DATA ANALYSIS AND CRITICAL THINKING SKILLS TRAINING FOR TEACHERS – THE WELSH BACCALAUREATE

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ABSTRACT

The Welsh Baccalaureate qualification has been adopted by most secondary schools within Wales. In years 12 and 13 (ages 16-18), 50% of the qualification requires students to collect primary data and also conduct secondary data analysis to write a 5000 word investigative report. To help teachers develop effective teaching strategies and resources, Welsh Government funding enabled key networking events to establish a teacher conference. This paper describes the supportive nature and potential portability of the conference to help teachers' delivery of critical thinking and data analysis skills. The impact of the conference over the last three years is also discussed, utilising delegate feedback.

Keywords: *Statistics education research; Teacher training; Teaching resources; Data analysis skills; Critical thinking skills*

1. THE WELSH BACCALAUREATE QUALIFICATION (WBQ)

1.1 THE WBQ

In 2001, the Welsh Government provided funding to pilot the Welsh Baccalaureate Qualification (WBQ) in collaboration with the main qualifications awarding body for Wales, the Welsh Joint Education Committee (WJEC) in order to "acquire knowledge, understanding and skills specific to the subject area that they want to pursue at university" (Yhnell et al., 2016). The pilot scheme was implemented in 18 centres (secondary schools and colleges) in 2003; by 2005, 31 centres were offering this qualification to their students. Due to the success and support from schools and colleges (Greatbatch, Wilmut, & Bellin, 2006), the qualification was extended and, by 2011, it was offered by over 240 secondary schools and colleges (see Yhnell et al, 2016, for this development).

A review of the WBQ (Welsh Government, 2012) highlighted many strengths, including employability skills, the broad nature of the qualification and the accommodation of academic and vocational pathways (CEIC, 2006; Yhnell et al., 2016). Yet, various concerns were expressed in this review; it suggested that, in order "to maintain the currency of the WBQ for entry into higher education, the qualification should be graded at the advanced level." Because of this critique, from 2015 onwards, candidates were moved from a pass or fail system, and instead were graded from A* to C, based on the total points obtained from these compulsory components.

To obtain the WBQ, learners must complete four challenges (WJEC, 2018):

(1) Enterprise and Employability Challenge,

(2) Global Citizenship Challenge,

(3) Community Challenge,
(4) Individual Project Challenge.

The Individual Project accounts for 50% of the qualification, which is the focus of this paper. The purpose of this Project is to develop learners' skills through carrying out a research activity. In addition, enhancing literacy, numeracy, digital literacy, planning and organisation, critical thinking and problem solving skills are core elements of this investigation. The WJEC (2018) states that

> "[the] Individual Project must be produced and presented either as a written account (3,000–5,000 words) or an artefact/product supported by written evidence (1,500–3,000 words). There are a wide range of possibilities that can be chosen as a focus for the Individual Project and learners are encouraged to explore a subject with an emphasis on future educational or career aspirations.
>
> To carry out and complete the Individual Project, learners need to develop and use a wide range of appropriate skills. In completing the project learners should recognise the importance that research plays in making informed decisions. Learners have to be encouraged to find, evaluate, analyse, communicate and use information to solve complex problems."

This is achieved by the students collecting primary data, as well as conducting secondary data analysis. The WJEC (2018) advise that learners spend 120 hours on the Individual Project. An appropriate teaching and learning programme of 40 hours aimed at developing the relevant underpinning essential and employability skills together with research and relevant practical skills should be provided.

1.2 TEACHER SKILLS

The increasing demand for teachers across many subject areas to develop numerical and statistical skills along with their own subject-specialism knowledge presents an enormous challenge for both the current teaching workforce and teacher training courses in the UK. In particular, subjects not normally associated with, or subjects that require increasing levels of statistical content at Key Stage 5 (ages 16-18), such as sociology and geography, necessitate teachers to upskill in this area (Porkess, 2013; RSS & ACME, 2015). New forms of applied mathematical and statistical content and associated pedagogical guidance could help to facilitate the essential changes needed to support teachers across disciplines.

