

e-Appendix 1: Timeline and items in questionnaire surveys re Entwistle *Short RASI* learning approaches, ‘satisfaction’, and the ‘ideal tutor’: Liverpool medical students:

Eight studies, four entry-cohorts, three academic years, three sets of individual follow-up

	Dataset label in Maudsley et al. (2010) re career intentions	Entrants	Entwistle learning approaches	Ideal tutor item-sets: 38-item in S5, S3, S6 24-item in K1 <i>Regression-based scores derived from principal components analysis (PCA)* for the two strongest components:</i> ▪Tell me what to learn ▪Help me with how to learn	Satisfaction: ▪1. I would still do Medicine... ▪2...in a problem-based curriculum ▪3...in this Liverpool problem-based curriculum
Academic year					
2001/02 (2 years before 4-year graduate-entry programme started)					
---S5: Mid-Y3	c)	1999	✓	✓	✓
~~S3: Start-of-Y1	d)	2001	✓	✓	
~~S6: End-of-Y1	e)	2001	✓	✓	✓
==S4: Interviewed applicants	f)	2002	✓		
2006/07					
==K2: Mid-Y5	g)	2002	✓		✓
##K1: Mid-Y1		2006		✓	✓
##K3: End-of-Y1		2006			[✓] Item 3. only
2010/11					
##K4: End-of-Y5		2006	✓		✓

Short Revised Approaches to Studying Inventory (RASI) from Approaches & Study Skills Inventory for Students (ASSIST)

Four entry-cohorts: --- ~~ == ##

Three sets of paired data

on: Learning approaches: ~~ ==

Satisfaction: ##

Analysis of examination performance:

End-of Y1, mid-Y3, end-of-Y4, **separately**, and **cumulative to end-of Y4**

End-of Y1 only

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End-of Y1, end-of-Y2, end-of-Y3, end-of-Y4, **not separately, but cumulative to end-of Y4**

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From 2003/04, the 4-year graduate-entry programme had started:

∴ K2 ‘mid-Year 5’ 2006/07 contained 5-year entry-cohort 2002/03 (including 2006/07 intercalators), plus 4-year entry-cohort 2003/04, plus returning intercalators from 2005/06

From 2006/07, the 5-year programme on the satellite campus had started:

∴ K1–to–K3 mid- and end-of-Year 1 2006/07 contained 5-year entry-cohort 2006/07 on main and satellite campus

∴ K4 ‘end-of-Year 5’ 2010/11 contained 5 year entry-cohort 2006/07 on main and satellite campus (including 2010/11 intercalators), plus 4-year entry-cohort 2007/08, plus returning intercalators from 2009/10

Three footnotes of clarification about the: core concept; response rates; ‘ideal tutor’* items:

Re: This study focused on Entwistle’s ‘learning approaches’, which are an evidence-based concept, not to be confused with ‘learning styles’ although they are sometimes mislabelled as such.

Sometimes ‘learning approaches’ are mislabelled as ‘learning styles’ in the literature, which complicates researching this topic. This study avoided the ‘entity model’ of fixed-traits (Scott 2010) called ‘learning styles’ (Curry 1999), which supposedly merit educators’ bespoke attention (Coffield et al. 2004a&b; Scott 2010).

The ‘learning styles’ evidence-base is unconvincing (Cook 2005; Pashler et al. 2008; Scott 2010) for such ‘aptitude-treatment interactions’ though, whereby adapting the ‘treatment’ (educators or curricula) to individual attributes, aptitudes, or traits (here ‘learning styles’) would improve outcomes (Scott 2010). They are invalid constructs for school education

(Hargreaves et al. 2005) or higher education and possibly promote damaging stereotypes (Scott 2010). Critics dismiss learning styles as fads (Scott 2010), “pseudoscientific”, “endless dichotomies...” (Coffield 2008, p33), “about as useful as a horoscope” (Norman 2009, p2), the “educational equivalent of snake oil” (Scott 2010, p8), and a “poster child of educational myths” (Norman 2018, p449).

Entwistle’s ‘learning approaches’ are “*intentions, learning processes, and associated motives*” (Entwistle et al. 2001, p110) that aligned with Biggs’ (1979) Study Process Questionnaire (SPQ) tendencies—*internalizing (deep)*, *utilizing (surface)*, and *achieving (strategic)*—changed subsequently to just deep and surface approaches (Biggs et al. 2001).

Re: Response rates were satisfactory overall without major differences between responders and non-responders.

In 2001/02, response was 71% (S3–start-of-Year 1 and S6–end-of-Year 1) to 91% (applicants) (Table 1, e-Appendix 5). From class-list or partial* data (from next or previous survey), non-responders showed few sex or age differences from responders. Responders were statistically significantly:

Start-of-Year 1:

- slightly older at entry: mean 20.3 (n=201) versus 19.4 years (n=37) ($p=0.014$ assuming unequal variances, as *Levene’s Test*: $F=7.83$, $p=0.006$; if equal: $t_{236}=1.51$, $p=0.133$).

End-of-Year 1:

- more likely to be female: 65.2% (129/198) versus 49.4% (40/81) ($p=0.014$, $\chi^2=5.985$).
- slightly older at entry: mean 20.3 (n=198) versus 19.4 (n=39*) years ($p=0.010$ assuming unequal variances, as *Levene’s Test*: $F=5.83$, $p=0.017$; if equal: $t_{235}=1.65$, $p=0.099$).

Non-significant results data are not shown. S5–mid-Year 3 had age data on only n=26 non-responders. Age data for S4–applicant non-responders were unavailable.*

In 2006/07, response rates were 41% (K1–mid-Year 1), 37% (K2–mid-Year 5), and 43% (K3–end-of-Year 1) (Table 1, e-Appendix 3). In 2010/11, it was 31% (K4–end-of-Year 5) (Table 1). Responders and non-responders had similar age-sex profiles in K2, K4 (Table 1), K1, K3, or the 2006-entry subset of K4 (*data not shown*), except:

K2–mid-Year 5 (2006/07): Responders were significantly:

- more likely to be female, i.e. 74.1% (86/116) versus 62.2% (125/201) ($p=0.030$, $\chi^2=4.718$).

K4–end-of-Year 5 (2010/11): Of 2006 entrants, responders were significantly:

slightly younger, i.e. mean 23.6 years versus 23.9 years (n=84 versus n=200; $t=-2.25$, $p=0.025$ assuming unequal variances, as *Levene’s Test*: $F=8.21$, $p=0.004$; if equal: $t_{282}=-1.73$, $p=0.085$).

