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The impact of attaining the Welsh Baccalaureate Advanced Diploma on academic performance in bioscience higher education

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ABSTRACT

Since the introduction of the Welsh Baccalaureate Advanced Diploma Qualification (WBQ) in 2003, an increasing number of students are applying to higher education institutions (HEIs) with this qualification. The advanced-level WBQ is regarded as equivalent to one General Certificate of Education A-Level (GCE A-Level). This study assesses the impact of attaining the WBQ in addition to three GCE A-Levels on overall university degree performance in comparison to attaining four GCE A-Levels, in three cohorts of undergraduate students (Year 1 = 318, Year 2 = 280, Year 3 = 236) studying Biosciences from 2005 to 2011 at a UK HEI. Binary logistic regression was used to compare the academic attainment of students who had achieved four GCE A-Levels to those who had achieved three GCE A-Levels in addition to the WBQ. Comparisons were also made between students who had achieved three GCE A-Levels and those who had achieved three GCE A-Levels in addition to the WBQ. The results suggest that students who achieved the WBQ qualification in its current form, in addition to three GCE A-Levels, performed less well academically in undergraduate studies than those who achieved four GCE A-Levels. Furthermore, this effect was still present when the balance between coursework and examination was considered, and when students who had achieved the WBQ in addition to three GCE A-Levels were compared to students who had achieved three GCE A-Levels.

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Introduction

The General Certificate of Education A-Level (GCE A-Level) has been regarded as the predominant entry-level qualification for higher education (HE) since it was introduced in 1951, and several studies have shown a significant positive correlation between the GCE A-Level grades obtained by students and their overall university degree performance (Barnett & Lewis, 1963; Chapman, 1996; Hoskins, Newstead, & Dennis, 1997; Sear, 1983). More recently, an array of GCE A-Level equivalent qualifications, including the

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Welsh Baccalaureate Qualification (WBQ), were introduced and offered to post-16 students as alternatives to the traditional GCE A-Level qualification. These equivalent qualifications are accepted for entry by the majority of higher education institutions (HEIs) in the UK. Recent research (Taylor, Rees, & Davies, 2013) has demonstrated that holding the WBQ was associated with significantly higher rates of university participation. In addition, holding the WBQ had a positive impact on the academic attainment of students studying at less-selective universities (requiring comparatively lower A-Level grades for entry) and on the academic attainment of students with lower levels of prior attainment. However, at more selective universities (requiring comparatively higher A-Level grades for entry) holding the WBQ negatively impacted upon the academic attainment of students.

Whether achieving the WBQ has any impact on learner attainment in HE when compared to achieving another additional equivalent qualification, in this case a fourth GCE A-Level, remains unclear. In essence, is there value in the addition of a broader baccalaureate qualification over an additional subject specialism? The answer to this question is important to the formation of education policy as well as the teaching and learning undertaken in secondary, tertiary and HE.

The Welsh Baccalaureate Advanced Diploma Qualification

In 2001 the Welsh Assembly Government (WAG) provided funding to pilot the WBQ, in collaboration with the Welsh Joint Education Committee (WJEC) at three levels: foundation, intermediate and advanced. The advanced level is considered to be a GCE A-Level equivalent qualification; therefore, it is only the advanced level of the WBQ that will be considered in this study.

The WBQ was introduced with the aim of widening participation, promoting access and encouraging completion at all levels of education and training in order to increase student achievement. WJEC and WAG documentation (WJEC & WAG, 2009) contains specific information on how the WBQ will prepare young people for entry into HE. It states that WBQ learners will 'acquire knowledge, understanding and skills specific to the subject area that they want to pursue at university'.

The WBQ pilot scheme was initially set up in 18 schools and colleges in September 2003, an additional 6 schools and colleges offered the WBQ to students in September 2004 and, by September 2005 a total of 31 schools and colleges were piloting the WBQ and offering the qualification to their students. After the successful introduction of the qualification during the pilot scheme and broad support for the qualification in schools and colleges (Greatbatch, Wilmut, & Bellin, 2006), the qualification was rolled out further in 2007. However, the external evaluation also identified the need for a longitudinal study of WBQ learner performance (Greatbatch et al., 2006). In September 2011, the qualification was estimated to be offered by over 240 centres, including both schools and colleges. From September 2013, over 70,000 learners are expected to take the WBQ.