The challenge of integrating mathematics and statistics into other curricula (a skill required to teach significant elements of the WBQ Individual Project) links to several interconnected issues. For example, mathematical and statistical subjects contain a specialised set of knowledge, use a specific lexicon, and have a pedagogic tradition that emphasises singular facts and precise tools to solve mathematical problems over broad concepts and generalisable ideas (Nikitina & Mansilla, 2003; Roth, 2014). These issues can also be said for the sciences, where Nikitina and Mansilla suggest these subjects have maintained subject boundaries for decades, or as C. P. Snow puts it, the divide between the, 'two cultures,' referring to the sciences versus the humanities. And since teachers of the WBQ are from a wide range of disciplinary areas and will be teaching their specialist subjects around their WBQ teaching, this could create a barrier, presenting difficulties for teachers not familiar with delivering unfamiliar subjects or content (for example a history teacher having to teach numerical data handling techniques).

Creating opportunities to link mathematics and statistics to social science could lead to disciplinary incongruence, perhaps due to the traditional incompatibilities in which the different subjects are taught; social-science subjects often include broad facts and generalisable ideas to explain social phenomena, which is the opposite to mathematics and statistics (Roth, 2014). These differences have a profound impact on the way these subjects are taught; humanities lend themselves to more discursive classroom activities, whereas mathematics and statistics have traditionally been delivered through didactic approaches and individual problem-solving tasks (Swan, 2005; Noyes, 2007; Roth, 2014).

Perceptions relating to the content and teaching of statistics in the UK reveal a general antipathy to the subject and lack in confidence of skills in problem solving, critical thinking and relational understanding (Skemp, 1976; Kitchen, Savage, & Williams, 1997; Minards, 2012; Ward-Penny, Johnston-Wilder, & Johnston-Wilder, 2013; Cole, 2015). Views from teachers and students in the UK, obtained from several large-scale investigations into the usefulness and engaging nature of statistics within mathematics curricula, especially at A' level, suggest the qualification as a whole is seen to leave students underprepared.

Several of the issues stated above, in relation to negative perceptions towards statistics from teachers and students, and the misalignment between humanities and sciences subjects and how they are taught, could prove to be problematic for teachers assigned to deliver the WBQ Individual Project. These teachers are also delivering a wide range of subjects (for example, physical education, mathematics, English, history, geography) within their own specialist area. However, it also provides an opportunity for universities to support teachers in developing strategies to deliver key themes linked to being able to teach research skills. Core streams within this include critical thinking and data analysis skills, which are extremely important skills needed to study statistics. This paper describes the processes involved in developing a teacher conference, to support teachers in improving their critical thinking and data analysis skills, in order to prepare them to teach the WBQ Individual Project.

1.3 REASONS FOR UNDERTAKING THE STUDY

The need for a national teacher conference to improve data analysis, critical thinking and research skills have been stated clearly, however this also provides an excellent opportunity to investigate the long-term impacts to teacher practise, for those who engage with this event.

The long-term goal of the WBQ teacher conference is to support teachers in the delivery of the Individual Project, leading to a change in teacher practise to deliver sessions that emphasise critical thinking and data-analysis skills. The accompanying research study will aid in evaluating the impact of the event, using each year's results as a proxy to inform future related events. Evaluation will come mainly in the form of a series of questionnaires, from delegates who attend the event.

The evaluation of teacher conferences and conferences more generally, have a rich literature, supporting the use of questionnaires and delegate feedback to help inform changes to future events, and to help inform other avenues for professional teacher development. (Ovando & Harris, 1993; Davis & Roblyer, 2005; Mair & Thompson, 2009; DeMonte, 2013). Several limitations reported by these articles highlight the difficulty in measuring long-term changes to teacher practise, which will have undoubtedly many other confounding variables that could influence any changes identified, as well as the problem of tracking delegates over long periods. These issues will be reflected upon in the discussion.

2. DEVELOPMENT OF THE WBQ TEACHER CONFERENCE

2.1 AIMS OF THE CONFERENCE AND KEY STAKEHOLDERS

The Welsh Baccalaureate Teacher Conference was developed and funded as part of the Research Councils UK (RCUK) School-University Partnership Initiative. Cardiff University's Schools Partnership Project (CUSP) is one of 12 universities from across the UK funded by RCUK to develop curricula-linked engagement activities. The project aimed to support researcher engagement with schools and colleges and develop effective partnership working models. The conference development was part of the University-wide Welsh Baccalaureate Project, managed centrally by CUSP. CUSP works with researchers and professional services from across the university as well as external partners to develop innovative and researcher-led engagement activities and resources. The external partners include: Welsh Government, Central

South Consortia (education training provider in Wales), WJEC, and the Education Achievement Services (education training provider in Wales). The main aims of the WBQ Teacher Conference were to engage teachers with research and research methods and to support the teaching of Individual Project in the new Welsh Baccalaureate Qualification.

