

An Exploration of Secondary Teachers' Perception of the Role of a Teacher and its Impact on Questioning within an Epistemic Insight¹ Lesson.

Students and teachers are first and foremost, humans, and thus, they are subject to the same subtle, subconscious biases as the rest of us. Traditionally, if a teacher were to steer the topic of the conversation toward their own subject, it would be considered a virtue, a necessity, of the learning environment. However, as we explore the benefits of breaking down 'silo learning' – defined as considering subjects in isolation or 'silos' (Zahradnik, 2018) – we must too consider whether the questions teachers ask are themselves subject to this same silo model. Modern education teaches students “via a compartmentalised system of individual curriculum boxes” (Billingsley, 2017, p. 59), meaning students are conditioned to think of single subjects according to their timetabled lesson. Whilst it is necessary for students to be able to explore the thought processes, questions, and methods of a solitary discipline there are drawbacks to adopting only this compartmentalised approach. “Pedagogically, secondary education today tends towards compartmentalisation” (Billingsley & Ramos Arias, 2017, p. 44), and this occurs not just with the timetable of individual subject slots mentioned above, but is also evident “in [single discipline] textbooks” and the subject specialised “types of rooms within which students learn” (Billingsley & Fraser, 2018, p. 1109). This creation of 'silos' confining subjects into singular disciplines can lead to barriers that “dampen students' expressed interest” and “limit opportunities for them to learn about the strengths and limitations [of disciplines] in real-world contexts and multidisciplinary arenas” (Billingsley, et al., 2018, p. 1117). These barriers are what we seek to remove through using EI as the curriculum goal of our education.

It is, therefore, crucial to understand the extent to which teachers, knowingly or otherwise, steer valuable cross-curricular opportunities down a path of subject segregation

¹ Henceforth referred to solely as EI, epistemic insight refers to 'knowledge about knowledge' (Billingsley & Ramos Arias, 2017).

themselves, depriving students of the virtues research suggests a multi-subject curriculum could offer (Barnes, 2015) (Billingsley, 2017). Indeed, it may even be the case that the teacher themselves unwittingly traps the narrative of a lesson within their specialism, refusing to permit the full exploration of ‘Big Questions’ and hampering the effectiveness of EI on pupils’ conceptual understanding (Barnes, 2015) (Perkins, 1993). An EI approach incorporates cross-curricular learning strategies to explore topics from multi-disciplinary perspectives. These cross-curricular pedagogies can be effectively used to “motivate, sustain, be meaningful and socially satisfying [to students]” (Barnes, 2015, p. 264). Without tearing down the current compartmentalisation of the curriculum, and allowing lessons to span multiple disciplines, we risk missing out on these benefits. Therefore, the aim of this study is to discover the way teachers perceive their role as either subject specialists or general educators, and to explore the impact this may have upon the questions they ask, and thus the level to which teachers themselves present a barrier to a future cross-subject curriculum.

Literature Review

To direct the focus of this study, it is important to look at current literature in this area. To date, there has been much research into EI with a focus on compartmentalised education, but no research has yet looked at whether teachers also compartmentalise within supposedly cross-curricular lessons. Further to this, research into EI has become more prevalent, with the UK government providing funding for this area to be further explored with a potential educational reform stemming from it.

To begin, let’s first consider what we understand about compartmentalised education. This is defined as “the creation of rigid boundaries between subject disciplines that make it difficult, if not impossible, for students to bridge those disciplines” (Billingsley & Ramos Arias, 2017). This creates an issue whereby students are unable to see the relevance of content outside of its own subject, hindering their ability to use and apply it in other

disciplines, or practically later in life. As Perkins (1993), a leading proponent of teaching for understanding argues, the purpose of education must be “to aim for active use of knowledge and skill”, and so if we fail to equip our students with an understanding of how their skills and knowledge interlink in context, we are failing to deliver on their education. To further this point, the OECD defines learning competency, giving a clear directive to those responsible for students’ education, as:

“The concept of competency implies more than just the acquisition of knowledge and skills; it involves the mobilisation of knowledge, skills, attitudes and values to meet complex demands [...] Epistemic knowledge, or knowledge about the disciplines, such as knowing how to think like a mathematician, historian or scientist, will also be significant, enabling students to extend their disciplinary knowledge.” (OECD, 2018, p. 5)

Thus, if we are to deliver on the myriad payoffs of a future curriculum in which students recognise and can implement cross-curricular knowledge and skills and can begin to apply those to real-world situations, then it is imperative that teachers aid students in making those connections. Something which is impossible to do if teachers hold an uncorrected bias towards monodisciplinary approaches to cross-curricular learning.

We can draw on some fascinating themes permeating studies that offer insight into the effects of an integrated learning curriculum on pupil understanding and motivation. The conclusions of studies into de-compartmentalised education show “in nearly every instance” students achieved “as well or better on standardised achievement tests” than those taught in a compartmentalised curriculum (Vars, 1991). Hence, as the future of education looks towards a widescale implementation of some level of inter-disciplinary curriculum, we must develop strategies that support this move, and cement student’s long-term progress.