Re: The two ‘ideal tutor’* items were derived from principal components analysis (varimax orthogonal rotation) in the four studies indicated above (Maudsley 2005, 2009).

Using a 38-item set (5-point Likert) about *“Ideally, my problem-based learning (PBL) tutor should...”*, the three 2001/02 studies (S5: n=158, S3: n=201, S6: n=198), each had a reasonably stable five-factor solution (45.0%, 42.0%, 37.0% residuals) and potentially explained 38.4%, 38.6%, 43.1% of variance, respectively. The two strongest items were (Maudsley 2005):

“Tell me what to learn”

For example: Items loading ≥ 0.4 included four that appeared in all three studies:

“Tell me exactly what syllabus I need to cover for each scenario, avoiding uncertainty”	0.6-0.7
“Take responsibility for complicated discussions by telling us the answers to difficult objectives”	0.6-0.7
“Give us the faculty learning objectives”	0.6-0.7
“Know the detailed content and answers of each objective we set”	0.4-0.6

“Help me with how to learn”

For example: Items loading ≥ 0.4 included six that appeared in all three studies:

“Help get us moving again if we are well and truly stuck and missing things right under our noses”	0.5-0.8
“Be a friendly character who puts the group at ease”	0.6-0.8
“Recognize and understand various students’ discomforts and difficulties during the session”	0.5-0.7
“Know how and when to interrupt the discussion without taking over”	0.6-0.7
“Guide us subtly back on the right track and depth if going off at a tangent or into too much detail”	0.5-0.7
“Ask questions that challenge us to think whether we really understand what we’re talking about”	0.5-0.6

In 2006/07, the fourth study (K1: n=142) edited this instrument to a 24-item set. A reasonably stable five-factor solution then potentially explained 50.5% of the variance. The two strongest items were (Maudsley 2009):

“Tell me what to learn” (15.6%)

For example: Items loading ≥ 0.40 had as the top four (of seven):

“Give me the syllabus I need to cover for each scenario”	0.7
“Take responsibility for complicated discussions by telling us the answers to difficult objectives”	0.7
“Give us the faculty learning objectives”	0.7
“Direct us strongly throughout our discussion, giving us answers and correcting our mistakes”	0.7

“Help me with how to learn” (10.1%)

For example: Items loading ≥ 0.40 comprised four:

“Be friendly, putting the group at ease”	0.8
“Guide us subtly back on the right track and depth if going off at a tangent or into too much detail”	0.8
“Make sure that the group takes time to evaluate how things are going at the end of each session”	0.5
“Get us to talk through and use what we already know about things, even simple stuff”	0.5

e-Appendix 2: Principal components analysis of Entwistle *Short RASI* learning approaches: Six 3-component models: Loadings ≥ 0.40 : Liverpool medical students & applicants

Six questionnaire surveys: 2001/02: Start/end-of-Year 1 (S3: n=201 & S6: n=198) & Mid-Year 3 (S5: n=159) plus medical school applicants on campus (S4: n=968)

2006/07: Mid-Year 5 (K2: n=115),

2010/11: End-of-Y5 (K4: n=121), including S4 individual follow-up

% variance explained after orthogonal rotation												2006/07			2010/11		
15.8	15.0	15.9	15.0	13.8	14.5	15.0	13.8	12.8	13.9	12.5	12.4	17.2	16.8	13.7	16.0	14.2	13.6
Loading: Component: C1				C2				C3				C1	C2	C3	C1	C2	C3
S3.Strategic	S6.Strategic	S5.Deep	S4.Strategic	S3.Surface	S6.Deep	S5.Strategic	S4.Surface	S3.Deep	S6.Surface	S5.Surface	S4.Deep	K2-Surface	K2.Strategic	K2.Deep	K4.Strategic	K4.Surface	K4.Deep
Q9	Q7	Q12	Q9	Q14	Q17	Q9	Q16	Q15	Q14	Q18	Q15	Q14	Q9	Q15	Q3	Q14	Q6
0.765	0.755	0.719	0.742	0.737	0.756	0.758	0.718	0.676	0.775	0.799	0.701	0.827	0.738	0.769	0.742	0.740	0.729
Q3	Q9	Q15	Q7	Q18	Q2	Q3	Q14	Q17	Q16	Q8	Q12	Q16	Q3	Q12	Q13	Q16	Q12
0.757	0.751	0.653	0.670	0.729	0.730	0.731	0.716	0.607	0.728	0.647	0.651	0.804	0.711	0.658	0.706	0.709	0.677
Q11	Q11 ...	Q17	Q3	Q16	Q15	Q11	Q18	Q10	Q18	Q16	Q17	Q18	Q11	Q2	Q9	Q18	Q15
0.717	0.703	0.630	0.665	0.700	0.582	0.715	0.693	0.591	0.640	0.617	0.584	0.752	0.631	0.620	0.650	0.602	0.664
Q7	Q3	Q2	Q11	Q1	Q12	Q7	Q8	Q6	Q1	Q1	Q2	Q8	Q13	Q6	Q5	Q4	Q17
0.694	0.653	0.630	0.607	0.593	0.559	0.668	0.586	0.584	0.606	0.564	0.562	0.482	0.614	0.523	0.581	0.559	0.592
Q13	Q13	Q10	Q13	Q8	Q10	Q13	Q1	Q2	Q8	Q4	Q6	Q11	Q7	Q10	Q10	Q8	Q10
0.566	0.571	0.560	0.556	0.433	0.554	0.431	0.536	0.542	0.581	0.390	0.520	-0.447	0.566	0.516	0.529	0.494	0.441
Q10	Q14	Q5	Q4	Q6	Q5	Q4	Q12	Q4	Q14	Q10	Q1	Q1	Q10	Q17	Q7	Q1	Q2
0.382	0.467	0.506	0.424	0.479	0.421	0.455	0.468	0.324	0.363	0.482	0.426	0.477	0.428	0.498	0.450	0.429	
Q6	Q10						Q4					Q7	Q17	Q4	Q11	Q7	Q4
0.446	0.333						-0.339					-0.419	0.417	-0.419	0.438	-0.385	-0.333
Q4												Q13	Q4		Q2	Q11	
-0.363												-0.405	-0.394		0.394	-0.319	
												Q5					
												0.388					
												Q8					
												-0.334					