Objectives for teachers:

1. To improve confidence to deliver the Individual Project.
2. To support the delivery of assessed skills within the Individual Project:
   - Critical thinking and problem solving,
   - Research methods,
   - Planning and organisation of a research project,
   - Collecting and analysing data,
   - Communicating findings.
3. To share best practice, knowledge and ideas to enable the development of a researcher-led school engagement programme.
4. To develop effective partnership working with university researchers.

Objectives for the University:

1. To provide an opportunity for university academics to engage teachers with their research and their teaching of research skills.
2. To support the introduction of the revised Welsh Baccalaureate Qualification.
3. To inform their staff of the changes to the Welsh Baccalaureate Qualification.
4. To identify areas for support and collaborative working with the education sector to support the University's key strategic aims.
5. To develop effective partnerships with schools, colleges, WJEC, Central South Consortium, and Welsh Government.

The conference started in 2015 and is now in its sixth year of delivery. A list of the full programme from 2017, along with teacher resources linked to the sessions delivered and hand-outs distributed for 2015-2017, are available online (CU WBQ, 2018).

2.2 WORKING GROUPS AND WORKSHOP DEVELOPMENTS

The conference was coordinated and managed by the CUSP team and this author, former Lecturer in Quantitative Methods at the School of Social Sciences at Cardiff University. An event-based team, made up of postgraduate students and professional staff, contributed to the event delivery. Tasks undertaken included:

- Development of the programme for the event;
- Arranged training and support of researchers presenting at the event;
- Development of an evaluation toolkit and producing an evaluation report;
- Organisation of the whole event logistics;
- Public relations and marketing.

Prior to the event, the project team set up training sessions for workshop presenters, delivered by a WJEC advisory teacher for the Welsh Baccalaureate Individual Project. These sessions involved sharing ideas for workshop topics, deciding which types of skills were most needed by teachers for the Individual Project. This also ensured the workshop leads were informed of the changes made to the WBQ in 2015, and understood how their knowledge and research could support the development of skills for teachers. This in turn could then be used to inform teacher development of resources and associated pedagogies to deliver key elements of the Individual Project. In addition to Cardiff University staff, the conference was developed in partnership with the WJEC and Welsh Government who provided an advisory teacher and gave

advice on the programme for the day, promoted the event, and delivered a keynote speech. Table 1 illustrates the topics and the variety of the workshops at the 2017 WBQ Teacher Conference.

Table 1. Workshops delivered in the 2017 WBQ Teacher Conference

Fun Times with Data Analysis and Presentation Rhys Jones (Social Sc.)
This session provides teachers with ready to go worksheets, with reference to data collection, analysis and presentation. It focuses on how to collect quantitative and some qualitative data, as well as how it should be best analysed and presented. This is a hands-on workshop, where participants are taking part in group work for the majority of the session.

Developing Critical Thinking Skills: "Is this information Reliable" Henrietta Standley (Biosc.)
Critical thinking is one of the 'essential and employability' skills of the Advanced Welsh Baccalaureate. During their research for the Individual Project, students need to critically assess multiple sources of information, and determine to what extent sources are current, valid and reliable. Equally as important, students need to cite and reference these sources consistently and accurately in their written reports. This workshop session incorporates two exercises that can be adapted for use in the classroom.

Critical Thinking in the Context of a Research Project Alison Wray (English & Philosophy)
Critically engaging with information is vital for successful research, particularly in the current context of 'Fake News'. One has to develop techniques for determining which claims 'out there' are most plausible, and what it means to look for the 'facts'. This workshop provides some basic pointers for helping students gain confidence and experience in asking questions about what they read. A knock-on effect is that they become more discerning about the quality of their own arguments when they write.

Research Skills and the Individual Investigation Charlotte Brookfield (Social Sc.)
This workshop aims to cover some key research skills necessary for students undertaking their individual investigation project. The first half of this workshop introduces the research process and offers some guidance on how to plan a research project. Following this, the workshop explores different sampling techniques and specifically the advantages and disadvantages of probability and non-probability samples. This workshop includes resources and activities that may be beneficial for teachers delivering lessons on the individual investigation.

