Monitoring practical science in schools and colleges

Appendix 3: Additional data

Durham University

Prepared for the Gatsby Charitable Foundation and the Wellcome Trust

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Appendix 3: Additional data in a technical appendix providing additional tables and graphs complementing those in the main report.

3 Additional data

Timetabled time (in hours) for science lessons

Table 1. 11 – 14 age range (England): Average science lesson time (in hours) per week over the three survey years and between subjects. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets. Statistically significant rates of change per year are highlighted in bold with the level of significance stated below the table.

	Year 1		Year 2		Year 3		Rate of change per year
	n	Hrs/wk	n	Hrs/wk	n	Hrs/wk	
Biology (state)	13	3.3 (4.2, 2.4)	18	1.9 (2.5, 1.3)	44	2.7 (3.1, 2.3)	-0.096
Biology (independent)	-	-	18	1.6 (1.9, 1.3)	20	1.6 (1.9, 1.3)	0.137
Chemistry (state)	13	3.2 (3.8, 2.6)	34	2.8 (3.3, 2.3)	66	2.5 (2.8, 2.2)	**-0.366***
Chemistry (independent)	10	1.6 (1.9, 1.3)	20	1.5 (1.8, 1.2)	32	1.7 (1.9, 1.5)	0.075
Physics (state)	11	2.2 (2.9, 1.5)	33	1.9 (2.2, 1.6)	46	2.9 (3.4, 2.4)	**0.547***
Physics (independent)	-	-	22	1.6 (1.9, 1.3)	45	1.4 (1.5, 1.3)	0.341
Science (state)	40	3.3 (3.6, 3.0)	72	3.6 (3.8, 3.4)	171	3.3 (3.4, 3.2)	-0.079
Science (independent)	-	-	14	2.6 (3.2, 2.0)	12	3.1 (3.6, 2.6)	0.440

***P<0.05 = statistically significant**

Table 2. 14 – 16 age range (England): Average science lesson time (in hours) per week over the three survey years and between subjects. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

	Year 1		Year 2		Year 3		Rate of change per year
	n	Hrs/wk	n	Hrs/wk	n	Hrs/wk	
Biology (state)	55	3.2 (3.7, 2.7)	76	3.2 (3.6, 2.8)	147	3.3 (3.6, 3.0)	0.060
Biology (independent)	31	2.7 (3.2, 2.2)	44	2.3 (2.5, 2.1)	45	2.6 (2.9, 2.3)	-0.029
Chemistry (state)	83	3.2 (3.5, 2.9)	97	3.1 (3.4, 2.8)	170	3.1 (3.3, 2.9)	-0.024
Chemistry (independent)	58	2.5 (2.8, 2.2)	50	2.7 (3.1, 2.3)	61	2.2 (2.3, 2.1)	-0.165
Physics (state)	70	2.8 (3.1, 2.5)	72	2.6 (2.9, 2.3)	140	3.2 (3.4, 3.0)	0.213
Physics (independent)	43	2.7 (3.3, 2.1)	55	2.3 (2.4, 2.2)	80	2.2 (2.3, 2.1)	-0.219

Table 3. Post – 16 age range (England): Average science lesson time (in hours) per week over the three survey years and between subjects. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

	Year 1		Year 2		Year 3		Rate of change per year
	n	Hrs/wk	n	Hrs/wk	n	Hrs/wk	
Biology (state)	67	5.1 (5.5, 4.7)	84	5.0 (5.4, 4.6)	114	4.9 (5.2, 4.6)	-0.072
Biology (independent)	32	4.9 (5.1, 4.7)	41	5.0 (5.3, 4.7)	56	5.1 (5.4, 4.8)	0.104
Chemistry (state)	85	4.9 (5.2, 4.6)	87	5.0 (5.3, 4.7)	142	4.9 (5.1, 4.7)	-0.004
Chemistry (independent)	57	5.3 (5.6, 5.0)	50	5.3 (5.7, 4.9)	59	5.1 (5.4, 4.8)	-0.083
Physics (state)	65	4.9 (5.2, 4.6)	67	4.7 (4.9, 4.5)	112	4.9 (5.1, 4.7)	0.002
Physics (independent)	42	5.3 (5.8, 4.8)	57	4.7 (4.9, 4.5)	77	4.9 (5.1, 4.7)	-0.148

Table 4. All subjects combined (Scotland): Average science lesson time (in hours) per week over the three survey years showing data for 11 – 14 age range (n = 76), 14 – 16 age range (n = 127) and post – 16 age range (n = 138). Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

	Year 1		Year 2		Year 3		Rate of change per year
	n	Hrs/wk	n	Hrs/wk	n	Hrs/wk	
11 – 14 age range							
All subjects (state)	-	-	16	2.6 (2.9, 2.3)	55	2.8 (3.0, 2.6)	0.234
14 – 16 age range							
All subjects (state)	22	3.7 (4.0, 3.4)	42	3.8 (4.0, 3.6)	60	4.0 (4.2, 3.8)	0.136
Post – 16 age range							
All subjects (state)	23	4.6 (5.1, 4.1)	45	4.6 (4.9, 4.3)	63	4.5 (4.7, 4.3)	-0.089

Science lesson time per week spent on practical work (in hours)

Table 5. 11 – 14 age range (England): Average science lesson time spent on practical work per week (in hours) over the three survey years and between subjects. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

	Year 1		Year 2		Year 3		
	n	Hrs/wk	n	Hrs/wk	n	Hrs/wk	Rate of change per year
Biology (state)	17	0.8 (1.0, 0.6)	16	0.6 (0.8, 0.4)	43	0.7 (0.8, 0.6)	-0.033
Biology (independent)	17	0.6 (0.7, 0.5)	18	0.6 (0.8, 0.4)	20	0.6 (0.7, 0.5)	-0.026
Chemistry (state)	23	1.0 (1.2, 0.8)	33	0.8 (1.0, 0.6)	62	0.8 (1.0, 0.6)	-0.063
Chemistry (independent)	32	0.7 (0.8, 0.6)	20	0.6 (0.7, 0.5)	32	0.7 (0.8, 0.6)	0.018
Physics (state)	18	0.7 (0.9, 0.5)	30	0.7 (0.9, 0.5)	42	0.9 (1.1, 0.7)	0.142
Physics (independent)	20	0.5 (0.6, 0.4)	21	0.6 (0.7, 0.5)	39	0.6 (0.7, 0.5)	0.045
Science (state)	57	1.1 (1.3, 0.9)	71	1.2 (1.4, 1.0)	165	1.1 (1.2, 1.0)	-0.045
Science (independent)	15	1.3 (1.6, 1.0)	14	1.4 (1.8, 1.0)	11	1.4 (1.8, 1.0)	0.078

Table 6. 14 – 16 age range (England): Average science lesson time spent on practical work per week (in hours) over the three survey years and between subjects. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets. Statistically significant rates of change per year are highlighted in bold with the level of significance stated below the table.

	Year 1		Year 2		Year 3		Rate of change per year
	n	Hrs/wk	n	Hrs/wk	n	Hrs/wk	
Biology (state)	55	0.6 (0.8, 0.4)	73	0.7 (0.8, 0.6)	142	0.9 (1.0, 0.8)	**0.125***
Biology (independent)	32	0.7 (0.8, 0.6)	44	0.6 (0.7, 0.5)	43	0.7 (0.8, 0.6)	0.017
Chemistry (state)	82	1.0 (1.1, 0.9)	100	0.9 (1.0, 0.8)	166	0.9 (1.0, 0.8)	-0.010
Chemistry (independent)	56	0.8 (0.9, 0.7)	51	0.9 (1.1, 0.7)	61	0.7 (0.8, 0.6)	-0.059
Physics (state)	67	0.8 (0.9, 0.7)	69	0.8 (0.9, 0.7)	128	0.9 (1.0, 0.8)	0.058
Physics (independent)	43	0.9 (0.8, 0.6)	54	0.7 (0.8, 0.6)	78	0.7 (0.8, 0.6)	-0.081

***P<0.05**

Table 7. Post – 16 age range (England): Average science lesson time spent on practical work per week (in hours) over the three survey years and between subjects. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

	Year 1		Year 2		Year 3		Rate of change per year
	n	Hrs/wk	n	Hrs/wk	n	Hrs/wk	
Biology (state)	65	1.0 (1.1, 0.9)	82	1.3 (1.5, 1.1)	112	1.1 (1.2, 1.0)	0.069
Biology (independent)	32	1.5 (1.7, 1.3)	41	1.4 (1.6, 1.2)	55	1.3 (1.5, 1.1)	-0.126
Chemistry (state)	83	1.3 (1.5, 1.1)	85	1.3 (1.4, 1.2)	138	1.4 (1.5, 1.3)	0.023
Chemistry (independent)	56	1.6 (1.8, 1.4)	52	1.6 (1.8, 1.4)	59	1.4 (1.6, 1.2)	-0.090
Physics (state)	65	1.5 (1.7, 1.3)	67	1.3 (1.5, 1.1)	109	1.3 (1.4, 1.2)	-0.068
Physics (independent)	42	1.6 (1.8, 1.4)	57	1.5 (1.7, 1.3)	79	1.7 (1.9, 1.5)	0.090

Table 8. All subjects combined (Scotland): Average science lesson time spent on practical work per week (in hours) over the three survey years and between subjects. Respondents were heads of science and science teachers.

	Year 1		Year 2		Year 3		Rate of change per year
	n	Hrs/wk	n	Hrs/wk	n	Hrs/wk	
11 – 14 age range							
All subjects (state)	13	1.1 (1.4, 0.8)	20	1.0 (1.3, 0.7)	58	1.3 (1.5, 1.1)	0.104
14 – 16 age range							
All subjects (state)	23	1.1 (1.3, 0.9)	43	1.1 (1.3, 0.9)	60	1.1 (1.3, 0.9)	-0.008
Post – 16 age range							
All subjects (state)	24	1.1 (1.4, 0.8)	50	1.1 (1.3, 0.9)	64	1.1 (1.3, 0.9)	0.022

Number of practical work activities

Table 9. 11 – 14 age range (England): Number of practical work activities undertaken by a student in an academic year over the three survey years and between subjects. Respondents were heads of science and science teachers teaching students. 95% confidence intervals are indicated in brackets.

	Year 1		Year 2		Year 3		Rate of change per year
	n	No. activities	n	No. activities	n	No. activities	
Biology (state)	17	19 (25, 13)	15	17 (23, 11)	44	20 (24, 16)	0.805
Biology (independent)	16	17 (20, 14)	18	17 (21, 13)	21	16 (21, 11)	-0.363
Chemistry (state)	20	22 (28, 16)	33	22 (26, 18)	64	21 (24, 18)	-0.624
Chemistry (independent)	30	21 (24, 18)	20	17 (20, 14)	32	20 (23, 17)	-0.234
Physics (state)	16	19 (24, 14)	30	20 (24, 16)	42	26 (31, 21)	3.884
Physics (independent)	20	20 (24, 16)	22	20 (24, 16)	45	21 (24, 18)	0.390
Science (state)	53	33 (38, 28)	66	33 (38, 28)	165	33 (36, 30)	-0.342
Science (independent)	13	38 (49, 27)	14	38 (45, 31)	11	27 (38, 16)	-5.20

Table 10. 14 – 16 age range (England): Number of practical work activities undertaken by a student in an academic year over the three survey years and between subjects. Respondents were heads of science and science teachers teaching students. 95% confidence intervals are indicated in brackets. Statistically significant rates of change per year are highlighted in bold with the level of significance stated below the table.

	Year 1		Year 2		Year 3		Rate of change per year
	n	No. activities	n	No. activities	n	No. activities	
Biology (state)	56	15 (18, 12)	75	21 (25, 17)	144	20 (22, 18)	**2.227***
Biology (independent)	31	18 (20, 16)	44	18 (21, 15)	45	17 (20, 14)	-0.848
Chemistry (state)	80	23 (26, 20)	93	23 (28, 22)	167	23 (25, 21)	0.171
Chemistry (independent)	55	24 (27, 21)	50	23 (25, 21)	61	20 (22, 18)	-1.791
Physics (state)	65	21 (24, 18)	71	24 (27, 21)	139	23 (26, 20)	0.951
Physics (independent)	41	20 (22, 18)	54	23 (25, 21)	79	20 (22, 18)	-0.467

***P<0.05**

Table 11. Post – 16 age range (England): Number of practical work activities undertaken by a student in an academic year over the three survey years and between subjects. Respondents were heads of science and science teachers teaching students. 95% confidence intervals are indicated in brackets. Statistically significant rates of change per year are highlighted in bold with the level of significance stated below the table.

	Year 1		Year 2		Year 3		Rate of change per year
	n	No. activities	n	No. activities	n	No. activities	
Biology (state)	65	18 (20, 16)	78	20 (23, 17)	113	21 (23, 19)	1.498
Biology (independent)	31	22 (25, 19)	41	22 (24, 20)	54	19 (22, 16)	-1.456
Chemistry (state)	81	28 (31, 25)	83	24 (27, 21)	139	22 (24, 20)	**-2.860***
Chemistry (independent)	55	30 (34, 26)	52	27 (30, 24)	59	24 (26, 22)	**-3.267***
Physics (state)	64	24 (27, 21)	67	22 (25, 19)	111	23 (25, 21)	-0.272
Physics (independent)	41	28 (32, 24)	56	28 (32, 24)	77	25 (28, 22)	-1.380

***P<0.05**

Table 12. All subjects combined (Scotland): Number of practical work activities undertaken by a student in an academic year over the three survey years showing data for 11 – 14 age range (n = 79), 14 – 16 age range (n = 112) and post – 16 age range (n = 123). Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

	Year 1		Year 2		Year 3		Rate of change per year
	n	No. activities	n	No. activities	n	% No. activities	
11 – 14 age range							
All subjects (state)	12	35 (45, 25)	14	25 (32, 18)	53	34 (38, 30)	1.256
14 – 16 age range							
All subjects (state)	20	25 (29, 21)	35	21 (27, 15)	57	20 (23, 17)	-2.629
Post – 16 age range							
All subjects (state)	22	17 (21, 13)	39	19 (25, 13)	62	15 (18, 12)	-1.317

Science lesson activities

Activities

Table 13. All age ranges (England and Scotland): Percentage of respondents who stated that the proportion of science lesson time spent on practical work activities/experiments had increased/decreased/stayed the same since the last academic year by subject (England only) – year 3 of the study. Respondents were heads of science and science teachers.

		Decreased	Stayed the same	Increased
	n	%	%	%
England state				
11 to 14				
Biology	42	17 (31, 8)	75 (85, 63)	9 (22, 3)
Chemistry	64	20 (31, 12)	62 (73, 49)	19 (30, 11)
Physics	45	15 (29, 7)	63 (76, 51)	22 (36, 12)
Science	169	10 (15, 6)	74 (80, 63)	16 (22, 11)
14 to 16				
Biology	144	19 (27, 14)	58 (65, 44)	23 (31, 17)
Chemistry	169	19 (26, 14)	64 (71, 52)	17 (23, 12)
Physics	139	21 (28, 15)	56 (64, 43)	23 (31, 17)
Post 16				
Biology	114	13 (21, 8)	52 (61, 38)	35 (44, 27)
Chemistry	140	9 (15, 5)	66 (73, 53)	25 (33, 19)
Physics	110	8 (15, 4)	62 (71, 49)	30 (39, 22)
England independent				
11 to 14				
Biology	21	0 (16, 0)	95 (99, 84)	5 (23, 1)
Chemistry	32	3 (16, 1)	97 (99, 88)	0 (11, 0)
Physics	44	5 (15, 1)	89 (95, 79)	7 (19, 2)
Science	12	17 (45, 5)	58 (81, 46)	25 (54, 9)
14 to 16				
Biology	43	7 (19, 2)	79 (89, 68)	14 (28, 6)
Chemistry	61	15 (26, 8)	80 (88, 70)	5 (14, 2)
Physics	79	5 (13, 2)	87 (93, 78)	8 (16, 3)
Post 16				
Biology	55	4 (13, 1)	62 (74, 49)	34 (48, 23)
Chemistry	57	12 (24, 6)	61 (73, 49)	26 (39, 16)
Physics	78	6 (13, 2)	68 (77, 56)	26 (37, 17)
Scotland state				
11 to 14	57	11 (21, 5)	74 (84, 62)	16 (28, 8)
14 to 16	58	36 (49, 25)	57 (69, 44)	7 (17, 3)
Post 16	62	37 (50, 26)	53 (65, 40)	10 (20, 4)

Frequency of students working as individuals, pairs and groups

Table 14. 11 - 14 age range (England – state schools): How often students worked as individuals, in pairs or in groups when carrying out practical work activities/experiments in each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

11 – 14		Never	Seldom	Half-time	Most of the time	Always
State schools	**n**	**%**	**%**	**%**	**%**	**%**
Biology						
Individual-year-1	17	47 (26, 69)	35 (17, 59)	0 (0, 19)	18 (6, 42)	0 (0, 19)
Individual-year-2	15	27 (11, 53)	60 (35, 81)	13 (4, 38)	0 (0, 21)	0 (0, 21)
Individual-year-3	41	27 (16, 42)	66 (50, 79)	5 (1, 17)	2 (0, 12)	0 (0, 9)
Pairs-year-1	16	6 (1, 29)	13 (4, 37)	6 (1, 29)	75 (50, 90)	0 (0, 20)
Pairs-year-2	17	0 (0, 19)	6 (1, 28)	35 (17, 59)	47 (26, 69)	12 (3, 35)
Pairs-year-3	43	0 (0, 9)	9 (3, 22)	21 (11, 36)	65 (50, 78)	5 (1, 16)
Groups-year-1	17	0 (0, 19)	41 (21, 64)	24 (10, 48)	29 (13, 53)	6 (1, 28)
Groups-year-2	16	0 (0, 20)	69 (44, 86)	19 (7, 44)	13 (7, 44)	0 (0, 20)
Groups-year-3	42	0 (0, 9)	45 (31, 60)	29 (17, 44)	24 (14, 39)	2 (0, 12)
Chemistry						
Individual-year-1	21	14 (5, 35)	71 (49, 86)	14 (5, 35)	0 (0, 16)	0 (0, 16)
Individual-year-2	33	27 (15, 44)	61 (44, 76)	3 (1, 16)	9 (3, 24)	0 (0, 11)
Individual-year-3	67	33 (23, 45)	54 (42, 66)	8 (4, 17)	6 (2, 15)	0 (0, 6)
Pairs-year-1	22	0 (0, 15)	9 (2, 28)	36 (19, 57)	46 (27, 66)	9 (2, 28)
Pairs-year-2	32	0 (0, 11)	6 (2, 20)	31 (18, 49)	53 (36, 69)	9 (3, 24)
Pairs-year-3	67	0 (0, 6)	12 (6, 22)	33 (23, 45)	49 (37, 61)	6 (2, 15)
Groups-year-1	22	0 (0, 15)	5 (1, 23)	18 (7, 39)	32 (16, 53)	5 (1, 23)
Groups-year-2	32	0 (0, 11)	44 (28, 61)	41 (26, 58)	16 (7, 33)	0 (0, 11)
Groups-year-3	65	0 (0, 6)	23 (14, 35)	40 (29, 52)	35 (24, 47)	2 (0, 9)
Physics						
Individual-year-1	15	33 (15, 58)	53 (30, 75)	13 (4, 38)	0 (0, 21)	0 (0, 21)
Individual-year-2	33	15 (6, 31)	58 (41, 73)	15 (6, 31)	12 (5, 28)	0 (0, 11)
Individual-year-3	49	22 (13, 36)	65 (51, 77)	8 (3, 19)	0 (0, 8)	4 (1, 14)
Pairs-year-1	17	0 (0, 19)	0 (0, 19)	65 (41, 83)	24 (10, 48)	12 (3, 35)
Pairs-year-2	34	0 (0, 11)	15 (7, 31)	29 (16, 46)	47 (31, 64)	9 (3, 24)
Pairs-year-3	49	0 (0, 8)	20 (11, 34)	35 (23, 49)	43 (30, 57)	2 (0, 11)
Groups-year-1	16	6 (1, 29)	13 (4, 37)	69 (44, 86)	13 (4, 37)	0 (0, 20)
Groups-year-2	33	9 (3, 24)	33 (19, 50)	18 (8, 35)	36 (22, 53)	3 (1, 16)
Groups-year-3	50	2 (0, 11)	34 (22, 48)	34 (22, 48)	22 (13, 36)	8 (3, 19)
Science						
Individual-year-1	63	24 (15, 36)	64 (51, 75)	10 (5, 20)	3 (1, 11)	0 (0, 6)
Individual-year-2	76	29 (20, 40)	67 (56, 77)	3 (1, 10)	1 (0, 7)	0 (0, 5)
Individual-year-3	168	27 (21, 34)	56 (48, 63)	11 (7, 17)	6 (3, 11)	1 (0, 4)
Pairs-year-1	65	2 (0, 9)	6 (2, 15)	51 (39, 63)	39 (28, 51)	3 (1, 11)
Pairs-year-2	76	4 (1, 11)	12 (6, 21)	41 (30, 53)	37 (27, 49)	7 (3, 15)
Pairs-year-3	170	1 (0, 4)	13 (9, 19)	42 (35, 50)	39 (32, 47)	5 (3, 10)
Groups-year-1	64	3 (1, 11)	28 (18, 40)	39 (28, 52)	28 (18, 40)	2 (0, 9)
Groups-year-2	77	5 (2, 13)	30 (21, 41)	30 (21, 41)	27 (18, 38)	8 (4, 16)
Groups-year-3	170	5 (3, 10)	27 (21, 34)	34 (27, 42)	31 (24, 39)	4 (2, 8)

Table 15. 11 - 14 age range (England – independent schools): How often students worked as individuals, in pairs or in groups when carrying out practical work activities/experiments in each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

