

Epistemic Insight

CONFERENCE: TRANSFORMING INTERDISCIPLINARY LEARNING THROUGH EPISTEMICALLY INSIGHTFUL CURRICULA

THURSDAY 23 - FRIDAY 24 JUNE 2022

PROGRAMME



St Mary's
University
Twickenham
London



Canterbury
Christ Church
University

Epistemic Insight



EPISTEMIC INSIGHT CONFERENCE 2022: TRANSFORMING INTERDISCIPLINARY LEARNING THROUGH EPISTEMICALLY INSIGHTFUL CURRICULA

Hosted by St Mary's University Twickenham
Waldegrave Suite TW1 4SX

Conference Background

Big questions about personhood and the nature of reality are intertwined with real-world problems that affect individuals, societies and global communities- such as artificial intelligence, mental and physical health, the environment and space travel.

Equipping students in school, further and higher education with the insight and skills they need to ask and explore Big Questions is a recognised curriculum priority nationally and internationally. Working out where and how to embed opportunities to ask and explore Big Questions within existing or revised curriculum frameworks is driving considerable debate. So too is the challenge of how to define the learning objectives and assessment.

The EI framework provides educators, students and parents with a suite of phrases to use when talking about the role and nature of science in relation to Big Questions. This includes assessment tools that recognise students' capacities to think critically about the nature, application and communication of knowledge within and across disciplines and to be insightful about the significance and roles of different disciplines when constructing and evaluating answers.

Conference Organisation Team

Dr Aga Gordon, Sherralyn Simpson, Finley Lawson, Aryn Litchfield, Robert Campbell, Elizabeth Jackson, Rachel Chaiton

Conference organised by



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A BRIEF HISTORY OF THE VENUE

- St. Mary's and Strawberry Hill House



Established in 1850 and with a deep heritage in education, St Mary's has a strong reputation for teaching excellence and a student-centred approach. However, St. Mary's did not start in Twickenham but rather in nearby Hammersmith.

St. Mary's moved to its current home in 1925. On 23rd January 2014, St Mary's University College, Twickenham, was awarded full university title by the Privy Council and became St Mary's University, Twickenham.



St. Mary's has a long and distinguished history as a Catholic institution for the education of teachers. It started in Brook Green in Hammersmith, where it was run by the Brothers of Christian Instruction, with an intake of just six young men. In 1899, the Catholic Hierarchy asked the Congregation of the Mission (Vincentian) to undertake the administration of the College.

Since opening in 1925, the campus buildings have been enlarged to meet the needs of around 6,000 students, including the construction of a new Chapel in 1962-63, based on designs by Sir Albert Richardson. Strawberry Hill House, located in the University grounds, is Britain's finest example of Georgian Gothic Revival architecture. It was designed and created as a Gothic fantasy between 1747 and 1792 by Horace Walpole, historian, writer, collector and son of Britain's first Prime Minister Sir Robert Walpole.