Getting Creative with Social Science Research Emma Renold (Social Sc.)
Social Science research is increasingly turning towards arts-based methods to understand and address social problems. This session outlines the benefits of a creative approach to research; how arts-based methods can be used in a creative research design; and how an arts-based, creative research project is especially effective for young people researching sensitive issues. Almost any art form can be used, across qualitative and quantitative paradigms and at any point in the research process. However, what makes these research methods 'creative' is when uncertainty and curiosity is folded into the mix.

Asking Good Questions – Designing Survey Projects Luke Sloan (Social Sc.)
This workshop explores how to ask good questions, both in terms of framing research projects when moving from an area of interest, to a refined research question and hypotheses, and also when designing data collection questions for surveys. Students often struggle when trying to adapt an interesting topic for independent empirical study, so we look at what makes a good research question as well as the common pitfalls (including some fun exercises you can run with your students). We then move on to designing survey items, focusing on the importance of clearly defining the concept that is to be measured.

Research Skills for the Individual Project Sion Llewelyn Jones (Social Sc.)
This workshop focuses on research skills – skills which are essential in order to succeed in the Individual project. This workshop goes through the process of doing a research project and discusses different aspects of research, such as developing research questions, choosing research methods and analysing data. This workshop provides participants with the opportunity to ask any questions related to conducting a research project.

Research, Teachers and Pupils: Linking Universities with the Classroom Ceri Morris & Clare Deane (Social Sc.)
This session explores how university and classroom research can be used to improve practices, as well as to train pupils and students in the art and craft of research. We explain the relevance of impact and engagement, discuss the significance of the position of the enquirer, and give some examples from both university and school based research that support teaching research methods for pupils and students.

Each year, the conference was a day in length and started at 9 a.m. and then finished at approximately 4 p.m. The aims of the workshops, each lasting an hour, were to practically show teachers how to teach research skills, mainly critical thinking and data analysis skills. Workshop leaders were reminded that their sessions needed to be as interactive as possible, so teachers could envisage how they may adapt the activities and content delivered into their own teaching of the Individual Project. Teachers chose the workshops, which were delivered twice to enable teachers to follow the workshop of their choice. In addition, all workshop teacher resources were made available online, so teachers could look at other workshops they have not been able to attend. Across the years, the presenters stayed more or less the same, with representation from academics and postgraduate students in the Cardiff Schools of Biosciences, English Communication and Philosophy, and Social Sciences. The number of workshops increased from four (2015) to eight (2016 and 2017). The presenters invested an estimated time of preparation and delivery of 30 hours.

3. METHODS USED TO EVALUATE THE WBQ TEACHER CONFERENCE

From 2015-2017, 251 delegates (not including presenters or working group members) attended the WBQ Teacher Conference. This was spread out roughly equally across the three years of delivery of the event. In terms of geographical location, an increasing number of delegates travelled from North Wales, which in turn developed the conference into a national annual event. This necessitated the introduction of a workshop being delivered through the medium of Welsh, to facilitate the growing attendance of WBQ teachers from Welsh medium schools in North Wales. This workshop was added in 2017 to accommodate the requests made by WBQ teachers. In 2015, 63% of the delegates were teachers directly involved in the WBQ, with the remainder being senior management from schools and colleges. This increased to 86% in 2016 and 82% in 2017.

Questionnaires were used throughout the three years of event delivery, to obtain delegate feedback (see Appendix 1). Questionnaires have been used widely by a variety of research groups as a legitimate research tool, to explore attitudes more generally (Boynton & Greenhalgh, 2004; Mincemoyer & Perkins, 2005; Trautwein, Lüdtke, Marsh, Köller, & Baumert, 2006; Croasmun and Ostrom, 2011; Majeed, Darmawan, & Lynch, 2013; Lee and Chapman, 2013; Williams *et al*. 2016). The use of questionnaires to gain delegate feedback have also been used widely in a variety of teacher conferences, and conferences more generally in the USA and UK (Ovando & Harris, 1993; Davis & Roblyer, 2005; Mair & Thompson, 2009; DeMonte, 2013)

4. RESULTS

4.1 TEACHER FEEDBACK

Across the three years of delivery, delegate feedback was obtained via an evaluation form developed by a postgraduate student specialising in quantitative methods, (Appendix 1). Attendance at the workshops was roughly equally split, across the three years. The workshops were assessed on a five-point Likert scale, 1 = not at all relevant, 2 = irrelevant, 3 = neither relevant nor irrelevant, 4 = relevant, and 5 = very relevant. Delegate response rate in terms of handing in the questionnaire was 71% in 2015, 65% in 2016, and 75% in 2017. The rating relevant or very relevant varied from 95 to 92 to 96% during 2015-17. Qualitative feedback provided a detailed description of the usefulness of the event, including identification of areas for improvement. The feedback was used to improve delivery of subsequent events. Since many of the delegates returned each year (as stated in the delegate evaluation form), we were able to flag up areas that we had addressed in relation their comments.