11 – 14		Never	Seldom	Half-time	Most of the time	Always
Independent schools	**n**	**%**	**%**	**%**	**%**	**%**
Biology						
Individual-year-1	17	18 (6, 42)	59 (36, 79)	18 (6, 42)	6 (1, 28)	0 (0, 19)
Individual-year-2	18	11 (3, 33)	78 (55, 91)	11 (3, 33)	0 (0, 18)	0 (0, 18)
Individual-year-3	21	14 (5, 35)	81 (60, 93)	0 (0, 16)	5 (1, 24)	0 (0, 16)
Pairs-year-1	17	0 (0, 19)	0 (0, 19)	24 (10, 48)	53 (31, 74)	24 (10, 48)
Pairs-year-2	18	0 (0, 18)	6 (1, 27)	11 (3, 33)	83 (60, 94)	0 (0, 18)
Pairs-year-3	21	5 (1, 24)	0 (0, 16)	24 (11, 46)	57 (36, 76)	14 (5, 35)
Groups-year-1	17	18 (6, 42)	65 (41, 83)	18 (6, 42)	0 (0, 18)	0 (0, 18)
Groups-year-2	18	11 (3, 33)	89 (67, 97)	0 (0, 18)	0 (0, 18)	0 (0, 18)
Groups-year-3	21	10 (3, 30)	62 (41, 80)	19 (8, 40)	5 (1, 24)	5 (1, 24)
Chemistry						
Individual-year-1	31	29 (16, 47)	68 (50, 82)	3 (1, 16)	0 (0, 11)	0 (0, 11)
Individual-year-2	20	10 (3, 31)	80 (58, 92)	5 (1, 24)	5 (1, 24)	0 (0, 17)
Individual-year-3	32	19 (9, 36)	69 (51, 82)	13 (5, 29)	0 (0, 11)	0 (0, 11)
Pairs-year-1	32	0 (0, 11)	3 (1, 16)	16 (7, 33)	56 (39, 72)	25 (13, 43)
Pairs-year-2	20	0 (0, 17)	5 (1, 24)	15 (5, 37)	65 (43, 82)	15 (5, 37)
Pairs-year-3	32	0 (0, 11)	0 (0, 11)	19 (9, 36)	66 (48, 80)	16 (7, 33)
Groups-year-1	31	19 (9, 36)	61 (43, 76)	13 (5, 29)	7 (2, 22)	0 (0, 11)
Groups-year-2	20	15 (5, 37)	60 (38, 78)	25 (11, 47)	0 (0, 17)	0 (0, 17)
Groups-year-3	32	22 (11, 39)	63 (45, 78)	9 (3, 24)	3 (1, 16)	3 (1, 16)
Physics						
Individual-year-1	20	10 (3, 31)	80 (58, 92)	10 (3, 31)	0 (0, 17)	0 (0, 17)
Individual-year-2	22	27 (13, 48)	50 (30, 70)	18 (7, 39)	5 (1, 23)	0 (0, 15)
Individual-year-3	43	28 (17, 43)	65 (50, 78)	7 (2, 19)	0 (0, 9)	0 (0, 9)
Pairs-year-1	20	0 (0, 17)	5 (1, 24)	40 (22, 62)	50 (30, 70)	5 (1, 24)
Pairs-year-2	22	0 (0, 15)	9 (2, 28)	32 (16, 53)	55 (35, 74)	5 (1, 23)
Pairs-year-3	45	0 (0, 8)	2 (0, 12)	29 (18, 44)	60 (45, 73)	9 (4, 21)
Groups-year-1	20	15 (5, 37)	45 (26, 66)	30 (14, 52)	10 (3, 31)	0 (0, 17)
Groups-year-2	22	14 (5, 34)	59 (38, 77)	23 (10, 44)	5 (1, 23)	0 (0, 15)
Groups-year-3	44	5 (1, 16)	61 (46, 74)	25 (14, 40)	9 (4, 21)	0 (0, 8)
Science						
Individual-year-1	15	13 (4, 38)	67 (42, 85)	0 (0, 21)	20 (7, 46)	0 (0, 21)
Individual-year-2	14	21 (7, 48)	50 (26, 74)	21 (7, 48)	0 (0, 22)	7 (1, 32)
Individual-year-3	12	33 (13, 61)	67 (39, 87)	0 (0, 25)	0 (0, 25)	0 (0, 25)
Pairs-year-1	15	13 (4, 38)	27 (11, 53)	53 (30, 75)	7 (1, 31)	0 (0, 21)
Pairs-year-2	13	0 (0, 24)	0 (0, 24)	15 (4, 42)	77 (49, 92)	0 (0, 24)
Pairs-year-3	12	8 (1, 36)	17 (5, 46)	25 (9, 54)	42 (19, 69)	8 (1, 36)
Groups-year-1	14	14 (4, 40)	64 (38, 84)	21 (7, 48)	0 (0, 22)	0 (0, 22)
Groups-year-2	13	0 (0, 24)	77 (49, 92)	15 (4, 42)	8 (1, 34)	0 (0, 24)
Groups-year-3	12	8 (1, 36)	42 (19, 69)	25 (9, 54)	17 (5, 46)	8 (1, 36)

Table 16. 14 - 16 age range (England – state schools): How often students worked as individuals, in pairs or in groups when carrying out practical work activities/experiments in each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

14 – 16		Never	Seldom	Half-time	Most of the time	Always
State schools	**n**	**%**	**%**	**%**	**%**	**%**
Biology						
Individual-year-1	52	39 (27, 53)	52 (39, 65)	8 (3, 19)	2 (0, 11)	0 (0, 7)
Individual-year-2	73	27 (18, 38)	59 (47, 70)	10 (5, 19)	4 (1, 12)	0 (0, 5)
Individual-year-3	138	19 (13, 27)	60 (52, 68)	15 (10, 22)	7 (4, 13)	0 (0, 3)
Pairs-year-1	52	2 (0, 11)	8 (3, 19)	39 (27, 53)	42 (29, 56)	10 (4, 21)
Pairs-year-2	75	0 (0, 5)	12 (6, 22)	36 (26, 48)	44 (33, 56)	8 (4, 17)
Pairs-year-3	142	1 (0, 5)	9 (5, 15)	28 (21, 36)	55 (47, 63)	9 (5, 15)
Groups-year-1	50	0 (0, 7)	38 (26, 52)	32 (21, 46)	28 (17, 42)	2 (0, 11)
Groups-year-2	75	1 (0, 7)	41 (30, 53)	29 (20, 40)	27 (18, 38)	1 (0, 7)
Groups-year-3	141	2 (1, 6)	41 (33, 49)	34 (27, 42)	21 (15, 29)	2 (1, 6)
Chemistry						
Individual-year-1	95	19 (12, 28)	61 (51, 70)	13 (8, 21)	7 (3, 14)	0 (0, 4)
Individual-year-2	92	26 (18, 36)	62 (52, 71)	7 (3, 14)	5 (2, 12)	0 (0, 4)
Individual-year-3	170	28 (22, 35)	57 (49, 64)	12 (8, 18)	4 (2, 8)	0 (0, 2)
Pairs-year-1	95	0 (0, 4)	8 (4, 15)	38 (29, 48)	51 (41, 61)	3 (1, 9)
Pairs-year-2	96	1 (0, 6)	12 (7, 20)	30 (22, 40)	52 (42, 62)	5 (2, 12)
Pairs-year-3	171	1 (0, 4)	8 (5, 13)	38 (31, 46)	46 (39, 54)	8 (5, 13)
Groups-year-1	94	3 (1, 9)	43 (33, 53)	32 (23, 42)	21 (14, 31)	1 (0, 6)
Groups-year-2	97	1 (0, 6)	45 (35, 55)	31 (23, 41)	19 (12, 28)	4 (2, 10)
Groups-year-3	171	4 (2, 8)	32 (25, 40)	30 (24, 37)	31 (24, 38)	4 (2, 8)
Physics						
Individual-year-1	63	22 (13, 34)	60 (47, 71)	16 (9, 27)	2 (0, 9)	0 (0, 6)
Individual-year-2	74	26 (17, 37)	50 (39, 61)	20 (12, 31)	3 (1, 10)	1 (0, 7)
Individual-year-3	139	25 (18, 33)	58 (50, 66)	9 (5, 15)	6 (3, 11)	2 (1, 6)
Pairs-year-1	63	3 (1, 11)	10 (5, 20)	46 (34, 58)	38 (27, 51)	3 (1, 11)
Pairs-year-2	73	0 (0, 5)	11 (6, 20)	33 (23, 45)	52 (41, 63)	4 (1, 12)
Pairs-year-3	140	1 (0, 5)	14 (9, 21)	36 (28, 44)	47 (39, 55)	3 (1, 7)
Groups-year-1	63	3 (1, 11)	35 (24, 48)	30 (20, 43)	29 (19, 41)	3 (1, 11)
Groups-year-2	74	0 (0, 5)	43 (32, 55)	31 (22, 43)	23 (15, 34)	3 (1, 10)
Groups-year-3	142	5 (2, 10)	32 (25, 40)	32 (25, 40)	25 (19, 33)	6 (3, 11)

Table 17. 14 - 16 age range (England – independent schools): How often students worked as individuals, in pairs or in groups when carrying out practical work activities/experiments in each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

14 – 16		Never	Seldom	Half-time	Most of the time	Always
Independent schools	**n**	**%**	**%**	**%**	**%**	**%**
Biology						
Individual-year-1	31	0 (0, 11)	74 (56, 86)	19 (9, 36)	7 (2, 22)	0 (0, 11)
Individual-year-2	44	9 (4, 21)	73 (58, 84)	14 (7, 28)	2 (0, 12)	2 (0, 12)
Individual-year-3	43	14 (7, 28)	70 (55, 82)	12 (5, 25)	5 (1, 16)	0 (0, 9)
Pairs-year-1	32	0 (0, 11)	6 (2, 20)	19 (9, 36)	66 (48, 80)	9 (3, 24)
Pairs-year-2	43	0 (0, 9)	2 (0, 12)	16 (8, 30)	74 (59, 85)	7 (2, 19)
Pairs-year-3	44	0 (0, 8)	2 (0, 14)	23 (13, 38)	61 (46, 74)	14 (7, 28)
Groups-year-1	31	13 (5, 29)	74 (56, 86)	10 (3, 26)	3 (1, 16)	0 (0, 11)
Groups-year-2	43	14 (7, 28)	72 (57, 83)	12 (5, 25)	2 (0, 12)	0 (0, 9)
Groups-year-3	44	11 (5, 24)	68 (53, 80)	11 (5, 24)	9 (4, 21)	0 (0, 8)
Chemistry						
Individual-year-1	55	15 (8, 27)	76 (63, 86)	4 (1, 13)	6 (2, 16)	0 (0, 7)
Individual-year-2	50	16 (8, 29)	68 (54, 79)	10 (4, 22)	4 (1, 14)	2 (0, 11)
Individual-year-3	59	10 (5, 21)	76 (64, 85)	12 (6, 23)	2 (0, 10)	0 (0, 6)
Pairs-year-1	58	0 (0, 7)	5 (2, 14)	7 (3, 17)	76 (63, 85)	12 (6, 23)
Pairs-year-2	50	2 (0, 11)	2 (0, 11)	14 (7, 27)	64 (50, 76)	18 (10, 31)
Pairs-year-3	61	0 (0, 6)	2 (0, 10)	21 (13, 33)	71 (58, 81)	7 (3, 17)
Groups-year-1	56	23 (14, 36)	61 (48, 73)	9 (4, 20)	5 (2, 14)	2 (0, 10)
Groups-year-2	49	22 (13, 36)	65 (51, 77)	12 (6, 24)	0 (0, 8)	0 (0, 8)
Groups-year-3	61	16 (9, 27)	64 (51, 75)	18 (10, 30)	2 (0, 10)	0 (0, 6)
Physics						
Individual-year-1	43	5 (1, 16)	81 (67, 90)	9 (3, 22)	5 (1, 16)	0 (0, 9)
Individual-year-2	54	17 (9, 29)	59 (45, 71)	20 (11, 33)	4 (1, 13)	0 (0, 7)
Individual-year-3	76	22 (14, 33)	66 (55, 76)	12 (6, 21)	0 (0, 5)	0 (0, 5)
Pairs-year-1	43	0 (0, 9)	2 (0, 12)	40 (27, 55)	54 (39, 68)	5 (1, 16)
Pairs-year-2	54	0 (0, 7)	6 (2, 16)	24 (14, 37)	67 (53, 78)	4 (1, 13)
Pairs-year-3	79	0 (0, 5)	4 (1, 11)	29 (20, 40)	60 (49, 70)	8 (4, 16)
Groups-year-1	42	17 (8, 31)	55 (40, 69)	24 (14, 39)	5 (1, 16)	0 (0, 9)
Groups-year-2	55	9 (4, 20)	75 (62, 85)	9 (4, 20)	6 (2, 16)	2 (0, 10)
Groups-year-3	78	6 (3, 14)	63 (52, 73)	21 (13, 32)	10 (5, 19)	0 (0, 5)

Table 18. Post – 16 age range (England – state schools): How often students worked as individuals, in pairs or in groups when carrying out practical work activities/experiments in each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

Post – 16		Never	Seldom	Half-time	Most of the time	Always
State schools	**n**	**%**	**%**	**%**	**%**	**%**
Biology						
Individual-year-1	65	1 (0, 8)	53 (41, 65)	24 (15, 36)	22 (14, 34)	0 (0, 6)
Individual-year-2	82	3 (1, 10)	36 (26, 47)	38 (28, 49)	20 (13, 30)	4 (1, 11)
Individual-year-3	112	3 (1, 8)	42 (33, 51)	38 (29, 47)	14 (9, 22)	4 (2, 10)
Pairs-year-1	66	0 (0, 6)	13 (7, 23)	38 (27, 50)	46 (34, 58)	4 (1, 12)
Pairs-year-2	83	1 (0, 6)	11 (6, 20)	37 (27, 48)	43 (33, 54)	7 (3, 15)
Pairs-year-3	113	0 (0, 3)	13 (8, 21)	35 (27, 44)	49 (40, 58)	4 (2, 10)
Groups-year-1	67	14 (8, 25)	51 (39, 63)	22 (14, 34)	11 (6, 21)	2 (0, 9)
Groups-year-2	83	20 (13, 30)	62 (51, 72)	8 (4, 16)	8 (4, 16)	1 (0, 6)
Groups-year-3	110	17 (11, 25)	60 (51, 69)	16 (10, 24)	7 (4, 14)	1 (0, 5)
Chemistry						
Individual-year-1	82	0 (0, 5)	39 (29, 50)	29 (20, 40)	28 (19, 39)	6 (3, 14)
Individual-year-2	88	4 (2, 11)	39 (29, 50)	28 (20, 38)	23 (15, 33)	6 (3, 13)
Individual-year-3	141	3 (1, 7)	39 (31, 47)	39 (31, 47)	18 (12, 25)	2 (1, 6)
Pairs-year-1	83	0 (0, 5)	25 (17, 36)	37 (27, 48)	38 (28, 49)	0 (0, 5)
Pairs-year-2	85	3 (1, 9)	18 (11, 28)	35 (26, 46)	43 (33, 54)	1 (0, 6)
Pairs-year-3	140	0 (0, 3)	15 (10, 22)	36 (28, 44)	46 (38, 54)	3 (1, 7)
Groups-year-1	80	27 (18, 38)	48 (36, 61)	16 (10, 26)	9 (4, 18)	0 (0, 5)
Groups-year-2	86	25 (17, 35)	60 (49, 70)	11 (6, 20)	4 (1, 11)	0 (0, 4)
Groups-year-3	141	21 (15, 29)	45 (37, 53)	16 (11, 23)	15 (10, 22)	3 (1, 7)
Physics						
Individual-year-1	60	4 (1, 13)	51 (38, 63)	33 (22, 46)	12 (6, 23)	0 (0, 6.3)
Individual-year-2	64	3 (1, 11)	63 (51, 74)	26 (17, 38)	11 (5, 21)	0 (0, 6)
Individual-year-3	112	6 (3, 12)	59 (50, 68)	22 (15, 31)	11 (6, 18)	2 (1, 7)
Pairs-year-1	62	0 (0, 6)	12 (6, 23)	51 (39, 63)	35 (24, 48)	2 (0, 9)
Pairs-year-2	64	0 (0, 6)	6 (2, 15)	35 (24, 48)	59 (47, 70)	0 (0, 6)
Pairs-year-3	112	0 (0, 3)	17 (11, 25)	34 (26, 43)	45 (36, 54)	4 (2, 10)
Groups-year-1	63	8 (3, 18)	52 (40, 64)	25 (16, 37)	15 (8, 26)	0 (0, 6)
Groups-year-2	65	5 (2, 14)	59 (47, 70)	22 (14, 34)	13 (7, 24)	2 (0, 9)
Groups-year-3	111	9 (5, 16)	54 (45, 63)	19 (13, 28)	14 (9, 22)	4 (2, 10)

Table 19. Post – 16 age range (England – independent schools): How often students worked as individuals, in pairs or in groups when carrying out practical work activities/experiments in each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

Post – 16		Never	Seldom	Half-time	Most of the time	Always
Independent schools	**n**	**%**	**%**	**%**	**%**	**%**
Biology						
Individual-year-1	32	0 (0, 11)	16 (7, 33)	31 (18, 49)	38 (23, 56)	16 (7, 33)
Individual-year-2	41	2 (0, 12)	10 (4, 23)	42 (28, 57)	39 (25, 55)	7 (2, 19)
Individual-year-3	55	2 (0, 10)	18 (10, 30)	34 (23, 48)	36 (24, 50)	11 (5, 22)
Pairs-year-1	31	7 (2, 22)	42 (26, 60)	32 (18, 50)	19 (9, 36)	0 (0, 11)
Pairs-year-2	39	0 (0, 9)	41 (27, 57)	36 (23, 52)	18 (9, 33)	5 (1, 17)
Pairs-year-3	55	0 (0, 7)	39 (27, 53)	45 (32, 58)	14 (7, 26)	2 (0, 10)
Groups-year-1	28	54 (36, 71)	39 (23, 58)	0 (0, 13)	7 (2, 23)	0 (0, 13)
Groups-year-2	39	41 (27, 57)	59 (43, 73)	0 (0, 9)	0 (0, 9)	0 (0, 9)
Groups-year-3	53	33 (22, 47)	57 (43, 70)	7 (3, 17)	2 (0, 10)	0 (0, 7)
Chemistry						
Individual-year-1	57	0 (0, 7)	16 (9, 28)	32 (21, 45)	39 (27, 52)	14 (7, 26)
Individual-year-2	53	0 (0, 7)	21 (12, 34)	25 (15, 38)	45 (32, 59)	9 (4, 20)
Individual-year-3	59	0 (0, 6)	10 (5, 21)	37 (26, 50)	42 (30, 55)	10 (5, 21)
Pairs-year-1	56	2 (0, 10)	46 (33, 59)	30 (19, 43)	21 (12, 34)	0 (0, 7)
Pairs-year-2	52	2 (0, 11)	44 (31, 58)	29 (18, 43)	21 (12, 34)	4 (1, 14)
Pairs-year-3	59	5 (2, 14)	39 (27, 52)	44 (32, 57)	12 (6, 23)	0 (0, 6)
Groups-year-1	52	50 (37, 63)	42 (29, 56)	8 (3, 19)	0 (0, 7)	0 (0, 7)
Groups-year-2	50	61 (47, 74)	37 (25, 51)	2 (0, 11)	0 (0, 7)	0 (0, 7)
Groups-year-3	58	50 (37, 63)	47 (35, 60)	0 (0, 7)	3 (1, 11)	0 (0, 7)
Physics						
Individual-year-1	42	0 (0, 9)	29 (17, 44)	52 (37, 67)	19 (10, 34)	0 (0, 9)
Individual-year-2	57	2 (0, 10)	30 (20, 43)	42 (30, 55)	26 (16, 39)	0 (0, 7)
Individual-year-3	79	0 (0, 5)	42 (32, 53)	35 (25, 46)	23 (15, 34)	0 (0, 5)
Pairs-year-1	42	0 (0, 9)	14 (6, 28)	52 (37, 67)	33 (21, 48)	0 (0, 9)
Pairs-year-2	57	0 (0, 7)	25 (15, 38)	39 (27, 52)	34 (23, 47)	2 (0, 10)
Pairs-year-3	78	1 (0, 7)	15 (9, 25)	42 (32, 53)	40 (30, 51)	1 (0, 7)
Groups-year-1	38	18 (9, 33)	68 (52, 81)	13 (6, 28)	0 (0, 10)	0 (0, 10)
Groups-year-2	55	15 (8, 27)	75 (62, 85)	7 (3, 17)	4 (1, 13)	0 (0, 7)
Groups-year-3	77	16 (9, 26)	65 (54, 75)	17 (10, 27)	3 (1, 10)	0 (0, 5)

Table 20. All age range (Scotland): How often students worked as individuals, in pairs or in groups when carrying out practical work activities/experiments in each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

All subjects		Never	Seldom	Half-time	Most of the time	Always
Scotland state schools	**n**	**%**	**%**	**%**	**%**	**%**
11 – 14						
Individual-year-1	25	23 (11, 43)	62 (42, 78)	8 (2, 25)	8 (2, 25)	0 (0, 14)
Individual-year-2	18	22 (9, 46)	61 (38, 80)	17 (6, 40)	0 (0, 18)	0 (0, 18)
Individual-year-3	54	11 (5, 22)	80 (67, 89)	4 (1, 13)	6 (2, 16)	0 (0, 7)
Pairs-year-1	25	0 (0, 14)	8 (2, 25)	15 (6, 34)	77 (57, 89)	0 (0, 14)
Pairs-year-2	19	0 (0, 17)	16 (6, 38)	21 (8, 44)	58 (36, 77)	5 (1, 25)
Pairs-year-3	55	0 (0, 7)	2 (0, 10)	35 (24, 49)	58 (45, 70)	6 (2, 16)
Groups-year-1	25	8 (2, 25)	46 (28, 65)	23 (11, 43)	23 (11, 43)	0 (0, 14)
Groups-year-2	19	5 (1, 25)	53 (32, 73)	21 (8, 44)	16 (6, 38)	5 (1, 25)
Groups-year-3	55	7 (3, 17)	38 (26, 52)	35 (24, 49)	16 (9, 28)	4 (1, 13)
14 – 16						
Individual-year-1	22	9 (2, 28)	50 (30, 70)	27 (13, 48)	5 (1, 23)	3 (0, 20)
Individual-year-2	43	12 (5, 25)	74 (59, 85)	12 (5, 25)	0 (0, 9)	2 (0, 12)
Individual-year-3	58	14 (7, 25)	66 (53, 77)	12 (6, 23)	5 (2, 14)	9 (4, 19)
Pairs-year-1	23	4 (1, 21)	4 (1, 21)	35 (19, 56)	57 (37, 75)	0 (0, 15)
Pairs-year-2	43	0 (0, 9)	9 (3, 22)	26 (15, 41)	65 (50, 78)	0 (0, 9)
Pairs-year-3	60	2 (0, 10)	8 (3, 18)	32 (21, 45)	57 (44, 69)	2 (0, 10)
Groups-year-1	23	13 (4, 33)	44 (26, 64)	30 (15, 51)	13 (4, 33)	0 (0, 15)
Groups-year-2	43	7 (2, 19)	54 (39, 68)	23 (13, 38)	14 (7, 28)	2 (0, 32)
Groups-year-3	58	3 (1, 11)	50 (37, 63)	22 (13, 35)	24 (15, 37)	0 (0, 7)
Post – 16						
Individual-year-1	23	22 (10, 43)	39 (22, 60)	22 (10, 43)	17 (7, 37)	0 (0, 15)
Individual-year-2	49	2 (0, 11)	53 (39, 67)	25 (15, 39)	14 (7, 27)	0 (0, 8)
Individual-year-3	63	8 (3, 18)	57 (45, 69)	19 (11, 31)	16 (9, 27)	6 (2, 15)
Pairs-year-1	23	0 (0, 15)	22 (10, 43)	30 (15, 51)	48 (29, 68)	0 (0, 15)
Pairs-year-2	47	0 (0, 8)	15 (7, 28)	36 (24, 51)	49 (35, 63)	0 (0, 8)
Pairs-year-3	62	0 (0, 6)	16 (9, 27)	40 (29, 53)	42 (30, 55)	2 (0, 9)
Groups-year-1	23	17 (7, 37)	22 (10, 43)	30 (15, 51)	22 (10, 43)	9 (3, 28)
Groups-year-2	46	11 (5, 24)	57 (42, 71)	20 (11, 34)	13 (6, 26)	0 (0, 8)
Groups-year-3	63	6 (2, 15)	43 (31, 56)	35 (24, 48)	16 (9, 27)	0 (0, 6)

Tasks within practical work activities

Table 21. 11 – 14 age range (England): How often students carried out the stated tasks in their practical work in each of the three survey years and by subject. Scale: 1 – 5 with 1 indicating the task was undertaken in no activities and 5 indicating the task was included in all activities. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets. Statistically significant rates of change per year are highlighted in bold with the level of significance stated below the table.