To obtain the WBQ, learners must complete both core and optional components. The core component comprises five elements, including:

(1) Essential Skills Wales and Key Skills
(2) Wales, Europe and the World
(3) Work-related Education

(4) Personal and Social Education
(5) Individual Investigation

The core components are assessed by a portfolio of evidence for either an Individual Investigation or an Extended Project, alongside the giving of presentations and undertaking community placements. The optional components of the WBQ can include both academic qualifications (such as AS-Levels and A-Levels) as well as vocational qualifications, including Business and Technology Education Council (BTEC) and National Vocational Qualifications. In order to complete the optional component, candidates must achieve qualifications at Level 3 equivalent to two GCE A-Levels. A maximum of three Level-3 qualifications can be chosen by candidates to comprise the optional component. For example a candidate undertaking four GCE AS-Levels would not be able to complete the optional component, whereas a candidate undertaking two GCE AS-Levels and one GCE A-Level would be able to complete the optional component. Only if a candidate passes both the core and optional components are they awarded a pass in the WBQ, which equates to 120 universities and colleges admissions service (UCAS) points.

Until 2014, WBQ awards are not graded; candidates either pass or fail the qualification based on the total points obtained from both core and optional components. An expert group conducted a UCAS Tariff review of the WBQ in 2009 (*Expert group report for review of award in the UCAS tariff WJEC Welsh Baccalaureate Advanced Diploma Qualification*). Although some members of the group suggested the value of the award should be increased to 140 UCAS points (equivalent to an A* at GCE A-Level), the original decision was re-affirmed to award the completion of the WBQ Advanced Diploma 120 UCAS points, the equivalent of an A grade at GCE A-Level.

A review of the WBQ qualification published in 2012 (Review of Qualifications for 14-to 19-year-olds in Wales) highlighted many strengths, including employability skills, the broad nature of the qualification and the accommodation of academic and vocational pathways within the WBQ. However, a number of concerns were raised, including the lack of recognition of different levels of achievement within the WBQ. Therefore, the review suggested 'to maintain the currency of the WBQ for entry into HE … the qualification should be graded at the advanced level.'

Therefore, candidates receiving the award from the summer of 2015 will be awarded a graded version of the WBQ. Advice from UCAS on the future grading of the WBQ currently indicates that the award will be 'graded from A*-C, where a C grade will continue to attract the equivalent of 120 UCAS points and where grades A*-B will require a better performance than that currently required to pass the qualification'. As the grading of the WBQ comes into effect, studies such as ours will become increasingly important in determining the impact of changes to the WBQ on learner progression into and achievement in HE. Moreover, such studies will inform further future development of the WBQ and other Baccalaureate-style qualifications as well as their standing among HEIs.

Data

Students entering the School of Biosciences at a UK HEI from 2005 were assessed over seven consecutive years. The data were obtained via the university's Student Information Management System. The data included descriptive factors such as age, gender and

ethnicity as well as numerical data such as individual module percentage marks and the average percentage marks obtained in each year of undergraduate study. For the purposes of this study, students with zero or blank marks, students who had withdrawn during their studies and students who were enrolled on a joint course with another academic school were excluded from the analysis. The overall sample size decreased in subsequent years due to students that had not yet entered the following year of study.

For the purposes of this study, the dependent (binary) variable analysed was whether a student obtained above the overall median mark for all students within the data set. Calculations were performed independently using either the average percentage year mark of students for years one, two or three of undergraduate study or the average percentage mark of students for each undergraduate module. The dependent (binary) variables used for the analysis included:

- *Academic Attainment in Years 1, 2 and 3*: a median score was calculated using the average mark obtained for each student in either the first, second or third year of undergraduate study, each student was then coded as to whether they achieved above or below the median score.
- *Attainment in a module assessed through coursework in Years 1, 2 and 3*: a median score was calculated using the average mark obtained for each student in either a first, second or third year module examined through coursework, each student was then coded as to whether they achieved above or below the median score.
- *Attainment in a Year 1 module assessed through examination*: a median score was calculated using the average mark obtained for each student in a first-year module examined through examination (comparative data were not available for equivalent Year 2 and 3 modules), each student was then coded as to whether they achieved above or below the median score.