2015 Event For the 2015 event – The key words used to describe the value were mainly positive, with 78 comments being made, of which 68 were positive and the remainder were negative, or suggested improvements that could be made. Many of the teachers commented on the relevance and the usefulness of the day. Many found the day reassuring and commented on the friendly environment of the conference. It was also said that the conference was well organised. The key way in which they felt the conference could be improved was by having access to the materials used in all the workshops. Secondly, there was some concern that the content of the workshops was only pitched at those of higher abilities and not suitable for those not planning to go to university. Key words and comments used to describe the day included:

- Useful, resourceful;
- Relevant and worthwhile;
- Informative, relevant;
- Inspirational;
- Research, critical thinking, independence;
- Useful, Research, networking – collaborative;
- Useful, informative, relative.

Several of the qualitative comments from delegates of the 2015 event stated:
"Critical Thinking was particularly insightful."
"Could we have the power points used please?"
"Plenary speaker not entirely useful."
"Practical application of theoretical aspects, ideas for teaching and learning."
"Accessible material that can be used with students. Relevant and focused material."
"Critical thinking was very clear and useful. Social data – thought provoking and shows what a challenge the new individual project is going to be."
"The lecturers were very knowledgeable in terms of the Baccalaureate and were presenting exceptionally good and interesting topics."

2016 Event For the 2016 event – delegates stressed a preference for workshops with practical resources that could help them with teaching the WBQ. In particular, the delegates gave very positive feedback for workshops that used lots of examples and ideas to inform their teaching of the Individual Project. Of the 91 comments that were made, 84 of these were positive, with the remainder being negative or suggesting improvements. The delegates commented on the good delivery of all workshops and said that they were both engaging and useful. There was some criticism that some workshops repeated material delivered in the 2015 conference, which led delegates to doubt the purpose and utility of future events. The delegates felt that some of the workshops were pitched at too high a level and did not provide relevant resources for school teaching. The delegates would have appreciated more explicit examples or greater support offered in some of the workshops.

2017 Event For the 2017 event – The qualitative comments about the workshops stressed a preference for workshops which provided teaching resources or practical activities that could be used in the classroom. Of the 85 comments that were received, 78 were positive, and the remainder were negative or suggested specific improvements. Several comments stated:

"The fun times workshop provided practical examples that can be used in schools."
"Really helpful to be able to visualise using resource sessions."
"All of the speakers contributed something to the conference that I feel I can use in the classroom."
"Perhaps some could have been more interactive. Very useful information on how to carry out research effectively, which will support me in my own research tasks and also support teachers."

Delegates struggled more to see how they could apply the ideas in 'Getting Creative with Social Science Research' and 'Research, Teachers and Pupils: Linking Universities with the Classroom' to the classroom environment:

"Last workshop very friendly but not much use in the context of teaching WBQ"
"The creative one was difficult to put into context of the advanced final report"
"Will find it difficult to use some creativity skills"

There was some slight criticism that the majority of the workshops focused on the Individual Project. Delegates asked for future conferences to have workshops addressing each of the challenges and a wider variety of workshops:

4.2 IMPACT OF THE WBQ TEACHER CONFERENCE

The WBQ Teacher Conference was received extremely well across the three years of delivery. In terms of impact and actual differences made on teacher practice/teaching of the WBQ Individual Project, emails received by the delivery team and event manager gave a glimpse into this. Below is a small sample across the three years:

Comment 1
"Every workshop/keynote sparked many ideas for moving forward with the Welsh Bac. The whole day was excellent – we left feeling we had learnt such a lot. I have just been reading through my notes and wanted to ask you to pass on my thanks to the workshop facilitators. What struck me most was the emphasis on the underpinning skills (critical thinking, analysing data to name a couple) – this is so important and something I feel we need to develop in Further Education (FE) particularly (whether or not a learner progresses to university). As I mentioned, we are part of a Colegau Cymru Project Team, where we are developing a CPD programme for FE teachers. This is to support the transition to the new Welsh Bac, Maths/English GCSEs and Essential Skills. […] are you willing to meet with us to look at ways we might link up further?"