It's also pivotal to examine the impact of a teacher within a classroom to understand the power of teacher's questions to limit the cross-curricular nature of an EI lesson. Foucault (1982) wrote about three key concepts: Power, Knowledge, and Self, and their impact on shaping individuals and their own self-perception. Foucault (1982) argues that teachers, along with many other authority figures, exert a powerful influence over their students through what he coined 'Technologies of Power' which "determine the conduct of individuals and submit them to certain ends". This would, therefore, suggest that any bias, subconscious or otherwise, of a teacher, would have a profound influence on their pupils. If teachers only lead discussion in their subject area, how can we expect students to break this mould and develop cross-curricular understanding, such is the aim of EI (Barnes, 2015)? It is thus vital we explore the existence of such a bias to improve the efficacy of any EI teaching.

Foucault (1982, p. 787) also described how power and knowledge impact upon teaching and learning to form what he called "blocks of capacity-communication-power", linking to the idea of education through subjection – students learn under the directed control of the teacher. This is best explored through Foucault's (1969, p. 54) adoption of the term 'discourse' which he took to be "practices that systematically form the objects of which they speak". To this end, we can view discourse as a social construct that produces meaning and knowledge within a structure or an 'episteme' (Foucault, 1969). We can infer from the ideas of Power and Knowledge explored previously, and this definition of discourse, that discourses derive from power present within society. This power prescribes its own rules and compartmentalises knowledge within a discourse to suit its framework. In relation to education, this portrays the idea that institutions, such as schools or government departments for education, in positions of power define the boundaries within which a teacher's discourse can operate to educate their students. Therefore, we must be conscious of what Foucault (1969) proposes through discourse analysis. It is essential to seek to question the

confinements placed upon discourse to free it to form relations with other discourses and interlink knowledge for our students. After all, this is our accepted definition of the purpose of education when we subscribe to an epistemic school of teaching.

In considering Foucault's (1969) ideologies above we strengthen our expected impact of the teacher as a focal point through which a lesson is received by students. No matter how well constructed the inter-disciplinary links are within a lesson, teacher questioning holds the balance of power to lead the students to either access those links or refute them (Foucault, 1982). Despite this it has also been reasoned that "power relations are seldom one-sided" and are "in most instances reciprocal" and it, therefore, follows that "those who exercise power in the school are caught up in and subjected by its functions" (Deacon, 2006, p. 184). This supports our knowledge surrounding compartmentalised education by suggesting that teachers, exerting their power within education, are often confined by educational constraints themselves, transferring the barriers forming the subject silo's down the power chain to the students in their lessons.

These ideas were representative of Foucault's, a controversial philosopher, view some 35+ years ago, and as such may not be wholly relevant today (Faubion, 2019). This research aims, therefore, to discover the extent to which Foucault's belief that teachers are defined as subjects by their schools, and ipso facto their governments, educational structure, is true within modern education, and by extension whether the predefined structure of discourses hinders the ability of a teacher to execute an epistemological curriculum through inter-disciplinary teaching.

Methodology

The fundamental question at the heart of this research revolves around whether there is teacher-led compartmentalisation that hinders the efficacy of a cross-curricular approach to learning. Therefore, it is imperative to gather a picture of what perceptions teachers have as

to their role in a classroom. Are they there to teach their subject only, or to foster the general education of their pupils across many subjects? Thus, a quantitative questionnaire was designed to gather the extent to which secondary teachers agreed with statements about their role in education, and what they considered their subject specialism. The use of quantitative, over qualitative, data allows for a more generalised response from a large sample size, in which the results are more easily compared to identify patterns (Choy, 2014). As the quantitative data was “collected rigorously, using the appropriate methods and analysed critically” we can be sure of its reliability, another advantage over using qualitative data collection methods (ACAPS, 2012, p. 6). This questionnaire was sent, and responses collected electronically, to teachers from both comprehensive and selective schools in Kent.

The results of this survey require context to give more relevance to the conclusions we can infer from them and so a ‘Big Question’ – “Will we ever bring back dinosaurs? Should we?” – was posed in 25-minute form times for students in Years 7-10, with a planned focus on exploring the question through multiple disciplines. An ethnographic study was then carried out, informed by the results from the questionnaire, to observe and form theories as to the paradigm formed under the direction of the teacher. This research will focus on a naturalistic approach, as opposed to the positivistic approach, serving as a description of what occurred. Inductive reasoning will then formulate the basis of analysis, knowing what happened and working back to the preconceptions highlighted in the questionnaire. The research intends to “create as vivid a reconstruction as possible of the culture or groups being studied” (LeCompte & Preissle, 1993, p. 235). It is important to ensure the research avoids “predetermining responses” in how the EI lesson is set up because the teachers themselves “have the emic, native cultural knowledge” (Spindler & Spindler, 1992, p. 74). To that end, the teachers were not informed of the purpose of my observations and were instead told my research would focus on the teaching of ‘Big Questions’. In order to ensure consistency, and

therefore increase the validity of the observations made, teachers were provided with a structure prior to the session controlling how the session would run, as suggested by (Frank, 1999). The only variable left for the teachers to decide themselves was on the direction they steered the research and discussion, which was recorded.

