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## **Improving the quantitative research skills of Welsh Baccalaureate teachers through university engagement**

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### **Abstract**

In 2015 the re-designed Welsh Baccalaureate Qualification (WBQ) was launched and, for the first time, students undertaking the qualification were required to complete the Skills Challenge Certificate (SCC). Consisting of four components: the Individual Project, the Enterprise and Employability Challenge, the Global Citizenship Challenge, and the Community Challenge, the SCC aims to enable learners to develop skills needed for education, employment and life. The Individual Project requires students to undertake a research project that includes analysing data utilising quantitative data analysis skills. This paper identifies the teaching of such quantitative skills as a difficulty for some teachers involved in the delivery of the qualification drawing on recent engagement work between Cardiff University and schools and colleges in South Wales. It argues that universities have an opportunity to engage with schools, teachers and pupils in the delivery of quantitative research skills that can be beneficial for both schools and universities.

**Keywords:** Welsh Baccalaureate, Skills Challenge Certificate, Individual Investigation, Quantitative Research, Number, Q-Step

**Key messages:**

- The re-configured Welsh Baccalaureate Qualification introduced in 2015 requires students to undertake an Individual Project utilising quantitative research and data analysis skills.
- Engagement work by Cardiff University with teachers delivering the qualification has revealed that many teachers lack the confidence and skills to deliver quantitative research and data analysis teaching to their students undertaking the Welsh Baccalaureate Qualification.
- Engagement work by universities in quantitative research methods can help to address this gap and ensure that pupils undertaking the WBQ have the skills needed to be successful.

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## Introduction

Academics are increasingly being required to undertake engagement and outreach activities, in addition to universities traditional functions of teaching and research (Johnson et al., 2019). Much of this can be seen as contributing toward what many universities now describe as their 'civic mission'. Bartel et al. (2003: 90) have suggested that historically such engagement and outreach activities were not seen as contributing to the core mission of the university and were devalued in comparison to teaching and research. However, they argue that outreach and engagement with schools can address not only social and environmental issues, but also enhance teaching and research efforts.

Much of the existing literature focusses on outreach and engagement with schools from the perspective of the pupil (e.g. Michels and Eijkelhof, 2018; Tansey and Gallo, 2018). Such studies therefore tend to focus on the benefits to pupils, in terms of knowledge and skills development resulting from university outreach, or to the universities themselves in terms of future student recruitment or good public relations. While some research has found that teachers positively value university outreach programmes for their students (Shaw, Harrison and Shallcross, 2010), what is less widely discussed in the literature is university outreach work with teachers themselves, and the potential benefits that this can bring. This paper seeks to address this gap in the current literature through presenting a case study of how one project at Cardiff University has sought to engage with teachers of the Welsh Baccalaureate Qualification (WBQ) as part of its 'civic mission'. As such it will be of interest to academics who are considering developing their own outreach programmes with school teachers, both in Wales for teachers of the WBQ

and also more widely across the UK where teachers may be required to deliver the Extended Project Qualification (EPQ).

This paper begins with an overview of the introduction and development of the WBQ since 2003. Here, we argue that the introduction of the Individual Project component of the qualification, which requires students to demonstrate, and therefore teachers deliver, higher level numeracy and quantitative research skills, provides an opportunity for universities in Wales to engage with teachers as part of their university's 'civic mission'. Following this, we outline a case study of recent outreach activities delivered by the Cardiff Q-Step Centre, focussing particularly on the 2018 Teacher's Conference. Analysis of the attendance information and feedback from the event are presented and we argue that this points to important opportunities for universities to engage with teachers as part of their 'civic mission'.