11 – 14	Year 1		Year 2		Year 3		Rate of change per year
State schools	**n**	**Mean**	**n**	**Mean**	**n**	**Mean**	
Biology							
Follow prepared instructions	17	4.1 (4.5, 3.7)	17	4.2 (4.5, 3.9)	43	3.9 (4.1, 3.7)	-0.149
Open-ended practical work	17	2.8 (3.2, 2.4)	17	2.6 (2.9, 2.3)	43	2.3 (2.5, 2.1)	0.142
Analyse data	17	3.6 (4.0, 3.2)	17	3.4 (3.7, 3.1)	43	3 (3.2, 2.8)	-0.242
Evaluate experiments	17	2.7 (3.1, 2.3)	17	2.9 (3.2, 2.6)	43	2.4 (2.6, 2.2)	-0.144
Chemistry							
Follow prepared instructions	23	3.8 (4.2, 3.4)	34	3.9 (4.2, 3.6)	66	4.1 (4.3, 3.9)	**0.210***
Open-ended practical work	23	2.6 (3.0, 2.2)	34	2.3 (2.5, 2.1)	66	2.3 (2.5, 2.1)	**-0.171***
Analyse data	23	3.5 (3.8, 3.2)	34	3.2 (3.4, 3.0)	66	3.1 (3.3, 2.9)	-0.164
Evaluate experiments	23	2.9 (3.3, 2.5)	34	2.7 (3.0, 2.4)	66	2.4 (2.6, 2.2)	**-0.287***
Physics							
Follow prepared instructions	18	3.6 (4.1, 3.1)	33	3.6 (3.9, 3.3)	46	3.7 (4.0, 3.4)	0.058
Open-ended practical work	18	2.0 (2.3, 1.7)	33	2.6 (2.9, 2.3)	46	2.4 (2.6, 2.2)	0.142
Analyse data	18	3.1 (3.4, 2.8)	33	3.1 (3.4, 2.8)	46	3.1 (3.3, 2.9)	0.027
Evaluate experiments	18	2.3 (2.6, 2.0)	33	2.8 (3.1, 2.5)	46	2.7 (3.0, 3.4)	0.125
Science							
Follow prepared instructions	57	3.9 (4.1, 3.7)	70	3.8 (4.0, 3.6)	172	3.9 (4.0, 3.8)	-0.026
Open-ended practical work	57	2.5 (2.7, 2.3)	70	2.5 (2.7, 2.3)	172	2.4 (2.5, 2.3)	-0.014
Analyse data	57	3.3 (3.5, 3.1)	70	3.1 (3.2, 3.0)	172	3.2 (3.3, 3.1)	-0.040
Evaluate experiments	57	2.6 (2.8, 2.4)	70	2.5 (2.7, 2.3)	172	2.5 (2.6, 2.4)	0.031
Independent schools							
Biology							
Follow prepared instructions	17	4.2 (4.5, 3.9)	18	4.1 (4.5, 3.7)	21	4.1 (4.5, 3.7)	-0.038
Open-ended practical work	17	2.3 (2.6, 2.0)	18	2.2 (2.5, 1.9)	21	2.2 (2.5, 1.9)	-0.010
Analyse data	17	3.4 (3.7, 3.1)	18	3.4 (3.8, 3.0)	21	3.1 (3.4, 2.8)	-0.153
Evaluate experiments	17	3.0 (3.4, 2.6)	18	2.5 (2.9, 2.1)	21	2.6 (3.0, 2.2)	-0.169
Chemistry							
Follow prepared instructions	32	4.3 (4.5, 4.1)	20	4.4 (4.7, 4.1)	32	4.0 (4.2, 3.8)	-0.109
Open-ended practical work	32	2.1 (2.3, 1.9)	20	2.1 (2.5, 1.7)	32	2.1 (2.3, 1.9)	-0.031
Analyse data	32	3.2 (3.4, 3.0)	20	3.2 (3.6, 2.8)	32	3. (3.3, 2.9)	-0.055
Evaluate experiments	32	2.4 (2.7, 2.1)	20	2.5 (2.8, 2.2)	32	2.2 (2.4, 2.0)	-0.102
Physics							
Follow prepared instructions	20	3.8 (4.2, 3.4)	22	3.9 (4.2, 3.6)	45	3.7 (4.0, 3.4)	-0.049
Open-ended practical work	20	2.3 (2.6, 2.0)	22	2.1 (2.4, 1.8)	45	2.1 (2.3, 1.9)	-0.086
Analyse data	20	3.3 (3.6, 3.0)	22	2.9 (3.2, 2.6)	45	3.1 (3.3, 2.9)	-0.059
Evaluate experiments	20	2.3 (2.7, 1.9)	22	2.1 (2.4, 1.8)	45	2.6 (3.0, 2.2)	0.038
Science							
Follow prepared instructions	15	4.1 (4.4, 3.8)	14	4.0 (4.5, 3.5)	12	3.9 (4.4, 3.4)	-0.075
Open-ended practical work	15	2.4 (2.7, 2.1)	14	2.6 (3.0, 2.2)	12	2.3 (2.6, 2.0)	-0.063
Analyse data	15	3.2 (3.6, 2.8)	14	3 (3.3, 2.7)	12	3 (3.3, 2.7)	-0.042
Evaluate experiments	15	2.5 (2.8, 2.2)	14	2.3 (2.7, 1.9)	12	2.1 (2.5, 1.7)	-0.194

***P<0.05**

Table 22. 14 – 16 age range (England): How often students carried out the stated tasks in their practical work in each of the three survey years and by subject. Scale: 1 – 5 with 1 indicating the task was undertaken in no activities and 5 indicating the task was included in all activities. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets. Statistically significant rates of change per year are highlighted in bold with the level of significance stated below the table.

14 – 16	Year 1		Year 2		Year 3		Rate of change per year
State schools	**n**	**Mean**	**n**	**Mean**	**n**	**Mean**	
Biology							
Follow prepared instructions	56	3.9 (4.1, 3.7)	77	3.9 (4.0, 3.8)	146	3.9 (4.0, 3.8)	-0.015
Open-ended practical work	56	2.6 (2.8, 2.4)	77	2.4 (2.5, 2.3)	146	2.6 (2.7, 2.5)	-0.014
Analyse data	56	3.5 (3.7, 3.3)	77	3.5 (3.7, 3.3)	146	3.4 (3.5, 3.3)	-0.036
Evaluate experiments	56	2.7 (2.9, 2.5)	77	2.7 (2.9, 2.5)	146	2.8 (2.9, 2.7)	0.064
Chemistry							
Follow prepared instructions	86	3.9 (4.1, 3.7)	98	3.8 (4.0, 3.6)	171	4.0 (4.1, 3.9)	0.067
Open-ended practical work	86	2.4 (2.6, 2.2)	98	2.4 (2.5, 2.3)	171	2.3 (2.4, 2.2)	-0.051
Analyse data	86	3.3 (3.4, 3.2)	98	3.3 (3.4, 3.2)	171	3.3 (3.4, 3.2)	-0.003
Evaluate experiments	86	2.7 (2.9, 2.5)	98	2.5 (2.7, 2.3)	171	2.6 (2.7, 2.5)	-0.077
Physics							
Follow prepared instructions	70	3.4 (3.6, 3.2)	73	3.5 (3.7, 3.3)	140	3.7 (3.9, 3.5)	0.088
Open-ended practical work	70	2.4 (2.6, 2.2)	73	2.5 (2.7, 2.3)	140	2.5 (2.6, 2.4)	0.038
Analyse data	70	3.3 (3.5, 3.1)	73	3.2 (3.4, 3.0)	139	3.3 (3.4, 3.2)	0.044
Evaluate experiments	70	2.5 (2.7, 2.3)	73	2.6 (2.7, 2.5)	139	2.7 (2.8, 2.6)	**0.152***
Independent Schools							
Biology							
Follow prepared instructions	32	3.9 (4.2, 3.6)	44	4.0 (4.2, 3.8)	45	4.0 (4.2, 3.8)	0.038
Open-ended practical work	32	2.4 (2.6, 2.2)	44	2.4 (2.6, 2.2)	45	2.4 (2.6, 2.2)	-0.037
Analyse data	32	3.7 (3.9, 3.5)	44	3.5 (3.7, 3.3)	45	3.4 (3.6, 3.2)	**-0.159***
Evaluate experiments	32	3.0 (3.3, 2.7)	44	2.7 (2.9, 2.5)	45	2.7 (2.9, 2.5)	-0.150
Chemistry							
Follow prepared instructions	58	4.1 (4.3, 3.9)	51	4.2 (4.4, 4.0)	61	4.2 (4.4, 4.0)	0.054
Open-ended practical work	58	2.2 (2.4, 2.0)	51	2.0 (2.2, 1.8)	61	2.0 (2.2, 1.8)	-0.073
Analyse data	58	3.2 (3.4, 3.0)	51	3.2 (3.4, 3.0)	61	3.2 (3.4, 3.0)	-0.036
Evaluate experiments	58	2.4 (2.6, 2.2)	51	2.4 (2.6, 2.2)	61	2.3 (2.5, 2.1)	-0.056
Physics							
Follow prepared instructions	43	3.7 (3.9, 3.5)	55	3.9 (4.1, 3.7)	80	3.7 (3.9, 3.5)	-0.035
Open-ended practical work	43	2.3 (2.5, 2.1)	55	2.2 (2.4, 2.0)	80	2.1 (2.3, 1.9)	-0.090
Analyse data	43	3.3 (3.5, 3.1)	55	3.2 (3.4, 3.0)	80	3.2 (3.3, 3.1)	-0.049
Evaluate experiments	43	2.5 (2.7, 2.3)	55	2.3 (2.5, 2.1)	80	2.3 (2.5, 2.1)	-0.065

***P<0.05**

Table 23. Post – 16 age range (England): How often students carried out the stated tasks in their practical work in each of the three survey years and by subject. Scale: 1 – 5 with 1 indicating the task was undertaken in no activities and 5 indicating the task was included in all activities. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets. Statistically significant rates of change per year are highlighted in bold with the level of significance stated below the table.

Post 16	Year 1		Year 2		Year 3		Rate of change per year
State schools	**n**	**Mean**	**n**	**Mean**	**n**	**Mean**	
Biology							
Follow prepared instructions	67	3.7 (3.9, 3.5)	84	3.8 (4.0, 3.6)	113	3.8 (3.9, 3.7)	0.095
Open-ended practical work	67	2.4 (2.6, 2.2)	84	2.4 (2.6, 2.2)	113	2.5 (2.6, 2.4)	0.010
Analyse data	67	3.7 (3.9, 3.5)	84	3.6 (3.7, 3.5)	113	3.7 (3.8, 3.6)	0.012
Evaluate experiments	67	2.8 (3.0, 2.6)	84	3.0 (3.1, 2.9)	113	3.0 (3.1, 2.9)	**0.140***
Chemistry							
Follow prepared instructions	84	3.9 (4.0, 3.8)	88	3.9 (4.0, 3.8)	142	3.9 (4.0, 3.8)	-0.030
Open-ended practical work	84	1.9 (2.0, 1.8)	88	2.1 (2.2, 2.0)	142	2.2 (2.3, 2.1)	**0.123***
Analyse data	84	3.4 (3.6, 3.2)	88	3.6 (3.7, 3.5)	142	3.5 (3.6, 3.4)	0.019
Evaluate experiments	84	2.4 (2.6, 2.2)	87	2.4 (2.6, 2.2)	142	2.9 (3.0, 2.8)	**0.192***
Physics							
Follow prepared instructions	64	3.2 (3.4, 3.0)	67	3.3 (3.5, 3.1)	112	3.4 (3.6, 3.2)	0.095
Open-ended practical work	65	2.2 (2.4, 2.0)	67	2.4 (2.5, 2.3)	112	2.2 (2.3, 2.1)	0.100
Analyse data	65	3.6 (3.8, 3.4)	67	3.7 (3.8, 3.6)	112	3.8 (3.9, 3.7)	0.067
Evaluate experiments	65	2.5 (2.7, 2.3)	67	2.9 (3.1, 2.7)	112	2.9 (3.0, 2.8)	**0.180***
Independent Schools							
Biology							
Follow prepared instructions	28	3.8 (4.0, 3.6)	35	3.8 (4.0, 3.6)	41	4.0 (4.2, 3.8)	0.117
Open-ended practical work	28	2.4 (2.6, 2.2)	35	2.3 (2.5, 2.1)	41	2.5 (2.7, 2.3)	0.027
Analyse data	28	3.9 (4.1, 3.7)	35	3.7 (3.9, 3.5)	41	3.6 (3.8, 3.4)	-0.108
Evaluate experiments	28	3.0 (3.3, 2.7)	35	3.0 (3.2, 2.8)	41	2.9 (3.1, 2.7)	0.071
Chemistry							
Follow prepared instructions	53	4.0 (4.2, 3.8)	44	3.8 (4.0, 3.6)	57	4.0 (4.1, 3.9)	0.027
Open-ended practical work	52	2.0 (2.2, 1.8)	43	2.0 (2.1, 1.9)	57	2.1 (2.2, 2.0)	0.086
Analyse data	52	3.4 (3.6, 3.2)	44	3.6 (3.8, 3.4)	57	3.4 (3.6, 3.2)	0.007
Evaluate experiments	52	2.5 (2.7, 2.3)	44	2.5 (2.7, 2.3)	57	2.7 (2.9, 2.5)	0.104
Physics							
Follow prepared instructions	41	3.5 (3.8, 3.2)	51	3.6 (3.8, 3.4)	75	3.6 (3.8, 3.4)	0.062
Open-ended practical work	41	2.3 (2.5, 2.1)	52	2.3 (2.5, 2.1)	75	2.2 (2.3, 2.1)	-0.036
Analyse data	41	3.7 (3.9, 3.5)	52	3.8 (4.0, 3.6)	75	3.8 (3.9, 3.7)	0.017
Evaluate experiments	41	2.5 (2.8, 2.2)	52	2.8 (3.0, 2.6)	75	2.8 (3.0, 2.6)	-0.045

***P<0.05**

Table 24. All age ranges (Scotland): How often students carried out the stated tasks in their practical work in each of the three survey years. Scale: 1 – 5 with 1 indicating the task was undertaken in no activities and 5 indicating the task was included in all activities. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

Scotland	Year 1		Year 2		Year 3		Rate of change per year
	n	Mean	n	Mean	n	Mean	
11 – 14							
Follow prepared instructions	13	3.9 (4.1, 3.7)	19	4.3 (4.6, 4.0)	58	4.2 (4.5, 3.9)	-0.165
Open-ended practical work	13	2.5 (2.7, 2.3)	19	2.4 (2.7, 2.1)	58	2.5 (3.0, 2.0)	0.015
Analyse data	13	3.1 (3.3, 2.9)	19	2.9 (3.2, 2.6)	58	3.2 (3.7, 2.7)	0.001
Evaluate experiments	13	2.6 (2.8, 2.4)	19	2.5 (2.8, 2.2)	58	2.6 (3.0, 2.2)	0.045
14 – 16							
Follow prepared instructions	23	3.7 (3.9, 3.5)	43	3.8 (4.0, 3.6)	60	3.6 (3.9, 3.3)	0.045
Open-ended practical work	23	2.7 (2.9, 2.5)	43	2.7 (3.0, 2.4)	60	2.8 (4.2, 2.4)	-0.071
Analyse data	23	3.4 (3.6, 3.2)	43	3.4 (3.6, 3.2)	60	3.4 (3.7, 3.1)	0.007
Evaluate experiments	23	2.9 (3.1, 2.7)	43	2.9 (3.1, 2.7)	60	3.0 (3.3, 2.7)	-0.059
Post 16							
Follow prepared instructions	23	3.6 (3.9, 3.3)	49	3.5 (3.7, 3.3)	64	3.5 (3.7, 3.3)	-0.068
Open-ended practical work	23	3.1 (3.3, 2.9)	49	2.8 (3.0, 2.6)	64	2.9 (3.2, 2.6)	-0.036
Analyse data	23	3.7 (3.9, 3.5)	49	3.7 (3.9, 3.5)	64	3.8 (4.1, 3.5)	0.046
Evaluate experiments	23	3.3 (3.5, 3.1)	49	3.1 (3.3, 2.9)	64	3.0 (3.3, 2.7)	-0.111

Table 25. Whether students had an opportunity to carry out open-ended, extended investigation (longer than 2 weeks) involving practical work in the last academic year. The question relates to year 3 of the study. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

Year 3		Yes	No
England state schools	**n**	**%**	**%**
11 – 14			
Biology	40	23 (13, 38)	78 (63, 88)
Chemistry	65	20 (12, 32)	80 (69, 88)
Physics	49	14 (7, 27)	86 (73, 93)
Science	171	14 (10, 20)	86 (80, 91)
14 – 16			
Biology	143	13 (8, 20)	87 (80, 92)
Chemistry	169	18 (13, 25)	82 (75, 87)
Physics	138	12 (8, 19)	88 (81, 93)
Post – 16			
Biology	110	23 (16, 32)	77 (68, 84)
Chemistry	134	16 (11, 23)	84 (77, 89)
Physics	109	85 (77, 91)	15 (9, 23)
England independent Schools			
11 – 14			
Biology	45	14 (7, 27)	86 (73, 93)
Chemistry	32	16 (7, 33)	84 (67, 93)
Physics	21	18 (7, 39)	82 (61, 93)
Science	12	8 (1, 36)	92 (64, 99)
14 – 16			
Biology	45	4 (1, 15)	96 (86, 99)
Chemistry	61	7 (3, 17)	93 (84, 97)
Physics	80	14 (8, 24)	86 (77, 92)
Post – 16			
Biology	56	21 (12, 34)	79 (66, 88)
Chemistry	59	24 (15, 37)	76 (64, 85)
Physics	79	23 (15, 34)	77 (66, 85)
Scotland state schools			
11 – 14	57	19 (11, 31)	81 (69, 89)
14 – 16	60	40 (28, 53)	60 (47, 72)
Post – 16	64	70 (58, 80)	30 (20, 42)

Outdoor practical work

Table 26. Number of days per year per allocated to outdoor practical work in each of the three survey years and by subject (in England). Respondents were heads of science and science teachers. 95% confidence intervals are displayed in brackets.

	Year 1		Year 2		Year 3		Rate of change per year
	n	Days	n	Days	n	Days	
England state							
11 – 14							
Biology	17	1.1 (1.7, 0.5)	17	0.8 (1.5, 0.1)	44	0.8 (1.1, 0.5)	-0.161
Chemistry	22	0.8 (1.3, 0.3)	34	0.5 (0.7, 0.3)	65	0.5 (0.8, 0.2)	-0.120
Physics	18	0.4 (0.7, 0.1)	31	0.5 (0.8, 0.2)	46	0.4 (0.7, 0.1)	-0.035
Science	55	1.0 (1.3, 0.7)	70	0.8 (1.1, 0.5)	172	0.8 (1.0, 0.6)	-0.078
14 – 16							
Biology	55	1.0 (1.3, 0.7)	77	1.0 (1.3, 0.7)	147	0.8 (1.0, 0.6)	-0.111
Chemistry	85	0.3 (0.4, 0.2)	97	0.4 (0.6, 0.2)	168	0.4 (0.6, 0.2)	0.057
Physics	67	0.5 (0.7, 0.3)	71	0.3 (0.5, 0.1)	139	0.3 (0.5, 0.1)	-0.057
Post – 16							
Biology	66	2.7 (3.2, 2.2)	84	2.4 (2.9, 1.9)	112	2.2 (2.5, 1.9)	-0.249
Chemistry	81	0.2 (0.3, 0.1)	84	0.1 (0.2, 0.0)	137	0.4 (0.6, 0.2)	0.105
Physics	62	0.3 (0.5, 0.1)	66	0.3 (0.5, 0.1)	110	0.4 (0.6, 0.2)	0.053
England independent							
11 – 14							
Biology	17	0.7 (1.0, 0.4)	16	0.9 (1.5, 0.3)	21	0.6 (0.9, 0.3)	-0.065
Chemistry	32	0.3 (0.5, 0.1)	20	0.1 (0.2, 0.0)	30	0.1 (0.2, 0.0)	-0.123
Physics	20	0.3 (0.5, 0.1)	21	0.2 (0.4, 0.0)	44	0.3 (0.6, 0.0)	0.056
Science	14	1.5 (2.4, 0.6)	13	0.7 (1.4, 0.0)	12	0.8 (1.3, 0.3)	-0.386
14 – 16							
Biology	32	1.0 (1.4, 0.6)	44	1.3 (1.7, 0.9)	44	0.8 (1.1, 0.5)	-0.120
Chemistry	56	0.1 (0.2, 0.0)	51	0.1 (0.2, 0.0)	61	0 (0,0)	-0.037
Physics	41	0.4 (0.7, 0.1)	54	0.2 (0.4, 0.0)	79	0.2 (0.3, 0.1)	-0.085
Post – 16							
Biology	32	3.2 (4.2, 2.2)	41	3.1 (3.7, 2.5)	54	2.5 (2.9, 2.1)	-0.388
Chemistry	54	0.2 (0.4, 0.0)	52	0.1 (0.2, 0.0)	56	0.4 (0.8, 0.0)	0.748
Physics	39	0.4 (0.7, 0.1)	56	0.3 (0.5, 0.1)	77	0.6 (1.1, 0.1)	0.118
Scotland state							
11 – 14	13	1.0 (1.8, 0.2)	19	1.0 (1.8, 0.2)	58	1.3 (1.7, 0.9)	0.214
14 – 16	23	1.0 (1.6, 0.4)	42	1.1 (1.6, 0.6)	59	1.1 (1.7, 0.5)	0.037
Post – 16	23	0.7 (1.3, 0.1)	48	0.6 (0.9, 0.3)	62	0.5 (0.8, 0.2)	-0.101

Qualifications of respondents teaching 11 – 14, 14 – 16 and post – 16 science

Table 27. All age ranges (England – state schools): Qualifications of respondents in years 2 and 3 of the study in their specialist science subject by the subject they reported on teaching for the survey. Respondents were heads of science and science teachers. Note: some respondents stated 'other' qualification, which is not detailed in this table.

