

Table S1. The Acoustic and Subjective Analysis of the Investigation Protocol was implemented in the nine case study schools.

Investigated scenario		Investigation Protocol			
School (K=Kinder- garten, P=Primary school, S= Secondary school) / City (F=Florence, P=Perugia, R=Rome)	(S1=Class- room, S2=Labora- tory, S3= Auditorium, S4=Gym, S5=Com- mon area, S6=Canteen, S7=Outdoor area)	Acoustic Measure- ments in Unoccu- pied Environments (Parameters)	Acoustic Measure- ments in Occupied Environments (In- formation)	Subjective Investigation Q1, Q2, Q3 (×= no question- naires, ✓= administered questionnaires)	Vocal Effort (Teacher code: Sub- ject of teaching)
K/F	S1	RT, C ₅₀ , D _{nT,w} (wall between the room and the corridor, wall between the room and adjacent class-room, floor between the room and the room below), L _{amb} , L _{Aeq} out of the room	Parameter: L _{Aeq} N. of students: 18	Q1: n/a ² Q3: ✓	FI1: - FI3: - FI4: - FI5: -
	S2	RT, C ₅₀ , D _{nT,w} (wall between the room and the corridor, wall between the room and adjacent class-room, floor between the room and the room below), L _{IC,int} , L _{amb} , L _{Aeq} out of the room	Parameter: L _{Aeq} N. of students: 6	Q2: n/a ² Q3: ✓	
	S3	RT, STI, D _{nT,w} (floor between the room and the room above), L _{IC,int} , L' _n (floor between the room and the room above)	n/a ¹	Q2: n/a ² Q3: ✓	
	S4	RT, L _{amb}	Parameter: L _{Aeq} N. of students: 11	Q2: n/a ² Q3: ✓	
	S5	RT, L _{amb}	Parameter: L _{Aeq} N. of students: 14	Q2: n/a ²	
	S6	RT	Parameter: L _{Aeq} N. of students: 40	Q2: n/a ²	
	S7	Outdoor L _{Aeq}	n/a ³	Q2: n/a ² Q3: ✓	
K/P	S1	RT, C ₅₀ , STI, D _{2m,nT,w} , D _{nT,w} (wall between the room and the corridor, wall between the room and adjacent classroom), L _{amb} , L _{Aeq} out of the room	Parameter: L _{Aeq} N. of students: 17	Q1: n/a ² Q3: ✓	PI1: - PI2: - PI3: - PI4: -
	S2	RT, C ₅₀ , STI, D _{2m,nT,w} , L _{amb} , L _{Aeq} out of the room	Parameter: L _{Aeq} N. of students: 17	Q2: n/a ² Q3: ✓	
	S3	n/a ¹	n/a ¹	Q2: n/a ² Q3: ✓	
	S4	n/a ¹	n/a ¹	Q2: n/a ² Q3: ✓	

School (K=Kindergarten, P=Primary school, S=Secondary school) / City (F=Florence, P=Perugia, R=Rome)	Investigated scenario	Investigation Protocol			
	(S1=Classroom, S2=Laboratory, S3=Auditorium, S4=Gym, S5=Common area, S6=Canteen, S7=Outdoor area)	Acoustic Measurements in Unoccupied Environments (Parameters)	Acoustic Measurements in Occupied Environments (Information)	Subjective Investigation Q1, Q2, Q3 (×= no questionnaires, ✓= administered questionnaires)	Vocal Effort (Teacher code: Subject of teaching)
K/R	S5	RT, L_{amb}	Parameter: L_{Aeq} N. of students: 18	Q2: n/a^2	
	S6	RT, $D_{2m,nT,w}$, L_{amb}	Parameter: L_{Aeq} N. of students: 30	Q2: n/a^2	
	S7	Outdoor L_{Aeq}	n/a^3	Q2: n/a^2 Q3: ✓	
	S1	RT, C_{50} , $D_{2m,nT,w}$, $D_{nT,w}$ (wall between the room and the corridor, wall between the room and adjacent classroom, floor between the room and the room below), L'_{nT} (floor between the room and the room above), $L_{IC,int}$, L_{Aeq} out of the room	n/a^1	Q1: n/a^2 Q3: ×	
	S2	RT, C_{50} , $D_{2m,nT,w}$, $D_{nT,w}$ (wall between the room and the corridor, wall between the room and adjacent classroom), L_{ID} , $L_{IC,int}$, L_{amb} , L_{Aeq} out of the room	n/a^1	Q2: n/a^2 Q3: ×	
	S3	n/a^1	n/a^1	Q2: n/a^2 Q3: ×	
	S4	RT, $L_{IC,int}$	n/a^1	Q2: n/a^2 Q3: ×	
	S5	RT	n/a^1	Q2: n/a^2	
	S6	RT	n/a^1	Q2: n/a^2	
	S7	Outdoor L_{Aeq}	n/a^3	Q2: n/a^2 Q3: ×	
	S1	RT, C_{50} , $D_{2m,nT,w}$, $D_{nT,w}$ (wall between the room and the corridor, wall between the room and adjacent classroom), L'_{nT} (floor between the room and the room above), $L_{IC,int}$, L_{amb}	Parameter: L_{Aeq} N. of students: 24	Q1: ✓ Q3: ✓	FPI1: Italian FPM1: Mathematics FPM2: Mathematics
	S2	RT, C_{50} , $D_{nT,w}$ (floor between the room and the room above, floor between the room and the room below),	Parameter: L_{Aeq} N. of students: 20	Q2: ✓ Q3: ✓	
P/F					