The independent variables available for use in this study were in accordance with associated literature (Hoskins et al., 1997; Hoare & Johnston, 2011). The independent variables were in some cases restricted by the data available for each student, as students were free to decline to answer particular questions or refuse to disclose information. In the instances that data were missing or unknown, the data were coded into the category 'other'. The independent variables used for statistical analysis included the following:

- *Prior attainment*: which was calculated for each student considering the total number of UCAS points obtained from their GCE A-Levels. For students who had attained the WBQ, an additional 120 points were added to the prior attainment score, in line with the UCAS-points-based tariff system.
- *Adjusted prior attainment*: previous work has suggested that the notional value of 120 UCAS points for achieving the WBQ does not reflect the student's ability and therefore requires adjustment if being compared against A-Level attainment (Taylor et al., 2013). An 'adjusted WBQ' score was generated considering the average prior GCE A-Level attainment of the student, as the WBQ is seen as a GCE A-Level equivalent qualification. For example if a student obtained three A grades at GCE A-Level and the WBQ the 'adjusted WBQ' score would be 120 points. If a candidate obtained an A, a B and a C at GCE A-Level and the WBQ, the student would be given 100 points for their 'adjusted

WBQ' score. The adjusted WBQ score was added to the total number of UCAS points obtained from GCE A-Levels to calculate a total adjusted prior attainment value.

- *WBQ*: as stated on the students UCAS form upon application to university, if they had obtained the WBQ.
- *Age*: students aged 21 or over at the time of admission were categorised as mature students.
- *Ethnicity*: students were asked to self-categorise their ethnic origin upon admission; students were free to refuse to declare this information. The data were then classified into three categories: white, non-white and other.
- *Disability*: students were asked to self-declare any disability upon admission although there is no independent check of the information provided. No distinction was made between the level and type of disability and students were free to refuse to declare this information.
- *Gender*: this variable was included in the binary logistic regression calculations as a control measure.
- *Nationality*: students were asked to self-declare their nationality, which was classified into three groups: British, European and other.
- *Socioeconomic class*: the socioeconomic class of each student was classified into eight categories according to the professions and employment status of their parents or guardians, as stated on the student's UCAS form upon application to university. Individuals were free to refuse to give this information. Categories included higher managerial/professional, lower managerial, intermediate, small employer, lower supervisor/technical, semi-routine, routine and not classified.
- *Welsh speaker*: students were asked to self-declare their language of correspondence upon entry; this relates to the language in which the student would prefer any university correspondence. Categories included fluent Welsh speaker, non-fluent Welsh speaker and non-Welsh speaker.
- *School attended*: as stated on the student's UCAS form upon application to university, the school or college previously attended was classified into five categories: independent, grammar, comprehensive, college and other.

Statistical modelling

Binary logistic regression was performed on the above data using the overall performance above or below the median in either undergraduate degree year or undergraduate degree module as the dependent variable. Statistical analysis was used to investigate the relationship between the average marks obtained and the independent variables as described above. Separate analyses were run for each year of undergraduate study and each undergraduate module considered. Relevant data were extracted, checked and coded prior to using IBM SPSS Statistics 20 software for analysis. The values reported for the binary logistic regression analysis are in accordance with associated literature (Peng, Lee, & Ingersoll, 2002).

The results of the data analysis produce four different reported figures:

(1) The test statistic (Wald) for multivariate analysis using binary logistic regression. This value reflects the relative importance of the variable in relation to the other variables that were included.

(2) The odds ratio (Exp(*B*)) reports the odds of an event occurring based on the data within the statistical analysis. An odds ratio greater than 1 indicates a better performance in relation to the comparator group, whereas an odds ratio score of less than 1 demonstrates a poorer performance than the comparator group (Bland & Altman, 2000).
(3) The lower and upper 95% confidence intervals (CI) of Exp(*B*).
(4) The statistical significance performed according to a 0.05 threshold level. Values under this threshold demonstrate that the associated regression coefficient is significant, whereas values over the 0.05 threshold measure have no significance in terms of the associated regression coefficient.

Results

Comparison of the university performance of students with four GCE A-Levels with those with three GCE A-Levels and the WBQ

When the WBQ is attributed 120 UCAS tariff points for prior attainment, as shown in Table 1, students with three GCE A-Levels and the WBQ achieved below the median year average in all three years of undergraduate study in comparison to students with four GCE A-Levels, as indicated by the odds ratio values < 1. In addition, prior attainment

Table 1. Binary logistic regression results for the academic performance of students with four GCE A-Levels compared to students with three GCE A-Levels and Welsh Baccalaureate Qualification (WBQ).