Key: If item meant to be: Deep ☐ Strategic ☐ Surface ☐
 If loading: ...in bold: negative score on an item from another subscale
 denotes 0.40 cut-off in loadings (only loadings ≥ 0.32 shown)

Responders with blanks: 5/973 S4, 1/116 K2, & 3/124 K4

Footnote:

S3 & S6: are same entry-cohort

K2: contained 5-year entry-cohort 2002/03 (including intercalators of 2006/07) + 4-year entry-cohort 2003/04 + plus returning intercalators from 2005/06

K4: contained 5 year entry-cohort 2006/07 on main and satellite campus (including intercalators of 2010/11) + 4-year entry-cohort 2007/08 + returning intercalators from 2009/10

Short RASI: 'Short Revised Approaches to Studying Inventory' from within Approaches & Study Skills Inventory for Students (ASSIST) Entwistle (2000)

"Deep: ☐ D02 When I'm reading an article or book, I try to find out for myself exactly what the author means.
 D06 Regularly I find myself thinking about ideas from lectures when I'm doing other things.
 D10 When I'm working on a new topic, I try to see in my own mind how all the ideas fit together.
 D12 Often I find myself questioning things I hear in lectures or read in books.
 D15 Ideas in course books or articles often set me off on long chains of thought of my own.
 D17 When I read, I examine the details carefully to see how they fit in with what's being said.

Strategic: ☐ T03 I organise my study time carefully to make the best use of it.
 T05 I look carefully at tutors' comments on course work to see how to get higher marks next time.
 T07 I'm pretty good at getting down to work whenever I need to.
 T09 I put a lot of effort into studying because I'm determined to do well.
 T11 I don't find it at all difficult to motivate myself.
 T13 I manage to find conditions for studying which allow me to get on with my work easily.

Surface/Apathetic: ☐ S01 Often I find myself wondering whether the work I am doing here is really worthwhile.
 S04 I concentrate on learning just those bits of information I have to know to pass.
 S08 Much of what I'm studying makes little sense: it's like unrelated bits and pieces.
 S14 Often I feel I'm drowning in the sheer amount of material we're having to cope with.
 S16 I often worry about whether I'll ever be able to cope with the work properly.
 S18 I often have trouble in making sense of the things I have to remember"

'Good factorability' criteria were: moderate % of correlation coefficients ≥ 0.3 in correlation matrix; all Kaiser-Meyer-Olkins (KMOs) ≥ 0.5 on diagonal of anti-image matrix; KMO Measures of Sampling Adequacy; % of non-redundant residuals > 0.05 ; extraction communalities relatively low

A footnote of clarification about the Entwistle instrument and about its performance:

Re: The Entwistle Short RASI had the advantage of being brief.

The Entwistle instruments started with deep and strategic approaches, then Entwistle and Ramsden's (1983) *Approaches to Studying Inventory* (ASI) added strategic approach (Entwistle et al. 2001), arguably as a subdomain of the others (Biggs et al. 2001; Kember and Leung 1998). Variations on the inventory continued (Entwistle and McCune 2004). Entwistle's Short RASI (Revised ASI) within ASSIST (*Approaches and Study Skills Inventory for Students*) was particularly brief at just 18 items but has featured little in the literature.

Re: The Entwistle Short RASI instrument performed satisfactorily

With exceptions, Cronbach alpha of strategic and surface subscales each increased if deleting one item (e-Appendix 5):

Strategic–Q5–prioritizing comments on coursework: all surveys of medical students (who had no 'coursework' known as such anyway), except pre-entry 2001/02

Surface–Q4–concentrating on bits to pass: all surveys, except start-of-Year 1 (2001/02) and end-of-Year 5 (2010/11), who were ~9-12 months pre-first and post-last examinations, respectively

Deleting each of three other items would reduce consistency in one survey only, i.e.:

Surface–Q14–drowning in work: only for mid-Year 3 (2001/02), surveyed soon after examination-time)

Surface–Q1–wondering whether the work is worthwhile: only for end-of-Year 5 (2010/11), closest to independent clinical practice.

Deep–Q6–thinking about ideas from lectures when elsewhere: only for mid-Year 5 (2006/07), who had no core plenaries.

In principal components analysis (**above**), the 18-item model had good factorability (Kaiser-Meyer-Olkin (KMO) measures=0.7–0.8). With occasional exceptions, items loaded as expected in the best (3-component) solution, showing modest-satisfactory reliability. Item-order was mostly: strategic, surface, deep. Median loadings were: 15.8%, 13.9%, 13.7%, respectively. The model potentially explained 42.4–47.7% of student variance and 41.1% for applicants. Overall, 5/6 strategic approach items loaded as expected, but *Q5–prioritizing comments on coursework* only loaded there for applicants, mid-Year 3 (2001/02), and end-of-Year 5 (2010/11), and just below cut-off for mid-Year 5 (2006/07) (0.39). In all surveys, 6/6 deep approach items loaded satisfactorily. While 4/6 surface approach items loaded satisfactorily, *Q4–concentrating on bits to pass* loaded (0.32 and 0.39) just below cut-off at end-of-Year 1 and mid-Year 3 (2001/02) and weakly (0.22) in mid-Year 5 (2006/07). Furthermore, *Q14–drowning in work* loaded (0.36) below cut-off in mid-Year 3 (2001/02), loading stronger on deep approach (0.47).

e-Appendix 3: 'Satisfaction' with curriculum (If I had my time again, I would...) (six questionnaire surveys) and correlation with Entwistle Short RASI learning approaches and ideal tutor component: Liverpool medical students:

2001/02: mid-Year 3 (S5), end-of-Year 1 (S6)

2006/07: mid-Year 5 (K2); mid- and end-of-Year 1 (K1 and K3)

2010/11: end-of-Year 5 (K4), including subgroup who had also responded in Y1 (2006/07)