	n	A-level or equivalent	Bachelor degree	Master's degree	Doctorate degree
England (state schools)		**%**	**%**	**%**	**%**
11 to 14					
Year 2					
Biology	18	10 (32, 3)	70 (86, 46)	10 (32, 3)	11 (33, 3)
Chemistry	35	0 (10, 0)	77 (88, 60)	10 (25, 4)	13 (28, 5)
Physics	33	2 (14, 0)	71 (84, 54)	19 (36, 9)	8 (23, 3)
Science	69	4 (12, 1)	66 (76, 54)	26 (38, 17)	4 (12, 1)
Year 3					
Biology	44	0 (8, 0)	74 (85, 59)	16 (30, 8)	10 (23, 4)
Chemistry	66	5 (13, 2)	64 (75, 52)	20 (31, 12)	12 (22, 6)
Physics	44	5 (16, 1)	67 (79, 52)	14 (27, 7)	7 (19, 2)
Science	171	5 (9, 3)	69 (76, 62)	15 (21, 10)	11 (17, 7)
14 to 16					
Year 2					
Biology	76	2 (8, 1)	67 (77, 56)	26 (37, 17)	6 (14, 2)
Chemistry	100	2 (7, 1)	67 (76, 57)	19 (28, 12)	12 (20, 7)
Physics	73	4 (11, 1)	74 (83, 63)	18 (29, 11)	5 (13, 2)
Year 3					
Biology	147	0 (3, 0)	75 (81, 67)	13 (20, 8)	12 (18, 8)
Chemistry	172	6 (11, 3)	66 (73, 58)	18 (25, 13)	10 (16, 6)
Physics	140	15 (22, 10)	65 (73, 57)	14 (21, 9)	6 (11, 3)
Post 16					
Year 2					
Biology	83	1 (6, 0)	71 (80, 60)	17 (27, 10)	12 (21, 6)
Chemistry	88	2 (8, 0)	70 (79, 60)	17 (26, 10)	12 (21, 7)
Physics	67	7 (16, 3)	64 (75, 52)	25 (37, 16)	4 (12, 1)
Year 3					
Biology	114	1 (5, 0)	70 (78, 61)	17 (22, 9)	15 (23, 10)
Chemistry	142	2 (6, 1)	64 (72, 56)	20 (27, 14)	15 (22, 10)
Physics	112	13 (21, 8)	58 (67, 49)	17 (25, 11)	10 (17, 6)

Table 28. All age ranges (England – independent schools): Qualifications of respondents in years 2 and 3 of the study in their specialist science subject by the subject they reported on teaching for the survey. Respondents were heads of science and science teachers. Note: some respondents stated 'other' qualification, which is not detailed in this table.

	n	A-level or equivalent	Bachelor degree	Master's degree	Doctorate degree
England (independent schools)		%	%	%	%
11 to 14					
Year 2					
Biology	18	0 (18, 0)	61 (80, 38)	11 (33, 3)	28 (51, 12)
Chemistry	20	0 (17, 0)	35 (57, 18)	35 (57, 18)	30 (52, 14)
Physics	22	9 (28, 2)	41 (62, 23)	36 (57, 20)	14 (34, 5)
Science	14	7 (32, 1)	71 (88, 45)	7 (32, 1)	7 (32, 1)
Year 3					
Biology	21	0 (16, 0)	67 (83, 45)	10 (30, 3)	19 (40, 8)
Chemistry	32	6 (20, 2)	56 (72, 39)	16 (33, 7)	22 (39, 11)
Physics	45	11 (24, 5)	60 (73, 45)	11 (24, 5)	18 (32, 9)
Science	12	0 (25, 0)	67 (87, 39)	8 (36, 1)	25 (54, 9)
14 to 16					
Year 2					
Biology	43	0 (9, 0)	67 (80, 52)	12 (25, 5)	19 (33, 10)
Chemistry	51	2 (11, 0)	43 (57, 30)	24 (37, 14)	31 (45, 20)
Physics	55	11 (22, 5)	44 (57, 31)	22 (35, 13)	24 (37, 14)
Year 3					
Biology	45	0 (8, 0)	71 (82, 56)	16 (29, 8)	13 (26, 6)
Chemistry	61	5 (14, 2)	54 (66, 41)	18 (30, 10)	23 (35, 14)
Physics	80	9 (17, 4)	54 (64, 43)	18 (27, 11)	19 (29, 12)
Post 16					
Year 2					
Biology	40	0 (9, 0)	68 (80, 52)	13 (26, 5)	20 (35, 10)
Chemistry	52	2 (10, 0)	39 (52, 26)	27 (41, 17)	33 (47, 21)
Physics	58	10 (21, 5)	48 (61, 36)	21 (33, 12)	19 (31, 11)
Year 3					
Biology	56	0 (7, 0)	71 (82, 58)	16 (28, 9)	13 (24, 6)
Chemistry	59	7 (16, 3)	49 (62, 37)	22 (34, 13)	22 (34, 13)
Physics	79	9 (17, 4)	51 (62, 40)	18 (28, 11)	22 (32, 14)

Table 29. All age ranges (Scotland): Qualifications of respondents in years 2 and 3 of the study in their specialist science subject by the subject they reported on teaching for the survey. Respondents were heads of science and science teachers. Note: some respondents stated 'other' qualification, which is not detailed in this table.

	n	A-level or equivalent	Bachelor degree	Master's degree	Doctorate degree
Scotland		%	%	%	%
11 to 14					
Year 2	18	0 (18, 0)	63 (82, 40)	11 (33, 3)	21 (45, 8)
Year 3	56	4 (13, 2)	68 (36, 14)	16 (59, 34)	12 (7, 0)
14 to 16					
Year 2	42	0 (9, 0)	71 (83, 56)	14 (28, 7)	14 (28, 7)
Year 3	60	3 (12, 1)	70 (80, 57)	13 (24, 7)	13 (24, 7)
Post 16					
Year 2	47	0 (8, 0)	72 (83, 58)	13 (26, 6)	15 (28, 7)
Year 3	63	3 (11, 1)	75 (84, 63)	8 (18, 3)	15 (26, 8)

Correlation between qualifications of science teachers and types of activities

Table 30. All age ranges (England – state schools): Correlations between the qualifications of respondents in years 2 and 3 of the study in their specialist science subject by the subject they reported on teaching for the survey and the proportion of science lesson time spent on different activities. Respondents were heads of science and science teachers. Statistically significant trends in the correlations are highlighted in bold with the level of significance stated below the table.

England state schools	n	Proportion practical work	n	Proportion teacher demonstrations	n	Proportion computer simulations
Correlations (Spearman's rho coefficients)						
11 to 14						
Year 2						
Biology	16	-0.076	16	0.190	16	0.165
Chemistry	32	0.333	32	-0.075	32	0.358
Physics	30	0.157	30	-0.027	30	0.110
Science	68	-0.047	68	-0.092	68	-0.189
Year 3						
Biology	43	0.285	43	-0.003	43	-0.054
Chemistry	62	0.119	62	-0.023	62	**0.348***
Physics	40	0.062	40	-0.051	40	0.049
Science	163	-0.046	163	-0.019	163	**-0.239***
14 to 16						
Year 2						
Biology	71	-0.037	71	-0.005	71	0.040
Chemistry	99	0.033	99	-0.050	99	-0.022
Physics	67	-0.087	67	0.019	67	-0.117
Year 3						
Biology	141	0.062	141	0.121	141	-0.043
Chemistry	166	-0.077	166	**0.167***	166	-0.059
Physics	125	-0.090	125	0.144	125	0.114
Post 16						
Year 2						
Biology	80	0.029	80	0.153	80	-0.042
Chemistry	85	0.150	85	-0.188	85	-0.053
Physics	65	-0.067	65	0.027	65	-0.053
Year 3						
Biology	112	0.007	112	0.083	112	0.161
Chemistry	138	-0.024	138	**-0.211***	138	-0.006
Physics	109	-0.045	109	0.083	109	0.140

***P<0.05**

Table 31. All age ranges (England – independent schools): Correlations between the qualifications of respondents in years 2 and 3 of the study in their specialist science subject by the subject they reported on teaching for the survey and the proportion of science lesson time spent on different activities. Respondents were heads of science and science teachers. Statistically significant trends in the correlations are highlighted in bold with the level of significance stated below the table.

	n	Proportion practical work	n	Proportion teacher demonstrations	n	Proportion computer simulations
Correlations (Spearman's rho coefficients)						
11 to 14						
Year 2						
Biology	18	0.069	18	0.027	18	-0.219
Chemistry	20	-0.117	20	0.338	20	0.093
Physics	21	0.027	21	-0.039	21	0.082
Science	13	-0.017	13	0.303	13	-0.118
Year 3						
Biology	20	-0.259	20	-0.008	20	-0.050
Chemistry	32	-0.226	32	0.106	32	-0.001
Physics	39	0.261	39	-0.274	39	-0.213
Science	11	-0.278	11	-0.298	11	-0.359
14 to 16						
Year 2						
Biology	42	**-0.380***	42	0.015	42	-0.210
Chemistry	50	-0.030	50	0.075	50	-0.001
Physics	54	0.116	54	-0.053	54	0.031
Year 3						
Biology	43	0.175	43	-0.092	45	-0.202
Chemistry	61	0.038	61	0.212	61	0.004
Physics	77	0.034	79	-0.117	79	0.090
Post 16						
Year 2						
Biology	40	-0.047	40	-0.022	35	-0.137
Chemistry	53	0.127	53	**0.289***	53	0.180
Physics	57	0.179	57	0.109	57	-0.142
Year 3						
Biology	54	**0.357***	54	0.166	55	0.111
Chemistry	59	-0.151	59	0.107	59	0.008
Physics	78	-0.023	78	0.132	78	0.006

***p<0.05 = statistically significant**

Table 32. All age ranges (Scotland): Correlations between the qualifications of respondents in years 2 and 3 of the study in their specialist science subject by the subject they reported on teaching for the survey and the proportion of science lesson time spent on different activities. Respondents were heads of science and science teachers.

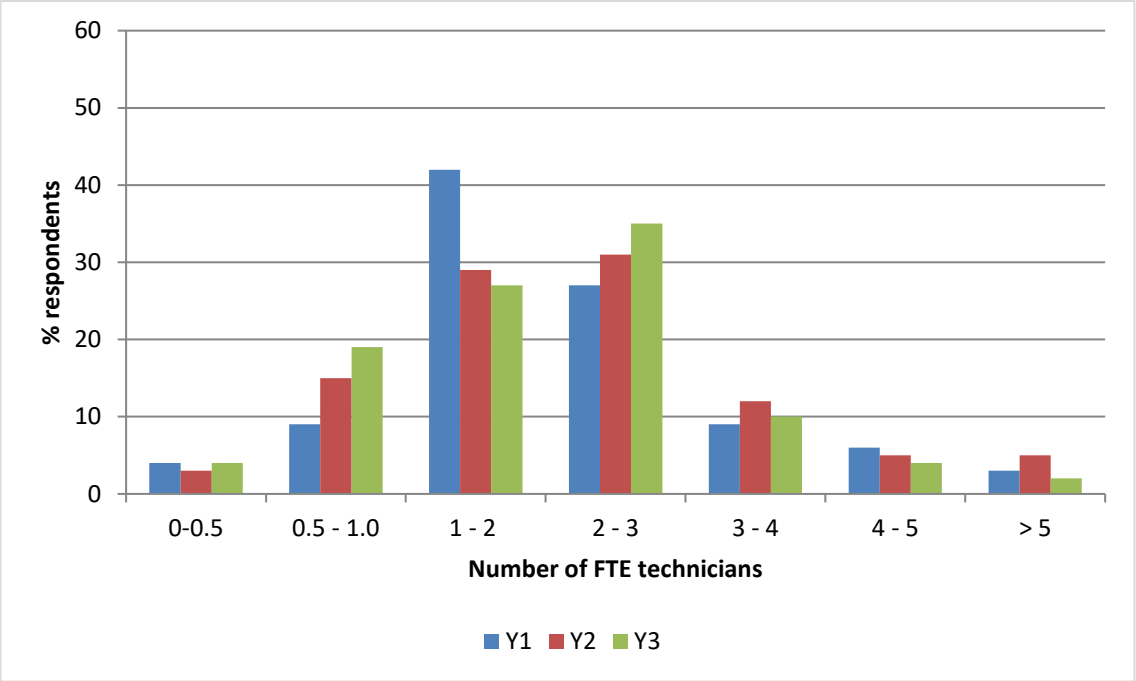
	n	Proportion practical work	n	Proportion teacher demonstrations	n	Proportion computer simulations
Scotland						
11 to 14						
Year 2	18	-0.430	18	-0.117	18	**0.623***
Year 3	56	0.433	56	-0.137	56	-0.045
14 to 16						
Year 2	43	-0.083	43	-0.110	43	**0.324***
Year 3	60	0.123	60	-0.039	60	-0.130
Post 16						
Year 2	49	0.164	49	-0.145	49	0.189
Year 3	61	0.082	61	-0.057	61	-0.231

***P<0.05**

Number of full time equivalent (FTE) technicians supporting science within schools

Figure 73. (England): Bar chart showing the number of FTE technicians within schools over the three years of the study. Respondents were heads of science.

a) State schools (base n = 434)



b) Independent schools (base n = 247)

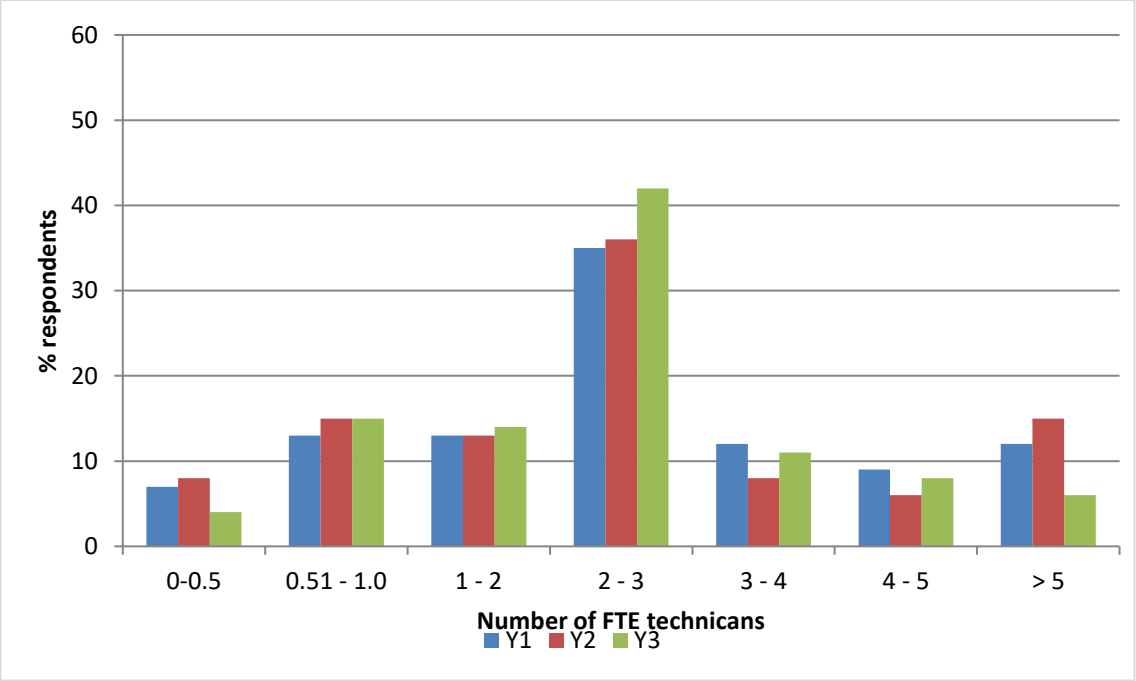


Table 33. (England) Number of FTE technicians within schools over the three years of the study. Respondents were heads of science.

	Year 1		Year 2		Year 3	
No. of FTE technicians	**n**	**%**	**n**	**%**	**n**	**%**
England state						
0 - 0.5	6	4	4	3	6	4
0.5 - 1.0	13	9	19	15	29	19
1 - 2	62	42	37	29	42	27
2 - 3	40	27	40	31	54	35
3 - 4	14	9	16	12	15	10
4 - 5	9	6	7	5	7	4
> 5	5	3	6	5	3	2
England independent						
0 – 0.5	6	7	6	8	3	4
0.5 - 1.0	12	13	12	15	11	15
1 - 2	12	13	10	13	10	14
2 - 3	32	35	29	36	30	42
3 - 4	11	12	6	8	8	11
4 - 5	8	9	5	6	6	8
> 5	11	12	12	15	4	6

Table 34. (England) Number of FTE technicians by school size over the three years of the study. Respondents were heads of science. 95% confidence intervals are indicated in brackets.

	Year 1		Year 2		Year 3	
No. pupils in school	n	Mean no. FTE technicians	n	Mean no. FTE technicians	n	Mean no. FTE technicians
England state						
<=300	7	2 (1,3)	5	2 (1,2)	7	2 (1,2)
301-600	9	3 (2,3)	14	3 (2,4)	10	2 (2,3)
601-900	37	4 (4,5)	29	4 (3,4)	40	4 (3,4)
901-1200	39	5 (5,6)	36	6 (5,6)	44	5 (5,5)
1201 -1500	32	6 (5,7)	24	7 (6,8)	28	7 (6,7)
>1500	20	8 (6,9)	20	7 (5,9)	28	6 (5,7)
England independent						
<=300	14	2 (2,3)	15	2 (1,2)	9	3 (2,4)
301-600	38	5 (4,6)	30	5 (4,6)	35	5 (5,6)
601-900	26	8 (7,8)	19	7 (6,8)	19	7 (6,8)
901-1200	9	11 (9,12)	12	11 (9,12)	5	9 (6,12)
1201 -1500	4	10 (8,12)	3	12 (10,13)	1	12 (12,12)
>1500	1	8 (8,8)	1	4 (4,4)	3	4 (4,4)

Perception of sufficiency of technical support

Table 35. (England) Heads of science satisfaction with sufficiency of technical support in the three years of the study. Respondents were heads of science. 95% confidence intervals are indicated in brackets.

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
	n	%	%	%	%	%
England state						
Year 1	152	5 (2,9)	20 (14,27)	13 (9,20)	34 (27,42)	28 (22,36)
Year 2	136	4 (2,9)	17 (11,24)	10 (6,16)	43 (34,51)	26 (20,35)
Year 3	156	8 (5,14)	14 (9,21)	15 (10,22)	39 (32,47)	23 (17,30)
England independent						
Year 1	96	4 (2,10)	9 (5,17)	10 (6,18)	24 (16,34)	52 (42,62)
Year 2	82	1 (0,7)	6 (3,14)	12 (7,21)	37 (27,48)	44 (33,55)
Year 3	71	1 (0,8)	10 (5,19)	21 (13,32)	27 (18,38)	41 (30,53)

Tasks undertaken by technicians

Table 36. (England – state schools): Frequency with which technicians undertook different tasks within their role in years 1 and 3 of the study. The final two tasks listed were only surveyed in year 3 of the study. Respondents were technicians.

England state schools	Survey year	n	Daily %	Weekly %	Monthly %	Termly %	Annually %	Never %
Advising a teacher how to do an experiment / use equipment	Y1	213	35	53	8	3	0	0
	Y3	916	37	46	11	4	0	2
Photocopying worksheets for lessons	Y1	212	33	22	12	4	2	27
	Y3	912	32	21	11	6	3	27
Discussing science curriculum requirements with a teacher	Y1	214	14	35	20	14	8	8
	Y3	914	19	33	17	13	8	10
Setting up equipment for an experiment	Y1	213	77	14	7	0	0	0
	Y3	919	73	20	5	1	0	1
Repairing technical equipment, e.g. oscilloscopes, microscopes	Y1	214	6	21	40	20	9	5
	Y3	916	12	27	29	19	8	5
Planning a new experiment, e.g. by constructing and/or modifying equipment	Y1	213	2	18	42	32	5	1
	Y3	916	5	26	37	22	6	5
Filing worksheets/paper resources	Y1	206	23	22	10	9	9	27
	Y3	912	22	24	11	10	7	26
Liaising with school senior managers about science practical equipment or resources	Y1	213	5	15	19	18	11	32
	Y3	916	5	16	17	16	12	33
Moving furniture or textbooks	Y1	206	33	20	6	11	6	24
	Y3	916	38	22	9	10	7	13
Setting up general IT equipment, e.g. electronic whiteboard, students' computers	Y1	213	11	11	8	8	2	60
	Y3	915	7	10	9	6	4	63
Working directly with students on practical science activities in lessons	Y3	915	7	23	21	17	10	22
Working directly with students on practical science activities outside lessons	Y3	915	1	13	10	12	13	49

Table 37. (England – independent schools): Frequency with which technicians undertook different tasks within their role in years 1 and 3 of the study. The final two tasks listed were only surveyed in year 3 of the study. Respondents were technicians.

England independent schools	Survey year	n	Daily %	Weekly %	Monthly %	Termly %	Annually %	Never %
Advising a teacher how to do an experiment / use equipment	Y1	39	23	42	18	5	6	6
	Y3	239	27	41	18	7	3	3
Photocopying worksheets for lessons	Y1	38	13	18	19	5	5	39
	Y3	237	22	23	10	10	5	30
Discussing science curriculum requirements with a teacher	Y1	37	8	30	19	15	16	11
	Y3	239	9	31	17	23	7	12
Setting up equipment for an experiment	Y1	39	81	13	3	3	0	0
	Y3	238	85	10	4	0	0	0
Repairing technical equipment, e.g. oscilloscopes, microscopes	Y1	39	5	21	26	27	8	13
	Y3	239	10	21	29	24	8	8
Planning a new experiment, e.g. by constructing and/or modifying equipment	Y1	37	3	16	33	36	7	5
	Y3	239	6	20	36	26	8	4
Filing worksheets/paper resources	Y1	38	16	18	14	14	8	30
	Y3	238	17	19	16	12	9	27
Liaising with school senior managers about science practical equipment or resources	Y1	39	3	18	15	16	16	32
	Y3	238	3	18	16	18	13	32
Moving furniture or textbooks	Y1	36	8	23	6	17	23	24
	Y3	237	6	19	14	22	24	15
Setting up general IT equipment, e.g. electronic whiteboard, students' computers	Y1	39	5	13	3	10	3	66
	Y3	236	5	10	12	12	5	56
Working directly with students on practical science activities in lessons	Y3	238	6	13	20	25	10	26
Working directly with students on practical science activities outside lessons	Y3	238	1	10	9	15	17	49

Table 38. (Scotland – year 3 only): Frequency with which technicians undertook different tasks within their role in years 1 and 3 of the study. Respondents were technicians.

			Daily	Weekly	Monthly	Termly	Annually	Never
Scotland state schools	**Survey year**	**n**	**%**	**%**	**%**	**%**	**%**	**%**
Advising a teacher how to do an experiment / use equipment	Y3	55	33	36	18	11	0	2
Photocopying worksheets for lessons	Y3	55	24	16	5	2	5	47
Discussing science curriculum requirements with a teacher	Y3	55	15	24	20	25	5	11
Setting up equipment for an experiment	Y3	55	58	24	4	7	2	5
Repairing technical equipment, e.g. oscilloscopes, microscopes	Y3	55	15	27	27	18	5	7
Planning a new experiment, e.g. by constructing and/or modifying equipment	Y3	55	9	22	27	31	9	2
Filing worksheets/paper resources	Y3	55	16	20	13	4	2	45
Liaising with school senior managers about science practical equipment or resources	Y3	55	0	5	16	16	15	47
Moving furniture or textbooks	Y3	55	15	11	16	9	7	42
Setting up general IT equipment, e.g. electronic whiteboard, students' computers	Y3	55	11	7	11	9	7	55
Working directly with students on practical science activities in lessons	Y3	54	4	20	13	22	26	15
Working directly with students on practical science activities outside lessons	Y3	54	2	15	6	20	28	30

Equipment and consumables

Laboratory facilities

Table 39. (England – state schools): Technicians' evaluation of the extent to which satisfactory (available and in good working order) facilities were available in laboratories in years 1 and 3 of the survey. Respondents were technicians.