	Independent variable	Number of students	Wald	Odds ratio (Exp(*B*))	95% CI for Exp(*B*) lower–upper
Year 1	Prior attainment	318	55.89***	1.05	1.03–1.06
	No WBQ[a]	255			
	WBQ	63	49.04***	0.01	0.00–0.26
	Missing/refused[a]	6			
	British	306	4.00*	0.12	0.02–0.96
	European	6	7.90**	0.01	0.00–0.30
	Non-Welsh speaker[a]	260			
	Fluent Welsh speaker	36	5.50*	0.32	0.12–0.83
	Non-fluent Welsh speaker	22	1.36	0.50	0.16–1.60
	Constant		22.07	0.00	
Year 2	Prior attainment	280	17.14***	1.02	1.01–1.03
	No WBQ[a]	243			
	WBQ	37	12.44***	0.10	0.03–0.36
	Male[a]	118			
	Female	162	5.82*	1.95	1.13–3.36
	Constant		6.93	0.01	
Year 3	Prior attainment	236	13.86***	1.02	1.01–1.03
	No WBQ[a]	219			
	WBQ	17	5.65*	0.16	0.37–0.73
	No disability[a]	219			
	Disabled	17	4.58*	0.23	0.58–0.88
	Constant		7.67	0.00	

Notes: This analysis is based on a sample of students (Year 1 = 318, Year 2 = 280 and Year 3 = 236) studying undergraduate biosciences degree schemes from 2005 to 2011 at a UK HEI. Only statistically significant variables are presented. An illustrative example of the full binary logistic regression results for the first year of undergraduate study is presented in the appendix.
[a]Reference category to which the other categorical variables are compared.
*$p < .05$.
**$p < .01$.
***$p < .001$.

was the greatest positive indicator of academic performance in all three years of undergraduate study, as indicated by the large value of the Wald statistic and the odds ratios > 1. Only statistically significant variables are provided in the tables of results. A representative output (including all of the variables used within the analysis) is shown in the appendix. For the purposes of this model, awarding the WBQ 120 UCAS tariff points within the prior attainment variable score may not be an accurate reflection of the prior attainment of the applicant. Therefore, further modelling was undertaken in which each applicant who had attained the WBQ had a number of UCAS tariff points allocated to it that was the mean points tariff gained from their three GCE A-Level awards. The adjusted WBQ score factored into the prior attainment score and classified as 'adjusted prior attainment' as described in the methods section. Statistical modelling of the relative value of the WBQ was an attempt to reflect prior attainment more accurately and to make more valid comparisons with students who had achieved four GCE A-Levels.

Binary logistic regression analysis performed using the adjusted prior attainment score for the WBQ (Table 2) revealed that attainment of the WBQ in addition to three GCE A-Levels is, again, a significant negative indicator of academic achievement in all years of undergraduate study in comparison to learners with four GCE A-Levels. In addition, adjusted prior attainment is a highly significant positive indicator of academic performance in all three years of undergraduate study.

Comparison of the university attainment of students with three GCE A-Levels with those with three GCE A-Levels and the WBQ

In order to evaluate the effect of obtaining the WBQ as an additional GCE A-Level equivalent qualification, statistical analysis was undertaken to compare the performance of students with three GCE A-Levels to students with three GCE A-Levels and the WBQ. The results (Table 3) demonstrate that, as above, achievement of the WBQ in addition to three GCE A-Levels is significantly disadvantageous in comparison to students with three GCE A-Levels in all three years of undergraduate study. Again, adjusted prior attainment is a significantly positive indicator of academic achievement in all three years of undergraduate study.

The effect of assessment strategy on students who have achieved the WBQ

In order to establish whether the assessment strategy used in undergraduate degree modules impacted upon students who had obtained the WBQ, statistical analysis was performed to consider different modules undertaken during undergraduate degrees. Modules that were assessed through coursework alone were included for each year of the three year undergraduate degree, and these variables were classified as CWK1, CWK2 and CWK3, respectively. For comparison, a first-year module assessed mainly through examination (70% examination) was used in the analysis; this variable was termed EXAM1.