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	(S1=Classroom, S2=Laboratory, S3=Auditorium, S4=Gym, S5=Common area, S6=Canteen, S7=Outdoor area)	Acoustic Measurements in Unoccupied Environments (Parameters)	Acoustic Measurements in Occupied Environments (Information)	Subjective Investigation Q1, Q2, Q3 (×= no questionnaires, ✓= administered questionnaires)	Vocal Effort (Teacher code: Subject of teaching)
P/P		L _{C,int} , L _{Aeq} out of the room			
	S3	RT, STI, D _{nT,w} (floor between the room and the room above), L _{C,int} , L' _n (floor between the room and the room above)	n/a ¹	Q2: ✓ Q3: ✓	
	S4	RT, L _{C,int}	Parameter: L _{Aeq} N. of students: 20	Q2: ✓ Q3: ✓	FPF1: Physical education
	S5	RT, L _{amb} , L _{Aeq} out of the room	Parameter: L _{Aeq} N. of students: 15	Q2: ✓	
	S6	RT	Parameter: L _{Aeq} N. of students: 18	Q2: ✓	
	S7	Outdoor L _{Aeq}	n/a ³	Q2: ✓ Q3: ✓	
	S1	RT, C ₅₀ , STI, D _{nT,w} (wall between the room and the corridor, wall between the room and adjacent classroom, floor between the room and the room below), L _{amb} , L _{Aeq} out of the room	Parameter: L _{Aeq} N. of students: 18	Q1: ✓ Q3: ✓	PPI1: Italian PPM2: Mathematics
	S2	RT, C ₅₀ , STI, D _{nT,w} (wall between the room and the corridor, wall between the room and adjacent classroom, floor between the room and the room above), L' _n (floor between the room and the room above), L _{amb} , L _{Aeq} out of the room	Parameter: L _{Aeq} N. of students: 18	Q2: ✓ Q3: ✓	
	S3	RT, C ₅₀ , STI, D _{nT,w} (wall between the room and the corridor, wall between the room and adjacent classroom, floor between the room and the room below), L _{amb} , L _{Aeq} out of the room	Parameter: L _{Aeq} N. of students: 18	Q2: ✓ Q3: ✓	
	S4	RT, L _{C,int}	Parameter: L _{Aeq} N. of students: 18	Q2: ✓ Q3: ✓	PPF3: Physical education PPF4: Physical education