### **What is the Welsh Baccalaureate Qualification?**

The Welsh Baccalaureate Qualification (WBQ) is a qualification for 14 to 19-year-old students in Wales. Following funding from the Welsh Government, it was initially piloted in 18 schools and Further Education (FE) colleges across Wales in 2003. By the end of 2005, 31 schools and colleges were piloting the qualification before it was rolled out across Wales in September 2007, following broad support for the qualification from schools and colleges (Greatbatch, Wilmut and Bellin, 2006). Yhnell et al. (2016) report that the qualification was offered in over 240 centres in September 2011 and highlighted that over 70,000 students would take the qualification in 2013. The WBQ was initially available for students to undertake at three levels: Foundation, Intermediate and Advanced and combined 'general and/or vocational education (through existing qualifications) with the development of key skills that are intended to equip young people with the skills they need after leaving school' (National Assembly for Wales Research Service, 2015: 1). Elements of the WBQ

initially included Essential Skills Wales and Key Skills; Wales, Europe and the World; Work-related Education; Personal and Social Education and the Individual Investigation.

In the Review of Qualifications for 14-19 year-olds In Wales (2012), employability skills, the broad nature of the qualification and the accommodation of academic and vocational pathways within the qualification were noted as particular strengths (Yhnell et al., 2016). However, the report also recommended that the WBQ should be revised to make it more rigorous, include grading at advanced level (previously students only received a pass or fail result) and ensure more effective engagement between education providers and employers.

A revised Welsh Baccalaureate Qualification was introduced across Wales in September 2015. In addition to including grading of the advanced qualification, the revised WBQ introduced a new element, the 'Skills Challenge Certificate' (SCC). The SCC comprises four elements that students must complete in order to achieve the qualification: Community Challenge, Global Citizenship Challenge, Enterprise and Employability Challenge and the Individual Project. The WJEC (who award the WBQ) state that 'The primary aim is to enable learners to develop and demonstrate an understanding of and proficiency in essential and employability skills: Communication, Numeracy, Digital Literacy, Planning and Organisation, Creativity and Innovation, Critical Thinking and Problem Solving, and Personal Effectiveness'. In particular, the Individual Project requires learners to develop high levels of independent study and research skills, thus preparing them for higher education or employment.

In a review of the implementation of the new qualification in September 2015, Qualifications Wales (2016) highlight the training offered to teachers delivering the new WBQ as a particular issue.

Drawing on feedback from teachers they note that the focus of training appeared to be on the design of the qualification while there was insufficient advice on delivering the new Skills Challenge Certificate. To gain top marks in the Individual Project students must not only demonstrate independent research skills, but also higher level numeracy and quantitative data analysis skills.

More recently, the National Assembly for Wales (2019) carried out an inquiry into the status of the WBQ. Speaking to a wide range of stakeholders, including pupils, teachers, universities and ministers, the report shows that the WBQ has a number of benefits for the pupils who study it, particularly in terms of the skills developed for future study or life. However, the inquiry also concluded that the delivery of the qualification and the way it is publicised has had a negative impact on its actual and perceived value. The report highlights, in particular, the need for there to be specialist WBQ teachers and specific timetabled classes for the WBQ, so that the WBQ is delivered by teachers fully trained in the qualification and that lessons are not only timetabled at the end of term when teachers have more availability.

This paper seeks to address the following question: 'How can universities support teachers and schools to deliver the quantitative research methods skills required as part of the Individual Project component of the Skills Challenge Certificate?' We suggest that such skills are often a concern for those delivering the WBQ to teach and that universities therefore have a key role to play in engaging with schools delivering the WBQ. In the next section we discuss research that has been conducted with teachers of the WBQ and then provide an overview of engagement work that The Cardiff Q-Step Centre (part of Cardiff University's School of Social Sciences) has undertaken with schools and colleges in South Wales.

## **Teaching the Welsh Baccalaureate Qualification**

Estyn (2018) state that the teaching and level of enthusiasm for the WBQ remains variable between schools and colleges in Wales. The 2018 report concludes that students are not adequately developing their numeracy skills as part of the WBQ. Specifically, the report states that students make 'perfunctory use of statistical information' and that only a minority 'exhibit a suitable grasp of numeracy' (p14). Estyn (2018) link this deficiency to a lack of experience and expertise amongst teachers involved with delivery of the qualification in Welsh schools and colleges. The report

suggests that timetabling, as opposed to skill level and knowledge, dictates who teaches the qualification and therefore, there are instances where teachers lack familiarity and confidence with the numerical skills they need to effectively deliver the qualification. This problem is exacerbated by the lack of access that teachers have to networks of good practice. Similarly, in her thesis, Golding (2016) provides a description of a personal tutor in a school in the South Wales valleys, who was somewhat apprehensive to support the delivery of the WBQ, having had no previous teaching or research experience. These findings, underscore the role that higher education institutions can play in bringing together and supporting teachers in learning how to effectively carry out research.