Statistical analysis revealed that achieving the WBQ was a significant negative indicator of achieving above the median score in all undergraduate modules that were included in the analysis (Table 4), when students who had the WBQ in addition to three GCE A-Levels were compared to students that had four GCE A-Levels. Interestingly, the WBQ was significantly disadvantageous both in first-year modules that were assessed through coursework (CWK1) and those predominantly assessed through examination (EXAM1). In the

Table 2. Binary logistic regression results for the academic performance of students with four GCE A-Levels compared to students with three GCE A-Levels and WBQ given an adjusted prior attainment score.

	Independent variable	Number of students	Wald	Odds ratio (Exp(*B*))	95% CI for Exp(*B*) lower–upper
Year 1	Adjusted prior attainment	318	53.91***	1.04	1.03–1.05
	No WBQ[a]	255			
	WBQ	63	41.31***	0.02	0.01–0.06
	Missing/refused[a]	8			
	White	277	0.90	0.42	0.07–2.52
	Non-white	33	4.33*	0.12	0.02–0.89
	Missing/refused[a]	6			
	British	306	3.92*	0.13	0.02–0.98
	European	6	7.50**	0.02	0.00–0.30
	Non-Welsh speaker[a]	260			
	Fluent Welsh speaker	36	5.63*	0.31	0.12–0.82
	Non-fluent Welsh speaker	22	1.43	0.49	0.15–1.58
	Constant		19.39	0.00	
Year 2	Adjusted prior attainment	280	13.75***	1.0	1.01–1.03
	No WBQ[a]	243			
	WBQ	37	8.79**	0.18	0.06–0.56
	Male[a]	118			
	Female	162	5.75*	1.94	1.13–3.34
	Missing/refused[a]	35			
	Higher managerial	75	0.99	0.64	0.27–1.54
	Lower managerial	74	0.57	1.41	0.58–3.46
	Intermediate	31	1.62	2.02	0.68–5.97
	Small employer	19	0.29	1.40	0.41–4.76
	Lower technical	15	4.25*	5.39	1.09–26.71
	Semi-routine	24	0.30	0.72	0.22–2.33
	Routine	7	0.80	2.40	0.35–16.27
	Constant		4.98	0.01	
Year 3	Adjusted prior attainment	236	12.85***	1.02	1.01–1.03
	No WBQ[a]	219			
	WBQ	17	3.92*	0.25	0.06–0.99
	No disability[a]	219			
	Disabled	17	4.38*	0.23	0.06–0.91
	Constant		6.89	0.00	

Notes: This analysis is based on a sample of students (Year 1 = 318, Year 2 = 280, Year 3 = 236) studying undergraduate biosciences degree schemes from 2005 to 2011 at a UK HEI. Only statistically significant variables are presented.
[a]Reference category to which the other categorical variables are compared.
*$p < .05$.
**$p < .01$.
***$p < .001$.

second year coursework module (CWK2), the precise nature of the coursework assignment within the module varied based on the degree scheme of the student. Attaining the WBQ was a significant negative indicator of achievement within the module. In the Final Year Dissertation Module (CWK3), which is proportionally worth a quarter of the final year marks, students who had three GCE A-Levels and the WBQ performed significantly worse than candidates with four GCE A-Levels. The adjusted prior attainment score was a significant positive indicator of attainment in all of the modules that were considered in the analysis.

Discussion

The findings presented here suggest that having the WBQ (pre-2014, ungraded WBQ) in addition to three GCE A-Levels is a significant negative indicator of academic degree

Table 3. Binary logistic regression results for the academic performance of students with three GCE A-Levels compared to students with three GCE A-Levels and Welsh Baccalaureate (WBQ).