School (K=Kindergarten, P=Primary school, S=Secondary school) / City (F=Florence, P=Perugia, R=Rome)	Investigated scenario (S1=Classroom, S2=Laboratory, S3=Auditorium, S4=Gym, S5=Common area, S6=Canteen, S7=Outdoor area)	Investigation Protocol			
		Acoustic Measurements in Unoccupied Environments (Parameters)	Acoustic Measurements in Occupied Environments (Information)	Subjective Investigation Q1, Q2, Q3 (×= no questionnaires, ✓= administered questionnaires)	Vocal Effort (Teacher code: Subject of teaching)
	S5	RT, L_{amb}	Parameter: L_{Aeq} N. of students: 3	Q2: ✓	
	S6	n/a ¹	n/a ¹	Q2: ✓	
	S7	Outdoor L_{Aeq}	n/a ³	Q2: ✓ Q3: ✓	
P/R	S1	RT, C_{50} , $D_{nT,w}$ (wall between the room and the corridor, wall between the room and adjacent classroom, floor between the room and the room below), L'_n (floor between the room and the room above), $L_{iC,int}$, L_{amb} , L_{Aeq} out of the room	Parameter: L_{Aeq} N. of students: 20	Q1: ✓ Q3: ✓	RPI1: Italian RPM2: Mathematics RPS5: Educational support
	S2	n/a ¹	n/a ¹	Q2: ✓ Q3: ✓	
	S3	n/a ¹	n/a ¹	Q2: ✓ Q3: ✓	
	S4	RT, $L_{iC,int}$	n/a ¹	Q2: ✓ Q3: ✓	RPF3: Physical education RPF4: Physical education
	S5	RT, L_{Aeq} out of the room	Parameter: L_{Aeq} N. of students: 13	Q2: ✓	
	S6	n/a ¹	n/a ¹	Q2: ✓	
	S7	Outdoor L_{Aeq}	n/a ³	Q2: ✓ Q3: ✓	
S/F	S1	RT, C_{50} , $D_{nT,w}$ (wall between the room and the corridor, wall between the room and adjacent classroom, floor between the room and the room above), L'_n (floor between the room and the room above), $L_{iC,int}$, L_{amb} , L_{Aeq} out of the room	Parameter: L_{Aeq} N. of students: 14	Q1: ✓ Q3: ✓	FSI1: Italian FSM1: Mathematics
	S2	RT, C_{50} , $D_{nT,w}$ (wall between the room and the corridor, wall between the room and adjacent classroom), $L_{iC,int}$, L_{amb}	Parameter: L_{Aeq} N. of students: 24	Q2: ✓ Q3: ✓	
	S3	RT, STI, $D_{nT,w}$ (floor between the room and the room above), L'_n (floor between the	Parameter: L_{Aeq} N. of students: 32	Q2: ✓ Q3: ✓	

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S/P		room and the room above), $L_{IC,int}$, L_{amb} , L_{Aeq} out of the room			
	S4	RT , $L_{IC,int}$	Parameter: L_{Aeq} N. of students: 21	Q2: ✓ Q3: ✓	FSF1: Physical education FSF2: Physical education
	S5	RT , L_{amb}	n/a ¹	Q2: ✓	
	S6	RT	Parameter: L_{Aeq} N. of students: 64	Q2: ✓	
	S7	Outdoor L_{Aeq}	n/a ³	Q2: ✓ Q3: ✓	
	S1	RT , STI , C_{50} , $D_{nT,w}$ (wall between the room and the corridor, wall between the room and adjacent classroom, floor between the room and the room below), L_{amb} , L_{Aeq} out of the room	Parameter: L_{Aeq} N. of students: 10	Q1: ✓ Q3: ✓	PSI1: Italian PSM2: Mathematics
	S2	RT , STI , C_{50} , $D_{nT,w}$ (wall between the room and the corridor, wall between the room and adjacent classroom, floor between the room and the room above), L'_{nT} (floor between the room and the room above), L_{amb} , L_{Aeq} out of the room	Parameter: L_{Aeq} N. of students: 10	Q2: ✓ Q3: ✓	
	S3	RT , STI , C_{50} , $D_{nT,w}$ (wall between the room and the corridor, floor between the room and the room above), L'_{nT} (floor between the room and the room above), L_{amb} , L_{Aeq} out of the room	n/a ¹	Q2: ✓ Q3: ✓	
	S4	RT , L_{amb}	Parameter: L_{Aeq} N. of students: 21	Q2: ✓ Q3: ✓	PSF3: Physical education PSF4: Physical education
	S5	RT , L_{amb}	Parameter: L_{Aeq} N. of students: 3	Q2: ✓	
	S6	n/a ¹	n/a ¹	Q2: ✓	
	S7	Outdoor L_{Aeq}	n/a ³	Q2: ✓	