Grigg (2016) asked teachers to rate the effectiveness of different education policies implemented by the Welsh Government. Almost 40% of respondents (66) rated the WBQ as a 'poor' or 'very poor' initiative. This is in comparison to 30% (57) who believed it was 'good' or 'very good'. The remaining teachers were neutral over the introduction and implementation of the WBQ. Grigg (2016) argues that the WBQ is just one of a number of initiatives that have been introduced to the Welsh education system in recent years, and that increasingly, teachers are feeling there are too many new initiatives to deliver on.

Despite this, increasingly, the WBQ advanced level qualification is being recognised outside of schools and colleges (Gunning and Rafle, 2011). All Welsh universities now recognise the qualification as part of their admissions process and gradually, higher education providers outside of Wales are recognising the value of the WBQ. Furthermore, employers see the qualification as an effective mechanism for preparing young people for the workplace. Therefore, it is important to ensure that training opportunities are available for all Welsh Baccalaureate teachers, regardless of the main subject that they teach or educational background, to ensure that they are able to give their students the best opportunities and prospects. Specially, the need to equip students with numerical skills is becoming ever more important in our digitalised society where numerical data is increasingly routinely collected (Savage and Burrows, 2007; Savage, 2009; Savage and Burrows,



2009). In the section which follows we introduce the Cardiff Q–Step Centre, created in order to improve numerical and quantitative research skills of students in the UK and, following this, we outline how the Centre has been undertaking outreach activities with Welsh Baccalaureate teachers.

### **The Cardiff Q-Step Centre**

In 2011, in response to calls to improve the numerical skills of the UK (British Academy, 2012), and specifically the quantitative research methods skills of social science students, the Nuffield Foundation, Economic Social Research Council and the Higher Education Funding Council for England launched a £19.5 million project, the Q-Step programme. This initiative is working in collaboration with fifteen universities across the UK, including Cardiff University’s School of Social Sciences. The Cardiff Q-Step Centre of Excellence in Quantitative Methods Teaching and Learning has two core aims. Firstly, through extensive module and curriculum redesign, it is committed to increasing the research methods training provision for social science undergraduate students at Cardiff University. Secondly, it aims to work with schools and colleges in the local community to improve students’ ability and confidence to utilise numerical data in order to undertake research projects. This second aim, is in line with the Nuffield Foundation’s original commitment to embedding quantitative methods teaching and learning throughout the educational lifecourse of students (Nuffield Foundation, No Date). It is deemed that such intensive and sustained engagement with research methods is needed in order to bring about necessary change in students’ confidence and ability to engage with a variety of approaches and methods. In turn, it is hoped that this will go some way toward upskilling the UK labour force. Indeed, Universities UK (2015) report that at present, there is a shortage of skilled graduates capable of managing such large quantitative datasets or producing quantitative analysis.

### ***Cardiff University Welsh Baccalaureate outreach activities***

The Welsh Baccalaureate Skills Challenge Certificate Qualification has provided a vehicle for the Cardiff Q-Step Centre to implement their ambition to enthuse young people about the potential of quantitative research. For instance, in the academic years 2016/2017 and 2017/2018 the Centre hosted students completing both the national and advanced level of the qualification for skills workshops. This included sessions on the key stages of the research process, sampling strategies, survey design and data analysis. Additional workshops have been delivered in collaboration with the University's widening participation team, which have focussed on how numerical data can enhance our understanding of global social inequalities. Alongside this, the Centre has delivered Continuing Professional Development sessions for teachers on research skills. Perhaps the biggest evidence of the Centre's commitment to this goal, is the development of a level three qualification in social analytics. This qualification equips students with techniques to utilise numerical data in order to investigate social issues ranging from health, crime and education. The qualification has been delivered for four years now and most recently, has been delivered alongside Welsh Baccalaureate Skills Challenge Certificate lessons in a local college. A further FE provider in South Wales is also piloting the qualification as a prerequisite course for A-level students undertaking the Extended Project Qualification.