		If I had my time again, I would still do Medicine	I would still do Medicine in a problem-based curriculum	I would still do Medicine in this Liverpool problem-based curriculum
<u>Academic year</u>				
Year-group				
Overall response (%)	no. answering	[median, mean] no. Agree + no. Agree somewhat (%)		
<u>2001/02</u> Mid-Y3 (S5)	158	[5.0, 4.7] 138 +8 (92.4)*	[4.0, 3.9] 56 +63 (75.3)	[4.0, 3.8] 53 +61 (72.2)
End-of-Y1 (S6)	197	[5.0, 4.8] 172 +17 (95.9)*	[5.0, 4.3] 104 +62 (84.3)	[5.0, 4.1] 100 +58 (80.2)
<u>2006/07</u> Mid-Y5 (K2)	113, 114, 115	[5.0, 4.7] 92 +14 (93.8)*	[4.0, 3.8] 49 +28 (67.5)	[4.0, 3.7] 47 +27 (64.3) [†]
Mid-Y1 (K1)	142/347 (41%)	[5.0, 4.9] 133 +7 (98.6)	[5.0, 4.3] 81 +35 (81.7)	[5.0, 4.4] 86 +31 (82.4)
End-of-Y1 (K3)	150/345 (43%)	— — —	— — —	[5.0, 4.3] 84 +43 (84.7) [†]
<u>2010/11</u> End-of-Y5 (K4)	119, 118, 118	[5.0, 4.4] 76 +28 (87.4)*	[4.0, 3.5] 30 +34 (54.2)	[3.5, 3.3] 24 +35 (50.0)
Wilcoxon Signed Rank Test, pairs		mean Z p		
K1 vs K3	96	— — —	— — —	4.46 vs 4.31 -1.31 0.190
K3 vs K4	55	— — —	— — —	4.11 vs 3.36 -3.73 0.0002
K1 vs K4	50, 49, 50	4.94 vs 4.60, -2.55, 0.011	4.14 vs 3.49, -3.03, 0.002	4.24 vs 3.46, -3.67, 0.0002
<u>Learning approach vs satisfaction:</u> Four cohorts		Spearman correlation coefficient r _s		
Response (%)	no. mean, standard deviation			
<u>2001/02</u> Mid-Y3 (S5)	Deep 20.7, 4.25	n=158 +0.21** 0.009	+0.17 [‡] 0.028	+0.16 [‡] 0.042
159/204 (78%)	n=159 Strategic 22.0, 4.27	+0.34** <0.0001	+0.26** <0.001	+0.32** <0.0001
	Surface 15.7, 4.22	-0.19 [‡] 0.016	-0.23** 0.004	-0.30** <0.001
End-of-Y1 (S6)	Deep 21.6, 3.78	n=197 +0.06 0.378	+0.16 [‡] 0.027	+0.07 0.319
198/279 (71%)	n=198 Strategic 23.1, 3.64	+0.21** 0.003	+0.27** <0.001	+0.27** <0.001
	Surface 15.3, 4.19	-0.18 [‡] 0.012	-0.30** <0.0001	-0.34** <0.000001
<u>2006/07</u> Mid-Y5 (K2)	Deep 21.5, 3.92	n=113 +0.05 0.585	n=114 +0.08 0.410	n=115 +0.08 0.396
116/317†† (37%)	n=115 Strategic 24.3, 4.23	+0.44** <0.000001	+0.27** 0.004	+0.20 [‡] 0.030
	Surface 14.9, 4.98	-0.28** 0.003	-0.49** <0.000001	-0.48** <0.000001
<u>2010/11</u> End-of-Y5 (K4)	Deep 21.1, 3.99	n=119 +0.04 0.639	n=118 +0.09 0.349	n=118 -0.01 0.876
124/406††† (31%)	n=121 Strategic 23.4, 3.95	+0.24** 0.009	+0.25** 0.006	+0.32** <0.001
	Surface 15.3, 4.21	-0.25** 0.006	-0.25** 0.006	-0.38** <0.0001
'Satisfaction' vs Ideally, my PBL tutor should:		Spearman correlation coefficient r _s		
<u>2001/02</u> Mid-Y3 (S5)	†† Tell me what	n=157 -0.09 0.278	-0.29** 0.0003	-0.21** 0.007
End-of-Y1 (S6)	to learn	n=197 -0.06 0.375	-0.19** 0.009	-0.25** 0.0005
<u>2006/07</u> Mid-Y1 (K1)	***	n=139 -0.01 0.941	-0.26** 0.002	-0.20 [‡] 0.021

Short RASI=Short Revised Approaches to Studying Inventory from within Approaches and Study Skills Inventory for Students (ASSIST)

Short RASI & satisfaction: 5=Agree, 4=Agree somewhat, 3=Unsure, 2=Disagree somewhat, 1=Disagree

* χ^2_1 for trend=6.53, $p=0.011$ across unpaired data: 95.9% end-of-Y1 (2001/02), 92.4% mid-Y3 (2001/02), 93.8% mid-Y5 (2006/07), 87.4%, end-of-Y5 (2010/11) for % responders agreeing that they would still do Medicine

† Pearson $\chi^2_1=14.67$, $p=0.0001$, unpaired data: end-of-Y1 vs mid-Y5 (2006/07) for % responders agreeing that they would still do Medicine in this Liverpool problem-based curriculum

‡ ** ‡at $p=0.05$ level and **at least at $p=0.01$ level for statistically significant correlation coefficient

†† contained 5-year entry-cohort 2002/03 (including intercalators from 2006/07), plus 4-year entry-cohort 2003/04, plus intercalators from 2005/06

‡‡ From 5-component principal components analysis of 38 items on 5-point Likert scale: Ideally, my problem-based learning (PBL) tutor should.

In S3, S5, & S6, 'Tell me what to learn' loaded as component 1, 1, 2, respectively. Of items loading at ≥ 0.4 , the four common to each survey were: 'tell me exactly what syllabus I need to cover for each scenario, avoiding uncertainty'; 'take responsibility for complicated discussions by telling us the answers to difficult objectives'; 'give us the faculty learning objectives'; 'know the detailed content and answers of each objective we set'. S3 did not include 'satisfaction' items.

In K1, 'Tell me what to learn' loaded as component 1. From the reduced set of revised items ($n=24$), of those loading at ≥ 0.4 , the strongest three loadings similar to the S3, S5, S6 models were: 'give me the syllabus I need to cover for each scenario'; 'take responsibility for complicated discussions by telling us the answers to difficult objectives'; 'give us the faculty learning objectives'.