Comment 2
"The resources are fantastic – thank you very much! It'll be a busy summer for me putting together a coherent learning programme for the individual investigation, and these presentations will be a great help. Would it be an idea to offer short courses on critical thinking or on designing research projects to teachers? What about offering evening courses to teachers, and to able children?

Comment 3
"Thank you very much for another excellent day delivering just what is needed for the Advanced Investigation Project Challenge. The workshops hit the nail on the head for teachers and gave just the right level of skills, knowledge and direction for schools and colleges to achieve A* with their learners if the work is delivered properly with enthusiasm."

Comment 4
"In the [conference] I attended your session on the use of questionnaires in research which I found fascinating. […] The responses from other teachers were very positive as you demonstrated very clearly the pitfalls and advantages of a properly constructed advanced questionnaire. […] As a result, I wonder if you would be available to speak to our next […] Network. The Bridgend Network consists of Welsh Baccalaureate Heads of Department from every school in the authority as well as two schools from other authorities. […] We meet to share good practice and your contribution to the use of questionnaires in the Advanced Welsh Baccalaureate would be much appreciated."

Themes began to emerge from an analysis of the qualitative data, using thematic analysis to identify recurring patterns in the qualitative comments (Braun & Clarke, 2006). Frequent comments included a reduction in teacher preparation for classroom activities in teaching the Individual Project, opportunities to network with other schools, colleges and education training providers, as well as requests for further workshops.

Over the three years, the event gained national recognition, demonstrated by an increasing number of delegates from North Wales. In addition, the Welsh education minister commented on the success of the event. The Vice Chancellor and Pro-Vice Chancellor also commented on the success in supporting teachers to deliver and inspire future researchers in schools and colleges. The event manager also wrote an article in a national newspaper in 2016, highlighting the aims of the event, as well as the impact. Because of the positive feedback, and recognition from WG, external funding from the Central South Consortia was obtained to run the event in 2017. In addition, the Central South Consortia commissioned the Cardiff School of Social Sciences to develop a masters module to help develop pedagogical approaches for teaching research skills. This module is currently in a pilot phase, with a small cohort of teachers currently enrolled on the course.

5. CONCLUSIONS

We summarise our experience with the organisation of teacher training programme with a discussion on limitations and an outlook on the possibility of a transfer of our approach to improve teachers' background.

5.1 DISCUSSION AND LIMITATIONS

There was a clear need to develop teachers' critical thinking and data analysis skills throughout Wales. This need resulted in the creation of a teacher conference that aimed to support teachers deliver essential components of the WBQ Individual Project. It is evident, from delegate's feedback that teachers appear to be gaining confidence in being able to structure their teaching of the Individual Project, supplemented with resources prepared by workshop leaders.

The long-term goals of this event have been achieved because of the cyclic action of gathering delegate feedback, reacting to feedback that suggested improvements for future events, and then continuing to gain more feedback to begin the cycle again. However, tracking changes to teacher practise proved a lot more difficult to obtain throughout the course of the research study. Attempts to interview WBQ teachers, asking for further feedback after the event, were mostly unanswered, with next to no data to analyse. Long-term changes to teacher practise to one-off annual events are difficult to measure and extremely time consuming, as reported by others researching this area (Ovando & Harris, 1993; Davis & Roblyer, 2005; Mair & Thompson, 2009; DeMonte, 2013).

An unanticipated outcome from the three years of delivery was the formation of networks of WBQ teachers throughout Wales, to support each other in creating resources to help deliver the qualification. Anecdotal evidence, in the form of twitter messages and emails, suggest that this event helped to foster the practise of sharing resources. One message in particular referred to the delegates of the event as a WBQ family, which to me really emphasises the inclusive and supportive nature that we were trying to foster over the three years. These networks of WBQ teachers could help to facilitate research into ascertaining if there has been any change in teacher practise of this qualification (using focus groups for example or collecting observational data of WBQ Individual Project classes over time), as a result of events like the conference described in this paper. It could also be extended to understand why certain teachers of the WBQ do not engage with events to develop their professional skills, with the aim to look for ways to support all teachers of the WBQ.