	Year 1						Year 3					
		All	Most	About half	A Few	None		All	Most	About half	A Few	None
England state	**n**	**%**	**%**	**%**	**%**	**%**	**n**	**%**	**%**	**%**	**%**	**%**
Easy access for technicians	213	59 (52,65)	29 (24,36)	6 (4,10)	5 (3,9)	1 (0,3)	917	58 (55,61)	33 (30,36)	5 (4,7)	3 (2,4)	1 (0,1)
Located close to prep rooms	0	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	917	47 (43,50)	36 (33,39)	12 (10,15)	6 (4,7)	0 (0,1)
Accessible to SEND students	0	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	893	55 (52,58)	24 (22,27)	8 (6,10)	8 (7,10)	4 (3,6)
Appropriate space for class sizes	213	33 (27,39)	54 (47,60)	7 (4,11)	3 (2,7)	3 (2,7)	909	33 (30,36)	45 (42,49)	11 (9,13)	7 (5,9)	4 (3,6)
Good quality furnishings, e.g. benches, stools, shelving, storage	208	32 (26,38)	36 (30,43)	19 (14,25)	9 (6,14)	5 (3,9)	913	35 (32,38)	34 (31,37)	13 (11,15)	12 (10,14)	6 (5,8)
Fully functioning sinks and drainage	211	45 (39,52)	33 (27,40)	12 (8,17)	9 (6,14)	0 (0,3)	911	47 (44,50)	32 (29,35)	11 (9,13)	8 (7,10)	2 (1,3)
Roof, floor, walls in good condition	208	52 (46,59)	32 (26,39)	9 (6,13)	5 (3,9)	2 (1,5)	912	51 (47,54)	29 (26,32)	10 (9,13)	7 (6,9)	3 (2,4)
Basic Health and Safety standards met, e.g. eye protection, screens, fire extinguisher	212	87 (81,91)	13 (9,18)	0 (0,3)	0 (0,2)	0 (0,2)	916	89 (87,91)	9 (7,11)	1 (1,2)	1 (0,2)	0 (0,1)
Mechanical ventilation	211	36 (29,42)	11 (8,16)	10 (7,15)	17 (13,23)	25 (20,32)	911	34 (31,37)	16 (14,18)	9 (7,11)	14 (12,17)	27 (24,30)
Computers available for student use	210	11 (7,16)	8 (5,12)	8 (5,12)	29 (24,36)	44 (38,51)	913	18 (16,21)	6 (5,8)	5 (4,7)	24 (21,27)	46 (43,49)
Space to leave long-term investigations/experiments	211	12 (8,17)	14 (10,19)	10 (6,15)	28 (22,35)	37 (31,44)	911	15 (12,17)	17 (15,20)	10 (8,12)	27 (24,30)	32 (29,35)
Well distributed taps	212	35 (29,42)	28 (22,34)	21 (16,27)	15 (11,21)	1 (0,4)	913	39 (36,42)	29 (26,32)	15 (13,18)	12 (10,14)	5 (4,6)
Well distributed power points	211	41 (34,48)	34 (28,41)	14 (10,20)	10 (6,14)	2 (1,4)	908	48 (45,52)	29 (26,32)	12 (10,15)	8 (6,10)	3 (2,4)
Accessible shut-offs for gas, electricity and water and an earth-leakage circuit breaker on the electrical supply	212	72 (65,77)	14 (10,19)	6 (4,10)	5 (3,9)	3 (2,7)	912	70 (66,73)	16 (14,18)	4 (3,6)	5 (4,6)	5 (4,7)
Provision for teacher-led demonstrations that might require gas, water and electricity	213	55 (49,62)	29 (23,35)	7 (5,12)	5 (2,8)	4 (2,8)	915	59 (56,63)	24 (21,27)	7 (6,9)	6 (4,7)	4 (3,6)
An interactive whiteboard, projector etc.	211	81 (75,85)	8 (5,13)	5 (2,8)	5 (3,8)	2 (1,5)	911	83 (81,86)	8 (6,10)	3 (2,4)	4 (3,5)	2 (1,3)
Working blinds/curtains/light-dimming system for black outs (Physics only)	209	39 (33,46)	24 (19,30)	15 (10,20)	15 (11,21)	7 (4,11)	905	42 (39,46)	24 (22,27)	15 (13,17)	12 (10,14)	7 (5,9)
Fume cupboard with working gas, electricity and water supplies (Chemistry only)	208	29 (23,35)	10 (7,15)	11 (7,16)	43 (36,50)	8 (5,12)	907	29 (26,32)	12 (10,15)	14 (12,16)	36 (33,39)	9 (7,11)
Well distributed gas taps (Chemistry only)	206	59 (52,65)	25 (20,32)	11 (7,16)	4 (2,8)	1 (0,3)	906	59 (56,62)	25 (22,28)	9 (7,11)	5 (4,6)	3 (2,4)

Table 40. (England – independent schools): Technicians' evaluation of the extent to which satisfactory (available and in good working order) facilities were available in laboratories in years 1 and 3 of the survey. Respondents were technicians.

	Year 1						Year 3					
		All	Most	About half	A Few	None		All	Most	About half	A Few	None
England independent	**n**	**%**	**%**	**%**	**%**	**%**	**n**	**%**	**%**	**%**	**%**	**%**
Easy access for technicians	39	47 (32,63)	44 (30,60)	3 (0,14)	3 (0,14)	3 (1,14)	238	63 (56,69)	30 (24,36)	5 (3,9)	2 (1,5)	0 (0,2)
Located close to prep rooms	0	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	239	48 (42,54)	39 (33,45)	10 (6,14)	4 (2,7)	0 (0,2)
Accessible to SEND students	0	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	0 (0,0)	234	50 (44,57)	21 (16,27)	10 (7,15)	8 (5,12)	10 (7,15)
Appropriate space for class sizes	39	45 (31,61)	42 (27,58)	5 (1,17)	3 (0,14)	5 (1,17)	234	49 (43,56)	41 (34,47)	7 (4,11)	3 (1,6)	0 (0,2)
Good quality furnishings, e.g. benches, stools, shelving, storage	38	50 (34,65)	37 (23,53)	5 (1,18)	8 (3,21)	0 (0,10)	239	50 (44,56)	37 (31,43)	11 (8,16)	1 (0,4)	0 (0,2)
Fully functioning sinks and drainage	39	79 (64,89)	15 (7,30)	0 (0,9)	5 (1,17)	0 (0,9)	239	70 (64,76)	23 (18,29)	5 (3,9)	1 (0,3)	0 (0,2)
Roof, floor, walls in good condition	39	51 (35,66)	34 (21,50)	13 (6,27)	3 (0,14)	0 (0,9)	239	63 (57,69)	27 (22,33)	7 (4,11)	2 (1,4)	0 (0,2)
Basic Health and Safety standards met, e.g. eye protection, screens, fire extinguisher	39	89 (75,95)	11 (5,25)	0 (0,9)	0 (0,9)	0 (0,9)	238	95 (91,97)	5 (3,9)	0 (0,2)	0 (0,2)	0 (0,2)
Mechanical ventilation	38	43 (28,59)	20 (10,35)	8 (3,22)	3 (0,14)	26 (15,42)	239	41 (35,48)	13 (9,18)	13 (9,18)	11 (7,16)	22 (17,28)
Computers available for student use	39	23 (13,39)	11 (4,25)	3 (1,14)	19 (9,34)	44 (30,60)	238	31 (25,37)	11 (7,15)	6 (4,10)	13 (9,18)	40 (34,46)
Space to leave long-term investigations/experiments	37	20 (10,36)	30 (17,46)	0 (0,10)	24 (13,41)	26 (14,42)	236	27 (22,33)	25 (20,31)	14 (10,19)	18 (14,24)	16 (12,21)
Well distributed taps	38	41 (27,57)	32 (19,48)	16 (7,31)	11 (4,25)	0 (0,10)	238	50 (44,56)	34 (28,40)	11 (8,16)	3 (2,7)	1 (0,4)
Well distributed power points	38	49 (34,65)	38 (24,54)	8 (3,21)	5 (1,18)	0 (0,10)	239	66 (60,72)	26 (21,32)	5 (3,9)	3 (1,5)	0 (0,2)
Accessible shut-offs for gas, electricity and water and an earth-leakage circuit breaker on the electrical supply	39	79 (64,89)	10 (4,24)	5 (1,17)	5 (1,17)	0 (0,9)	237	77 (71,82)	15 (11,20)	3 (1,6)	3 (1,5)	3 (1,6)
Provision for teacher-led demonstrations that might require gas, water and electricity	39	60 (44,74)	32 (19,48)	8 (3,21)	0 (0,9)	0 (0,9)	238	69 (63,75)	20 (16,26)	7 (5,12)	2 (1,4)	1 (0,4)
An interactive whiteboard, projector etc.	39	79 (64,89)	5 (1,17)	8 (3,21)	5 (1,17)	3 (0,14)	239	84 (79,88)	8 (5,12)	3 (1,5)	3 (1,6)	3 (2,6)
Working blinds/curtains/light-dimming system for black outs (Physics only)	35	58 (41,73)	12 (5,27)	9 (3,24)	9 (3,23)	12 (5,27)	218	84 (78,88)	8 (5,12)	3 (1,6)	3 (1,6)	3 (2,7)
Fume cupboard with working gas, electricity and water supplies (Chemistry only)	31	53 (36,70)	17 (7,34)	10 (4,26)	16 (7,33)	3 (1,17)	214	61 (54,68)	14 (10,20)	7 (4,11)	8 (5,12)	9 (6,14)
Well distributed gas taps (Chemistry only)	31	77 (60,89)	16 (7,33)	3 (1,17)	3 (1,17)	0 (0,11)	210	81 (75,86)	10 (7,15)	2 (1,5)	2 (1,6)	4 (2,8)

Table 41. (Scotland – year 3 only): Technicians' evaluation of the extent to which satisfactory (available and in good working order) facilities were available in laboratories. Respondents were technicians.

	Year 3					
		All	Most	About half	A Few	None
Scotland state	**n**	**%**	**%**	**%**	**%**	**%**
Easy access for technicians	55	71 (58,81)	22 (13,35)	7 (3,18)	0 (0,7)	0 (0,7)
Located close to prep rooms	55	51 (38,64)	27 (17,41)	13 (6,24)	9 (4,20)	0 (0,7)
Accessible to SEND students	45	53 (39,67)	18 (9,32)	4 (1,15)	16 (8,29)	9 (3,21)
Appropriate space for class sizes	52	63 (50,75)	33 (21,47)	2 (0,10)	0 (0,7)	2 (0,10)
Good quality furnishings, e.g. benches, stools, shelving, storage	55	35 (23,48)	33 (22,46)	15 (7,26)	11 (5,22)	7 (3,18)
Fully functioning sinks and drainage	55	40 (28,53)	36 (25,50)	20 (11,33)	2 (0,10)	2 (0,10)
Roof, floor, walls in good condition	55	47 (34,60)	36 (25,50)	7 (3,18)	7 (3,18)	2 (0,10)
Basic Health and Safety standards met, e.g. eye protection, screens, fire extinguisher	55	82 (69,90)	18 (10,31)	0 (0,7)	0 (0,7)	0 (0,7)
Mechanical ventilation	53	43 (31,57)	8 (3,18)	4 (1,13)	15 (8,27)	30 (19,44)
Computers available for student use	54	13 (6,25)	24 (14,37)	2 (0,10)	26 (16,39)	35 (24,49)
Space to leave long-term investigations/experiments	55	9 (4,20)	13 (6,24)	13 (6,24)	33 (22,46)	33 (22,46)
Well distributed taps	55	55 (41,67)	27 (17,41)	7 (3,18)	4 (1,13)	7 (3,18)
Well distributed power points	55	58 (45,70)	35 (23,48)	2 (0,10)	5 (2,15)	0 (0,7)
Accessible shut-offs for gas, electricity and water and an earth-leakage circuit breaker on the electrical supply	55	82 (69,90)	11 (5,22)	0 (0,7)	0 (0,7)	7 (3,18)
Provision for teacher-led demonstrations that might require gas, water and electricity	55	58 (45,70)	20 (11,33)	5 (2,15)	7 (3,18)	9 (4,20)
An interactive whiteboard, projector etc.	54	80 (67,88)	9 (4,20)	2 (0,10)	4 (1,13)	6 (2,15)
Working blinds/curtains/light-dimming system for black outs (Physics only)	55	53 (40,66)	16 (9,29)	15 (7,26)	11 (5,22)	5 (2,15)
Fume cupboard with working gas, electricity and water supplies (Chemistry only)	55	38 (26,52)	15 (7,26)	16 (9,29)	20 (11,33)	11 (5,22)
Well distributed gas taps (Chemistry only)	55	78 (65,87)	15 (7,26)	4 (1,13)	4 (1,13)	0 (0,7)

Preparation rooms

Table 42. (England – state schools): Technicians' evaluation of the factors and facilities of preparation rooms relevant within their school/college in years 1 and 3 of the survey. Respondents were technicians.

	Year 1				Year 3			
		Available and sufficient / working	Available but insufficient/ not working	Not available		Available and sufficient / working	Available but insufficient/ not working	Not available
England state schools	**n**	**%**	**%**	**%**	**n**	**%**	**%**	**%**
Storage space for equipment	211	46 (39,53)	51 (45,58)	2 (1,6)	915	55 (52,58)	43 (40,46)	2 (1,3)
Working surfaces to meet the needs of the department	209	41 (34,47)	57 (50,64)	2 (1,6)	911	52 (48,55)	46 (43,49)	2 (1,3)
Gas, water, electricity supply	209	72 (66,78)	26 (21,33)	1 (0,4)	916	75 (72,77)	24 (22,27)	1 (1,2)
Proximity to laboratories	211	87 (82,91)	12 (8,17)	0 (0,3)	914	84 (82,86)	15 (13,17)	1 (1,2)
Computer, internet connections and telephone	209	83 (78,88)	15 (11,21)	1 (0,4)	911	84 (81,86)	14 (12,17)	2 (1,3)
Trolley for moving equipment	210	78 (72,83)	17 (13,23)	5 (3,9)	908	83 (81,86)	13 (11,15)	4 (3,5)
Space for trolleys	205	44 (37,51)	46 (39,53)	10 (7,15)	904	51 (48,54)	40 (37,44)	9 (7,11)
First aid kit	209	86 (81,90)	6 (3,10)	8 (5,13)	904	89 (87,91)	5 (4,7)	6 (4,7)
Mechanical ventilation	205	48 (41,55)	26 (21,33)	25 (20,32)	894	55 (52,59)	23 (20,25)	22 (19,25)
A lockable, ventilated chemical store	205	76 (70,82)	16 (12,22)	8 (5,12)	894	73 (70,76)	16 (14,19)	11 (9,13)
Refrigerator/freezer	209	88 (83,92)	8 (5,13)	4 (2,8)	907	92 (90,93)	7 (5,9)	2 (1,3)
Dishwasher or laboratory glass washer	209	79 (73,84)	8 (5,13)	13 (9,18)	904	80 (77,83)	10 (9,13)	10 (8,12)
Fume cupboard	202	69 (62,75)	12 (8,17)	19 (14,25)	898	75 (72,78)	14 (11,16)	11 (9,14)
A still for distilling water	202	78 (72,84)	7 (4,11)	15 (11,21)	881	82 (79,84)	6 (5,8)	12 (10,14)
Provision for the secure storage of gas cylinders	117	40 (31,49)	10 (6,17)	50 (41,59)	467	57 (52,62)	13 (10,16)	30 (26,34)

Table 43. (England – independent schools): Technicians' evaluation of the factors and facilities of preparation rooms relevant within their school/college in years 1 and 3 of the survey. Respondents were technicians.

	Year 1				Year 3			
		Available and sufficient / working	Available but insufficient/ not working	Not available		Available and sufficient / working	Available but insufficient/ not working	Not available
England independent schools	**n**	**%**	**%**	**%**	**n**	**%**	**%**	**%**
Storage space for equipment	37	49 (34,65)	47 (32,63)	3 (1,15)	239	68 (61,73)	31 (25,37)	1 (0,4)
Working surfaces to meet the needs of the department	39	60 (44,74)	40 (26,56)	0 (0,9)	236	60 (54,66)	38 (32,45)	1 (0,4)
Gas, water, electricity supply	38	89 (75,96)	8 (3,21)	3 (0,14)	237	85 (80,89)	13 (10,19)	1 (0,4)
Proximity to laboratories	39	81 (66,91)	19 (9,34)	0 (0,9)	239	89 (84,93)	11 (7,16)	0 (0,2)
Computer, internet connections and telephone	39	85 (70,93)	13 (6,27)	3 (0,14)	239	86 (81,90)	13 (9,18)	2 (1,4)
Trolley for moving equipment	39	84 (69,92)	11 (4,25)	5 (1,17)	225	85 (80,89)	7 (4,11)	8 (5,13)
Space for trolleys	39	39 (25,55)	48 (33,63)	13 (6,27)	226	59 (52,65)	33 (27,40)	8 (5,13)
First aid kit	38	92 (78,97)	3 (0,14)	6 (2,18)	236	95 (92,97)	3 (1,6)	2 (1,5)
Mechanical ventilation	36	48 (32,64)	21 (11,37)	31 (19,48)	225	63 (57,69)	19 (14,25)	18 (13,23)
A lockable, ventilated chemical store	32	71 (53,84)	13 (5,29)	16 (7,33)	214	69 (62,75)	15 (11,21)	16 (12,22)
Refrigerator/freezer	36	91 (77,97)	3 (0,15)	6 (2,19)	234	90 (85,93)	6 (4,10)	4 (2,8)
Dishwasher or laboratory glass washer	35	81 (65,91)	6 (2,20)	13 (5,28)	219	88 (83,92)	6 (4,11)	6 (3,10)
Fume cupboard	32	64 (46,79)	9 (3,25)	26 (14,44)	206	75 (68,80)	8 (5,13)	17 (13,23)
A still for distilling water	33	76 (59,87)	3 (1,16)	21 (11,38)	206	84 (78,88)	2 (1,5)	14 (10,20)
Provision for the secure storage of gas cylinders	17	47 (26,69)	6 (1,28)	47 (26,69)	135	57 (49,65)	15 (10,23)	27 (20,36)

Table 44. (Scotland – year 3 only): Technicians' evaluation of the factors and facilities of preparation rooms in their school/college. Respondents were technicians.

	Year 3			
		Available and sufficient / working	Available but insufficient/ not working	Not available
Scottish state schools	**n**	**%**	**%**	**%**
Storage space for equipment	55	55 (41,67)	44 (31,57)	2 (0,10)
Working surfaces to meet the needs of the department	55	53 (40,66)	44 (31,57)	4 (1,13)
Gas, water, electricity supply	55	69 (56,80)	27 (17,41)	4 (1,13)
Proximity to laboratories	54	91 (80,96)	9 (4,20)	0 (0,7)
Computer, internet connections and telephone	55	85 (74,93)	15 (7,26)	0 (0,7)
Trolley for moving equipment	55	84 (71,91)	15 (7,26)	2 (0,10)
Space for trolleys	55	60 (47,72)	35 (23,48)	5 (2,15)
First aid kit	53	85 (73,92)	8 (3,18)	8 (3,18)
Mechanical ventilation	53	68 (54,79)	6 (2,16)	26 (16,40)
A lockable, ventilated chemical store	54	80 (67,88)	9 (4,20)	11 (5,22)
Refrigerator/freezer	55	95 (85,98)	4 (1,13)	2 (0,10)
Dishwasher or laboratory glass washer	54	70 (57,81)	15 (8,27)	15 (8,27)
Fume cupboard	55	76 (63,86)	13 (6,24)	11 (5,22)
A still for distilling water	54	46 (33,60)	11 (5,22)	43 (30,56)
Provision for the secure storage of gas cylinders	40	38 (24,53)	20 (10,35)	43 (28,58)

Availability of science equipment

Table 45. (England – state schools): Technicians' evaluation of biology or general science laboratory equipment in years 1 and 3 of the study. Respondents were technicians.

	Year 1				Year 3			
		Available in working order/ complete set	Available but not working/ not complete set	Not available		Available in working order/ complete set	Available but not working/ not complete set	Not available
	n	%	%	%	n	%	%	%
Genetic engineering kit	175	15 (10,21)	12 (8,18)	73 (66,79)	740	14 (11,16)	13 (11,16)	73 (70,76)
Digital microscope with visualizer and/or camera	194	41 (34,48)	17 (13,24)	42 (35,49)	840	37 (34,40)	19 (17,22)	44 (40,47)
Haemocytometer	170	32 (25,40)	13 (9,19)	55 (47,62)	738	31 (28,35)	15 (13,18)	53 (50,57)
Gel electrophoresis equipment and centrifuge	189	28 (22,35)	22 (16,28)	50 (43,57)	831	37 (33,40)	19 (17,22)	13 (11,16)
Class set (groups) of datalogger with sensors	197	39 (32,46)	38 (31,45)	23 (18,30)	865	40 (37,43)	30 (27,33)	31 (28,34)
Class set (groups) of optical microscopes	197	90 (85,94)	10 (6,15)	0 (0,3)	875	90 (88,92)	9 (7,11)	1 (1,2)
Water bath and thermometers	200	78 (72,83)	21 (16,27)	1 (0,3)	882	84 (81,86)	15 (13,18)	2 (1,3)
Class set (groups) of colorimeters	192	33 (26,40)	34 (28,41)	33 (27,40)	856	40 (36,43)	34 (31,37)	27 (24,30)
Class set (groups) of field work equipment	189	58 (51,65)	26 (20,33)	16 (11,22)	832	66 (63,69)	25 (22,28)	9 (8,12)
Anatomical models, e.g. eye, torso, ear, heart	196	75 (69,81)	23 (18,30)	2 (1,5)	877	80 (77,82)	19 (16,22)	1 (1,2)
Class set (groups) of dissection kit	196	89 (83,92)	9 (6,14)	2 (1,6)	875	93 (91,94)	6 (5,8)	1 (1,2)
Class set (groups) of plastic petri dishes	199	98 (95,99)	2 (1,5)	0 (0,3)	876	99 (98,99)	1 (1,2)	0 (0,0)

Table 46. (England – independent schools): Technicians' evaluation of biology or general science laboratory equipment in years 1 and 3 of the study. Respondents were technicians.