*** contained 5-year entry-cohort 2006/07 on main campus and satellite campus

††† contained 5 year entry-cohort 2006/07 on main campus and satellite campus (including intercalators from 2010/11), plus 4-year entry-cohort 2007/08, plus intercalators from 2009/10. Curtis et al.'s (2018) general practitioners (GPs) ($n=544$) vs GP registrars ($n=461$) vs mean Liverpool end-Y5, unpaired t-test: Deep: 20.9 vs 21.1 ($t=0.52$, $p=0.60$), 20.2 vs 21.1 ($t=2.34$, $p=0.02$); Strategic: 20.2 vs 23.4 ($t=7.51$, $p<0.0001$), 20.0 vs 23.4 ($t=7.72$, $p<0.001$); Surface: 13.9 vs 15.3 ($t=3.75$, $p=0.0002$), 15.2 vs 15.3 ($t=0.25$, $p=0.80$)

e-Appendix 4: Outline of three main domains of analysis of questionnaire surveys re Entwistle Short RASI learning approaches, ‘satisfaction’, the ‘ideal tutor’, and attainment: Liverpool medical students: Eight studies, four entry-cohorts, three academic years (2001/02, 2006/07, 2010/11), three sets of individual follow-up

a) Learning approaches: distribution, reliability, changes
• Median and mean learning approaches between cohorts; percentage-distribution of dominant approach (Pearson Chi-square) between cohorts; means between applicants admitted or not (unpaired t-test); means between those currently and previously intercalating an extra degree between Year 4–5 or not (analysis of variance); percentage of total points allocated across three subscales (continuous data) for each subscale for non-deferred or deferred entry (Mann-Whitney U).
• Learning approach item-reliability (Cronbach’s alpha).
• Learning approach item-loading on principal components analysis, using varimax orthogonal rotation and scree-plots.
b) Learning approaches and satisfaction
• Distribution of satisfaction across cohorts (% ‘agree+agree somewhat’: Chi-square for trend) and within cohorts (paired means over time: Wilcoxon Signed Rank Test).
• Spearman rank correlation coefficient between: ■learning approaches versus satisfaction ■learning approaches versus z-scores on ideal tutor should “<i>tell me what to learn</i>” or “<i>help me with how to learn</i>”.
c) Learning approaches and summative examination outcomes
• Three measures of attainment, according to data availability (footnote, e-Appendix 1):
– Cumulative examination outcomes by end-of-Year 4 (after last written examinations in 5-year programme), available to compile for <u>two entry-cohorts</u>: 1999 and 2006 (including those subsequently intercalating pre-Year 5).
– Cumulative points-score (‘medical school performance’) summarizing marks to-date by end-of-Year 4—introduced for the most recent entry-cohort.
<i>From 2010/11 (2006 entry-cohort, 5-year programme), UK medical schools derived a locally determined performance-ranking by end-of-Year 4 for national recruitment to graduates’ first (foundation) jobs as doctors. Liverpool scores used summative assessments Years 1-4, with Year 4 weighted 50% more than each of Years 1–3.</i>
– End-of-Year 1 examination outcomes in <u>a third entry-cohort</u>.
<i>Analysis was by: age, sex, White British (or Home versus overseas status), Townsend deprivation index linked to 1991 census (England and Wales residents’ permanent postcode at entry, 1999 and 2001 entry-cohorts only) (Hoare 2003), medical parent(s), learning approaches, ‘satisfaction’, ‘ideally... tutor should tell me what to learn’.</i>

e-Appendix 5: Entwistle *Short RASI* learning approaches (six questionnaire surveys): Liverpool medical students:

2001/02: mid-Year 3 (S5) and start→end-of-Year 1 (S3→S6) plus interviewed applicants (S4)

2006/07: mid-Year 5 (K2), including subgroup (n=74) who had also responded as applicants (2001/02: S4)

2010/11: end-of-Year 5 (K4) plus those intercalating an extra degree that year

Academic year Year-group Overall response ▶ RASI blank % male, White British; mean age	Approach (median score out of 30.0 on each subscale)	Cronbach's alpha (standardized item alpha)	Predominant approach for: no. %	Least evident approach for: no. %	As % of total points over all subscales overall %
2001/02	•Deep 21.0	0.722 (0.729)	61 38.4	17 10.7	35.4
Mid-Y3 (S5)	•Strategic 22.0	0.705* (0.720)	82 51.6 ^{†††}	21 13.2	37.7
159/204 (78%) response	•Surface 15.0	0.608 [†] (0.621)	16 10.1	121 76.1	26.9
40.9%, 73.6%; 20.2 at entry	Total	159	100.1	159 100.0	100.0
Start-of-Y1 (S3)	•De 22.0	0.633 (0.644)	82 40.8	19 9.5	36.8
201/283 (71%)	•St 23.0	0.720* (0.725)	105 52.2 ^{†††}	19 9.5	37.9
37.3%, 72.6%; 20.3 at entry	•Su 15.0	0.706 (0.705)	14 7.0	163 81.1	25.2
Followed n=160 paired	Total	201	100.0	201 100.1	99.9
End-of-Y1 (S6)	•De 22.0	0.716 (0.723)	80 40.4	19 9.6	36.1
198/279 (71%)	•St 23.0	0.671* (0.685)	105 53.0	13 6.6	38.5
34.8%, 73.7%; 20.3 at entry	•Su 15.0	0.684 [†] (0.687)	13 6.6	166 83.8	25.5
	Total	198	100.0	198 100.0	100.1
Pre-entry (S4)	•De 24.0	0.648 (0.655)	299 30.9	24 2.5	37.9
973/1,064 (91%) ▶ 5 blank	•St 27.0	0.723 (0.731)	659 68.1 ^{†††}	18 1.9	41.2
37.3%, 74.7%; 19.8 at possible 2002 entry	•Su 13.0	0.673 [†] (0.682)	10 1.0	926 95.7	20.9
	Total	968	100.0	968 100.1	100.0
At pre-entry, this is the n=74 subgroup then followed to Y5	•De 23.5	0.650** (0.636)	13 17.6	1 1.4	37.3
	•St 27.0	0.694* (0.709)	61 82.4	0 0	42.4
	•Su 12.0	0.615 [†] (0.623)	0 0	73 98.6	20.4
	Total	74	100.0	74 100.0	100.1
2006/07	•De 22.0	0.667 ^{††} (0.678)	30 26.1	12 10.4	35.4
Mid-Y5 (K2) [§]	•St 25.0	0.744* (0.747)	77 67.0	13 11.3	40.1
116/317 (37%) ▶ 1 blank	•Su 14.0	0.731 [†] (0.731)	8 7.0	90 78.3	24.5
25.9%, 75.9%; 24.4 at survey	Total	115	100.1	115 100.0	100.0
At mid-Y5, this is the n=74 subgroup followed from pre-entry	•De 21.0	0.699 ^{††} (0.698)	19 25.7	11 14.9	34.9
	•St 24.5	0.683* (0.684)	48 64.9	8 10.8	40.0
	•Su 14.0	0.716 [†] (0.720)	7 9.5	55 74.3	25.1
	Total	74	100.1	74 100.0	100.0
2010/11 +intercal. 2010/11	•De 21.0	0.689 (0.692)	29 24.0	19 15.7	35.2
End-of-Y5 (K4) ^{§§}	•St 24.0	0.720* (0.725)	81 66.9 ^{†††}	9 7.4	39.1
124/406 (31%) ▶ 3 blank	•Su 15.0	0.675*** (0.680)	11 9.1	93 76.9	25.6
32.3%, 75.4% (92/122); 24.3 end-of-Y5	Total	121	100.0	121 100.0	99.9