School (K=Kindergarten, P=Primary school, S=Secondary school) / City (F=Florence, P=Perugia, R=Rome)	Investigated scenario (S1=Classroom, S2=Laboratory, S3=Auditorium, S4=Gym, S5=Common area, S6=Canteen, S7=Outdoor area)	Investigation Protocol		
	Acoustic Measurements in Unoccupied Environments (Parameters)	Acoustic Measurements in Occupied Environments (Information)	Subjective Investigation Q1, Q2, Q3 (×= no questionnaires, √= administered questionnaires)	Vocal Effort (Teacher code: Subject of teaching)
S/R	S1	RT, C_{50} , $D_{nT,w}$ (wall between the room and adjacent classroom, floor between the room and the room above), L'_n (floor between the room and the room above), $L_{iC,int}$, L_{iD} , L_{amb} , L_{Aeq} out of the room	n/a ¹	Q1: × Q3: ×
	S2	RT, C_{50} , $D_{nT,w}$ (wall between the room and adjacent classroom, floor between the room and the room above), L_{amb} , L_{Aeq} out of the room	n/a ¹	Q2: × Q3: ×
	S3	n/a ¹	n/a ¹	Q2: × Q3: ×
	S4	RT, $L_{iC,int}$	n/a ¹	Q2: × Q3: ×
	S5	RT	n/a ¹	Q2: ×
	S6	n/a ¹	n/a ¹	Q2: ×
	S7	n/a ¹	n/a ³	Q2: × Q3: ×

¹ This space has not been investigated (reasons: not existing in the school, not accessible or not used).

² Not applicable for children of kindergarten.

³ Not pertinent for outdoor environments

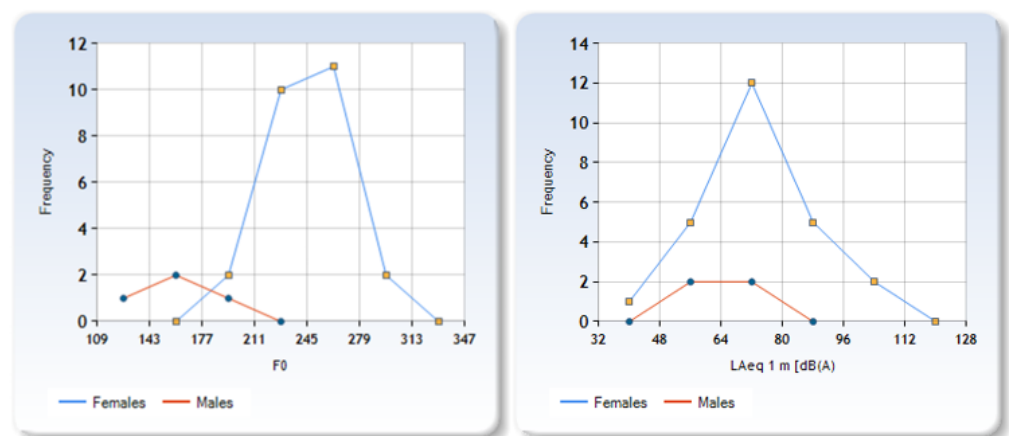


Figure S1. A histogram showing how the fundamental frequency is distributed (on the left). A histogram showing the distribution of the levels of the acoustic signal (SPL) emitted by the speaker at 1 m (vocal effort) (on the right).