	Independent variable	Number of students	Wald	Odds ratio (Exp(*B*))	95% CI for Exp(*B*) lower–upper
Year 1	Adjusted prior attainment	1285	155.28***	1.03	1.02–1.03
	No WBQ[a]	1222			
	WBQ	63	38.30***	0.10	4.78–20.35
	Non-Welsh speaker[a]	1149			
	Fluent Welsh speaker	70	3.33	0.60	0.34–1.04
	Non-fluent Welsh speaker	66	14.94***	0.30	0.16–0.55
	Missing/refused[a]	91			
	Comprehensive school	587	4.76*	0.53	0.30–0.94
	Grammar school	114	2.00	0.62	0.31–1.20
	Independent school	193	15.62***	0.29	0.16–0.53
	College	290	8.88**	0.40	0.23–0.74
	Other school	40	1.57	3.09	0.53–17.98
	Constant		56.44	0.00	
Year 2	Adjusted prior attainment	1266	115.24***	1.02	1.02–1.03
	No WBQ[a]	1229			
	WBQ	37	36.94***	0.06	0.03–0.16
	No disability[a]	1174			
	Disabled	92	4.07*	0.61	0.38–0.99
	Non-Welsh speaker[a]	930			
	Fluent Welsh speaker	68	11.11**	0.39	0.22–0.68
	Non-fluent Welsh speaker	68	8.19**	0.45	0.26–0.78
	Missing/refused[a]	88			
	Comprehensive school	565	0.01	0.97	0.57–1.65
	Grammar school	120	0.20	1.16	0.61–2.20
	Independent school	193	6.85**	0.46	0.26–0.82
	College	290	1.07	0.75	0.43–1.30
	Other school	10	4.21*	6.10	1.08–34.29
	Constant		58.81	0.00	
Year 3	Adjusted prior attainment	1129	112.11***	1.02	1.02–1.03
	No WBQ[a]	1112			
	WBQ	17	5.08*	0.24	0.07–0.83
	Non-Welsh speaker[a]	1005			
	Fluent Welsh speaker	62	6.87***	0.46	0.26–0.82
	Non-fluent Welsh speaker	62	8.45***	0.42	0.24–0.76
	Missing/refused[a]	78			
	Comprehensive school	506	4.15*	1.77	1.02–3.06
	Grammar school	112	4.12*	1.96	1.02–3.76
	Independent school	179	0.14	1.12	0.62–2.04
	College	246	2.15	1.54	0.86–2.74
	Other school	8	1.56	2.82	0.55–14.34
	Constant		6.862	0.00	

Notes: This analysis is based on a sample of students (Year 1 = 1285, Year 2 = 1266, Year 3 = 1299) studying undergraduate biosciences degree schemes from 2005 to 2011 at a UK HEI. Only statistically significant variables are presented.
[a]Reference category to which the other categorical variables are compared.
*$p < .05$.
**$p < .01$.
***$p < .001$.

performance in comparison to having four GCE A-Levels. Furthermore, having the WBQ was a significant negative indicator of attainment in modules assessed through both coursework and predominantly through examination.

Although the WBQ has had positive reviews both internally (Welsh Baccalaureate Qualification Internal Evaluation, University of Bath, 2006) and externally (Greatbatch et al., 2006) (Review of Qualifications for 14- to 19-year-olds in Wales), these reviews largely focus on the range and diversity of skills which the qualification encourages and develops. However, not all of these skills will necessarily be directly transferable to an academic

Table 4. Binary logistic regression results for the academic performance of students with four GCE A-Levels compared to students with three GCE A-Levels and WBQ in undergraduate modules with differing assessment strategies.

	Independent variable	Number of students	Wald	Odds ratio (Exp(*B*))	95% CI for Exp(*B*) lower–upper
CWK1	Adjusted prior attainment	313	11.48***	1.01	1.01–1.02
	No WBQ[a]	253			
	WBQ	60	15.86***	0.12	0.04–0.34
	Constant		9.62	0.00	
EXAM1	Adjusted prior attainment	313	45.29***	1.04	1.02–1.05
	No WBQ[a]	253			
	WBQ	60	28.57***	0.05	0.02–0.14
	Non-Welsh speaker[a]	265			
	Fluent Welsh speaker	30	6.65*	0.25	0.09–0.72
	Non-fluent Welsh speaker	18	2.67	0.35	0.10–1.23
	Constant		13.74	0.00	
CWK2	Adjusted prior attainment	262	8.29***	1.01	1.00–1.02
	No WBQ[a]	228			
	WBQ	34	4.10*	0.30	0.01–0.96
	No disability[a]	240			
	Disabled	22	4.99*	0.27	0.09–0.85
	Male[a]	106			
	Female	156	11.50***	2.80	1.55–5.09
	Missing/refused[a]	32			
	Higher managerial	70	0.00	0.98	0.38–2.54
	Lower managerial	69	1.70	1.93	0.72–5.16
	Intermediate	30	5.77*	4.22	1.30–13.68
	Small employer	17	0.45	0.62	0.15–2.52
	Lower technical	14	4.96*	6.58	1.25–34.49
	Semi-routine	22	0.10	1.23	0.34–4.44
	Routine	8	1.25	0.34	0.05–2.27
	Constant		4.77	0.01	
CWK3	Adjusted prior attainment	201	13.97***	1.02	1.01–1.03
	No WBQ[a]	185			
	WBQ	16	9.52**	0.75	0.01–0.38
	Missing/refused[a]	6			
	White	175	4.19*	0.04	0.00–0.87
	Non-white	20	3.90*	0.04	0.00–0.98
	Constant		0.00	0.00	