	Year 1				Year 3			
		Available in working order/ complete set	Available but not working/ not complete set	Not available		Available in working order/ complete set	Available but not working/ not complete set	Not available
	n	%	%	%	n	%	%	%
Genetic engineering kit	25	38 (22,58)	20 (9,40)	42 (25,61)	142	54 (46,62)	16 (11,23)	30 (23,38)
Digital microscope with visualizer and/or camera	29	47 (30,64)	36 (21,55)	17 (8,35)	166	59 (51,66)	15 (10,21)	26 (20,34)
Haemocytometer	25	60 (40,77)	24 (11,44)	16 (6,35)	139	64 (56,72)	9 (5,15)	27 (20,35)
Gel electrophoresis equipment and centrifuge	29	58 (40,74)	28 (15,47)	14 (5,31)	170	67 (60,74)	15 (10,21)	18 (13,25)
Class set (groups) of datalogger with sensors	32	38 (23,55)	23 (11,40)	40 (24,57)	177	61 (53,68)	22 (16,29)	17 (12,23)
Class set (groups) of optical microscopes	32	97 (84,99)	3 (1,16)	0 (0,11)	185	98 (95,99)	2 (1,5)	1 (0,3)
Water bath and thermometers	32	84 (67,93)	16 (7,33)	0 (0,11)	190	93 (88,96)	7 (4,12)	0 (0,2)
Class set (groups) of colorimeters	30	52 (35,69)	44 (28,62)	3 (1,17)	175	69 (62,76)	20 (15,27)	10 (7,16)
Class set (groups) of field work equipment	29	67 (49,82)	33 (18,51)	0 (0,12)	183	87 (82,92)	10 (6,15)	3 (1,6)
Anatomical models, e.g. eye, torso, ear, heart	32	77 (60,89)	20 (9,37)	3 (1,16)	189	91 (86,94)	8 (5,13)	1 (0,4)
Class set (groups) of dissection kit	32	84 (68,93)	16 (7,32)	0 (0,11)	189	97 (93,99)	2 (1,5)	2 (1,5)
Class set (groups) of plastic petri dishes	31	97 (83,99)	3 (1,17)	0 (0,11)	190	99 (97,100)	1 (0,3)	0 (0,2)

Table 47. (Scotland – year 3 only): Technicians' evaluation of biology or general science laboratory equipment. Respondents were technicians.

	Year 3			
		Available in working order/ complete set	Available but not working/ not complete set	Not available
	n	%	%	%
Genetic engineering kit	54	7 (3,18)	19 (10,31)	56 (42,68)
Digital microscope with visualizer and/or camera	55	29 (19,42)	22 (13,35)	47 (34,60)
Haemocytometer	55	38 (26,52)	24 (14,37)	31 (20,44)
Gel electrophoresis equipment and centrifuge	55	53 (40,66)	27 (17,41)	15 (7,26)
Class set (groups) of datalogger with sensors	54	19 (10,31)	24 (14,37)	50 (37,63)
Class set (groups) of optical microscopes	55	85 (74,93)	11 (5,22)	2 (0,10)
Water bath and thermometers	55	76 (63,86)	22 (13,35)	0 (0,7)
Class set (groups) of colorimeters	55	35 (23,48)	36 (25,50)	25 (16,39)
Class set (groups) of field work equipment	55	60 (47,72)	29 (19,42)	9 (4,20)
Anatomical models, e.g. eye, torso, ear, heart	55	67 (54,78)	29 (19,42)	2 (0,10)
Class set (groups) of dissection kit	55	64 (50,75)	24 (14,37)	9 (4,20)
Class set (groups) of plastic petri dishes	55	96 (87,99)	2 (0,10)	0 (0,7)

Table 48. (England – state schools): Technicians' evaluation of chemistry or general science laboratory equipment in years 1 and 3 of the study. Respondents were technicians.

	Year 1				Year 3			
		Available in working order/ complete set	Available but not working/ not complete set	Not available		Available in working order/ complete set	Available but not working/ not complete set	Not available
	n	%	%	%	n	%	%	%
UV Spectrophotometer	176	19 (14,26)	4 (2,8)	77 (70,83)	757	22 (19,25)	9 (7,11)	70 (67,73)
More than one digital precision balance (±0.001g)	200	49 (42,56)	11 (7,16)	40 (33,47)	879	54 (51,58)	10 (8,12)	36 (32,39)
Class set (groups) of magnetic stirrers	198	9 (6,14)	25 (19,31)	66 (59,72)	878	16 (13,18)	23 (20,26)	62 (58,65)
Class set (groups) of heating mantles	198	13 (9,18)	22 (17,29)	65 (58,72)	860	22 (19,25)	21 (18,24)	57 (54,61)
Class set (groups) of distillation apparatus	198	41 (34,48)	30 (24,36)	30 (24,36)	874	53 (49,56)	22 (20,25)	25 (22,28)
Class set (groups) of pH meters	201	27 (21,33)	41 (35,48)	32 (26,39)	874	42 (39,45)	31 (28,34)	27 (24,30)
Class set (groups) of student molecular modelling kit	202	72 (65,78)	22 (16,28)	7 (4,11)	878	78 (75,80)	17 (14,19)	6 (4,7)
Class set (groups) of ground glass gas syringes	195	57 (50,64)	30 (24,37)	13 (9,18)	867	66 (62,69)	20 (17,23)	14 (12,17)
Class set (groups) of titration equipment	202	92 (87,95)	5 (3,10)	3 (1,6)	878	93 (92,95)	5 (4,6)	2 (1,3)
Class set (groups) of Erlenmeyer flasks	183	72 (65,78)	10 (6,15)	19 (14,25)	771	71 (68,74)	10 (8,12)	19 (17,22)
Class set (groups) of Bunsen burners	205	99 (97,100)	1 (0,3)	0 (0,2)	892	99 (98,99)	1 (0,2)	0 (0,1)
Eye protection for all students	204	100 (98,100)	0 (0,2)	0 (0,2)	888	98 (97,99)	1 (1,2)	0 (0,1)

Table 49. (England – independent schools): Technicians' evaluation of chemistry or general science laboratory equipment in years 1 and 3 of the study. Respondents were technicians.

	Year 1				Year 3			
		Available in working order/ complete set	Available but not working/ not complete set	Not available		Available in working order/ complete set	Available but not working/ not complete set	Not available
	n	%	%	%	n	%	%	%
UV Spectrophotometer	24	14 (5,34)	13 (4,32)	73 (53,87)	150	37 (30,46)	11 (7,17)	52 (44,60)
More than one digital precision balance (±0.001g)	29	76 (57,88)	14 (5,31)	10 (4,27)	184	79 (73,84)	5 (3,9)	16 (11,22)
Class set (groups) of magnetic stirrers	27	48 (30,66)	22 (11,41)	30 (16,49)	168	39 (31,46)	26 (19,33)	36 (29,43)
Class set (groups) of heating mantles	25	38 (22,58)	32 (17,52)	29 (15,49)	163	37 (30,45)	26 (20,34)	36 (29,44)
Class set (groups) of distillation apparatus	27	81 (63,92)	15 (6,33)	4 (1,19)	173	87 (81,92)	8 (5,13)	5 (2,9)
Class set (groups) of pH meters	28	74 (55,87)	22 (11,41)	4 (1,18)	181	75 (68,81)	18 (13,25)	7 (4,12)
Class set (groups) of student molecular modelling kit	29	83 (65,92)	14 (5,31)	3 (1,18)	183	93 (88,96)	6 (3,10)	2 (1,5)
Class set (groups) of ground glass gas syringes	26	79 (60,90)	16 (7,35)	5 (1,21)	173	92 (87,95)	5 (3,10)	2 (1,6)
Class set (groups) of titration equipment	28	93 (77,98)	0 (0,13)	7 (2,23)	182	95 (91,97)	2 (1,6)	3 (1,6)
Class set (groups) of Erlenmeyer flasks	24	87 (68,96)	4 (1,21)	8 (2,26)	156	85 (78,90)	7 (4,13)	8 (4,13)
Class set (groups) of Bunsen burners	30	100 (88,100)	0 (0,12)	0 (0,12)	192	99 (96,100)	1 (0,3)	1 (0,3)
Eye protection for all students	30	100 (88,100)	0 (0,12)	0 (0,12)	192	100 (98,100)	0 (0,2)	0 (0,2)

Table 50. (Scotland – year 3 only): Technicians' evaluation of chemistry or general science laboratory equipment. Respondents were technicians.

	Year 3			
		Available in working order/ complete set	Available but not working/ not complete set	Not available
	n	%	%	%
UV Spectrophotometer	50	46 (33,60)	20 (11,33)	34 (22,48)
More than one digital precision balance (±0.001g)	53	60 (47,73)	21 (12,34)	19 (10,32)
Class set (groups) of magnetic stirrers	53	34 (22,48)	38 (26,51)	28 (18,42)
Class set (groups) of heating mantles	52	27 (17,41)	52 (38,65)	21 (12,34)
Class set (groups) of distillation apparatus	53	30 (19,44)	53 (39,66)	17 (9,30)
Class set (groups) of pH meters	53	28 (18,42)	47 (34,61)	25 (15,38)
Class set (groups) of student molecular modelling kit	52	81 (68,89)	19 (11,32)	0 (0,7)
Class set (groups) of ground glass gas syringes	52	33 (21,47)	46 (33,60)	21 (12,34)
Class set (groups) of titration equipment	52	88 (77,95)	12 (5,23)	0 (0,7)
Class set (groups) of Erlenmeyer flasks	47	74 (60,85)	23 (13,38)	2 (0,11)
Class set (groups) of Bunsen burners	53	98 (90,100)	2 (0,10)	0 (0,7)
Eye protection for all students	53	96 (87,99)	4 (1,13)	0 (0,7)

Table 51. (England – state schools): Technicians' evaluation of physics or general science laboratory equipment in years 1 and 3 of the study. Respondents were technicians.

	Year 1				Year 3			
		Available in working order/ complete set	Available but not working/ not complete set	Not available		Available in working order/ complete set	Available but not working/ not complete set	Not available
	n	%	%	%	n	%	%	%
Oscilloscope with spectrum analysis	191	65 (58,72)	15 (11,21)	20 (14,26)	791	70 (66,73)	16 (13,18)	15 (13,18)
Van de Graaff Generator	196	92 (87,95)	6 (4,11)	2 (1,5)	853	89 (87,91)	8 (6,10)	3 (2,4)
Air Track with air source	192	73 (66,79)	10 (7,16)	16 (12,23)	831	81 (78,83)	9 (7,11)	10 (8,13)
Electric Vacuum Pump	193	75 (68,80)	8 (5,13)	17 (12,23)	830	79 (76,81)	10 (8,13)	13 (11,16)
Class set (groups) of data loggers with sensors	201	42 (35,49)	34 (28,41)	24 (18,30)	862	43 (40,47)	30 (27,33)	27 (24,30)
Class set (groups) of ray boxes and lenses	199	92 (88,95)	7 (4,11)	1 (0,4)	849	93 (91,95)	6 (5,8)	1 (0,2)
Magnetic field observation kit (iron filings, magnets)	196	93 (89,96)	6 (3,10)	1 (0,4)	848	93 (91,94)	6 (4,7)	2 (1,3)
Class set (groups) of multimeters or volt and ammeters	202	94 (90,96)	5 (3,9)	1 (0,4)	869	94 (92,95)	5 (4,7)	1 (0,2)
Class set (groups) of Newtonmeters	198	96 (92,98)	3 (2,7)	1 (0,4)	845	94 (92,95)	5 (4,7)	1 (0,2)
Class set (groups) of magnets	200	97 (94,99)	2 (1,5)	1 (0,4)	863	95 (93,96)	4 (3,6)	1 (0,1)
Class set (groups) of tuning forks	195	48 (41,56)	38 (31,45)	14 (10,19)	835	57 (54,61)	31 (28,35)	11 (9,14)
Class set (groups) of bulbs, bulb holders and wires	199	97 (93,99)	3 (1,6)	1 (0,3)	866	95 (93,96)	4 (3,6)	0 (0,1)

Table 52. (England – independent schools): Technicians' evaluation of physics or general science laboratory equipment in years 1 and 3 of the study. Respondents were technicians.

	Year 1				Year 3			
		Available in working order/ complete set	Available but not working/ not complete set	Not available		Available in working order/ complete set	Available but not working/ not complete set	Not available
	n	%	%	%	n	%	%	%
Oscilloscope with spectrum analysis	27	58 (39,75)	15 (6,33)	27 (14,46)	154	83 (76,88)	6 (3,12)	10 (6,16)
Van de Graaff Generator	28	74 (55,87)	18 (8,36)	8 (2,24)	174	97 (93,99)	2 (1,5)	1 (0,4)
Air Track with air source	26	64 (44,79)	24 (12,43)	12 (4,30)	164	92 (87,96)	3 (1,7)	5 (2,9)
Electric Vacuum Pump	27	69 (50,84)	19 (8,37)	12 (4,30)	172	90 (84,93)	5 (2,9)	13 (9,19)
Class set (groups) of data loggers with sensors	29	49 (32,66)	38 (23,57)	13 (5,30)	182	71 (64,77)	22 (16,29)	7 (4,12)
Class set (groups) of ray boxes and lenses	28	84 (66,93)	16 (7,34)	0 (0,13)	178	97 (93,98)	3 (1,7)	1 (0,3)
Magnetic field observation kit (iron filings, magnets)	28	88 (70,96)	12 (4,30)	0 (0,13)	173	96 (92,98)	3 (2,7)	1 (0,3)
Class set (groups) of multimeters or volt and ammeters	29	92 (77,98)	8 (2,23)	0 (0,12)	181	99 (96,100)	1 (0,3)	1 (0,3)
Class set (groups) of Newtonmeters	28	85 (67,94)	15 (6,33)	0 (0,13)	173	99 (96,100)	1 (0,3)	1 (0,3)
Class set (groups) of magnets	28	88 (71,96)	12 (4,29)	0 (0,13)	181	98 (95,99)	1 (0,4)	1 (0,3)
Class set (groups) of tuning forks	26	51 (33,69)	40 (24,60)	9 (2,26)	165	79 (72,84)	19 (13,26)	2 (1,6)
Class set (groups) of bulbs, bulb holders and wires	29	97 (82,99)	3 (1,18)	0 (0,12)	185	99 (97,100)	0 (0,2)	1 (0,3)

Table 53. (Scotland – year 3 only): Technicians' evaluation of physics or general science laboratory equipment. Respondents were technicians.

	Year 3			
		Available in working order/ complete set	Available but not working/ not complete set	Not available
	n	%	%	%
Oscilloscope with spectrum analysis	48	69 (54,80)	21 (12,35)	10 (4,22)
Van de Graaff Generator	54	85 (73,92)	15 (8,27)	0 (0,7)
Air Track with air source	49	82 (68,90)	16 (8,29)	2 (0,11)
Electric Vacuum Pump	48	73 (59,84)	19 (10,32)	13 (6,26)
Class set (groups) of data loggers with sensors	48	35 (23,50)	23 (13,37)	42 (29,56)
Class set (groups) of ray boxes and lenses	55	89 (78,95)	11 (5,22)	0 (0,7)
Magnetic field observation kit (iron filings, magnets)	54	83 (71,91)	13 (6,25)	4 (1,13)
Class set (groups) of multimeters or volt and ammeters	54	91 (80,96)	9 (4,20)	0 (0,7)
Class set (groups) of Newtonmeters	49	92 (81,97)	6 (2,17)	2 (0,11)
Class set (groups) of magnets	53	91 (79,96)	8 (3,18)	2 (0,10)
Class set (groups) of tuning forks	49	55 (41,68)	35 (23,49)	10 (4,22)
Class set (groups) of bulbs, bulb holders and wires	54	91 (80,96)	9 (4,20)	0 (0,7)

Satisfaction with factors affecting the delivery of high quality practical work

Table 54. (England – state) Heads of sciences' satisfaction with factors in their department for delivering high quality practical work. Respondents were heads of science. Scale - 1 – Very dissatisfied, 2 – Dissatisfied, 3 – Neither satisfied nor dissatisfied, 4 – Satisfied 5 – Very satisfied. 95% confidence intervals are indicated in brackets.

	Year 1		Year 2		Year 3		Rate of change per year
England state	**n**	**Mean**	**n**	**Mean**	**n**	**Mean**	
The department has sufficient laboratory facilities	152	3.3 (3.1, 3.5)	135	3.4 (3.2, 3.6)	157	3.4 (3.2, 3.6)	0.075
The department has sufficient equipment and consumables	152	3.5 (3.3, 3.7)	135	3.6 (3.4, 3.8)	157	3.5 (3.3, 3.7)	-0.013
The department has sufficient technical support	152	3.6 (3.4, 3.8)	135	3.7 (3.5, 3.9)	156	3.5 (3.3, 3.7)	-0.039
The department has a sufficient budget	151	3.1 (2.9, 3.3)	135	3.0 (2.8, 3.2)	157	2.9 (2.7, 3.1)	-0.078
The teachers have sufficient competency	151	4.2 (4.0, 4.3)	134	4.1 (4.0, 4.3)	157	4.0 (3.9, 4.2)	-0.069
Teachers are offered sufficient professional development	152	3.7 (3.5, 3.8)	135	3.6 (3.4, 3.8)	157	3.5 (3.3, 3.7)	-0.071

Table 55. (England – independent) Heads of sciences' satisfaction with factors in their department for delivering high quality practical work. Respondents were heads of science. Scale - 1 – Very dissatisfied, 2 – Dissatisfied, 3 – Neither satisfied nor dissatisfied, 4 – Satisfied 5 – Very satisfied. 95% confidence intervals are indicated in brackets. Statistically significant rates of change per year are highlighted in bold with the level of significance stated below the table.

	Year 1		Year 2		Year 3		Rate of change per year
England independent	**n**	**Mean**	**n**	**Mean**	**n**	**Mean**	
The department has sufficient laboratory facilities	96	4.0 (3.7,4.2)	82	3.5 (3.2,3.7)	72	3.4 (3.0,3.7)	**-0.316***
The department has sufficient equipment and consumables	96	4.4 (4.2,4.6)	82	4.2 (4.0,4.4)	72	4.2 (4.0,4.4)	-0.118
The department has sufficient technical support	96	4.1 (3.9,4.3)	82	4.2 (4,4.4)	72	3.9 (3.7,4.2)	-0.073
The department has a sufficient budget	96	4.1 (3.8,4.3)	82	4.0 (3.7,4.2)	72	3.9 (3.7,4.2)	-0.065
The teachers have sufficient competency	96	4.6 (4.5,4.7)	82	4.6 (4.5,4.8)	72	4.4 (4.2,4.6)	-0.098
Teachers are offered sufficient professional development	95	4.0 (3.8,4.2)	82	3.9 (3.7,4.2)	72	3.8 (3.5,4.0)	-0.126

***P<0.05**

Table 56. (Scotland) Heads of sciences' satisfaction with factors in their department for delivering high quality practical work. Respondents were heads of science. Scale - 1 – Very dissatisfied, 2 – Dissatisfied, 3 – Neither satisfied nor dissatisfied, 4 – Satisfied 5 – Very satisfied. 95% confidence intervals are indicated in brackets.

	Year 1		Year 2		Year 3		Rate of change per year
Scotland	**n**	**Mean**	**n**	**Mean**	**n**	**Mean**	
The department has sufficient laboratory facilities	18	4.3 (3.9,4.8)	17	3.9 (3.4,4.4)	21	3.3 (2.7,3.9)	-0.503
The department has sufficient equipment and consumables	18	3.0 (2.4,3.6)	17	3.4 (2.8,3.9)	21	3.1 (2.7,3.5)	0.065
The department has sufficient technical support	18	3.3 (2.8,3.8)	17	3.2 (2.7,3.7)	21	3.5 (3.1,3.9)	0.077
The department has a sufficient budget	18	1.9 (1.4,2.4)	16	2.4 (1.8,2.9)	21	2.3 (2.0,2.6)	0.192
The teachers have sufficient competency	18	4.4 (4.2,4.7)	17	4.4 (4.1,4.6)	21	4.2 (3.9,4.5)	-0.128
Teachers are offered sufficient professional development	18	3.7 (3.2,4.2)	17	3.6 (3.1,4.0)	21	3.5 (3.0,3.9)	-0.123

Science budget per capita

Table 57. (England and Scotland): Per capita science budget (mean and range) as reported by heads of science. 95% confidence intervals are indicated in brackets.

Budgets		Mean	Range	Rate of change per year
	n	£/pupil	£/pupil	
England state				
Year 1	118	12 (13, 11)	38	-0.79
Year 2	109	12 (13, 11)	32	
Year 3	149	11 (12, 10)	52	
England independent				
Year 1	65	33 (36, 30)	78	0.66
Year 2	74	37 (40, 34)	100	
Year 3	61	34 (37, 31)	92	
Scotland state				
Year 1	16	5 (6, 4)	9	-0.52
Year 2	13	6 (7, 5)	8	
Year 3	19	4 (4, 4)	7	

Table 58. (England and Scotland): Heads of sciences' reporting as to how their departmental budget had changed since the previous year (years 2 and 3 of the study). 95% confidence intervals are indicated in brackets.

Change in school budgets	n	Decreased	Stay the same	Increased
		%	%	%
England state				
Year 2	133	47 (39,56)	40 (32,49)	13 (8,20)
Year 3	155	51 (43,59)	41 (34,49)	8 (4,13)
England independent				
Year 2	80	23 (15,33)	55 (44,66)	23 (15,33)
Year 3	70	27 (18,39)	56 (44,67)	17 (10,28)
Scotland state				
Year 2	17	59 (36,79)	41 (21,64)	0 (0,19)
Year 3	20	80 (58,92)	20 (8,42)	0 (0,17)

How does practical science prepare students for their next steps in science education?

How well prepared do heads of science and science teachers in schools consider their students to be in each stage of their education?