This raised an ethical consideration as to whether the teachers could offer informed consent without knowledge of the specific research and how the observations of them would be used. To counter this, Heads of Year were fully informed of the plan and consented, and the teachers themselves were briefed on what would happen if they participated. Every participant knew they had the right to decide to withdraw at any point. Upon completion of my observations, all participants were then informed of the full extent of the research and asked again if they were still willing to participate, giving their informed consent after the observation via signed consent forms, collated in Appendix 1.

Analysis of Data

The first aim of the study is to identify whether, and to what extent, there exists a bias amongst teachers towards their own subject when considering an inter-disciplinary approach to their teaching practice. To this aim, teachers were asked to complete a survey indicating their level of agreement with a range of statements about the role of a teacher relating to their subject and questioning. The responses have been collated below in Figure 1 and represented visually in the graph in Figure 2.

Question Number	Question	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1	The role of a teacher is primarily to teach their subject	5%	10%	7%	55%	24%
2	Teachers are responsible for the general education of their students	0%	2%	7%	67%	24%
3	Teachers cannot be expected to answer questions from subjects other than their own	7%	67%	19%	5%	2%
4	I (would) ask questions from a variety of subjects in a lesson if they are relevant to the topic	0%	5%	2%	64%	29%
5	I only tend to ask questions that are founded in my subject specialism	19%	38%	14%	26%	2%
6	Teachers are responsible for encouraging student questioning across all subjects, not just the teacher's own	0%	5%	12%	52%	31%
7	My own subject has relevance in other subject curricula	0%	0%	0%	40%	60%
8	Other subjects have relevance within my subject's curriculum	0%	0%	0%	52%	48%
9	I use cross-curricular approaches in my teaching	5%	0%	7%	60%	29%
10	I would be comfortable with students asking me questions outside of my subject specialism	2%	2%	12%	50%	33%
11	I consider myself to be a subject specialist first and a teacher second	7%	36%	19%	24%	14%