However, it is not only pupils whom the Q-Step Centre has sought to engage with. Since the introduction of the revised Welsh Baccalaureate Qualification, the Cardiff Q-Step Centre has hosted an annual teacher conference on the qualification. The aim of the conference is to give teachers the confidence to deliver research methods teaching in their classroom and therefore, allow their students to undertake focused, feasible and interesting research. This paper evaluates data collected at the 2018 conference to demonstrate the role universities can play in equipping teachers with the tools to effectively deliver quantitative research methods teaching.

As part of the 2018 Skills Challenge Certificate Conference, there were two quantitative research methods workshops. The first workshop was concerned with understanding different levels of data

and being able to effectively write survey questions to obtain all levels of data. The second quantitative workshop, introduced delegates to crosstabulations and the chi-square statistic. These workshops sat alongside other sessions on creating interview schedules and analysing interview transcripts. There were also talks from the Cardiff University's Schools Health Research Network and Open Access Team on the resources they have freely available to teachers delivering the SCC. As such, the event aimed to provide not only training to teachers but also to provide them with ideas for teaching in their own classrooms.

Talking specifically about UK higher education, Johnson et al. (2019) argue that with the introduction of policies including the removal of the cap on student numbers and increased student fees, intuitions across the UK are under increased pressure to undertake civic duties and engage with external agencies. However, despite this increased scrutiny, Johnson et al. (2019) suggest that there remains very little motivation among some academics to undertake such work, with outreach activities often being side-lined as administrative work. Indeed, Johnson et al. (2019) found that often academics do not have such work recognised in their workload model, and even in instances where such work was accounted for, the allocation was often insufficient. This means that often time devoted on outreach and engagement work impinges on time set aside for other research and scholarly activities which can be considered by some institutions as more imperative in the promotion process. Talking specifically about engaging with schools, Johnson et al. (2019) highlight the added constraint of negotiating a suitable time to undertake engagement work with the tightening of curriculum space. The authors suggest that administrative support and/or student interns can be extremely valuable for academics who wish carry out such work. For the case study shared in this paper, a paid postgraduate student and a member of administrative staff within the

University assisted extensively with the planning, delivery and evaluation of the event.

## **Skills Challenge Certificate Conference 2018**

### ***A case study of engagement***

The 2018 Welsh Baccalaureate Skills Challenge Certificate Teachers Conference took place on Friday 21st September 2018. This paper draws on both registration and evaluation data for the event to report a case study of school engagement. Scholarly activities that engage directly with teachers, are often underreported and rarely are the findings from such work disseminated (Johnson et al., 2019). Therefore, while this paper is based on findings from a small number of teachers and indeed, is not generalisable to the whole population, it begins to give us an insight into how HE providers can engage with teachers and some of the challenges HE providers may face when delivering school engagement activities.

The data for this paper was analysed both quantitatively and qualitatively. Due to the small number of participants and the non-probability sampling approach employed, the quantitative findings merely provide a snapshot of some of the challenges teachers face delivering research skills teaching. Further to this, the small number of respondents has restricted the extent to which this quantitative data can be analysed and as such, the paper presents descriptive statistics only. For Likert scale questions, the data has been treated as ordinal and the median response (middle response) has been reported. The median score can be calculated when you have logically ordered categorical data. As a measure of central tendency, it is considered to be less effected by extreme values or skewed data. The qualitative data presented in this paper is used to complement and

illustrate the ideas that begun to emerge from the analysis of the quantitative data. The qualitative data was analysed thematically and salient themes that emerged from the data are reported as part of this case study.