Table 59. 11 – 14 age range (England – state schools): How well prepared staff considered their students to be for practical activities/experiments at the start of the 11 – 14 phase of their education for each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

11 – 14	n	Unprepared	Marginally prepared	Well prepared	Very well prepared
State schools		%	%	%	%
Biology					
Writing science reports-year-1	17	41 (64, 21)	24 (48, 9)	29 (54, 13)	6 (28, 1)
Writing science reports-year-2	17	29 (54, 13)	41 (64, 21)	24 (48, 9)	6 (28, 1)
Writing science reports-year-3	44	27 (42, 16)	57 (71, 42)	16 (30, 8)	0 (8, 0)
Using science equipment-year-1	17	24 (48, 9)	35 (59, 17)	35 (59, 17)	6 (28, 1)
Using science equipment-year-2	17	12 (35, 3)	41 (64, 21)	35 (59, 17)	12 (35, 3)
Using science equipment-year-3	44	11 (24, 5)	52 (67, 38)	36 (51, 24)	0 (8, 0)
Following a set of instructions-1	17	6 (28, 1)	29 (54, 13)	53 (74, 31)	12 (35, 3)
Following a set of instructions-2	17	18 (42, 6)	24 (48, 9)	53 (74, 31)	6 (28, 1)
Following a set of instructions-3	44	9 (21, 4)	50 (64, 36)	41 (56, 27)	0 (8, 0)
Working independently in a laboratory-year-1	17	35 (59, 17)	29 (54, 13)	35 (59, 17)	0 (19, 0)
Working independently in a laboratory-year-2	16	31 (56, 14)	50 (72, 28)	19 (44, 6)	0 (20, 0)
Working independently in a laboratory-year-3	44	25 (40, 14)	55 (69, 40)	21 (35, 11)	0 (8, 0)
Chemistry					
Writing science reports-year-1	23	22 (42, 9)	39 (60, 22)	22 (42, 9)	17 (38, 7)
Writing science reports-year-2	34	24 (40, 12)	53 (69, 36)	24 (40, 12)	0 (11, 0)
Writing science reports-year-3	66	41 (53, 30)	36 (49, 26)	18 (29, 11)	5 (13, 2)
Using science equipment-year-1	23	17 (38, 7)	26 (47, 12)	44 (64, 25)	13 (33, 4)
Using science equipment-year-2	34	12 (27, 5)	35 (52, 21)	47 (64, 31)	6 (19, 2)
Using science equipment-year-3	66	18 (29, 11)	39 (52, 28)	36 (49, 26)	6 (15, 2)
Following a set of instructions-1	23	9 (27, 2)	26 (47, 12)	52 (71, 33)	13 (33, 4)
Following a set of instructions-2	34	18 (34, 8)	24 (40, 12)	53 (69, 36)	6 (19, 2)
Following a set of instructions-3	66	22 (21, 5)	35 (47, 24)	49 (61, 37)	6 (15, 2)
Working independently in a laboratory-year-1	23	30 (51, 15)	39 (60, 22)	26 (47, 12)	4 (21, 1)
Working independently in a laboratory-year-2	34	21 (37, 10)	41 (58, 26)	35 (52, 21)	3 (15, 0)
Working independently in a laboratory-year-3	66	39 (52, 28)	39 (52, 28)	18 (29, 11)	3 (11, 1)
Physics					
Writing science reports-year-1	18	28 (51, 12)	39 (62, 20)	33 (57, 16)	0 (18, 0)
Writing science reports-year-2	33	12 (28, 5)	55 (70, 38)	33 (51, 20)	0 (11, 0)
Writing science reports-year-3	44	16 (30, 8)	55 (69, 40)	25 (40, 14)	5 (15, 1)
Using science equipment-year-1	17	12 (35, 3)	35 (59, 17)	53 (74, 31)	0 (19, 0)
Using science equipment-year-2	33	12 (28, 5)	33 (51, 20)	52 (68, 35)	4 (16, 1)
Using science equipment-year-3	45	11 (24, 5)	44 (59, 31)	40 (55, 27)	4 (15, 1)
Following a set of instructions-1	18	6 (26, 1)	39 (62, 20)	50 (71, 29)	6 (26, 1)
Following a set of instructions-2	34	9 (23, 3)	32 (50, 19)	53 (69, 36)	6 (19, 2)
Following a set of instructions-3	45	2 (12, 0)	47 (61, 33)	47 (61, 33)	4 (15, 1)
Working independently in a laboratory-year-1	18	17 (40, 6)	67 (84, 43)	17 (40, 6)	0 (18, 0)
Working independently in a laboratory-year-2	33	21 (38, 11)	39 (57, 24)	39 (57, 24)	0 (11, 0)
Working independently in a laboratory-year-3	45	18 (32, 9)	49 (63, 35)	31 (46, 19)	2 (12, 0)
Science					
Writing science reports-year-1	55	27 (41, 17)	51 (64, 38)	18 (31, 10)	4 (13, 1)
Writing science reports-year-2	71	34 (46, 24)	45 (57, 34)	20 (31, 12)	1 (8, 0)
Writing science reports-year-3	170	42 (50, 35)	38 (46, 31)	19 (26, 14)	0 (2, 0)
Using science equipment-year-1	57	25 (37, 15)	35 (48, 24)	37 (50, 25)	4 (12, 1)

	n	Unprepared	Marginally prepared	Well prepared	Very well prepared
		%	%	%	%
Using science equipment-year-2	71	23 (34, 14)	34 (46, 24)	39 (51, 29)	4 (12, 1)
Using science equipment-year-3	171	25 (32, 19)	33 (41, 27)	37 (44, 30)	5 (9, 2)
Following a set of instructions-1	57	9 (19, 4)	37 (50, 25)	49 (62, 36)	5 (15, 2)
Following a set of instructions-2	71	6 (15, 3)	31 (43, 22)	56 (67, 45)	6 (15, 3)
Following a set of instructions-3	171	15 (21, 10)	33 (40, 26)	46 (54, 39)	6 (11, 4)
Working independently in a laboratory-year-1	57	40 (54, 28)	40 (54, 28)	18 (30, 10)	2 (10, 0)
Working independently in a laboratory-year-2	71	41 (53, 30)	35 (47, 25)	23 (34, 14)	1 (8, 0)
Working independently in a laboratory-year-3	171	36 (43, 29)	43 (50, 35)	22 (29, 16)	0 (2, 0)

Table 60. 11 – 14 age range (England – independent schools): How well prepared staff considered their students to be for practical activities/experiments at the start of the 11 – 14 phase of their education for each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

11 – 14	n	Unprepared	Marginally prepared	Well prepared	Very well prepared
Independent schools		%	%	%	%
Biology					
Writing science reports-year-1	17	12 (35, 3)	35 (59, 17)	35 (59, 17)	18 (42, 6)
Writing science reports-year-2	18	22 (46, 9)	44 (67, 24)	33 (57, 16)	0 (18, 0)
Writing science reports-year-3	21	33 (55, 17)	48 (68, 28)	14 (35, 5)	5 (23, 1)
Using science equipment-year-1	17	6 (28, 1)	24 (48, 9)	29 (54, 13)	41 (64, 21)
Using science equipment-year-2	18	6 (26, 1)	28 (51, 12)	67 (84, 43)	0 (18, 0)
Using science equipment-year-3	21	14 (35, 5)	29 (50, 14)	52 (72, 32)	5 (23, 1)
Following a set of instructions-1	17	6 (28, 1)	12 (35, 3)	47 (69, 26)	35 (59, 17)
Following a set of instructions-2	18	6 (26, 1)	22 (46, 9)	72 (88, 49)	0 (18, 0)
Following a set of instructions-3	21	19 (40, 8)	33 (55, 17)	38 (60, 20)	10 (29, 3)
Working independently in a laboratory-year-1	17	24 (48, 9)	18 (42, 6)	35 (59, 17)	24 (48, 9)
Working independently in a laboratory-year-2	18	17 (40, 6)	39 (62, 20)	44 (67, 24)	0 (18, 0)
Working independently in a laboratory-year-3	21	24 (46, 10)	33 (55, 17)	38 (60, 20)	5 (23, 1)
Chemistry					
Writing science reports-year-1	31	23 (40, 11)	52 (68, 35)	26 (44, 14)	0 (11, 0)
Writing science reports-year-2	20	25 (47, 11)	35 (57, 18)	40 (62, 22)	0 (17, 0)
Writing science reports-year-3	31	39 (57, 23)	48 (65, 32)	7 (21, 2)	7 (21, 2)
Using science equipment-year-1	31	7 (21, 2)	32 (50, 18)	52 (68, 35)	10 (25, 3)
Using science equipment-year-2	20	10 (31, 3)	40 (62, 22)	50 (70, 30)	0 (17, 0)
Using science equipment-year-3	31	16 (33, 7)	36 (53, 21)	36 (53, 21)	13 (29, 5)
Following a set of instructions-1	31	3 (17, 1)	32 (50, 18)	58 (74, 40)	7 (21, 2)
Following a set of instructions-2	20	0 (17, 0)	20 (42, 8)	70 (86, 48)	10(31, 3)
Following a set of instructions-3	31	3 (17, 1)	48 (65, 32)	36 (53, 21)	13 (29, 5)
Working independently in a laboratory-year-1	31	10 (25, 3)	45 (63, 29)	45 (47, 11)	3 (24, 1)
Working independently in a laboratory-year-2	20	10 (31, 3)	60 (78, 38)	25 (47, 11)	5 (24, 1)
Working independently in a laboratory-year-3	31	19 (37, 9)	39 (57, 23)	39 (57, 23)	3 (17, 1)
Physics					
Writing science reports-year-1	20	35 (57, 18)	40 (62, 22)	25 (47, 11)	0 (17, 0)
Writing science reports-year-2	21	19 (40, 8)	48 (68, 28)	29 (50, 14)	5 (23, 1)
Writing science reports-year-3	45	33 (48, 21)	47 (61, 33)	20 (34, 11)	0 (8, 0)
Using science equipment-year-1	20	10 (31, 3)	60 (78, 38)	30 (52, 14)	0 (17, 0)
Using science equipment-year-2	22	9 (28, 2)	41 (62, 23)	46 (66, 27)	5 (22, 1)
Using science equipment-year-3	44	9 (21, 4)	48 (62, 33)	41 (56, 27)	2 (12, 0)
Following a set of instructions-1	20	10 (31, 3)	30 (52, 14)	55 (74, 34)	5 (24, 1)
Following a set of instructions-2	22	5 (22, 1)	41 (62, 23)	50 (70, 30)	5 (22, 1)
Following a set of instructions-3	45	7 (18, 2)	42 (57, 29)	47 (61, 33)	4 (15, 1)
Working independently in a laboratory-year-1	20	25(47, 11)	45 (66, 26)	30 (52, 14)	0 (17, 0)
Working independently in a laboratory-year-2	22	23 (44, 10)	55 (73, 34)	18 (39, 7)	5 (22, 1)
Working independently in a laboratory-year-3	45	18 (32, 9)	51 (65, 37)	29 (44, 18)	2 (12, 0)

	n	Unprepared	Marginally prepared	Well prepared	Very well prepared
		%	%	%	%
Science					
Writing science reports-year-1	15	3 (26, 0)	53 (76, 30)	20 (46, 7)	7 (30, 1)
Writing science reports-year-2	14	43 (68, 21)	50 (74, 26)	7 (32, 1)	0 (22, 0)
Writing science reports-year-3	12	33 (61, 14)	42 (69, 19)	25 (54, 9)	0 (25, 0)
Using science equipment-year-1	15	20 (46, 7)	13 (38, 4)	47 (70, 24)	20 (46, 7)
Using science equipment-year-2	14	7 (32, 1)	64 (84, 38)	29 (55, 12)	0 (22, 0)
Using science equipment-year-3	12	8 (36, 1)	58 (81, 31)	33 (61, 14)	0 (25, 0)
Following a set of instructions-1	15	7 (30, 1)	27 (52, 11)	53 (76, 30)	13 (38, 4)
Following a set of instructions-2	14	14 (41, 4)	43 (68, 21)	43 (68, 21)	0 (22, 0)
Following a set of instructions-3	12	8 (36, 1)	33 (61, 14)	58 (81, 31)	0 (25, 0)
Working independently in a laboratory-year-1	15	27 (52, 11)	27 (52, 11)	47 (70, 24)	0 (21, 0)
Working independently in a laboratory-year-2	14	43 (68, 21)	50 (74, 26)	7 (32, 1)	0 (22, 0)
Working independently in a laboratory-year-3	12	17 (45, 5)	58 (81, 31)	25 (54. 9)	0 (25, 0)

Table 61. 14 – 16 age range (England – state schools): How well prepared staff considered their students to be for practical activities/experiments at the start of the 14 – 16 phase of their education for each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

14 – 16	n	Unprepared	Marginally prepared	Well prepared	Very well prepared
State schools		%	%	%	%
Biology					
Writing science reports-year-1	56	20 (32, 11)	45 (58, 32)	32 (45, 21)	4 (12, 1)
Writing science reports-year-2	77	27 (38, 18)	40 (52, 30)	27 (38, 18)	5 (13, 2)
Writing science reports-year-3	147	20 (27, 14)	53 (61, 45)	26 (34, 19)	1 (5, 0)
Using science equipment-year-1	56	9 (19, 4)	30 (44, 20)	50 (63, 37)	11 (22, 5)
Using science equipment-year-2	77	5 (13, 2)	38 (49, 28)	49 (61, 38)	8 (16, 4)
Using science equipment-year-3	147	2 (6, 1)	40 (48, 32)	50 (58, 42)	8 (14, 5)
Following a set of instructions-1	56	5 (15, 2)	34 (47, 23)	48 (61, 35)	13 (24, 6)
Following a set of instructions-2	77	7 (15, 3)	27 (38, 18)	57 (68, 46)	9 (18, 4)
Following a set of instructions-3	147	3 (7, 1)	33 (41, 26)	56 (64, 48)	8 (14, 5)
Working independently in a laboratory-year-1	56	25 (38, 15)	43 (56, 31)	30 (44, 20)	2 (10, 0)
Working independently in a laboratory-year-2	77	26 (37, 17)	51 (62, 39)	21 (35, 21)	3 (9, 2)
Working independently in a laboratory-year-3	146	15 (22, 10)	53 (61, 45)	27 (35, 21)	4 (9, 2)
Chemistry					
Writing science reports-year-1	86	16 (26, 10)	44 (62, 41)	31 (42, 22)	1 (7, 0)
Writing science reports-year-2	99	19 (28, 13)	50 (59, 40)	28 (38, 20)	3 (9, 1)
Writing science reports-year-3	171	24 (31, 18)	51 (52, 37)	28 (35, 22)	4 (8, 2)
Using science equipment-year-1	86	5 (12, 2)	35 (46, 25)	55 (65, 44)	6 (13, 2)
Using science equipment-year-2	99	6 (13, 3)	26 (35, 18)	59 (69, 49)	9 (17, 5)
Using science equipment-year-3	171	5 (9, 2)	33 (40, 26)	57 (64, 49)	5 (10 ,3)
Following a set of instructions-1	86	4 (10, 1)	19 (28, 12)	69 (78, 58)	9 (17, 5)
Following a set of instructions-2	99	1 (6, 0)	20 (30, 13)	64 (73, 54)	14 (23, 9)
Following a set of instructions-3	171	5 (10, 2)	30 (38, 22)	53 (61, 45)	12 (19, 8)
Working independently in a laboratory-year-1	86	13 (22, 7)	50 (61, 39)	37 (48, 28)	0 (4, 0)
Working independently in a laboratory-year-2	99	13 (21, 8)	44 (54, 35)	36 (46, 27)	6 (4, 0)
Working independently in a laboratory-year-3	171	23 (30, 18)	47 (55, 40)	28 (35, 22)	1 (13, 3)
Physics					
Writing science reports-year-1	68	22 (34, 14)	47 (59, 35)	28 (40, 18)	3 (10, 1)
Writing science reports-year-2	73	8 (17, 4)	63 (73, 51)	27 (39, 18)	1 (8, 0)
Writing science reports-year-3	139	21 (29, 15)	48 (57, 40)	27 (35, 20)	4 (8, 2)
Using science equipment-year-1	69	4 (12, 1)	32 (44, 22)	54 (65, 42)	10 (20, 5)
Using science equipment-year-2	73	4 (12, 1)	33 (45, 23)	58 (68, 46)	6 (13, 2)
Using science equipment-year-3	139	3 (7, 1)	37 (46, 30)	51 (59, 43)	9 (15, 5)
Following a set of instructions-1	69	1 (8, 0)	23 (35, 15)	65 (76, 53)	10 (20, 5)
Following a set of instructions-2	73	4 (12, 1)	22 (33, 14)	69 (78, 57)	6 (13, 2)
Following a set of instructions-3	139	5 (10, 2)	30 (38, 22)	53 (61, 45)	12 (19, 8)
Working independently in a laboratory-year-1	69	13 (23, 7)	42 (54, 31)	44 (55, 32)	1 (8, 0)
Working independently in a laboratory-year-2	72	10 (19, 5)	47 (59, 36)	42 (53, 31)	1 (8, 0)
Working independently in a laboratory-year-3	139	13 (20, 8)	48 (57, 40)	36 (44, 28)	3 (7, 1)

Table 62. 14 – 16 age range (England – independent schools): How well prepared staff considered their students to be for practical activities/experiments at the start of the 14 – 16 phase of their education for each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

14 – 16	n	Unprepared	Marginally prepared	Well prepared	Very well prepared
Independent schools		%	%	%	%
Biology					
Writing science reports-year-1	32	6 (21, 2)	50 (67, 33)	34 (52, 20)	9 (25, 3)
Writing science reports-year-2	43	14 (28, 6)	44 (59, 30)	37 (52, 24)	5 (16, 1))
Writing science reports-year-3	45	13 (26, 6)	49 (63, 35)	36 (51, 23)	2 (12, 0)
Using science equipment-year-1	32	0 (11, 0)	9 (25, 3)	66 (80, 48)	25 (42, 13)
Using science equipment-year-2	44	0 (8, 0)	32 (47, 20)	57 (71, 42)	11 (24, 5)
Using science equipment-year-3	44	2 (12, 0)	16 (30, 8)	77 (87, 63)	5 (15, 1)
Following a set of instructions-1	32	0 (11, 0)	9 (25, 3)	66 (80, 48)	25 (42, 13)
Following a set of instructions-2	44	2 (12, 0)	23 (37, 13)	57 (73, 44)	16 (30, 8)
Following a set of instructions-3	45	0 (8, 0)	27 (41, 16)	77 (77, 49)	9 (21, 3)
Working independently in a laboratory-year-1	32	9 (25, 3)	31 (49, 18)	47 (64, 31)	13 (28, 5)
Working independently in a laboratory-year-2	44	5 (15, 1)	41 (56, 27)	46 (60, 31)	9 (21, 4)
Working independently in a laboratory-year-3	45	4 (15, 1)	40 (55, 27)	53 (67, 39)	2 (12, 0)
Chemistry					
Writing science reports-year-1	58	14 (25, 7)	62 (58, 32)	36 (49, 25)	5 (14, 2)
Writing science reports-year-2	51	12 (24, 5)	47 (61, 34)	37 (51, 25)	4 (13, 1)
Writing science reports-year-3	61	18 (30, 10)	45 (74, 49)	16 (28, 9)	3 (11, 1)
Using science equipment-year-1	58	0 (6, 0)	7 (17, 3)	72 (82, 60)	21 (33, 12)
Using science equipment-year-2	51	0 (7, 0)	20 (33, 11)	61 (73, 47)	20 (33, 11)
Using science equipment-year-3	61	2 (9, 0)	26 (39, 17)	62 (74, 49)	10 (20, 4)
Following a set of instructions-1	58	0 (6, 0)	16 (27, 8)	60 (72, 47)	24 (37, 15)
Following a set of instructions-2	51	2 (11, 0)	8 (19, 3)	61 (73, 47)	29 (43, 19)
Following a set of instructions-3	61	2 (9, 0)	20 (32, 12)	71 (81, 58)	8 (18, 3)
Working independently in a laboratory-year-1	58	5 (14, 2)	22 (35, 13)	62 (74, 49)	10 (14, 2)
Working independently in a laboratory-year-2	51	8 (19, 3)	37 (51, 25)	45 (59, 32)	10 (21, 4)
Working independently in a laboratory-year-3	61	8 (18, 3)	46 (59, 34)	41 (54, 29)	5 (14, 2)
Physics					
Writing science reports-year-1	43	28 (43, 17)	47 (61, 32)	21 (35, 11)	5 (16, 1)
Writing science reports-year-2	55	22 (35, 13)	51 (64, 38)	27 (41, 17)	0 (7, 0)
Writing science reports-year-3	80	23 (33, 15)	44 (55, 33)	31 (42, 22)	3 (9, 1)
Using science equipment-year-1	43	2 (12, 0)	33 (48, 20)	44 (59, 30)	21 (35, 11)
Using science equipment-year-2	55	2 (10, 0)	26 (39, 16)	66 (77, 52)	7 (18, 3)
Using science equipment-year-3	80	0 (5, 0)	38 (49, 28)	55 (66, 44)	8 (16, 3)
Following a set of instructions-1	43	5 (16, 1)	21 (35, 11)	51 (66, 37)	23 (38, 13)
Following a set of instructions-2	55	0 (7, 0)	20 (33, 11)	62 (74, 48)	18 (31, 10)
Following a set of instructions-3	80	1 (7, 0)	30 (41, 21)	59 (69, 48)	10 (19, 5)
Working independently in a laboratory-year-1	43	9 (22, 4)	44 (59, 30)	37 (52, 24)	9 (22, 4)
Working independently in a laboratory-year-2	55	7 (18, 3)	44 (57, 31)	46 (59, 33)	4 (13, 1)
Working independently in a laboratory-year-3	80	13 (22, 7)	46 (57, 36)	35 (46, 25)	6 (14, 3)

Table 63. Post – 16 age range (England – state schools): How well prepared staff considered their students to be for practical activities/experiments at the start of the Post -16 phase of their education for each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

Post 16	n	Unprepared	Marginally prepared	Well prepared	Very well prepared
State schools		%	%	%	%
Biology					
Writing science reports-year-1	67	25 (37, 16)	42 (54, 31)	25 (37, 16)	8 (17, 3)
Writing science reports-year-2	84	14 (24, 8)	39 (50, 29)	39 (50, 29)	7 (15, 3)
Writing science reports-year-3	113	12 (19, 7)	42 (51, 33)	37 (47, 29)	10 (17, 5)
Using science equipment-year-1	67	8 (17, 3)	39 (51, 28)	40 (53, 29)	13 (24, 7)
Using science equipment-year-2	84	4 (10, 1)	26 (37, 18)	55 (65, 44)	16 (25, 9)
Using science equipment-year-3	113	3 (8, 1)	29 (38, 21)	51 (60, 42)	17 (25, 11)
Following a set of instructions-1	67	5 (13, 2)	25 (37, 16)	46 (58, 35)	24 (36, 15)
Following a set of instructions-2	84	1 (7, 0)	23 (33, 15)	55 (65, 44)	21 (32, 14)
Following a set of instructions-3	113	2 (6, 0)	17 (25, 11)	52 (61, 43)	29 (38, 21)
Working independently in a laboratory-year-1	67	18 (29, 10)	48 (60, 36)	22 (34, 14)	12 (22, 6)
Working independently in a laboratory-year-2	84	10 (18, 5)	52 (63, 42)	29 (39, 20)	10 (18, 5)
Working independently in a laboratory-year-3	113	8 (15, 4)	42 (51, 33)	45 (54, 36)	5 (11, 2)
Chemistry					
Writing science reports-year-1	84	20 (30, 13)	52 (63, 42)	23 (33, 15)	5 (12, 2)
Writing science reports-year-2	88	18 (28, 11)	39 (49, 29)	36 (47, 27)	7 (14, 3)
Writing science reports-year-3	140	18 (25, 12)	40 (48, 32)	34 (43, 27)	8 (14, 4)
Using science equipment-year-1	84	4 (10, 1)	29 (39, 20)	46 (57, 36)	21 (32, 14)
Using science equipment-year-2	88	6 (13, 2)	19 (29, 12)	52 (63, 42)	23 (33, 15)
Using science equipment-year-3	139	4 (8, 2)	24 (32, 17)	53 (61, 45)	19 (27, 14)
Following a set of instructions-1	84	0 (5, 0)	20 (30, 13)	50 (61, 39)	30 (41, 21)
Following a set of instructions-2	88	1 (6, 0)	18 (28, 11)	50 (60, 40)	31 (41, 22)
Following a set of instructions-3	140	2 (6, 1)	18 (25, 12)	44 (53, 36)	36 (44, 28)
Working independently in a laboratory-year-1	84	14 (24, 8)	33 (44, 24)	37 (48, 27)	16 (25, 9)
Working independently in a laboratory-year-2	88	13 (21, 7)	28 (39, 20)	48 (58, 37)	11 (20, 6)
Working independently in a laboratory-year-3	140	11 (17, 7)	38 (46, 30)	44 (53, 36)	7 (13, 4)
Physics					
Writing science reports-year-1	64	19 (30, 11)	53 (65, 41)	27 (39, 17)	2 (9, 0)
Writing science reports-year-2	67	13 (24, 7)	48 (60, 36)	34 (46, 24)	5 (13, 2)
Writing science reports-year-3	112	13 (20, 8)	49 (58, 40)	32 (41, 24)	6 (13, 3)
Using science equipment-year-1	62	2 (9, 0)	33 (40, 18)	57 (68, 44)	15 (26, 8)
Using science equipment-year-2	67	3 (10, 1)	31 (45, 23)	54 (65, 42)	10 (20, 5)
Using science equipment-year-3	112	2 (6, 0)	27 (41, 23)	51 (60, 42)	16 (24, 10)
Following a set of instructions-1	64	5 (13, 2)	22 (34, 13)	52 (64, 39)	22 (34, 13)
Following a set of instructions-2	67	0 (6, 0)	28 (40, 19)	55 (67, 43)	16 (27, 9)
Following a set of instructions-3	112	2 (6, 0)	29 (38, 21)	47 (57, 38)	22 (31, 15)
Working independently in a laboratory-year-1	64	9 (19, 4)	50 (62, 38)	36 (48, 25)	5 (13, 2)
Working independently in a laboratory-year-2	67	5 (13, 2)	51 (63, 39)	39 (51, 28)	6 (15, 2)
Working independently in a laboratory-year-3	112	8 (15, 4)	38 (48, 30)	46 (55, 36)	8 (15, 4)