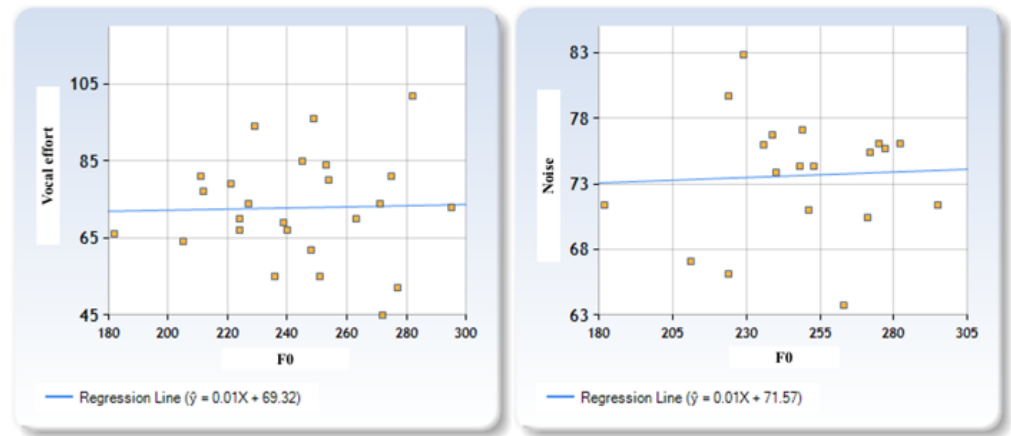


Figure S2. Scatter plots represent the linear regression between two variables. The relationship between F0 and Vocal Effort (on the left): linear regression $x = \text{F0 [Hz]}$, $y = \text{SPL voice [dB(A)]}$; $r = 0.03$, $p = 0.89$. The relationship between F0 and Noise (on the right): linear regression $x = \text{F0 [Hz]}$, $y = \text{SPL noise [dB(A)]}$; $r = 0.05$, $p = 0.84$.

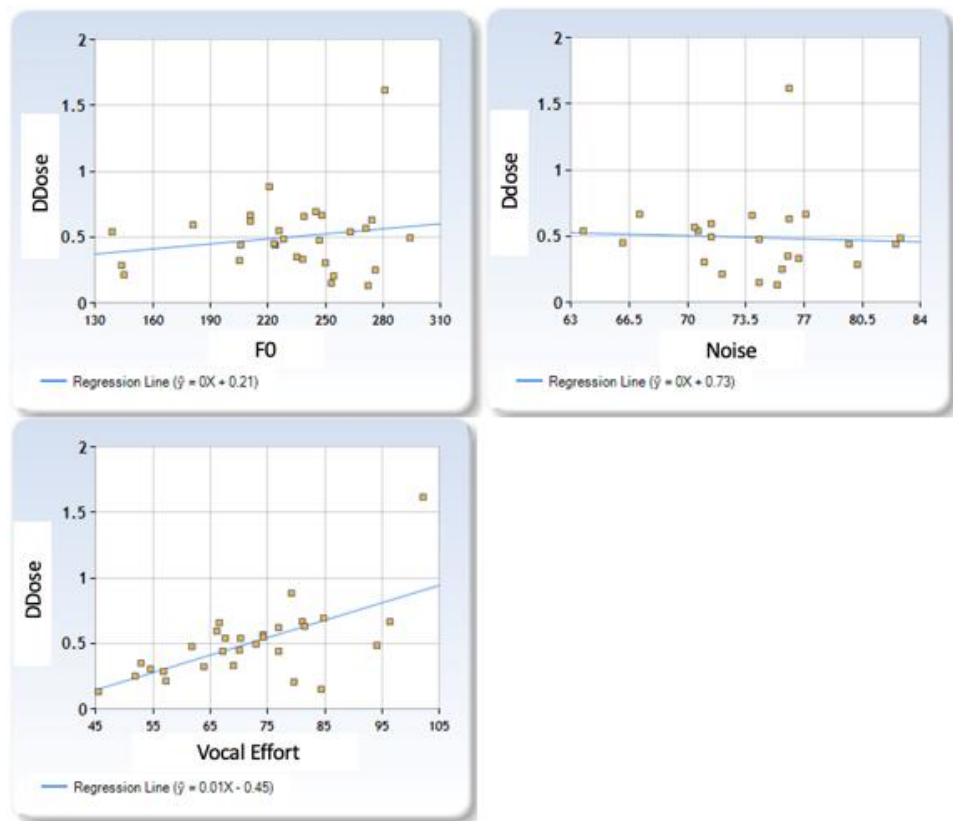


Figure S3. Scatter plots represent the linear regression between two variables. The relationship between F0 and DDose (top left): linear regression $x = \text{F0 [Hz]}$, $y = \text{DDose [m/s]}$; $r = 0.05$, $p = 0.81$. The relationship between Noise and DDose (top right): linear regression $x = \text{SPL noise [dB(A)]}$, $y = \text{DDose [m/s]}$; $r = -0.01$, $p = 0.97$. The relationship between Vocal effort and DDose (bottom left): linear regression $x = \text{SPL voice [dB(A)]}$, $y = \text{DDose [m/s]}$; $r = 0.62$, $p = 0.001$.