Notes: This analysis is based on a sample of students (Year 1 = 313, Year 2 = 262, Year 3 = 201) studying undergraduate biosciences degree schemes from 2005 to 2011 at a UK HEI. Modules examined predominantly through coursework in years one, two and three of undergraduate study are coded CWK1, CWK2 and CWK3, respectively. A first-year module assessed predominantly through examination was coded EXAM1. Only statistically significant variables are presented.

[a]Reference category to which the other categorical variables are compared.

*$p < .05$.

**$p < .01$.

***$p < .001$.

university environment, particularly as the broad nature of the WBQ results in the encouragement of work-related and personal skills. Therefore, it could be the case that students who have been awarded the WBQ outperform students that have only GCE A-Levels in non-HE routes or in skills not directly assessed in HE, for example by achieving apprenticeships and gaining employment.

The results presented here consider, for the first time, the value of the WBQ as a GCE A-Level equivalent qualification and the relationship between assessment strategies on university outcomes for students who have obtained the WBQ. The results demonstrated are in accordance with previous findings regarding the WBQ (Taylor, Rees, Wilkins, & Davies, 2011) and the WBQ generally among HEIs (Taylor et al., 2013), although the

data presented here are specific to a School of Biosciences within a UK HEI. Previous studies included much larger sample sizes (Taylor et al., 2011, 2013); therefore, their conclusions can be considered more robust than the present study. However, independent variables such as gender, ethnicity, the type of school attended, Welsh speaking ability and prior attainment revealed similar trends in the effect they had on degree performance, although these effects were not consistently demonstrated throughout the analyses. Crucially, previous analyses have not considered the impact of assessment strategy on the academic performance of students who have obtained the WBQ.

Analysis considering different assessment strategies revealed that students who had attained three GCE A-Levels and the WBQ performed significantly worse in both coursework and examination assessed modules in comparison to students who had attained four GCE A-Levels (Table 4). While differences in academic attainment in university examinations may be due to the absence of formal examinations within the core component of the WBQ, and consequently reduced exposure to summative examinations, differences in coursework attainment are harder to explain. Therefore, future assessment of the impact of the WBQ may need to consider the different assessment tools being used for coursework and examinations in HE. For example, holding the WBQ may result in differing academic attainment in coursework between essay writing, laboratory reports and field skills. The same may be true of examination question styles, for example between essays and multiple choice questions.

The introduction of a grading system to the WBQ in the summer of 2015 will allow the ability of student achievement and effort during and throughout the qualification to be assessed more specifically. A grading system will undoubtedly help with admission into HE, as it will allow admissions staff to make more informed decisions and comparisons regarding the academic abilities of potential students. The impact of grading the WBQ needs to be monitored to ensure that the qualification continues to aid entry into HE as has been shown previously (Taylor et al., 2013) and to continue to monitor the progression of WBQ learners through HE.

This statistical analysis did not include domicile of students or the distance from their HEI to home as this was not available. Previous studies have included Welsh domicile in statistical analysis of university performance (Rees & Taylor, 2006; Taylor et al., 2013). There is a strong correlation between Welsh domicile students and the completion of the WBQ, as the WBQ is typically only offered to students studying in Wales. Furthermore there may well be a relationship between the degree performance of WBQ students and domicile. Therefore, in future studies, the domicile of Welsh students may also need to be considered in relation to economic factors associated with Welsh domicile students (Faggian, McCann, & Sheppard, 2007), which may affect university performance.

