Appendix

In the following, complete coding examples from each of the three groups are given. In each table these abbreviations are used:

SG: semantic gravity
SG+: strong semantic gravity
SG-: weak semantic gravity
IM: intermediate level of semantic gravity
↑ : weakening semantic gravity
↓ : strengthening semantic gravity

Table 1. Coding of discussion in group 1.

#	Utterance	Code SG	Code Change
1	Una: But … I don't understand why the weight gets heavier when the elevator moves upwards	SG+	
2	Vilma: I feel like it just makes sense	SG+	
3	Una: Yes, it makes sense, but I don't understand the law behind it, in a way	SG+	
4	Synne: Yes, and the only way i can justify it is Newton's 2nd law.	SG-	↑
5	Una: Yes, but the acceleration will increase	SG-	
6	Synne: Yes, when the acceleration increases, the sum of forces also increases	SG-	
7	Una: yes, but the mass won't increase …?	SG-	
8	Synne: No, no, no. It remains the same. But if the mass is zero, then … then the sum of forces still will still be zero … I believe	SG-	
9	Synne: If the mass is 10 … and you suddenly have an acceleration of 1.5 … then the sum of forces will increase	IM	↓
10	Una: Yes, but we say that when the elevator moves upwards, the weight will … If a person is standing on a scale in an elevator moving upwards, then the weight will increase	SG+	↓
11	Synne: Yes		
12	Synne: By that … we mean that the force pushing down on the scale will increase	IM	↑
13	Una: Is this in some way related to action equals reaction? … What is the reaction force to the person standing on the scale? Is it …	SG-	↑
14	Synne: The reaction force to the gravitation is the pull you exert on the earth	SG-	
15	Una: Action and reaction force on the person standing on the scale, will be the reaction force … No!	IM	↓
16	Vilma: Isn't it the reaction force from the scale?	IM	
17	Una: The person is pushing down on the elevator with a weight, and the elevator pushes up on the person … with a weight. And when the weight the elevator pushes up on the person gets bigger, the force the person pushes down on the elevator gets bigger … because they are action and reaction	IM	
18	Vilma: Now I didn't follow!		
19	Synne: Ok, lets draw, folks!	SG+	↓
20	Una: The person … or … The force's point of attack will be in the feet	SG+	
21	Vilma: It will push downwards towards the elevator	SG+	
22	Una: But it won't be the gravitational force, because it is not the force between the person and …	SG-	↑
23	Synne: No, it isn't the earth we are talking about here	SG-	
24	Una: It will be a force … in a way, a force pushing the person downwards towards the elevator … acting from the person on the elevator	SG+	↓
25	Synne: Yes		
26	Una: Mm … and then there will be a reaction force which … have the same point of attack	IM	↑
27	Synne: Yes		

28	Una: … which will be right here *[points to the drawing]* … at the feet or in the bottom of the elevator, in a way … which pushes from the elevator and then pushes the person upwards … And they will have the same size	SG+	↓
29	Synne: Yes		
30	Una: So, when the elevator moves upwards, the force pushing upwards on the person increases …	IM	↑
31	Synne: And the force pushing upwards is the normal force, right?	SG-	↑

Table 2. Coding of discussion in group 2.