Figure 1 A table showing the results of the initial survey of teachers

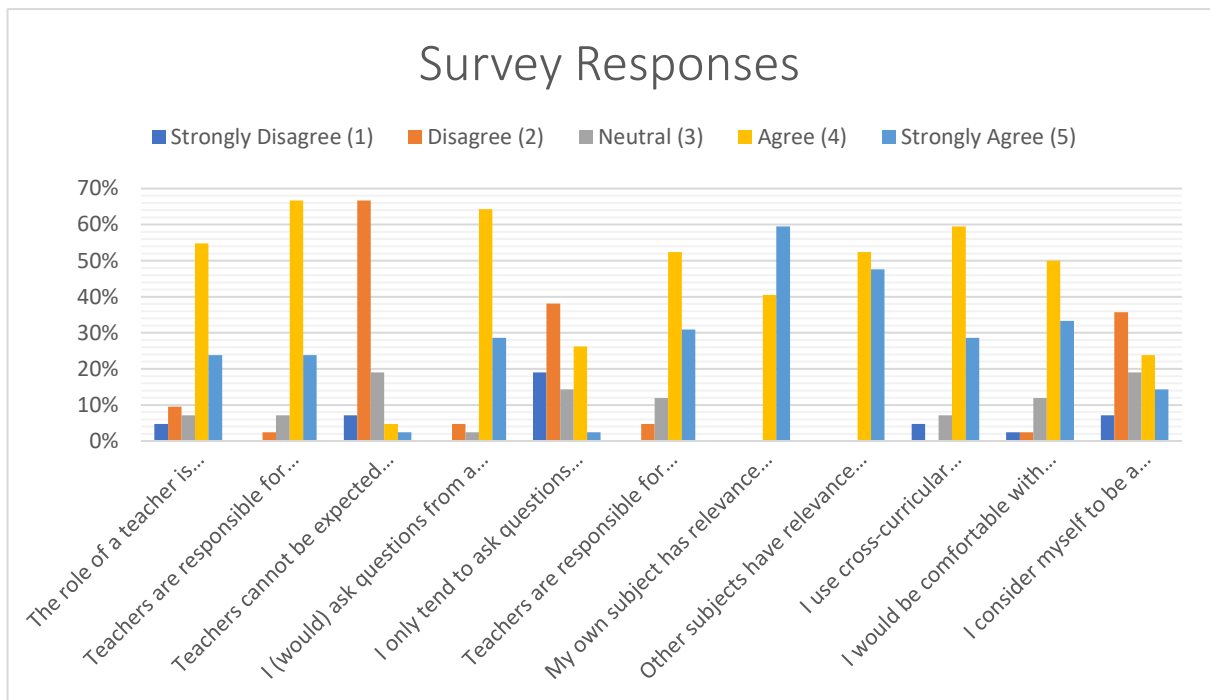


Figure 2 A graph representing the data from Figure 1

We can use a process of inductive reasoning to work from the responses to form hypotheses of the perceptions teachers as general hold regarding their role. Given the questions asked are slightly leading in the sense that it is difficult to disagree with many of them, the most interesting aspect of the response data is that the degree to which teachers agreed with statements diminished when they answered about their subject as opposed to other subjects. This is most clearly apparent if we look at questions 7 and 8 from Figure 1. In their replies, teachers agreed unilaterally that both their subject had relevance in other curricula, and other subjects had relevance in their own subject's curriculum. However, the degree to which they reported agreeing decreased when admitting the relevance of other subjects to their own, compared with when we reverse it. This not only suggests that teachers do hold a bias, but also that this bias may be subconscious as teachers still agreed, just to a lesser extent. Teachers also responded very positively to questions 4, 5, 6, 9, and 10. These questions explored a teacher's receptiveness and propensity to carry out cross-curricular techniques to create interdisciplinary learning for their pupils. Overall, we can conclude from

this that the teachers have the desire to enact the practices proposed in adopting an epistemic insight approach, and thus will not be a barrier to executing the planned session. Therefore, if the observations do reveal teachers focusing on one or two disciplines, we can attribute this to the subconscious bias towards their subject identified from the survey.

To apply these preliminary findings about what preconceptions teachers have towards epistemic insight and cross-curricular learning, we must turn to the form sessions observed. Four teachers were chosen and consented to take part in the study, targeting four key demographics of teacher – (1) A teacher of a subject with a distinct relationship to the question; (2) A teacher of a subject with no apparent relationship to the question; (3) A teacher who regularly practices cross-curricular approaches; (4) A teacher with no experience with cross-curricular strategies². The aim of this was to repeat the observations to increase the reliability of the inferences to be made from the sessions; however, this was not possible due to the school closure caused by COVID-19. Thus, we must take caution of the conclusions drawn and use them to direct further research into the field rather than accept them without due scrutiny.

Appendix 2 shows the lesson plan given to each teacher who delivered a session, and Appendix 3 details the notes made during the study, from which the inferences will be made, including the teachers' interpretations of the successes and barriers to cross-curricular learning in a post-session debrief. Below, Figure 3 and Figure 4 outline the disciplines that were discussed during each session, how many times they were used, and how many times this was at the direction of the teacher. For the purposes of this study, a discipline was taken to be directed by the teacher if the teacher asked a student a question focused in one discipline, if the teacher assigned a group a focus limited to a discipline, or if the teacher

² These will be henceforth referred to by their subject specialism. So, (1) will now be Geography; (2) will be Philosophy; (3) will be Computer Science; and (4) will be History.

responded to the class using a single discipline that immediately triggered a response in the same discipline. It was not taken that a teacher-directed discussion towards a discipline for subsequent responses to a student point as a continuation within the same discipline.

Discipline	Number of Occurrences				Number of occurrences directed by teacher			
	Geography	Philosophy	Computer Science	History	Geography	Philosophy	Computer Science	History
Science	4	6	8	7	3	4	3	5
Philosophy	0	3	0	0	0	2	0	0
Computer Science	0	2	0	0	0	0	0	0
Geography	6	2	6	5	5	0	2	2
Business/Economics	1	1	3	0	0	0	2	0
Ethics	1	2	5	0	0	1	3	0
History	2	0	6	5	1	0	3	3
Maths	1*	0	0	0	0	0	0	0

Figure 3 A table showing the frequency of disciplines and the frequency of teacher direction