While the introduction of GCSE attainment as a variable in the model may have assisted in assessing the impact of prior attainment, such data are not routinely made available by UCAS or HESA (HE Statistics Agency). Differences in the academic attainment of students prior to undertaking their A-Levels may account for the differences seen in academic performance of students taking 3 A-Levels and the WBQ compared to those undertaking 4 A-Levels in HE, thus an interaction between prior attainment and taking the WBQ cannot be excluded from this model. However, one might also expect students undertaking the WBQ as an additional qualification to have higher previous academic attainment than those undertaking 3 A-Levels alone and to consequently

see increased attainment in HE with the addition of the WBQ. The evidence of this study would suggest that those students holding 3 A-Levels appear to outperform those that have undertaken the WBQ in addition to 3 A-Levels.

Although this study has focused exclusively on the WBQ, it is interesting to note that others have seen similar results when analysing the effects of other GCE A-Level equivalent qualifications such as Access courses (Osborne, Leopold, & Ferrie, 1997) and BTECs (Hatt & Baxter, 2003). Therefore, there seems to be a general lack of parity of esteem between traditional GCE A-Level qualifications and GCE A-Level equivalent qualifications (Connor, Sinclair, & Banerji, 2006). This was particularly evident in the Internal Reviews of the WBQ conducted by the University of Bath (Welsh Baccalaureate Qualification Internal Evaluation, University of Bath, 2006). Internal reviews also highlighted that there are many common misconceptions regarding the WBQ. A general increase in public awareness of the specification of this qualification may resolve these misconceptions.

The results presented here demonstrate that university students who have attained the WBQ qualification may need extra support and guidance throughout the duration of their undergraduate degree. However, the addition of a grading system to the WBQ in the summer of 2015 will allow differing levels of attainment to be accounted for and will therefore significantly alter the qualification. Therefore, it will be essential to continue to study the effect of the WBQ to determine the impact of grading and to inform the future development of baccalaureate-style qualifications.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix. An illustrative example of the full binary logistic regression results comparing the first-year undergraduate academic performance of students with four GCE A-Levels to students with three GCE A-Levels and the WBQ

	Independent variable	Number of students	Wald	Odds ratio (Exp(*B*))	95% CI for Exp(*B*) lower–upper
Year 1	Prior attainment points	318	55.86***	1.05	1.03–1.06
	No WBQ[a]	255			
	WBQ	63	49.04***	0.01	0.00–0.03
	Non-mature student[a]	316			
	Mature student	2	3.40	18.74	0.83–422.57
	Missing/refused[a]	8			
	White	277	0.96	0.41	0.07–2.45
	Non-white	33	4.50	0.12	0.02–0.85
	No disability[a]	285			
	Disabled	33	1.16	0.61	0.24–1.51
	Male[a]	139			
	Female	179	3.30	1.70	0.96–3.02
	Missing/refused[a]	6			
	British	306	4.00*	0.12	0.02–0.96
	European	6	7.90**	0.01	0.01–0.03
	Missing/refused[a]	39			
	Higher managerial	88	0.22	0.80	0.32–2.03
	Lower managerial	89	0.30	0.77	0.30–1.97
	Intermediate	34	0.05	0.88	0.27–2.83
	Small employer	17	0.01	1.07	0.27–4.16
	Lower technical	15	0.80	2.14	0.40–11.27
	Semi-routine	29	0.09	0.83	0.25–2.80
	Routine	7	0.61	0.48	0.08–3.07
	Non-Welsh speaker[a]	260			
	Fluent Welsh speaker	36	5.50*	0.32	0.12–0.83
	Non-fluent Welsh speaker	22	1.36	0.50	0.16–1.60
	Missing/refused[a]	25			
	Comprehensive school	157	0.27	0.74	0.24–2.31
	Grammar school	23	0.83	0.51	0.12–2.17
	Independent school	33	0.44	0.63	0.16–2.47
	College	80	2.04	0.42	0.13–1.38
	Constant		22.07	0.00	

Notes: This analysis is based on a total sample of 318 students studying undergraduate biosciences degree schemes at a UK HEI. Here, no students were categorised into the 'other' school category; therefore, only five categories were used.
[a]Reference category to which the other categorical variables are compared.
*$p < .05$.
**$p < .01$.
***$p < .001$.