Supplementary analyses of S4 and K4

Mean score: S4 responders n=968

Admitted vs not t₉₆₆, p

•De 24.1 24.1 0.28, 0.783

•St 26.4 26.2 0.89, 0.373

•Su 13.0 13.4 -1.08, 0.283

n=238 n=730

Admitted. n=238

% of total score across subscales:

n=220 n=18 Mann-Whitney U

2002/03 03/04 U p

•De 37.9 38.5 1,780.0 0.476

•St 41.7 39.3 1,443.5^{†††} 0.056

•Su 20.4 22.1 1687.5 0.298

100.0 99.9

Mean score (sd): K4 responders, n=121

Intercalated vs Not

2009/10 2010/11

•De 21.2 (4.1) 23.5 (4.1) 20.6 (3.9)

•St 23.8 (2.8) 22.9 (4.9) 23.4 (4.0)

•Su 15.6 (3.6) 14.8 (4.6) 15.4 (4.3)

ANOVA De p=0.04, St p=0.84, Su p=0.85

Revised Approaches to Studying Inventory (RASI) from Approaches & Study Skills Inventory for Students (ASSIST)

This e-Appendix 5) is an expanded version of Table 2).

Four entry-cohorts ----- All totals do not add to 100.0% due to rounding. Intercal.=Intercalated/extra degree year between Y4 & Y5

ANOVA=analysis of variance

Cronbach's alpha [including subgroup of n=74]:

* ↑ to 0.724 & ↑ to 0.767 & ↑ to 0.744 [& ↑ to 0.715] & ↑ to 0.768 [& ↑ to 0.717] & ↑ to 0.723, if delete Q5–re–prioritizing comments on coursework–Strategic

† ↑ to 0.620 & ↑ to 0.706 & ↑ to 0.679 [& ↑ to 0.660] & ↑ to 0.748 [& ↑ to 0.749], if delete Q4–re–concentrating on bits to pass–Surface

‡ ↑ to 0.613 if delete Q14–re–drowning in work–Surface

[** ↑ to 0.663 if delete Q10–re–in a new topic, trying to fit ideas together]–Deep

†† ↑ to 0.683 if delete Q6–re–thinking about ideas from lectures when elsewhere–Deep

[†† ↑ to 0.707 if delete Q17–re–when reading, examining details to see how they fit]–Deep

*** ↑ to 0.686 if delete Q1–re–wondering whether the work is worthwhile–Surface

Comparisons:

††† $\chi^2(3)=30.16$, $p<0.0001$ across: 68.1% pre-entry (2001/02), 52.2% start-of-Y1 (2001/02), 51.6% mid-Y3 (2001/02), and 66.9% end-of-Y5 (2010/11) for % responders with strategic scoring highest; $\chi^2(3)=55.8$, $p<0.0001$ for surface; $\chi^2(3)=14.0$, $p=0.003$ for deep

††† for difference in mean strategic score 26.5 vs 25.2, $p=0.154$ assuming unequal variances (as Levene's Test: $F=4.63$, $p=0.033$); if equal: $t(236)=1.77$, $p=0.079$

§ 5-year entry-cohort 2002/03 (including intercal. of 2006/07), + 4-year entry-cohort 2003/04, + returning intercal. of 2005/06

§§ 5 year entry-cohort 2006/07 (main + satellite campuses; including intercal. of 2010/11), + 4-year entry-cohort 2007/08, + returning intercal. of 2009/10

A footnote of clarification about predominant learning approach:

Re: The % for whom each of the three subscale scores was highest was an alternative to median or mean score.

Above, cross-sectionally:

- *Strategic approach*: predominated in about one-half to two-thirds of responders, being highest (68.1%) at pre-entry (64.9% at mid-Year 5 follow-up) and end-of-Year 5 (66.9%) and lowest (51.6%) in mid-Year 3, $p < 0.0001$.
- *Surface approach*: predominated for only 1.0% at pre-entry versus 7.0%, 10.1%, and 9.1%, respectively, $p < 0.0001$.
- *Deep approach*: predominated most for start-of-Year 1 (40.8%) and mid-Year 3 (38.4%) versus pre-entry (30.9%) and end-of-Year 5 (24.0%), $p = 0.003$.

Of total points allocated across three subscales, surface approach received fewest (2001/02: pre-entry=20.9% to mid-Year 3=26.9%).

**e-Appendix 6: Entwistle *Short RAS* learning approaches longitudinally and learning approaches vs assessment outcomes in bivariable analysis:
Summary-table for Liverpool medical students:**

Six studies, four entry-cohorts, three academic years, two longitudinal sets of individual follow-up:

Survey label: Timing of learning approaches measurement	Year of entry	Learning approaches for Pass vs Pass with resit (or cumulative points-score for all assessments) if progressed in-cohort and Learning approaches: Longitudinally over time
2001/02 (2 years before 4-year graduate-entry programme started) --- <u>S5</u> : Mid-Y3	1999	Difference in mid-Y3 means <u>Y1 Pass vs Pass with resit</u> : De↑ ns Str↑ ns <i>Su</i> ↓ -1.6, <i>p</i> =0.053 <u>Y1-Y4 Pass*† vs Pass with resit (if remained in-cohort throughout)</u> : De↑ +1.5, <i>p</i> =0.038 Str↑ ns Su↓ ns
~~ <u>S3</u> : Start-of-Y1	2001	Longitudinal: Start-of Y1 to End-Y1: Mean difference: St mean↑ +0.8, <i>p</i> =0.008 De unchanged Su unchanged Difference in Start-of-Y1 means <u>Y1 Pass*† vs Pass with resit</u> : St↑ +1.3, <i>p</i> =0.072 Su↓ -2.4, <i>p</i> =0.002 De↑ negligible ns
~~ <u>S6</u> : End-of-Y1 == <u>S4</u> : Pre-entry	2001 2002	Longitudinal: Pre-entry to Mid-Y5: Mean difference: De↓ -2.6, <i>p</i> <10 ⁻⁶ St↓ -2.7, <i>p</i> <10 ⁻⁷ Su↑ +2.2, <i>p</i> <0.001
2006/07 == <u>K2</u> : Mid-Y5	2002	
2010/11 ## <u>K4</u> : End-of-Y5	2006	Difference in End-of-Y5 means <u>Y1-Y4 Pass*† vs Pass with resit (if remained in-cohort throughout)</u> : No clear pattern <u>Y1-Y4 Top ¾ Cumulative points-score*†‡ vs not</u> : No clear pattern, but <i>De</i> ↑ +2.3, <i>p</i> =0.058