5.2 PORTABILITY OF THE WBQ TEACHER CONFERENCE

This paper has outlined the processes, subsequent delivery and evaluative methods, and impact of a national teacher conference to help support and change teachers' practise in delivering the Individual Project as part of the WBQ. While there is no concrete data to support this finding, anecdotal evidence from delegates via emails, telephone conversations, meetings, and the creation of WBQ networks to foster resource sharing, help to support this conclusion. The core themes addressed during the conference, across the three years of delivery, included critical thinking and data analysis skills.

For others wanting to adopt a similar style of conference outlined in this paper, several key considerations are listed below. These are generic points that can be used for teacher conferences across all educational levels and subjects.

- Form an initial working group with the key stakeholders of the conference. This group should consider funding requirements and ideas on who is going to provide this.
- A clear outline of the aims and objects of the conference. Is there a need for it on a national or local level?
- Once a need has been established, recruit teachers identified as being lead practitioners in the area, to support development of the conference programme.
- Identify workshop leads and working groups to support the logistical operations of the conference.
- Provide guidance to workshop leads, and ensure they are informed by the lead practitioners in the qualification for the conference being developed to support teacher training.
- Ensure key stakeholders are given the opportunity to speak at the event, which helps to legitimise it as being supported by an awarding body or national training provider.
- Ensure to have suitable evaluation tools, and learn from them for subsequent events. Use the feedback to feed forward, make tweaks to future events. And ensure to highlight this at future events to flag up the response to previous feedback.
- For each event produce a report, highlighting all the steps mentioned above. This report can then be used as evidence to demonstrate the impact of the event, and also help in securing future funds to run additional events.

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APPENDIX: QUESTIONNAIRE USED FOR EVALUATION 2016

We are interested in finding out your opinions about today's event and would be grateful if you complete the following short questionnaire. ***(Welsh copies of this questionnaire are available upon request.)***

Subject(s) and Key Stage(s) Taught:
(If applicable)

Teach Welsh Baccalaureate:
(If applicable)

- ❍ Yes
- ❍ No

Which four workshops did you attend?
(Please tick three)

- ❍ Dr Sheila Amici-Dargan: Flexible teaching resources for science projects
- ❍ Dr Honor Young: Designing a research project – key aspects and pitfalls
- ❍ Dr Huw Williams: The use and abuse of theory- critical thinking
- ❍ Dr Henrietta Standley: Developing Critical thinking in the Biosciences
- ❍ Cara Jones: Critical data: Questionnaire Design
- ❍ Tracy Eastment: Inspiring learners and building confidence
- ❍ Dr Ian Jones: State of Youth: How to teach Research Skills in the Classroom
- ❍ Rebecca Mogg: Finding and evaluating the evidence

How useful did you find the workshops?

- ❍ Very Relevant
- ❍ Relevant
- ❍ Neither Relevant nor Irrelevant
- ❍ Irrelevant
- ❍ Not at all Relevant

Please add any further comments that you have about the workshops that you attended
Which of the following forum stands did you attend?

- ❍ Cardiff University (CU) Prime Centre and DECIPHeR
- ❍ CU Higher Education Roadshow
- ❍ CU Health Research Network DECIPHeR
- ❍ CU School of Geography and Planning
- ❍ CU Welsh School of Architecture
- ❍ CU School of Medicine
- ❍ Amgueddfa Cymru – National Museum Wales
- ❍ The FirstBite Project
- ❍ National Assembly of Wales – Education and Youth Engagement Service
- ❍ See Science
- ❍ Welsh Government –Curriculum Division
- ❍ WJEC – Welsh Baccalaureate Team

How useful did you find the forum stands?

- ❍ Very Relevant
- ❍ Relevant
- ❍ Neither Relevant nor Irrelevant
- ❍ Irrelevant
- ❍ Not at all Relevant

Please add any further specific comments that you have about the forum stands

Which key words would you use to describe the value of the day?

What do you think were the most successful aspects of the day, and why?

How could the day have been improved?

Please indicate your priority for further help, on a scale of 1–5 (where 1 is your top priority), for each of the following aspects of the Welsh Baccalaureate:

Employability and Enterprise	☐
Community Engagement	☐
Research Design	☐
Global Citizenship	☐
Critical Thinking	☐

What would you like Cardiff University to do to follow up on today's event?

Would an online forum for Welsh Baccalaureate teachers be useful?

- ❍ Yes
- ❍ No

Would you attend a similar event in the future?

- ❍ Yes
- ❍ No

What other CPD opportunities could Cardiff University offer practising teachers? *(Not specifically Welsh Baccalaureate)*

Any further comments or feedback: