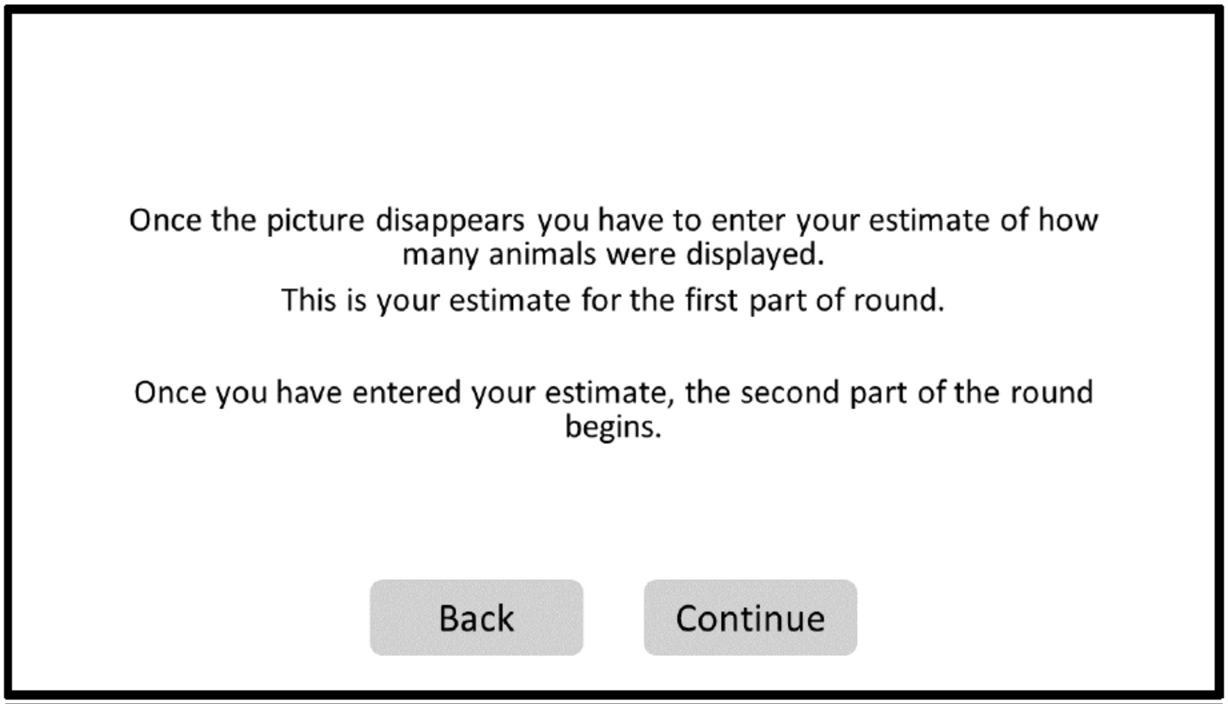
This game consists of 2 blocks (block I and block II).
Each block consists of 5 rounds.
So there are **10 rounds** in total.