In total, 62 delegates registered to attend the event, with 51 delegates attending the event. There was some attrition in response rate in the registration data, therefore not all the totals reported in this paper sum to 62. The cognitive burden involved in completing surveys can directly impact on response rate. In order to maintain response rates and to avoid attrition, it is recommended that researchers minimise the length of their survey tools and avoid using too many open-response questions (Crawford et al., 2011). This along with a well-formatted survey and an incentive, can encourage participation. For the present research, the registration data was downloaded from Eventbrite. While questions can be posed in the registration forms created through Eventbrite, it is first and foremost a mode for promoting and registering for events and not a survey software tool. This means that the question format types are limited and therefore in some instances, this may have been somewhat off-putting for delegates. In addition to this, the Eventbrite registration form contained a number of mandatory questions including name, dietary and access needs. These questions along with a few others were essential to ensure that the event ran smoothly and was health and safety compliant. As a result, these questions were presented first and then followed by additional questions. It is possible that some participants did not wish to invest the additional cognitive burden to complete the non-mandatory, latter sections of the registration form. Finally, it is worth noting that the Welsh language standards (2018) stipulate that all public events must be advertised bilingually, with the Welsh version appearing first. This meant that non-Welsh speaking teachers who

registered for the event had to scroll and click through all registration questions in Welsh before reaching the English ones. This may have caused some frustration among delegates and again, increased the attrition rate.

As well as the mandatory questions in the registration form, delegates were also asked about the subject(s) they taught, the key issues or concerns they had with teaching the skills challenge certificate, and for details of what they hoped to achieve from attending the conference.

At the end of the conference, delegates were asked to complete a short evaluation form. In order to encourage participation, time was set aside during the closing address for the teachers to do this. The evaluation form aimed to measure how relevant teachers found each of the workshops. It asked delegates to score each of the workshops they attended on a 5-point Likert scale from 'Very relevant' to 'Not at all relevant'. Delegates were encouraged to report on the most and least successful aspects of the conference.

### ***Sample Demographics***

While the sample is non-probabilistic, many of the schools and colleges in the region were represented at the conference and representatives from the two regional consortiums attended the event. The Central South Consortium and the Educational Achievement Service for South East Wales work to develop and implement change in schools in order to raise educational standards. The consortiums cover the following areas of South Wales: Bridgend, Cardiff, Merthyr Tydfil, Rhondda Cynon Taf, Vale of Glamorgan, Blaenau Gwent, Caerphilly, Monmouthshire, Newport and Torfaen.

As shown in table 1, the majority (77%) of the delegates registered were teachers. The 47 teachers that attended the conference came from 35 different schools and colleges from across South Wales.

INSERT TABLE 1 HERE

Table 2 shows the number of years' experience the delegates had delivering the qualification. The greatest proportion (39%) had taught the qualification for 1-3 years, however, a sizeable percentage (33%) had been delivering the qualification for 4-8 years. Thus demonstrating the importance of engaging with experienced as well as newly qualified teachers.

INSERT TABLE 2 HERE

Most of the delegates (53.8%) who registered, reported that the main subject they taught was the Welsh Baccalaureate Qualification. However, Table 3 also shows the range of disciplines that teachers delivering the qualification came from, these include, Business and Economics (7.7%), Art (3.8%) and Religious Studies (3.8%). From this evidence, there appears to be very few STEM teachers delivering the qualification. There were no maths teachers registered and only 3 science teachers. This reflects the fact school timetabling as opposed to expertise often dictates who delivers the qualification (Estyn, 2018). Maths, Science, English and Welsh are compulsory subjects for all Welsh students until the age of 16, therefore these teachers are likely to have much more demanding workloads and less likely to be delivering the SCC. As a result of fewer STEM teaching delivering the qualification, those teaching the SCC may be less confident in numeracy and quantitative analysis. This underscores the importance of university outreach in supporting these teachers.

INSERT TABLE 3 HERE

The following section will present data on the challenges that teachers delivering research skills teaching face and discuss the role that university outreach can play in addressing these challenges.