#	Utterance	Code	
		SG	Change
1	Sara: What we should find is a … hypothesis about what will happen. Like if the elevator is pulled upwards, the weight will be higher than if the elevator is falling	SG+	
2	Rob: The scale will show more?	SG+	
3	Sara: Yes, exactly		
4	Rob: So, if we say the elevator moves upwards …	SG+	
5	Sara: But we need a … «because» … Why do we mean we are getting heavier?	SG+	
6	Britt: We have the gravity force and … how you are moving. You are moving down.	IM	↑
7	Rob: What it the acceleration was opposite? Opposite direction? If we said thar positive direction was downwards …?	SG-	
8	Britt: It would be just the same answers, just opposite sign. Positive sign on those who have negative, end negative on those who have positive. If you see what I mean?	SG-	
9	Rob: Yes		
10	Rob: The scale measures the normal force …	IM	
11	Sara: What I believe makes it, is that … If he stands still on the scale, we measure the gravity which is mass times acceleration	IM	
12	Sara: … and when we measure the sum of forces as ... or when we measure the normal force, we also calculate forces as mass times acceleration, and the acceleration will in this case be gravity because no other forces are acting	SG-	↑
13	Rob: Yes		
14	Sara: ... but when we are measuring gravity on a person in an elevator ... then it is still mass times acceleration, and it will be the same as it wasn't affected of anything, but if we should measure the normal force which is not ... or is in a way a different force than gravity, so ... or I think it is the normal force in motion, then you should use the acceleration to the elevator, maybe?	IM	↓
15	Rob: mm		
16	Rob: It makes sense, though. If you have an elevator … it's not like you are moving yourself away from the elevator. You will have the same velocity as the elevator.	SG+	↓
17	Sara: Yes, exactly! Your body will have the same acceleration as the elevator.	SG+	
18	Sara: I believe that's what makes it. But I'm not sure how this will be related to the acceleration due to gravity. Should you in a way … eh, just use the elevator's acceleration or you should also use the acceleration due to gravity in some way?	IM	↑
19	Britt: If we go to the elevator and try it out, and find that ... if someone is standing on the scale ...before we enter the elevator, we'll find how much it shows, the weight, or the mass or what you will call it, is then …	SG+	
20	Rob: Shall we try?	SG+	
21	Britt: … and when we are inside the elevator, we'll see how much it changes, and then we can calculate	SG+	

Table 3. Coding of discussion in group 3.

#	Utterance	Code SG	Change
1	Allan: ... but the scale measures … it will vary	SG+	
2	Allan: So, if the scale measures the reaction force … No … the reaction force to the reaction force, if you see what I mean? The reaction force to the force acting from the object and up.	IM	↑
3	Allan Right?		
4	Jan: Yes … the force needs to resist what's on top of it	SG+	↓
5	Allan Yes, … in a way		
6	Eva: Ok. But we are supposed to have a simple experiment with theory, figure, equipment, method and calculations	SG+	
7	Eva: Theory … *(writes)*	SG+	
8	Jan: The equations of motion might be useful … or … no	SG-	
9	Eva: It is difficult to measure the velocity of the elevator	SG+	↓
10	Jan: Yes. And the only thing we can use is the bathroom scale. Right?	SG+	
11	Jan: Not a GLX or any measuring devices	SG+	
12	Jan: We should measure something prior to … in a way close by the elevator, and something inside the elevator … and use this to calculate	SG+	
13	Eva: Yes, ok		
14	Eva: But in the theory *(the theory part of the experiment)* …	SG+	
15	Eva: We can say that … ehm … Newton's 2.law … explains that … the sum of forces equals the mass times the acceleration (*talks while writing)*	SG-	
16	Eva: But it doesn't work for the elevator!	SG+	↓
17	Jan: We should measure something on the scale before we enter the elevator, and then find the weight. Afterwards we do the same inside the elevator	SG+	
18	Allan: A person must stand in the elevator to read the value	SG+	
19	Jan: Yes, on the scale while it's moving upwards	SG+	
20	Jan: … and then it weighs more because it is a force upwards. It seems logical.	IM	↑
21	Allan: Yes		
22	Jan: And the difference is … the weight will be higher … The difference in mass is because the acceleration increases …	IM	
23	Jan: … because the elevator moves upwards	SG+	↓
24	Allan: And then I think ... when we are entering the elevator, we must place the scale on the floor. Then we place something on top of it. And when it moves upwards, the mass is ... or the weight ... the elevator shows bigger	SG+	
25	Allan: We can use the second equation of motion. Because we know the distance, and we know the initial velocity which is zero …	IM	
26	Eva: Do we know the distance?	SG+	↓