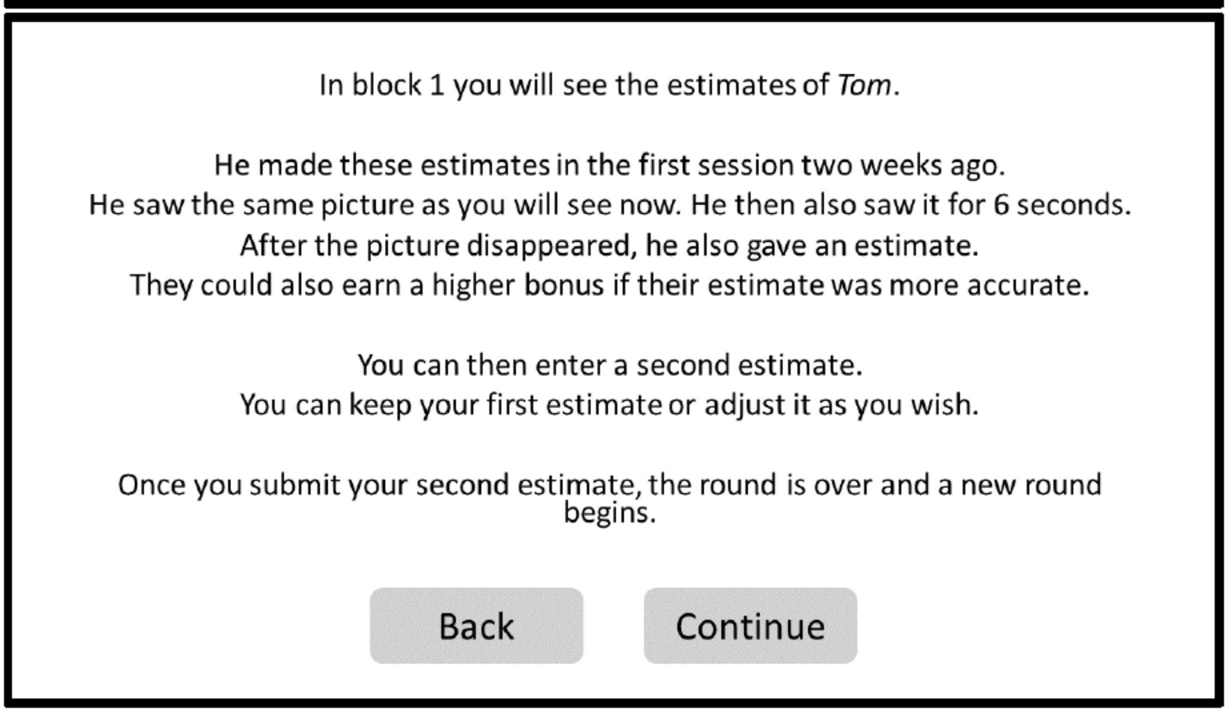
At the beginning of each round, you will observe an image showing a number of animals.



The picture disappears after 6 seconds.
Then you have to estimate how many animals were in the picture.
The more accurate your estimate, the more points you can earn.

Back Continue


Once the picture disappears you have to enter your estimate of how many animals were displayed.
This is your estimate for the first part of round.
Once you have entered your estimate, the second part of the round begins.
Back
Continue


In block 1 you will see the estimates of *Tom*.
He made these estimates in the first session two weeks ago.
He saw the same picture as you will see now. He then also saw it for 6 seconds.
After the picture disappeared, he also gave an estimate.
They could also earn a higher bonus if their estimate was more accurate.
You can then enter a second estimate.
You can keep your first estimate or adjust it as you wish.
Once you submit your second estimate, the round is over and a new round begins.
Back
Continue

Your goal is to earn as many points as possible.

The more accurate your estimates, the more points you can earn.

At the end of the game, the computer will randomly select 1 of your estimates from 1 of the 10 rounds.

If you estimated the number of animals exactly right, you earn 100 points.

For each animal that you are off, 5 points are deducted.

The number of points cannot go below zero.

For example, if the actual number of animals in the image was 60, and your estimation was 53, you were 7 off.
This would mean that we subtract 7 x 5 = 35 Points.
Your earnings for that estimate would be 100 - 35 = 65 Points.

Click 'Continue' if you understand your task.

There are then a few short control questions to check if you understand.

Back Continue

Quiz

1. In each round of this task you will view an image. You have to estimate how many animals were displayed in it.

correct incorrect

2. Once you entered your estimate, you can observe the estimate of another classmate who completed this task before,(block 1: Tom, block 2: Mark). You can then make a second estimate.