***Registration Data:***

When registering, delegates were asked to list any key issues or concerns that they had about delivering the SCC. Table 4 provides a summary of this data. For this question, some participants listed more than one concern, therefore, each response does not necessarily represent a unique delegate. The concern listed with the greatest prevalence was numeracy or quantitative skills (35.7%). This concern was listed much more frequently than other issues, such as engagement (14.3%), enterprise (7.1%), and level descriptors which indicate the intended outcomes of learning (7.1%). Equally, when asked about what they aimed to gain from attending the event 7% of those who responded, made reference to research skills and data analysis (see table 5).

INSERT TABLE 4 HERE

INSERT TABLE 5 HERE

Furthermore, participants who registered, gave information on how they believed Cardiff University could best support them with delivery of the WBQ SCC. Again, many delegates listed more than one response and as such each response does not necessarily represent a different delegate. Comments included ‘the advanced numeracy element for the project’, ‘handling data’ and ‘the use of numeracy for the individual project’ (See Table 6). Again, there was a much greater emphasis placed on the support needed to deliver quantitative methods teaching for



students to successfully complete their individual research projects than anything else.

INSERT TABLE 6 HERE

### ***Evaluation Data***

At the end of the conference, delegates completed a short evaluation form. The evaluation data revealed that on average, delegates believed that all the workshops were relevant. Delegates were asked to score the workshops from 1 (not at all relevant) to 5 (very relevant). Table 7 shows that the median scores for all the workshops were above 4, indicating that participants found the workshops to be relevant. The workshops on survey design and developing interview schedules were deemed the most relevant. The relevance of the workshops was underscored in the qualitative comments given in the feedback. For instance, delegates described the conference as ‘Coherent, purposeful and engaging’ and ‘Comprehensive and thorough’. Figure 1 summarises the key words that the delegates used to describe the conference in the evaluation forms.

INSERT TABLE 7 HERE

INSERT FIGURE 1 HERE

Looking specifically at the feedback for the workshops aimed at developing numerical skills, the median score for the relevance of the survey workshop was 5 (very relevant), while the median score for the relevance of the quantitative data analysis workshop was 4 (relevant) (see table 7). The qualitative comments indicated that some participants found these sessions particularly advantageous and that the sessions had equipped them with the necessary confidence to begin to

deliver more quantitative research methods teaching. For instance, when asked about the most successful aspects of the conference delegates said; 'Quantitative data analysis workshop- because I can use it in class to help improve grades' and 'Quantitative workshops...interactive and useful for teaching'. However, some delegates found the material too 'complex' and stated that it 'was a bit above [their] head'. Another delegate expressed the need for more 'quantitative data help', while another stated that they 'would have liked more time to understand the quantitative data'. This links back to some of Estyn's (2018) recent concerns over the variability and skill level of teachers delivering the qualification. It also highlights the skills gaps that needs to be addressed to ensure that the qualification fulfils its potential and adequately prepares young people for Higher Education and the workplace.

This dichotomy of opinions was not as apparent or stark for the qualitative workshops. In contrast, the only concern raised in relation to these workshops, was in regard to their acceptance by the WJEC as legitimate means of researching and obtaining knowledge. For instance, one participant stated 'It would be useful to check with WJEC if aspects spoken about in conference are acceptable (e.g. visual methods)'. This suggests that the majority of anxiety toward teaching the individual investigation aspect of the SCC lies predominately in the delivery of quantitative research methods. This poses a challenge for the Cardiff Q-Step Centre and the Welsh education system more broadly, if we are to ensure that future generations are sufficiently trained to analyse and work with big data efficiently and effectively.