Short Revised Approaches to Studying Inventory (RASi) from Approaches & Study Skills Inventory for Students (ASSIST)

Four entry-cohorts: --- ~~ == ## Paired data on: Learning approaches: ~~ == ns=non-significant at *p*<0.05

From 2003/04: plus 4-year graduate-entry programme

∴ K2 'mid-Year 5' 2006/07 contained 5-year entry-cohort 2002/03 (including 2006/07 intercalators), plus 4-year entry-cohort 2003/04, plus returning intercalators from 2005/06

From 2006/07: plus 5-year programme on satellite campus

∴ K1-to-K3 mid- and end-of-Year 1 2006/07 contained 5-year entry-cohort 2006/07 on main and satellite campus

∴ K4 'end-of-Year 5' 2010/11 contained 5 year entry-cohort 2006/07 on main and satellite campus (including 2010/11 intercalators), plus 4-year entry-cohort 2007/08, plus returning intercalators from 2009/10

* Mean 'I would still do Medicine in this Liverpool problem-based curriculum' at:

Mid-Year 3, 1999 entry-cohort, for Pass vs Pass with Resit(s) end-of-Year 4 cumulative: 3.83 vs 3.87 (*n*=88, *n*=53) (*t*(139)=-0.18, *p*=0.855)

End-of-Year 1, 2001 entry-cohort, for Pass vs Pass with Resit(s) end-of-Year 1: 4.25 vs 3.92 (*n*=152, *n*=36) (*t*(186)=1.69, *p*=0.093)

End-of-Year 5, 2006 entry-cohort, for Pass vs Pass with Resit(s) end-of-Year 4 cumulative: 3.61 vs 3.33 (*n*=33, *n*=46) (*t*(77)=0.93, *p*=0.355)

End-of-Year 5, 2006 entry-cohort, for Upper ¾ vs Lower ¼ on end-of-Year 4 'cumulative points-score': 3.46 vs 3.33 (*n*=67, *n*=12) (*t*(77)=0.31, *p*=0.756)

† In lower two-fifths of 'affluence of England and Wales resident postcodes at entry' of:

1999 entry-cohort, for Pass vs Pass with Resit(s) end-of-Year 4 cumulative: 29/81 (35.8%) vs 18/45 (40.0%) ($\chi^2(1)=0.22$; *p*=0.641)

2001 entry-cohort, for Pass vs Pass with Resit(s) end-of-Year 1: 61/152 (40.1%) vs 10/31 (32.3%) ($\chi^2(1)=0.67$; *p*=0.412)

2006 entry-cohort: not analysed

‡ Y1-Y4 Cumulative points-score: No clear pattern in Spearman rank correlation coefficients with learning approaches

A footnote of clarification about the general pattern of learning approaches:

Re: Students with higher attainment tended towards more deep or strategic learning and less surface learning, possibly expected tutors to help rather than tell, and for sustained examination success were more likely (on bivariable analysis) to be female, White British, of non-medical parents.

In the 1999 entrants, at each level of assessment, the general pattern was higher mean deep and strategic approaches and lower surface approach (mid-Year 3 scores) if passing first time versus resitting [*data not shown*] but was non-significant. That general pattern also held for *percentage for whom each learning approach was most/least evident and points percentage across scales*.

In the 2001 entrants, direction of start-of-Year 1 and end-of-Year 1 mean ideal tutor (regression-based) score recurred for passing without resits, respectively:

- ‘ideally... tutor should tell...’: -0.08 versus 0.28 ($t_{(51.7)}=-1.69$, $p=0.097$), assuming unequal variances, as Levene’s Test: $F=11.69$, $p=0.001$) and -0.04 versus 0.06 ($t_{(187)}=-0.54$, $p=0.592$).
- ‘ideally... tutor should help...’: 0.009 versus -0.07 ($n=147$, $n=41$) ($t_{(186)}=0.46$, $p=0.645$) and 0.02 versus -0.15 ($n=153$, $n=36$) ($t_{(187)}=0.92$, $p=0.358$).

In the 2006 entrants staying in-cohort:

‘Cumulative points-score’ (out of 6.75) was significantly higher if:

- female: 4.84 ($n=170$) versus 4.64 ($n=105$) ($t_{(273)}=2.08$, $p=0.039$: 95% CI on 0.20 difference: 0.01, 0.39)
- White British: 4.95 ($n=126$) versus 4.46 ($n=63$) ($t_{(187)}=4.27$, $p=0.00003$: 95% CI on 0.49 difference: 0.26, 0.71)
- Home status: 4.80 ($n=261$) versus 4.19 ($n=14$) ($t_{(273)}=2.87$, $p=0.004$: 95% CI on 0.60 difference: 0.19, 1.02)
- of non-medical parent(s): 4.89 ($n=153$) versus 4.22 ($n=26$) ($t_{(177)}=4.27$, $p=0.00003$: 95% CI on 0.68 difference: 0.36, 0.99)

Students with an upper three-quarters ‘cumulative points-score’ were significantly more likely to be:

- White British: 105/148 (70.9%) versus 21/41 (51.2%) ($\chi^2_{(1)}=5.62$; $p=0.018$)
- lower-scoring on ‘ideally... tutor should tell...’ (mid-Year 1): -0.11 ($n=97$) versus 0.38 ($n=23$) ($t_{(118)}=-2.10$, $p=0.038$)
- of non-medical parent(s): 128/140 (91.4%) versus 25/39 (64.1%) ($\chi^2_{(1)}=18.35$; $p=0.00002$)

but did not differ significantly by:

- age, sex, Home versus ‘international’ ($\chi^2_{(1)}=3.32$; $p=0.068$), ‘ideally... tutor should help...’ (mid-Year 1) [*data not shown*], end-of-Year 5 Liverpool problem-based curriculum ‘satisfaction’ (footnote, **above**)

e-Appendix 7a)-d): Assessment-outcomes for three (1999-, 2001-, 2006 entry-) cohorts of Liverpool medical students progressing in-cohort (5-year programme):

Questionnaire survey responders with complete data on independent variables, including Entwistle *Short RASI* learning approaches

a)-c) Multiple logistic regression on passing without resitting examinations

d) Multiple linear regression on 'cumulative points-score' on assessments overall (examinations and assignments)

Multiple logistic regression						95% confidence interval	
Dependent variable=passing* without (vs with) resitting component(s)		B	p-value	Exp(B)			
Independent variables							•Omnibus Test of Model Coefficient •Hosmer & Lemeshow (H&L) Test: for fit •Cox & Snell and Nagelkerke R^2: predict outcome variance •Variance inflation factor (VIF) <3.00 to avoid multicollinearity •no. (%) predicted overall: pass with or without resit(s)
a)2001 entry-cohort: End-of-Y1 examinations							n=188: 147 passed all first time, 41 with resit(s)
Start-of-Y1 scores:	Deep approach	-0.016	0.763	0.984	0.884	1.095	<i>Indicative maximum variables to avoid overfit ~41/10</i>
	Surface approach	-0.114	0.008	0.892	0.820	0.970	
	Home (vs overseas)	1.208	0.042	3.347	1.045	10.722	
	Male (vs female)	-0.132	0.732	0.877	0.412	1.865	
	Constant	2.382	0.155	10.823			
*Y1—Papers 1, 2; communication skills objective structured clinical examination (OSCE); clinical skills OSCE							•Model p=0.009 •H&L p=0.276 •Possibly explains 6.9% to 10.6% •VIF 1.01 to 1.10 •149/188 (79.3%) correctly predicted
b)1999 entry-cohort: By end-of-Y4: Cumulative examinations: end-of-Y1, mid-Y3, end-of-Y4							n=141: 88 passed all first time, 53 with resit(s)
Mid-Y3 scores:	Deep approach	0.096	0.033	1.101	1.008	1.203	<i>Indicative maximum variables to avoid overfit ~53/10</i>
	Surface approach	-0.047	0.317	0.954	0.869	1.047	
	‘Ideal tutor should tell me what to learn’	-0.151	0.444	0.860	0.584	1.266	
	Home (vs overseas)	1.030	0.164	2.801	0.657	11.933	
	Male (vs female)	-0.507	0.186	0.603	0.284	1.278	
	Constant	-1.482	0.280	0.227			•Model $p=0.081$ •H&L p=0.686 •Possibly explains 6.7% to 9.1% •VIF 1.01 to 1.26 •89/141 (63.1%) correctly predicted
*Y1—Papers 1, 2; communication skills OSCE; clinical skills OSCE; Y3—Papers 1, 2, 3; clinical skills OSCE; Y4—Papers 1, 2, 3; clinical skills OSCE; clinical skills long-case examination							
c)2006 entry-cohort: By end-of-Y4: Cumulative examinations: end-of-Y1, end-of-Y2, end-of-Y3, end-of-Y4, K1—to–K3—to–K4 data							n=77: 33 passed all first time, 44 with resit(s)
End-of-Y5 score:	Deep approach	0.049	0.481	1.050	0.917	1.201	<i>Indicative maximum variables to avoid overfit ~33/10</i>
	White British (vs not)	1.154	0.058	3.171	0.961	10.461	
	Medical parent(s) (vs not)	-0.924	0.305	0.397	0.068	2.324	
	Male (vs female)	-1.022	0.067	0.360	0.120	1.075	
	Satellite (vs main) campus	-2.044	0.079	0.129	0.013	1.271	
	Constant	-1.636	0.268	0.195			•Model $p=0.051$ •H&L p=0.657 •Possibly explains 13.3% to 17.9% •VIF 1.01 to 1.08 •52/77 (67.5%) correctly predicted
*Y1—Papers 1, 2; communication skills OSCE; clinical skills OSCE; Y2—Papers 1, 2, 3; clinical skills OSCE; Y3—Papers 1, 2, 3; clinical skills OSCE; Y4—Papers 1, 2, 3; clinical skills OSCE; Liverpool Objective Structured Clinical Assessment System (LOCAS) examination							
Multiple linear regression						95% confidence interval for B	
Dependent variable=points-score (theoretically 0-6.75)		B	p-value	Standardized beta			
Independent variables							•Analysis of variance (ANOVA) •R, R^2 •Adjusted R^2 •Standard error (se) of estimate •VIF <3.00 to avoid multicollinearity
d)2006 entry-cohort: By end-of-Y4: ‘Cumulative points-score’ re all Y1-Y4 assessments, K1—to–K3—to–K4 data							n=77: 33 passed all first time, 44 with resit(s)
	Constant	3.417	0.000		1.654	5.180	<i>Indicative maximum variables to avoid overfit ~77/10</i>
End-of-Y5 score:	Deep approach	0.045	0.039	0.239	0.002	0.088	
	Strategic approach	-0.020	0.378	-0.112	-0.064	0.025	
	Surface approach	0.016	0.442	0.094	-0.025	0.056	
	Home (vs overseas)	1.053	0.010	0.284	0.265	1.842	
	Medical parent(s) (vs not)	-0.537	0.035	-0.228	-1.036	-0.038	
	Male (vs female)	-0.263	0.170	-0.171	-0.640	0.115	
	Satellite (vs main) campus	-0.685	0.019	-0.256	-1.256	-0.114	
							•Model p=0.004, $F_{(7, 69)}=3.400$ •$R=0.506$, $R^2=0.256$ •Possibly explains ~18.1% •se=0.654 •VIF 1.01 to 1.23 - Categorical independent variables: 0=reference, 1=indicator

Key: c) & d): comprised 5-year entry-cohort 2006/07 on main campus and satellite campus (including intercalators of 2010/11)

Learning approaches: Short RASI='Short Revised Approaches to Studying Inventory' from Approaches & Study Skills Inventory for Students (ASSIST)

$p < 0.050$, $0.050 \leq p < 0.100$