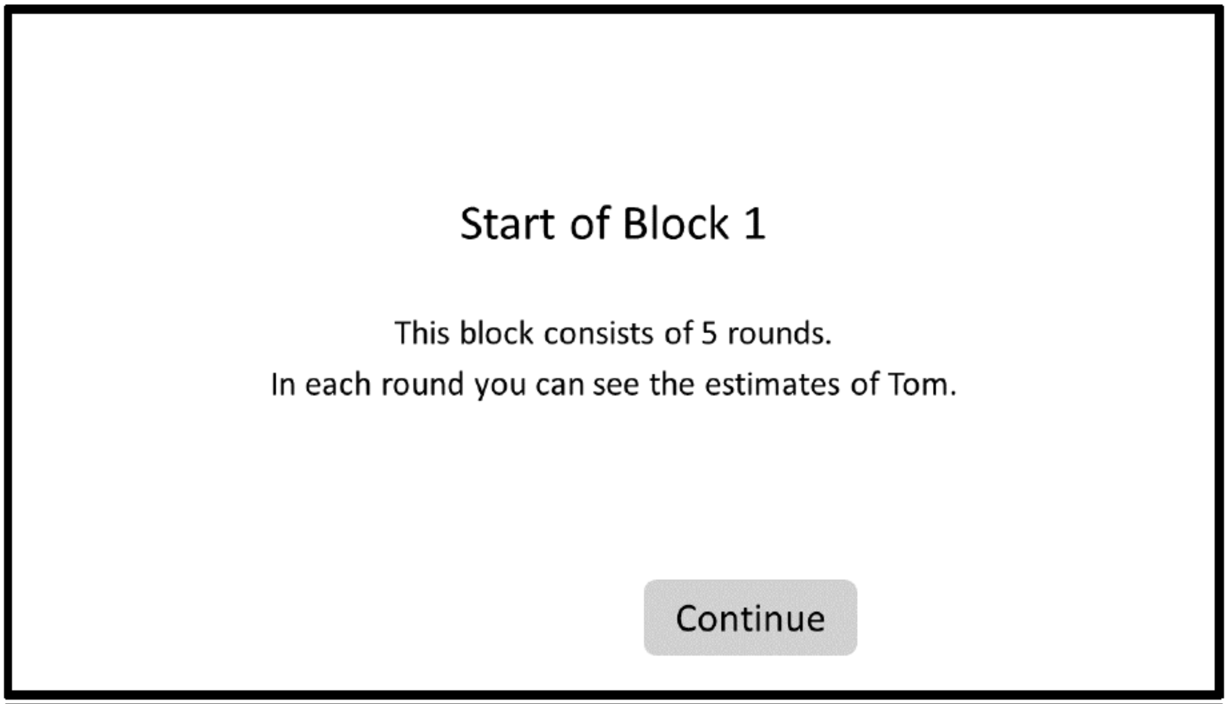
correct incorrect

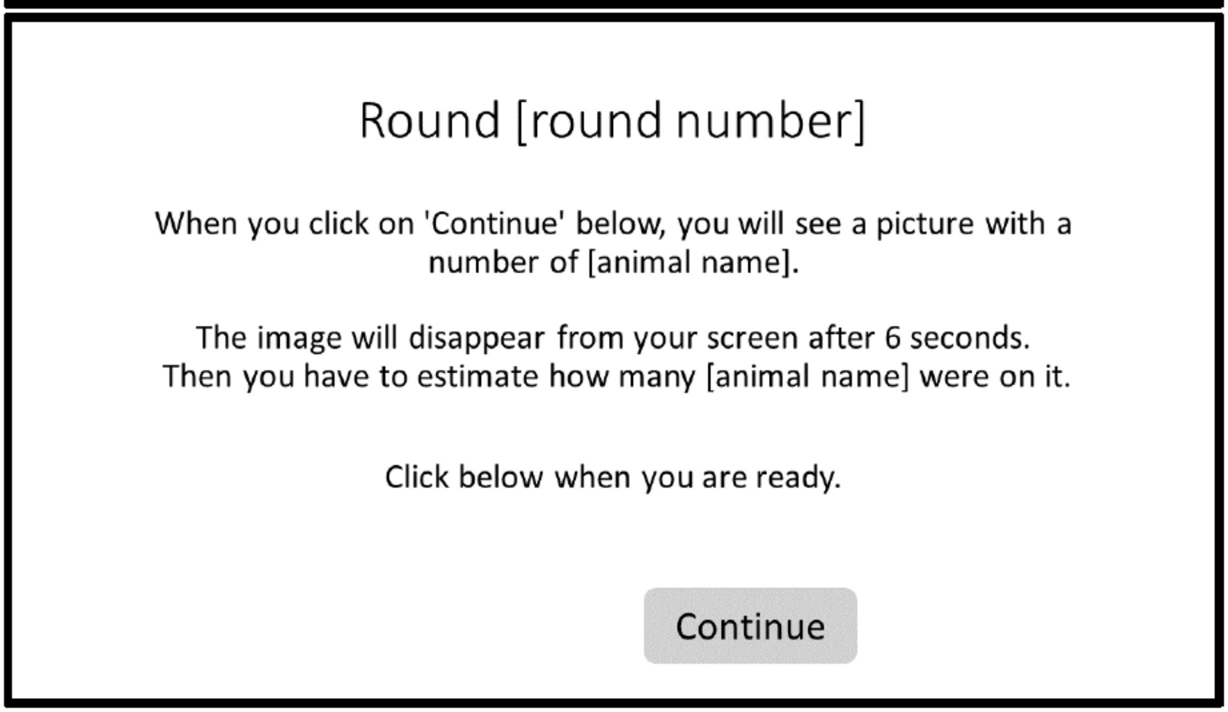
3. The more accurate your estimates, the more points you can earn.

correct incorrect

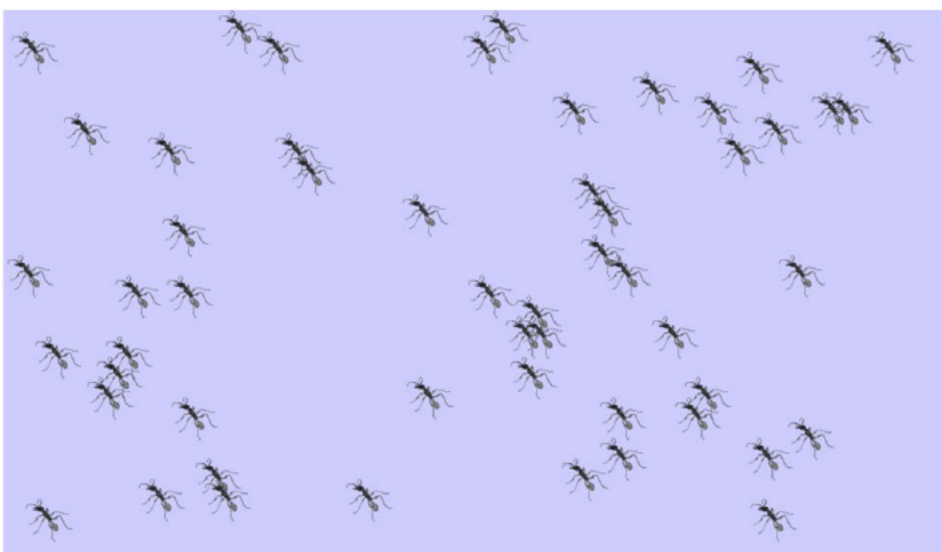
If you have any questions, raise your hand. The test leader will come to you.

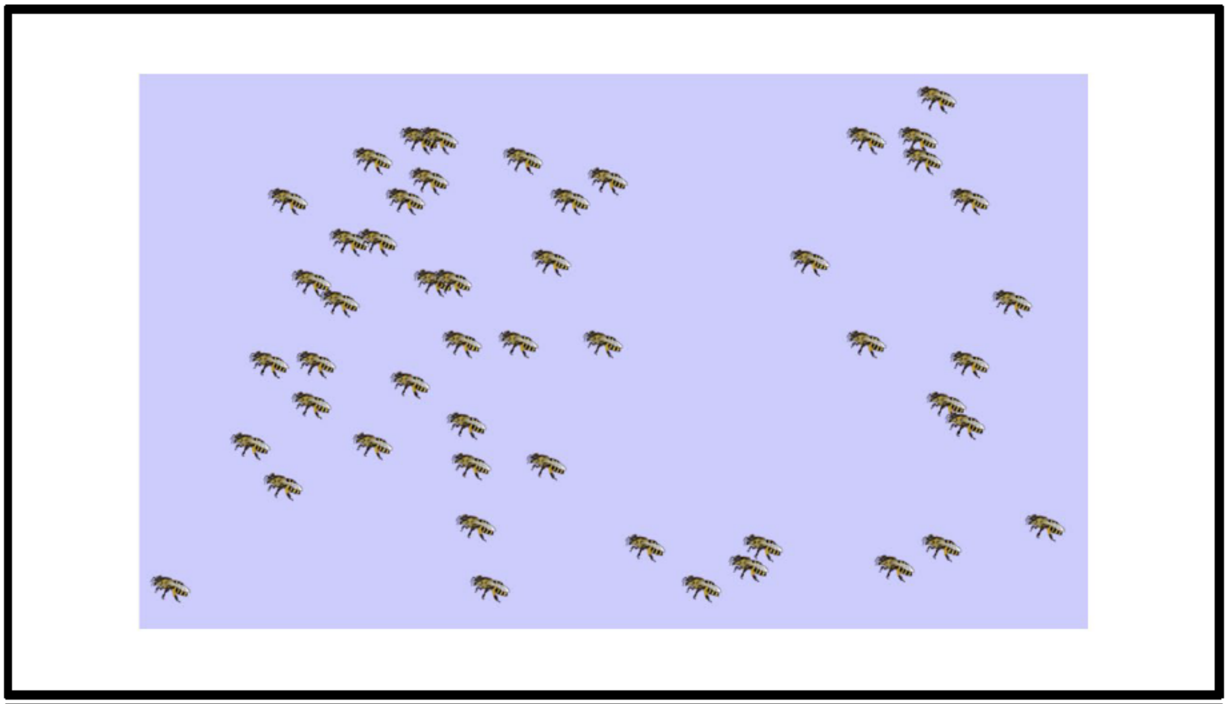
Back Continue

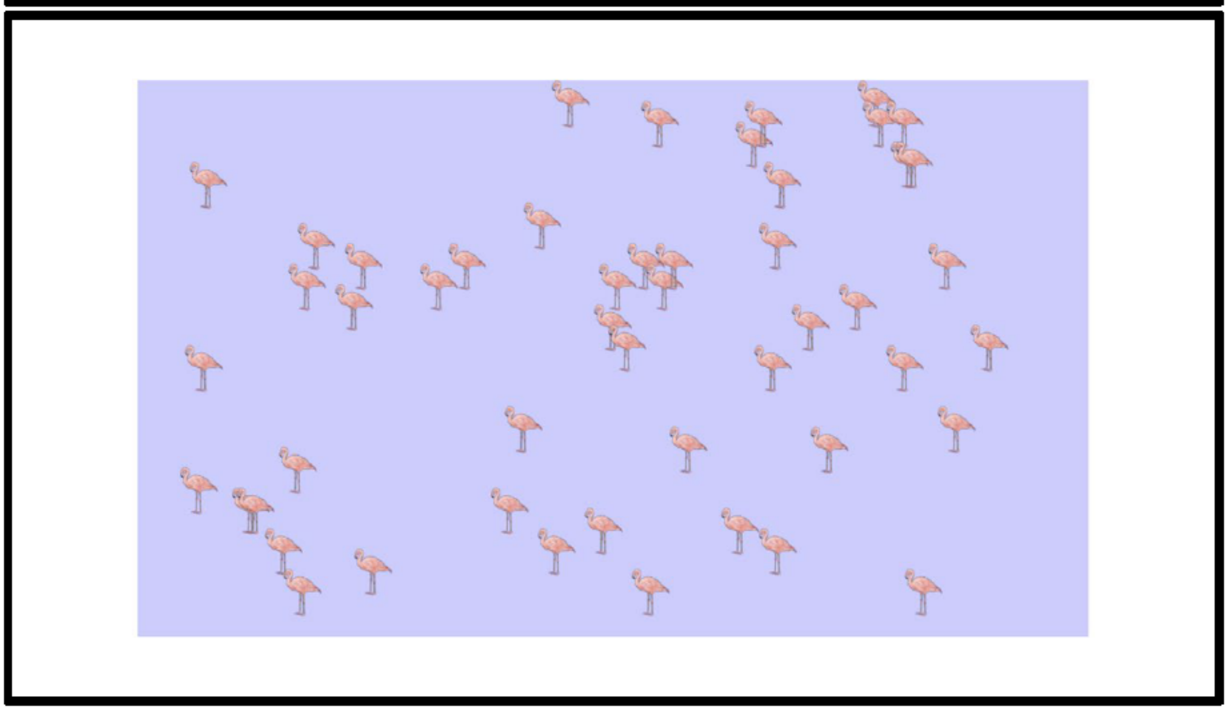

Start of Block 1
This block consists of 5 rounds.
In each round you can see the estimates of Tom.
Continue

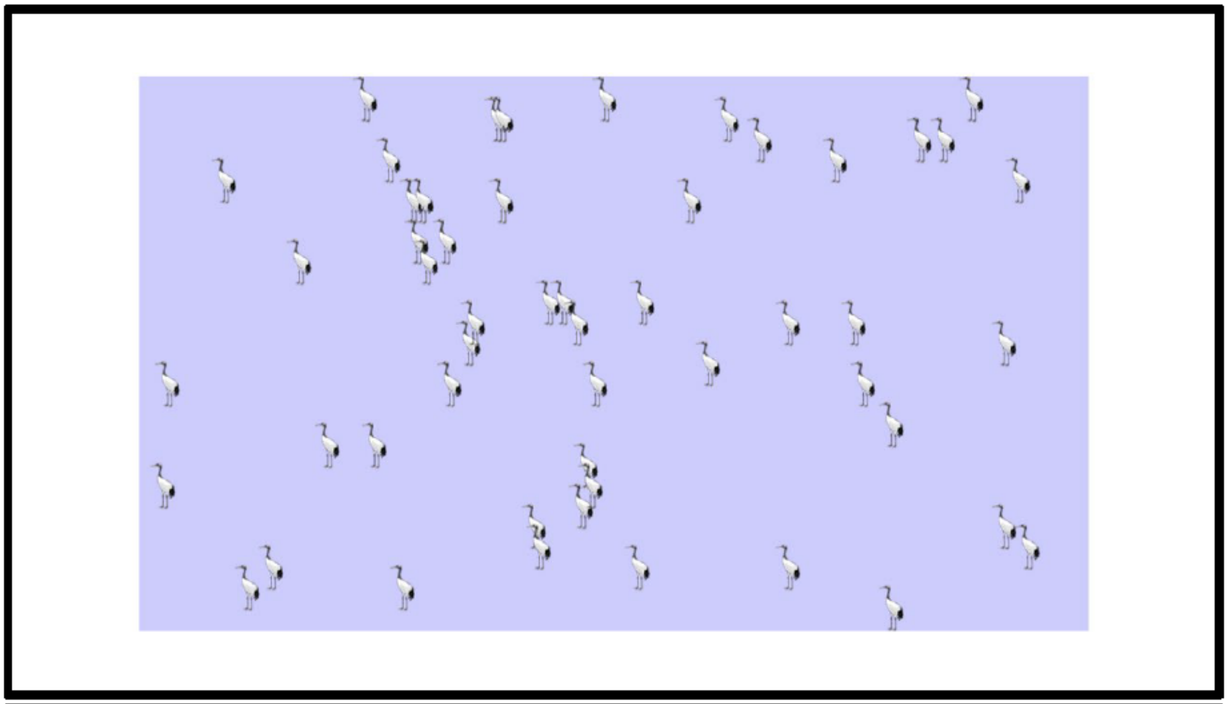

Round [round number]
When you click on 'Continue' below, you will see a picture with a number of [animal name].
The image will disappear from your screen after 6 seconds.
Then you have to estimate how many [animal name] were on it.
Click below when you are ready.
Continue

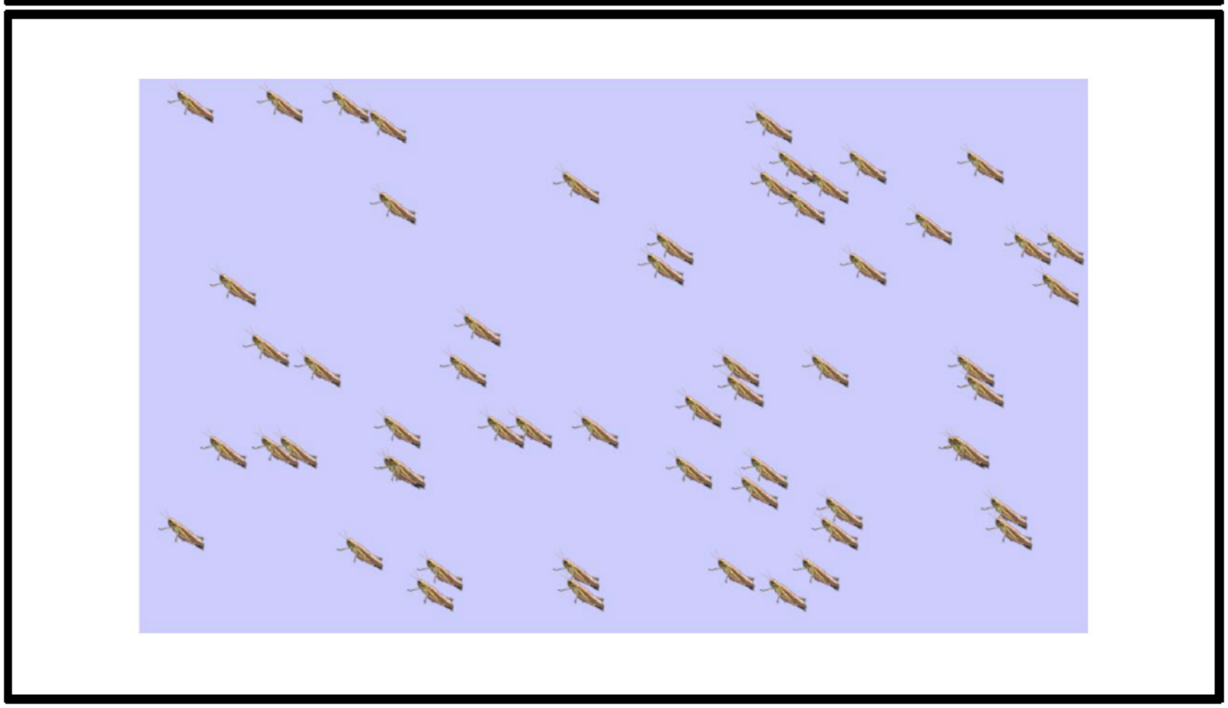
*[Screenshots of the 5 possible stimuli follow,
each stimulus was displayed for 6 seconds]*