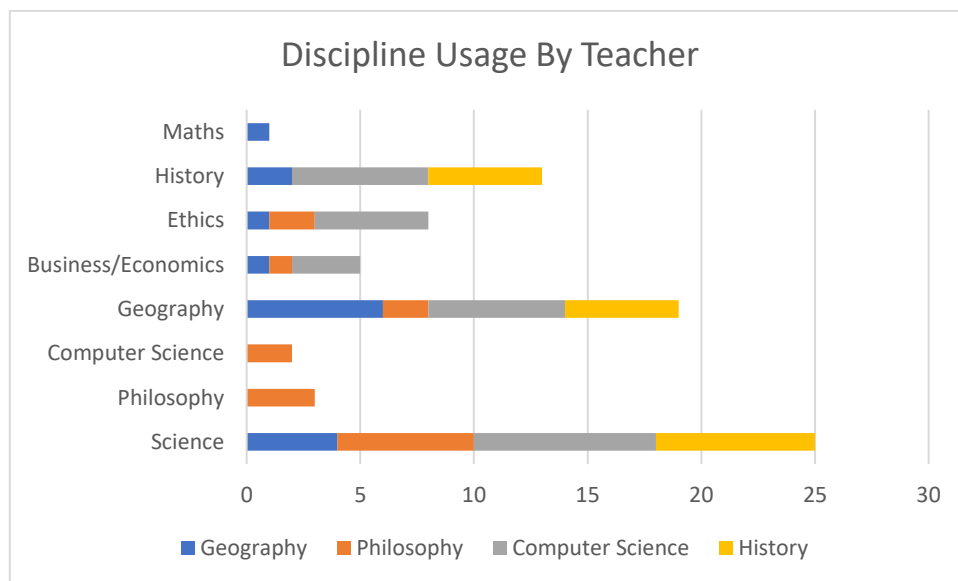


Figure 4 A graph showing the overall frequency of each discipline by teacher

Some immediately notable conclusions can be gathered from this data. The most apparent is perhaps in looking at the bars for Philosophy and Computer Science. These topics were only discussed in the Philosophy teacher’s session. Now for philosophy, this is understandable, the expectation is that education is compartmentalised into subject silos and

teachers are confined to operate within silos themselves through power relationships, be that schools or governments, in the form of the National Curriculum (Foucault, 1982). However, what is less obvious is why computer science was featured here and not in the session directed by the computer science teacher. We can surmise by looking at the teacher direction side of the table in Figure 3 that computer science was not a topic directed to by any of the teachers; however, the philosophy teacher did challenge students to question the nature of truth, and whether science was enough to give answers we could trust when students made points in these areas. This leads me to think that other factors may have been the cause of the computer science appearance, one of which may have been the increased age of the students in the philosophy teacher's session – they were year 9. In contrast, the computer science teacher delivered it to a group of year 7's. This is a potential limitation and a reason I would have liked more data but does provide the scope for further investigation into the area.

Another key feature of the results can be seen in the spread of disciplines each teacher managed to get students to explore. This ranged from three up to six. This is likely due to the observed difference in the approaches of the teachers to the epistemic insight framework during the sessions. The teacher of history was very receptive to the concept but admitted they lacked familiarity with it in practice. I believe this is evidenced by the relative balance they achieved between the three disciplines they explored – history, geography, and science – showing a desire to link between the disciplines. However, the lack of exposure to this style of teaching may have led to only utilising disciplines which could be seen as the obvious ones to answer the questions and sticking with these throughout as Tylack and Tobin (1994) argue that teacher's styles become entrenched and habitual, and thus difficult to change. This is in stark contrast to the teacher of computer science, who practices cross-curricular approaches regularly, as they achieved a similar degree of balance but across six disciplines. In my observations, it was also clear that the teacher was directing students to form links between

the disciplines rather than exploring one fully before moving to the next. When offered a point about the climate of the earth's current suitability for dinosaurs, they asked another student what was the climate like in dinosaur times, and how is it different now? This is a positive indicator that if teachers have the desire and exposure to develop their epistemic insight practice, they can overcome the barriers of compartmentalisation, but that at the start this is something for teachers to be mindful of.

Now the purpose of this study was to identify whether or not teachers subconsciously steer an epistemic insight lesson away from forming interdisciplinary relationships between subjects. To do that we must look further at the amount of teacher direction that occurred in the observed sessions. Here the data is very mixed, making it difficult to draw too many concrete or worthwhile conclusions. One that is worth exploring is from the geography teacher's session. Here we can see a very heavy weighting towards leading the discussion in their subject, a pattern that is consistent across the other sessions except for the computer science teacher. In terms of the philosophy teacher, we have mentioned how the students were challenged to think in this area, where students in the other sessions were not. This came at the specific direction of the teacher and shows us that there is a potential for teachers of subjects without a clear connection to the topic of the lesson to still be governed by a subconscious specialism bias. This need not be considered a bad thing. In the case of the philosophy session, I would argue that the students were given an enriched experience due to this as they formed connections between disciplines that otherwise went unnoticed for other students. However, it is always important to be aware of any bias, especially subconscious, to monitor and ensure that it does not become too dominant a focus within these sessions. Scholars have highlighted the "denigrating impact" such a bias could have on students, "given that a teacher's ideology is manifested through his or her instructional strategies" (Cooper, 2003, p. 103). This is seen to be a more prevalent danger when we consider those

teachers whose specialism lies as a direct contributor of answers to the topic or question of focus – as was the case with both history and geography.

Before returning to the anomalous maths data point, I would like to offer one final insight into the findings of this research. After each session, I conducted a 5-10 minute informal debrief with each teacher to explain my observations and discuss their perceptions of what decisions they had consciously made and why. A detailed table of these notes can be found in Appendix 3. A common theme amongst the three teachers, with little experience in cross-curricular teaching strategies, was that they were unaware of any subject favouritism and did not feel they ‘steered’ the class discussion towards any one subject in particular. Upon being presented with the data for their session, they could reflect and agree that they did direct the discussion, suggesting reasons for this with the main being a limited understanding of other disciplines, meaning teachers felt uncomfortable or unable to adequately facilitate discussion through a particular disciplinary lens.

Another key point to address is the pre-planned areas of focus. These were filled in by the teachers prior to delivering the session and can be seen as part of Appendix 1. Some teachers managed to split the topic into inter-disciplinary sub-questions targeting an array of subjects, whereas others found their questions were limited to a key area of science and/or humanities. This is another example of the subconscious subject bias at play, but it also speaks to an extension of this in terms of the way the teacher would answer the question posed. To this extent, it is worth considering how a session is planned, and perhaps teachers could work together across departments to ensure that multiple disciplines are considered in the planning stage. This type of increased teacher collaboration has long since been advocated by many researchers, although studies into effects on student achievement have been limited, as outlined by (Goddard, et al., 2007). I must also admit to being surprised by the ability of the students to incorporate elements of computer science and philosophy as in

my planning of the question had not considered these topics, and how they may offer insight to the overarching question. This is indicative of a limitation of EI in that it is necessarily difficult to facilitate students to connect and explore topics through disciplines that we, as teachers have not connected to the question ourselves.

Finally, it is also necessary to consider the solitary exploration of the question through maths. The student who raised this point was a student to whom I taught maths. During my observation, he asked me whether or not we could use a mathematical model to predict what might happen and began to research into this possibility. This topic was not governed by anything the class teacher delivering the session did, and so I have included it with an asterisk as I believe it shows an interesting counterpoint to the conclusions being drawn here. It is entirely possible that simply a student's perception of a teacher as the subject they teach is enough to compartmentalise their thinking and inhibit the discipline connectivity aimed for by adopting an EI approach (Billingsley & Ramos Arias, 2017).

In conclusion, this research has preliminarily determined that teachers do hold a subconscious bias towards their subject specialism, and it would appear that this affects their delivery of multi-discipline lessons, trapping the narrative as Foucault (1969) (1982) would have predicted. However, we can see that this can lead to some interesting, insightful, and valuable connections if the teacher's subject is not prominent in the topic of study. It would also seem to be the case that this bias is not damning and can be overcome with acknowledgement and taking steps to address the barriers to achieving the goals of inter-disciplinary learning within an EI framework (Billingsley, et al., 2018). This study must be recognised for its limitations of being a small data set, with more than one variable. With conclusions drawn from inductive reasoning, we must obtain as much data as possible from which to support our conclusions (Ketokivi & Mantere, 2010). The scope of this research is far too broad for just one study to cover; thus, further research must be carried out to not only

repeat the data but to also uncover what the barriers for teachers may be in delivering true epistemic insight to pupils. If we cannot identify the hindrances to EI delivery within our classrooms, how can we expect to achieve any progress towards delivering the curriculum reform that students need to realise our educational objectives for them and really understand their subjects? To not just regurgitate memorised facts but to be able to apply them and connect them to a larger context outside of the classroom and to thrive in later life, which after all is at least my ambition for my students, and one I am sure the vast majority of teachers share.

References

- ACAPS, 2012. *Qualitative and Quantitative Research Techniques for Humanitarian Needs Assessment*. s.l.:s.n.
- Barnes, J., 2015. *An Introduction to Cross-Curricular Learning*. s.l.:s.n.
- Belsey, T., 2005. Foucault, truth telling, and technologies of the self in schools. *Journal of Education Enquiry*, 6(1), p. 78.
- Billingsley, B., 2017. Teaching and Learning about Epistemic Insight. *School Science Review*, 365(9), pp. 59-64.
- Billingsley, B. & Fraser, S., 2018. Towards an Understanding of Epistemic Insight: the Nature of Science in Real World Contexts and a Multidisciplinary Arena. *Research in Science Education*, 48(6), pp. 1107-1113.
- Billingsley, B., Nassaji, M., Fraser, S. & Lawson, F., 2018. A Framework for Teaching epistemic Insight in Schools. *Research in Science Education*, Volume 48, pp. 1115-1131.
- Billingsley, B. & Ramos Arias, A., 2017. Epistemic Insight and Classrooms with Permeable Walls. *School Science Review*, 99(367), pp. 44-53.
- Choy, L. T., 2014. The Strengths and Weaknesses of Research Methodology: Comparison and Complimentary between Qualitative and Quantitative Approaches. *IOSR Journal Of Humanities And Social Science*, 19(4), pp. 99-104.
- Cooper, C. W., 2003. The Detrimental Impact of Teacher Bias: Lessons Learned From the Standpoint of African American Mothers. *Teacher Educational Quarterly*, 30(2), pp. 101-116.
- Deacon, R., 2006. Michel Foucault on education: a preliminary theoretical overview. *South African Journal of Education*, 26(2), pp. 177-187.
- Faubion, J., 2019. *Michel Foucault / French Philosopher and Historian*. [Online] Available at: <https://www.britannica.com/biography/Michel-Foucault> [Accessed 13 April 2020].
- Foucault, M., 1969. *Archaeology of Knowledge*. Surrey: Tavistock Publications Limited.

- Foucault, M., 1982. *Technologies of the Self*, s.l.: University of Vermont.
- Foucault, M., 1982. The Subject and Power. *Critical Enquiry*, 8(4), pp. 777-795.
- Frank, C., 1999. *Ethnographic Eyes: A Teacher's Guide to Classroom Observation*. Portsmouth: Heinemann.
- Goddard, Y. L., Goddard, R. D. & Tschannen-Moran, M., 2007. A theoretical and empirical investigation of teacher collaboration for school improvement and student achievement in public elementary schools.. *Teachers college record*, 109(4), pp. 877-896.
- Ketokivi, M. & Mantere, S., 2010. Two strategies for inductive reasoning in organizational research. *Academy of management review*, 35(2), pp. 315-333.
- LeCompte, M. & Preissle, J., 1993. *Ethnography and Qualitative Design in Educational Research*. 2nd ed. London: Academic Press.
- OECD, 2018. *The Future of Education and Skills*. Paris: Organisation for Economic Co-operation and Development.
- Perkins, D., 1993. Teaching for Understanding. *American Educator: The Professional Journal of the American Federation of Teachers*, 17(3), pp. 28-35.
- Spindler, G. & Spindler, L., 1992. Cultural process and ethnography: an anthropological perspective. . In: *M. LeCompte, W. L. Millroy and J. Preissle (eds) The Handbook of Qualitative Research in Education*.. London: Academic Press, pp. 53-92.
- Tylack, D. & Tobin, W., 1994. The grammar of schooling: Why has change been so hard?. *American Educational Research Journal*, 31(3), pp. 453-479.
- Vars, G. F., 1991. Integrated Curriculum in Historical Perspective. *Educational Leadership*, Volume 49, pp. 14-15.
- Zahradnik, B., 2018. *Silos in Education: How to Break Them Down with These Tips*. [Online]
Available at: <https://www.leaderinme.org/blog/silos-in-education-how-to-break-them-down-with-these-tips/>
[Accessed 13 April 2020].

Appendix 1 – The signed consent forms

Dear Sir/Madam

This letter is to inform you about the subject and purpose of the research project you participated in.

Further to your agreement to deliver, and subsequent delivery of, the cross-curricular session during form time I can now explain the purpose of the research and the subject of my observations. I am aiming with my research to identify whether or not a teacher's subject specialism affects their questioning within a cross-curricular lesson. I hope to identify any patterns between teachers' perceptions of their role as a teacher and the questions asked in practice. To this extent my observations focused solely on the number of times a particular subject was discussed within the session, and whether it was directed by your questions. I also made notes on the structure of the session to draw parallels between the sessions where they may have impacted the questioning.

All data is anonymised and will be stored electronically. No data will be kept past the point of usefulness and you have the right to withdraw your consent at any time, should you choose to give it.

If you choose to give your consent, I will be using the data collected in the following ways:

1. All data will be stored anonymously.
2. The observations I made will be presented anonymously within the analysis of the research.
3. The research may potentially be published publicly as part of the National Epistemic Insight Research Project.

Please return the following slip to me via email by 30/03/2020 to indicate whether you are prepared for your data to be used in this way.

Thank you,

Yours sincerely,

Andy Beaumont

Signed: George MOORE 30.3.2020 Print Name: George MOORE

I have read the above outlining the nature of the research project, and give my consent to participate.

Dear Sir/Madam

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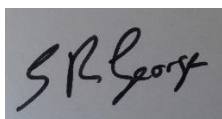
Please return the following slip to me via email by 30/03/2020 to indicate whether you are prepared for your data to be used in this way.

Thank you,

Yours sincerely,

Andy Beaumont

Signed:



30.3.2020

Print Name: GRAEME GEORGE

I have read the above outlining the nature of the research project, and give my consent to participate.

Dear Sir/Madam

This letter is to inform you about the subject and purpose of the research project you participated in.

Further to your agreement to deliver, and subsequent delivery of, the cross-curricular session during form time I can now explain the purpose of the research and the subject of my observations. I am aiming with my research to identify whether or not a teacher's subject specialism affects their questioning within a cross-curricular lesson. I hope to identify any patterns between teachers' perceptions of their role as a teacher and the questions asked in practice. To this extent my observations focused solely on the number of times a particular subject was discussed within the session, and whether it was directed by your questions. I also made notes on the structure of the session to draw parallels between the sessions where they may have impacted the questioning.

All data is anonymised and will be stored electronically. No data will be kept past the point of usefulness and you have the right to withdraw your consent at any time, should you choose to give it.

If you choose to give your consent, I will be using the data collected in the following ways:

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Yours sincerely,

Andy Beaumont

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Thank you,

Yours sincerely,

Andy Beaumont

Signed: J. Franczak 30.3.2020 Print Name: JAN FRANCAK

I have read the above outlining the nature of the research project, and give/~~do not give~~ my consent to participate.

Appendix 2 – The Session Plan

Will we ever bring back Dinosaurs? Should We?
Lesson Plan

Introduction
5 mins

Teacher to introduce the Big Question and briefly explain it from their own perspective.