## **Discussion and Conclusions**

Cardiff University (2018: 2) states in its strategy document *The Way Forward*, in relation to its 'civic mission' that 'we will work with colleges, educational partners, and all schools in Wales through our Strategic Framework for School Engagement, supporting teachers and working towards improved educational attainment'. As such, it appears that the initiatives of the Cardiff Q-Step Centre described in this paper align closely with this strategic vision. However, these findings are also of wider relevance beyond Wales given the similarities to the Extended Project Qualification (EPQ), which is now widely offered across both England and Wales. As such, engaging in outreach with teachers of the WBQ and EPQ could be a way in which universities more generally contribute toward their 'civic mission' strategies.

As we discussed in the introduction to this paper, traditional university outreach in schools has predominantly focussed on working with pupils to develop their skills and knowledge as preparation for Higher Education or as a means of recruiting future students (Bartel, 2003). However, the findings of this paper highlight the need to view outreach in schools as moving beyond simply engaging with pupils and to consider the ways in which academic knowledge can also benefit the on-going development of teachers. As we have shown, the delegates registered for the 2018 Skills Challenge Certificate Conference were not predominantly STEM teachers and almost half were teaching the WBQ in addition to their specialist subjects which included art, Information Technology and business studies. We suggested that many of the delegates therefore did not have the research or quantitative skills necessary to confidently teach their pupils the skills they needed to succeed in the Individual Project. Indeed, difficulties with number were shown to be the biggest area of concern for delegates prior to the event and we therefore suggest that

centres, such as the Cardiff Q-Step Centre, have a key role to play in supporting teachers to develop these skills.

The findings of this study also indicated that many teachers had attended the Skills Challenge Certificate Conference in 2018 in order to gain teaching ideas and resources that they could use as project ideas for their students. Again, we suggest here that this is another area where universities can engage teachers with their research projects. For example, at the 2018 conference, Cardiff University's School's Health Research Network (SHRN) delivered a session for teachers about data they collect which is summarised in school level reports that pupils could use in their Individual Projects. Other University departments and outside organisations also showcased their research through the form of project briefs that teachers could use or develop for their own pupils. Thus, we would argue that such outreach with teachers also offer academics an alternative method of disseminating their research which also contributes toward the 'civic mission' of the University.

### **Next steps: future outreach plans with teachers of the Welsh Baccalaureate Qualification**

In light of the evidence here, the Cardiff Q-Step Centre along with the consortium in Wales, have decided that the 2019 SCC conference should focus specifically on the development of numeracy for the individual investigation part of the SCC. Specifically, the conference programme has been designed to afford teachers the opportunity to become more familiar with open access datasets and how these can be analysed using Microsoft Excel. This will enable teachers to encourage their students to engage with existing data across a range of diverse topics and to

undertake more sophisticated data analysis. One of the anticipated challenges of adopting this focus is the range of abilities among teachers. While some who deliver the Welsh Baccalaureate SCC are qualified STEM teachers (see table 3) and confident with number, the majority have had no engagement with number for several years, and may have only achieved minimum maths GCSE or the equivalent requirements at the time they qualified. While some of these teachers are keen to develop their skills, others are apprehensive (even scared) to engage with number work. Delivering to a wide spectrum of abilities presents a challenge that the team need to consider carefully.

It is important for the Cardiff Q-Step Centre and the higher education system more widely, that these teachers embrace quantitative methods in order to ensure that our future learners are better equipped for post-compulsory study and for learning, working and living in society full of big data. We suggest that it is here where university researchers have a key role to play in continued engagement work with schools. Such engagement could help Cardiff University fulfil its civic mission of engaging with all schools in Wales over the next five years (Cardiff University, 2018). The University's strategic mission underscores the role that the higher education sector has in improving educational standards and attainment. Given that the WBQ is exclusive to Wales and that the National Assembly for Wales (2019) has recently reiterated its commitment to the continuation of the qualification in the future, this gives Cardiff University a platform from which it can make a unique and valuable contribution to teaching practice. Indeed, this is further supported by the recent National Assembly for Wales (2019) report which suggests that a focus on future development of the qualification should be on the delivery of the qualification and ensuring that teachers of the qualification receive

on-going training to support its delivery. However, the findings of this paper will also be of relevance more broadly across England and Wales where the Extended Project Qualification is now being offered to pupils more widely.

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