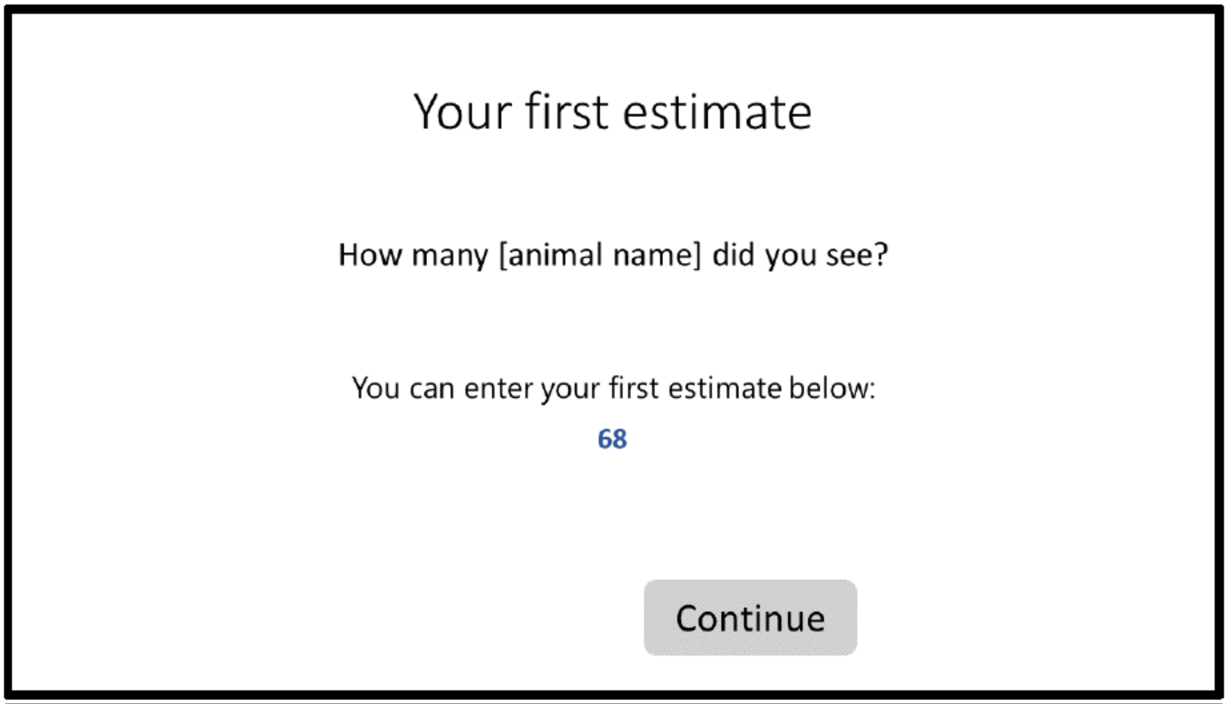


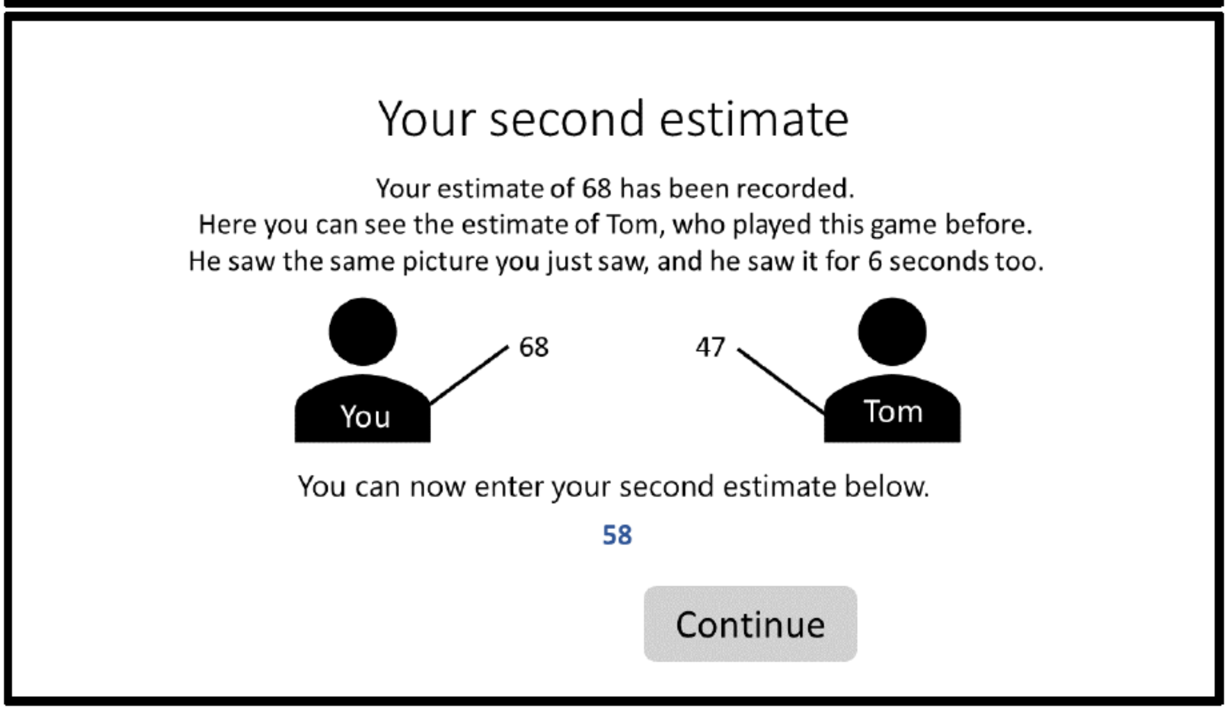




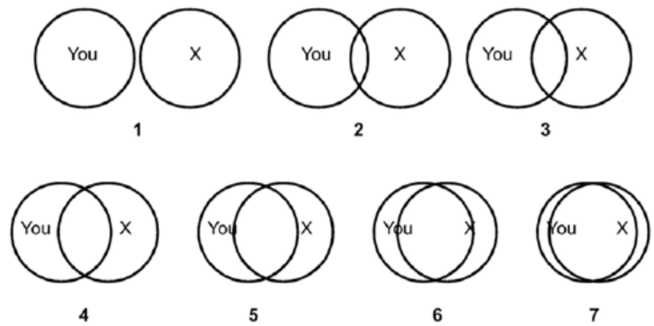





Your first estimate
How many [animal name] did you see?
You can enter your first estimate below:
68
Continue


Your second estimate
Your estimate of 68 has been recorded.
Here you can see the estimate of Tom, who played this game before.
He saw the same picture you just saw, and he saw it for 6 seconds too.
68
47
You
Tom
You can now enter your second estimate below.
58
Continue

In this picture you see 7 pairs of circles. The 'X' in the circles represents 1 of your classmates.



	1	2	3	4	5	6	7
Which of these pairs of circles best describes your relationship with Tom?	O	O	O	O	O	O	O
Which of these pairs of circles best describes your relationship with Mark?	O	O	O	O	O	O	O