Outline the structure of the form line, 10 mins research in groups and 10 mins teacher led discussion of the question.

Research
10 mins

Teacher to guide and direct students into groups of 3 or 4. Give each group an area to focus their research on to answer the question. Teacher to come up with these potential areas of focus and fill in below. (could be as many areas as the teacher wishes for diverse viewpoints)

Potential Area of Focus 1	Potential Area of Focus 2
Potential Area of Focus 3	Potential Area of Focus 4

Discussion
10 mins

Teacher to bring class back together in order to discuss and answer the question as a class.

Teacher to lead this discussion through their questions of students and groups to explore the different ideas and viewpoints researched.

Appendix 3 – Session Observation Notes

Year 9		Philosophy		
Subject	Number of occurrences (Teacher direction)	Planned Focus Areas	R&EE Form Observation Notes	Post Observation De-brief
Science	6 (4)	How would we do it?	Question introduced with no subject direction	Focus areas planned as teachers understanding of four main sub-questions to answer the big question.
Philosophy	3 (2)	Why would we do it?	Took students answers from science discipline, brought discussion to philosophy of science	Focus areas not used to prompt discussion but to organise responses.
Computer Science	2	Should we do it?	Delivery was very cross-curricular friendly, allowed students to discuss multitude of subjects	Not consciously aware of steering conversation to specialism, but recognised it happened
Geography	2	What would happen if we did do it?	Questions asked prompted students to either science (obvious linked subject of question) or teachers own subject	Guided discussion based on own interest and understanding (areas comfortable discussing)
Business Economics	1		Does philosophy feature in forms not led by a philosophy teacher	Students intelligent and discussion flowed from student responses, not a large need to direct from teacher.
Ethics	2 (1)		Students discussed in pairs, varied subjects - most defaulted to science	Has limited experience of cross-curricular learning through linking philosophy to other subjects.

Yr 7

Geography

Subject	Number of occurrences (Teacher direction)	Planned Focus Areas	R&EE Form Observation Notes	Post Observation De-brief
Science	4 (3)	Biodiversity	* A student of mine discussed trying to graph/model the situation because I (a maths teacher) was sat near him to observe	Students required strong structure and support to facilitate answering the question
Geography	6 (5)	Climate/Ecology	More structured to support Yr 7 students	Teacher hadn't considered multiple disciplines to discuss, thus focus was limited to geography and science as the "main" subject areas
Business Economics	1	Impacts on us	Students directed to perform research in groups	Felt the students had difficulty identifying other subject areas linked to question.
Maths	1*	What would they eat	Group discussion at end on research	Never used cross-curricular approaches and largely unfamiliar with techniques to develop
History	2 (1)		Much more teacher led discussion due to Yr 7	
Ethics	1		Delivery utilised a cross-curricular framework, assigning different groups different areas of focus to cover multiple disciplines through feedback.	
			Focii of groups were varied allowing multi-discipline exploration of topic so variation stems from teacher impact	

Yr 8

Computer Science

Subject	Number of Occurences (Teacher Direction)	Planned Focus Areas	R&EE Form Observation Notes	Post Observation De-brief
History	6 (3)	Is it Possible?	Groups of 4, 1 question per person rather than per group	Teacher was very pro cross curricular learning and is involved in a cross curricular robotics project within the school
Science	8 (3)	Is it right for the dinosaurs?	Framework utilised was cross-curricular friendly allowing mutple disciplines to be explored	Was consciously aware of trying to prompt students to actively engage with the question through different subjects
Geography	6 (2)	Is it right for society?	Groups were varied in focus allowing intergroup discussion as well as whole class discussion.	
Business Economics	3 (2)	What would be the purpose?	Very even and cross curricular, questioning led on to link other subjects in. E.g. A student talked about the biome necessary for dinosaurs to live, and teacher questioned climate change impacts on suitable climates and historical climates of earth in dinosaur times - interlinking science, history, and geography.	
Ethics	5 (3)			

Yr 8

Science

Subject	Number of Occurrences (Teacher Direction)	Planned Focus Areas	R&EE Form Observation Notes	Post Observation De-brief
History	5 (3)	Similarities between dinosaurs and current animals	Groups of 4, designated one question as a group	Had experience of delivering lessons in many disciplines in teaching career
Geography	5 (2)	How would we bring them back?	Discuss given question in group	Encourages cross-curricular learning as a concept but not used it in practice.
Science	7 (5)	Is it possible to genetically engineer animals to resemble dinosaurs?	Brought back to discuss as a class	Identified key areas of focus prior to lesson and wanted to keep discussion limited to answering those questions.
Business Economics	0	Is it desirable to bring them back? What would we gain?	Students were more readily discussing history within groups than other forms observed (history classroom)	Didn't deliberately close questions to three subjects but recognised they had a main focus in science and humanities
Ethics	0		Planned focus has strong relationships to science, directed similarities to biological similarities Very narrow focus in terms of 3 disciplines used compared to other forms where 5 or 6 disciplines were used	