Table 64. Post – 16 age range (England – independent schools): How well prepared staff considered their students to be for practical activities/experiments at the start of the Post -16 phase of their education for each of the three survey years and by subject. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

Post 16	n	Unprepared	Marginally prepared	Well prepared	Very well prepared
Independent schools		%	%	%	%
Biology					
Writing science reports-year-1	31	7 (21, 2)	48 (65, 32)	36 (53, 21)	10 (25, 3)
Writing science reports-year-2	36	17 (32, 8)	50 (66, 34)	28 (44, 16)	6 (19, 2)
Writing science reports-year-3	44	14 (27, 6)	50 (64, 36)	34 (49, 22)	2 (12, 0)
Using science equipment-year-1	31	0 (11, 0)	10 (25, 3)	61 (77, 43)	29 (47, 16)
Using science equipment-year-2	37	0 (10, 0)	30 (46, 17)	62 (76, 46)	8 (22, 3)
Using science equipment-year-3	44	2 (12, 0)	16 (30, 8)	77 (87, 62)	5 (16, 1)
Following a set of instructions-1	31	0 (11, 0)	10 (25, 3)	61 (77, 43)	29 (47, 26)
Following a set of instructions-2	37	5 (18, 1)	24 (40, 13)	57 (72, 41)	14 (28, 6)
Following a set of instructions-3	44	0 (8, 0)	25 (40, 14)	66 (78, 51)	9 (21, 4)
Working independently in a laboratory-year-1	31	10 (25, 3)	29 (47, 16)	52 (68, 35)	10 (25, 3)
Working independently in a laboratory-year-2	37	8 (22, 3)	41 (57, 26)	49 (64, 33)	3 (14, 0)
Working independently in a laboratory-year-3	44	5 (15, 1)	39 (54, 25)	55 (69, 40)	2 (12, 0)
Chemistry					
Writing science reports-year-1	55	13 (24, 6)	47 (60, 34)	35 (48, 23)	6 (15, 2)
Writing science reports-year-2	44	14 (27, 6)	50 (64, 36)	34 (49, 22)	2 (12, 0)
Writing science reports-year-3	55	20 (33, 11)	60 (72, 47)	16 (29, 9)	4 (13, 1)
Using science equipment-year-1	55	0 (7, 0)	6 (15, 2)	75 (84, 61)	20 (33, 11)
Using science equipment-year-2	44	0 (8, 0)	18 (32, 9)	64 (76, 49)	18 (32, 90
Using science equipment-year-3	55	2 (10, 0)	27 (41, 17)	62 (74, 48)	9 (20, 4)
Following a set of instructions-1	55	0 (7, 0)	15 (26, 7)	58 (70, 45)	27 (41, 17)
Following a set of instructions-2	44	0 (8, 0)	9 (21, 4)	64 (76, 49)	27 (42, 16)
Following a set of instructions-3	55	2 (10, 0)	20 (33, 11)	71 (81, 58)	7 (18, 3)
Working independently in a laboratory-year-1	55	6 (15, 2)	22 (35, 13)	62 (74, 48)	11 (22, 5)
Working independently in a laboratory-year-2	44	5 (15, 1)	43 (58, 29)	46 (60, 31)	7 (19, 2)
Working independently in a laboratory-year-3	55	9 (20, 4)	44 (57, 31)	42 (55, 30)	6 (15, 2)
Physics					
Writing science reports-year-1	41	29 (45, 17)	46 (61, 32)	20 (34, 10)	5 (16, 1)
Writing science reports-year-2	51	22 (35, 12)	53 (66, 39)	26 (39, 15)	0 (7, 0)
Writing science reports-year-3	73	23 (34, 15)	45 (57, 34)	29 (40, 20)	3 (10, 1)
Using science equipment-year-1	41	5 (16, 1)	34 (50, 21)	44 (59, 30)	17 (32, 8)
Using science equipment-year-2	51	2 (11, 0)	26 (39, 15)	65 (77, 51)	8 (19, 3)
Using science equipment-year-3	73	0 (5, 0)	38 (50, 28)	53 (65, 42)	8 (17, 4)
Following a set of instructions-1	41	7 (20, 2)	22 (37, 12)	51 (66, 36)	20 (34, 10)
Following a set of instructions-2	51	0 (7, 0)	22 (35, 12)	59 (71, 45)	20 (33, 11)
Following a set of instructions-3	73	1 (8, 0)	32 (43, 22)	56 (67, 45)	11 (20, 6)
Working independently in a laboratory-year-1	41	12 (26, 5)	46 (61, 32)	32 (47, 19)	10 (23, 4)
Working independently in a laboratory-year-2	51	8 (19, 3)	45 (59, 32)	43 (57, 30)	4 (13, 1)
Working independently in a laboratory-year-3	73	14 (24, 8)	45 (57, 34)	36 (47, 25)	6 (13, 2)

Table 65. All age range (Scotland): How well prepared staff considered their students to be for practical activities/experiments at the start of each phase of their education for each of the three survey years. Respondents were heads of science and science teachers. 95% confidence intervals are indicated in brackets.

Scotland	n	Unprepared	Marginally prepared	Well prepared	Very well prepared
State schools		%	%	%	%
11 – 14					
Writing science reports-year-1	13	39 (65, 17)	23 (51, 8)	31 (58, 12)	8 (34, 1)
Writing science reports-year-2	19	47 (69, 27)	37 (59, 19)	16 (38, 5)	0 (17, 0)
Writing science reports-year-3	58	31 (44, 20)	55 (68, 42)	12 (23, 6)	2 (9, 0)
Using science equipment-year-1	13	39 (65, 17)	31 (58, 12)	23 (51, 8)	8 (34, 1)
Using science equipment-year-2	19	32 (54, 15)	42 (64, 23)	16 (38, 5)	11 (32, 3)
Using science equipment-year-3	58	24 (37, 15)	40 (53, 28)	33 (46, 22)	3 (12, 1)
Following a set of instructions-1	13	23 (51, 8)	31 (58, 12)	39 (65, 17)	8 (34, 1)
Following a set of instructions-2	19	16 (38, 5)	47 (69, 27)	37 (59, 19)	0 (17, 0)
Following a set of instructions-3	58	17 (29, 9)	48 (61, 36)	31 (44, 20)	3 (12, 1)
Working independently in a laboratory-year-1	13	46 (71, 23)	31 (58, 12)	15 (43, 4)	8 (34, 1)
Working independently in a laboratory-year-2	19	42 (64, 23)	42 (64, 23)	11 (32, 3)	5 (25, 1)
Working independently in a laboratory-year-3	58	33 (46, 22)	57 (69, 44)	10 (21, 5)	0 (6, 0)
14 – 16					
Writing science reports-year-1	23	0 (15, 0)	36 (57, 20)	50 (70, 30)	14 (34, 5)
Writing science reports-year-2	43	14 (28, 6)	28 (43, 17)	51 (66, 37)	7 (19, 2)
Writing science reports-year-3	60	0 (6, 0)	52 (64, 39)	43 (56, 31)	5 (14, 2)
Using science equipment-year-1	23	0 (15, 0)	30 (51, 15)	57 (75, 36)	13 (33, 4)
Using science equipment-year-2	43	9 (22, 4)	30 (45, 18)	58 (72, 43)	2 (12, 0)
Using science equipment-year-3	60	3 (12, 1)	47 (59, 34)	42 (55, 30)	8 (18, 4)
Following a set of instructions-1	23	0 (15, 0)	22 (42, 9)	65 (81, 44)	13 (33, 4)
Following a set of instructions-2	43	5 (16, 1)	33 (48, 20)	56 (70, 41)	7 (19, 2)
Following a set of instructions-3	60	2 (9, 0)	43 (56, 31)	48 (61, 36)	7 (16, 3)
Working independently in a laboratory-year-1	23	4 (21, 1)	30 (51, 15)	57 (75, 36)	9 (27, 2)
Working independently in a laboratory-year-2	43	26 (41, 15)	44 (59, 30)	30 (45, 18)	0 (9, 0)
Working independently in a laboratory-year-3	60	18 (30, 10)	67 (77, 54)	13 (24, 7)	2 (9, 0)
Post 16					
Writing science reports-year-1	24	0 (14, 0)	33 (54, 18)	54 (72, 35)	13 (31, 4)
Writing science reports-year-2	50	0 (7, 0)	24 (38, 14)	66 (78, 52)	10 (22, 4)
Writing science reports-year-3	63	0 (6, 0)	33 (46, 23)	56 (67, 43)	11 (21, 5)
Using science equipment-year-1	24	0 (14, 0)	21 (41, 9)	67 (82, 46)	13 (31, 4)
Using science equipment-year-2	50	0 (7, 0)	20 (33, 11)	68 (79, 54)	12 (24, 6)
Using science equipment-year-3	63	0 (6, 0)	27 (39, 17)	59 (70, 46)	14 (25, 8)
Following a set of instructions-1	24	0 (14, 0)	21 (41, 9)	50 (69, 31)	29 (50, 15)
Following a set of instructions-2	50	0 (7, 0)	12 (24, 6)	70 (81, 56)	18 (31, 10)
Following a set of instructions-3	63	0 (6, 0)	33 (46, 23)	56 (67, 43)	11 (21, 5)
Working independently in a laboratory-year-1	24	4 (21, 1)	42 (62, 24)	42 (62, 24)	13 (31, 4)
Working independently in a laboratory-year-2	50	14 (26, 7)	46 (60, 33)	40 (54, 27)	0 (7, 0)
Working independently in a laboratory-year-3	63	6 (15, 2)	68 (79, 56)	22 (34, 14)	3 (11, 1)

Table 66. Correlation between the perceived importance of skills by HE staff and their estimation of students' preparedness in biological sciences, chemistry and physics. Respondents were HE staff involved with the teaching of first year undergraduate laboratories.

	Biological sciences		Chemistry		Physics	
	n	Correlation	n	Correlation	n	Correlation
Year 1	15	0.50	14	0.70	12	0.81
Year 2	22	0.64	26	0.72	17	0.47
Year 3	24	0.60	15	0.58	14	0.61

Table 67. Response of HE staff as to whether they assume that a good grade in A levels (or equivalent) reflects a level of practical skill which will enable the student to fully access the course for which s/he has applied. The statistical significance of any trends were investigated using binary logistic regression – none were found to be significant.

	Year 1		Year 2		Year 3		Rate of change (logits per year)
	n	%	n	%	n	%	
Biological sciences							
Yes	15	46.7	23	43.5	24	45.8	-0.01
No		46.7		47.8		54.2	0.16
Don't know		6.7		8.7		0.0	-0.84
Chemistry							
Yes	14	42.9	26	30.8	16	37.5	-0.10
No		57.1		65.4		62.5	0.11
Don't know		0.0		3.8		0.0	-0.07
Physics							
Yes	13	46.2	17	47.1	14	35.7	-0.22
No		46.2		41.2		42.9	-0.07
Don't know		7.7		11.8		21.4	0.62

Figure 74. Bar chart showing the response of HE staff as to whether they assume that a good grade in A levels (or equivalent) reflects a level of practical skill which will enable the student to fully access the course for which s/he has applied (Biological sciences n = 62, chemistry n = 56, physics n = 44). 95% confidence intervals are indicated on the graph.

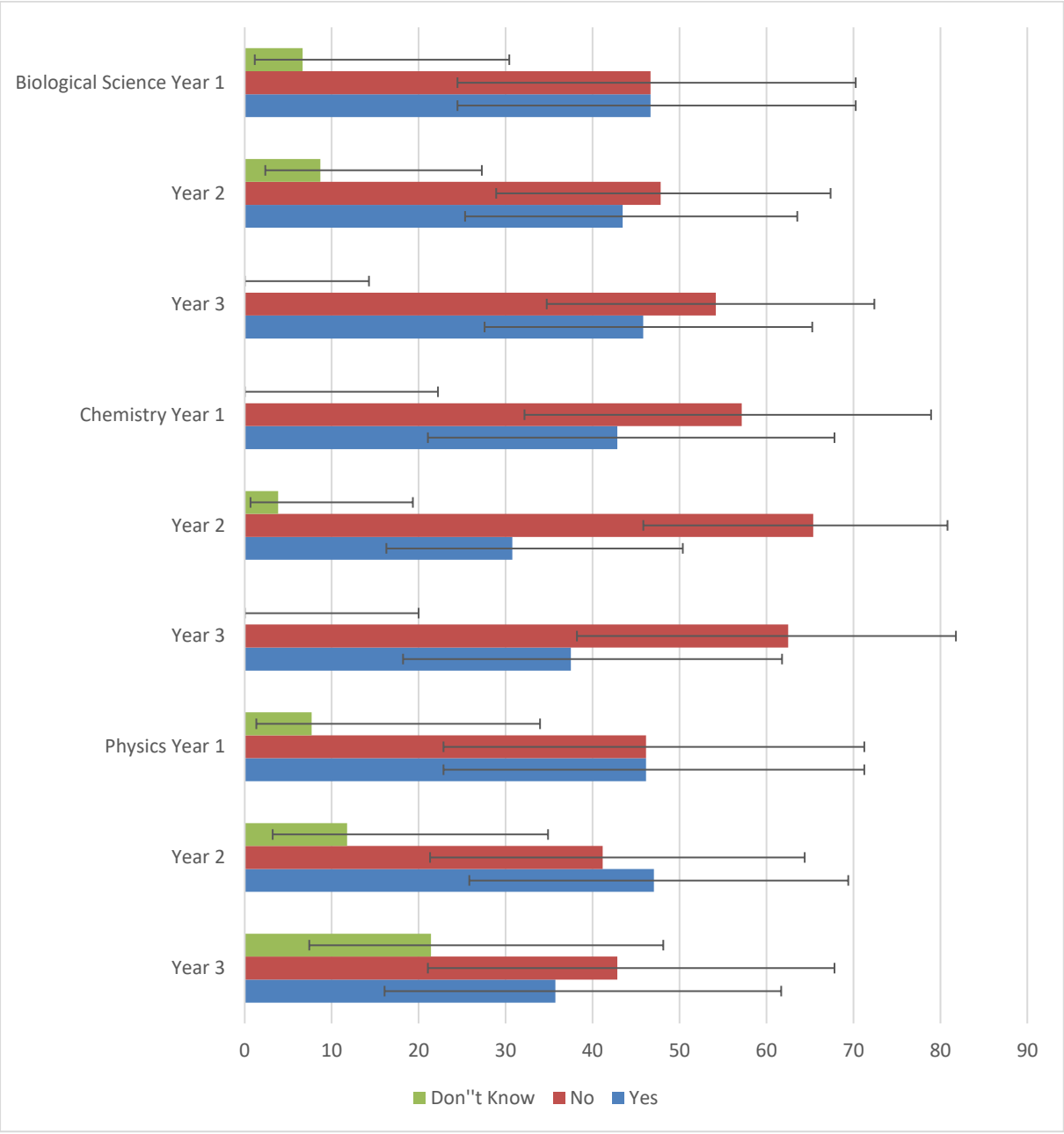


Table 68. HE staff's response as to whether their department currently takes into account an applicant's Expended Project Qualification (EPQ) or CREST Award/Nuffield Research Placement experience in their entry requirements. 95% confidence intervals are indicated on the graph. The statistical significance of any trends was investigated using binary logistic regression – none were found to be significant.

	Year 1		Year 2		Year 3		Rate of change (logits per year)
	n	%	n	%	n	%	
Biological sciences							
Yes	15	6.7	23	8.7	24	25.0	0.91
No		46.7		47.8		25.0	-0.51
Don't know		46.7		43.5		50.0	0.08
Chemistry							
Yes	14	7.1	26	23.1	16	31.3	0.75
No		50.0		38.5		37.5	-0.25
Don't know		42.9		38.5		31.3	-0.25
Physics							
Yes	13	7.7	16	0.0	14	7.1	-0.04
No		53.8		43.8		42.9	-0.22
Don't know		38.5		56.3		50.0	0.23

Changes to undergraduate ability and understanding

Table 69. (Biological sciences) Respondents' perception of changes to first year undergraduates' skills in the previous 5 years (year 1 of the study), and since the last academic year (years 2 and 3 of the study). Respondents were HE staff. 95% confidence intervals are indicated in brackets. The statistical significance of any trends was investigated using binary logistic regression – those found to be significant are highlighted in bold with the level of significance stated below the table.

	Year 1		Year 2		Year 3		Rate of change (logits per year)
	n	%	n	%	n	%	
Laboratory skills							
Improved	2	17(5,45)	3	15(5,37)	3	13(4,33)	-0.04
Stayed about the same	6	50(25,75)	14	70(48,86)	15	65(44,81)	0.43
Declined	4	33(14,61)	3	15(5,37)	5	22(10,42)	-0.13
Ability to plan experiments in the laboratory							
Improved	1	8(1,36)	3	16(5,38)	0	0(0,17)	-0.70
Stayed about the same	6	50(25,75)	14	74(51,88)	14	70(48,86)	0.33
Declined	5	42(19,68)	2	11(3,32)	6	30(14,52)	-0.14
Ability to work independently in the laboratory							
Improved	1	8(1,36)	2	10(3,31)	2	9(2,28)	0.10
Stayed about the same	7	58(32,81)	17	85(63,95)	14	64(43,81)	0.17
Declined	4	33(14,61)	1	5(1,24)	6	27(13,49)	0.07
Level of knowledge							
Improved	4	33(14,61)	4	20(8,42)	2	9(2,28)	-0.65
Stayed about the same	8	67(39,86)	15	75(53,89)	16	73(51,87)	0.33
Declined	0	0(0,25)	1	5(1,24)	4	18(7,39)	**1.74***
Level of understanding							
Improved	1	8(1,36)	2	11(3,32)	4	17(7,38)	0.57
Stayed about the same	8	67(39,86)	17	89(68,97)	14	61(40,78)	0.04
Declined	3	25(9,54)	0	0(0,17)	5	22(10,42)	0.20

***P<0.05**

Table 70. (Chemistry) Respondents' perception of changes to first year undergraduates' skills in the previous 5 years (year 1 of the study), and since the last academic year (years 2 and 3 of the study). Respondents were HE staff. 95% confidence intervals are indicated in brackets. The statistical significance of any trends was investigated using binary logistic regression – those found to be significant are highlighted in bold with the level of significance stated below the table.

	Year 1		Year 2		Year 3		Rate of change (logits per year)
	n	%	n	%	n	%	
Laboratory skills							
Improved	1	7(1,32)	4	17(7,36)	6	40(20,65)	**1.08***
Stayed about the same	2	14(4,41)	18	75(55,88)	8	53(30,76)	0.69
Declined	11	79(52,93)	2	8(2,26)	1	7(1,30)	**-2.78***
Ability to plan experiments in the laboratory							
Improved	1	8(1,34)	4	17(7,38)	2	13(4,38)	0.23
Stayed about the same	7	54(29,77)	14	61(40,78)	13	87(62,96)	0.70
Declined	5	38(17,65)	5	22(10,42)	0	0(0,21)	**-1.39***
Ability to work independently in the laboratory							
Improved	1	7(1,32)	3	14(5,34)	4	27(11,52)	0.78
Stayed about the same	6	43(21,68)	15	68(47,84)	10	67(41,85)	0.39
Declined	7	50(26,74)	4	18(7,39)	1	7(1,30)	**-1.46***
Level of knowledge							
Improved	2	14(4,41)	7	28(14,48)	4	29(12,55)	0.29
Stayed about the same	10	71(45,88)	15	60(40,77)	10	71(45,88)	-0.18
Declined	2	14(4,41)	3	12(4,30)	0	0(0,22)	-0.96
Level of understanding							
Improved	1	8(1,34)	3	12(4,30)	2	15(4,43)	0.28
Stayed about the same	7	54(29,77)	14	56(37,74)	10	77(49,92)	0.26
Declined	5	38(17,65)	8	32(17,52)	1	8(1,34)	-0.84

***P<0.05**

Table 71. (Physics) Respondents' perception of changes to first year undergraduates' skills in the previous 5 years (year 1 of the study), and since the last academic year (years 2 and 3 of the study). Respondents were HE staff. 95% confidence intervals are indicated in brackets. The statistical significance of any trends was investigated using binary logistic regression – those found to be significant are highlighted in bold with the level of significance stated below the table.

	Year 1		Year 2		Year 3		Rate of change (logits per year)
	n	%	n	%	n	%	
Laboratory skills							
Improved	0	0(0,27)	2	12(3,35)	0	0(0,24)	-0.04
Stayed about the same	5	45(21,72)	14	82(58,94)	12	92(66,99)	**1.27***
Declined	6	55(28,79)	1	6(1,28)	1	8(1,34)	**-1.58***
Ability to plan experiments in the laboratory							
Improved	1	9(2,38)	1	6(1,29)	1	10(2,41)	-0.04
Stayed about the same	8	73(43,90)	14	88(63,97)	8	80(48,94)	-0.12
Declined	2	18(5,48)	1	6(1,29)	1	10(2,41)	-0.50
Ability to work independently in the laboratory							
Improved	0	0(0,27)	3	18(6,42)	0	0(0,25)	-0.04
Stayed about the same	6	55(28,79)	14	82(58,94)	9	75(46,91)	0.39
Declined	5	45(21,72)	0	0(0,19)	3	25(9,54)	-0.56
Level of knowledge							
Improved	1	10(2,41)	1	6(1,29)	3	21(7,48)	0.74
Stayed about the same	7	70(39,89)	15	94(71,99)	8	57(32,79)	0.05
Declined	2	20(6,52)	0	0(0,20)	3	21(7,48)	0.33
Level of understanding							
Improved	1	11(2,44)	2	13(3,37)	0	0(0,24)	-0.65
Stayed about the same	3	33(12,65)	12	75(50,90)	9	69(42,88)	**0.86***
Declined	5	56(26,81)	2	13(3,37)	4	31(12,58)	-0.25

***P<0.05**

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