DAY 1 – 23 JUNE 2022

Epistemic Insight in Higher Education and Initial Teacher Education

	WALDEGRAVE ROOM	SENIOR COMMON ROOM	BILLIARD ROOM
9:00 – 9:45	WELCOME COFFEE	REGISTRATION	
9:45 – 10:15	Conference Welcome <i>Annalise Gordon, St Mary's Twickenham; and Aga Gordon CCCU</i>		
10:20 – 10:50	Alice Sheridan <i>Interdisciplinarity and Academic development</i>	Stefan Colley & Finley Lawson <i>Inspiring Minds Research-Engaged STEAM Outreach: Affecting attitudinal and attainment change through interdisciplinary outreach.</i>	Sophie Wilson <i>The Disciplinary Wheel: a Lens for Epistemological Insight. Why does this matter?</i>
11:00 – 11:30	Jacqueline Perrin <i>Research Study: A sense of purpose: Perspectives of autistic young people</i>	Sijia Wang & Yuan Xi <i>Anthropomorphism and Robots: A New and Understated Topic in the Humanities - ONLINE PRESENTATION</i>	Hannah Bapty <i>Must genetics education start with Mendel? Two attempts to do otherwise in the 1970s and 80s.</i>
11:40 – 12:30		KEYNOTE 1 – Sibel Eduran, University of Oxford <i>Fostering Epistemic Insight in Science and Religious Education through Argumentation</i>	
12:30 – 13:30	NETWORKING LUNCH – FOOD SERVED IN WALDEGRAVE ROOM		
13:40 – 14:30	KEYNOTE 2 – Martyn Pickersgill, University of Edinburgh <i>Neuroscience, Epigenetics, and Society: The Imagined Biological within Professional Practice and Everyday Life (ONLINE)</i>		
14:40 – 15:10	Eri Mountbatten-O'Malley <i>An exploration of conceptual insight through wonder-filled pedagogy.</i>	Agnieszka J. Gordon <i>Leading transformation in ITE teaching within the EI consortium</i>	Michelle Lawson & Finley Lawson <i>A Case Study of how research co-creation is supporting the development of 'Epistemically Insightful' curriculum transformation in English Secondary Schools.</i>
15:10 – 16:00	<i>Set up for EI Exploration</i>	Robert Campbell, Agnieszka J. Gordon, Lee Hazeldine, Leigh Hoath, Paul Hopkins, Adrian Warhurst <i>Embedding a research-informed epistemically insightful curriculum within Initial Teacher Education (ITE).</i>	SEMINAR: Nicola Tierney <i>Thinking Like a Mathematician – The curriculum content-intent gap in primary education</i>
16:00 – 17:00	EI Exploration for schools new to EI		
19:00	RECEPTION DRINKS AND CONFERENCE NETWORKING DINNER		

DAY 2 – 24 JUNE 2022

Epistemic Insight and School Curricula

	WALDEGRAVE ROOM	SENIOR COMMON ROOM	BILLIARD ROOM
9:00 – 9:45	WELCOME COFFEE	REGISTRATION	
9:45 – 10:15	Conference Welcome <i>Annalise Gordon, St Mary's Twickenham; & Finley Lawson CCCU</i>		
10:20 – 11:10	KEYNOTE 3 – Gert Biesta, Maynooth University; University of Edinburgh <i>Curriculum as course of study: On content, knowledge, and the purposes of education</i>		
11:10 – 11:30	COFFEE (Presenting PW schools arrive)		
11:40 – 12:10	Henry Coates (sec) <i>"It's Just a Rock" – How interdisciplinary research projects can support the development of students' critical thinking and curriculum engagement</i>	Arthur Galamba (sec) <i>Epistemic Insight: bridging physics and history</i>	Leith Hoath (pri) <i>Exploring Climate Justice through an Epistemic Insights Approach: a Vertically Integrated Project</i>
12:15 – 13:15		NETWORKING LUNCH AND POSTER PRESENTATIONS – PRIZES PRESENTED TO STUDENTS	
13:20 – 14:00	Presenting School Students receive Interactive EI sessions Finley Lawson	SEMINAR (pri) Marianne Cutler <i>Exploring the potential of multidisciplinary approaches to primary education (ONLINE)</i>	SEMINAR (sec) Mandy Dhaliwal, Sarah Jones & Fiona Maycock <i>Research-Informed Curricula: Developing Student and Staff Epistemic Agency</i>
14:10 – 14:40		Richard Pountney <i>The design of the school curriculum for climate education and climate literacy – All Through MAT Case Study</i>	Stephen Thompson <i>Critical consideration of the role of imagination in epistemically insightful teaching and learning in secondary science.</i>
14:40 – 14:50	COFFEE (Presenting PW schools depart)		
15:00 – 15:50	KEYNOTE 4 – Jonathan Barnes, Educate4Diversity <i>Cross-curricular Learning; Discovering Meaning in a Hostile Environment</i>		
16:00 – 16:30	PANEL <i>Berry Billingsley, Jonathan Barnes and Gert Biesta</i>		
16:30 – 16:45	PLENARY AND CONFERENCE PHOTO		

KEYNOTE PRESENTERS

Jonathan Barnes



Jonathan Barnes (www.education4diversity.co.uk) is a National Teaching Fellow and currently Visiting Senior Research Fellow at Canterbury Christ Church University. In 50 years in education he has taught and researched throughout Asia and Africa and in primary and secondary schools in England.

He was a head teacher between 1992 and 2000 and has taught primary and secondary teachers ever since. His books and journal articles on Cross-Curricular Learning and values are widely used throughout teacher education.

His current work on diversity and inclusion is founded on his international research on teachers' values.

Gert Biesta



Gert Biesta (www.gertbiesta.com) is Professor of Public Education at the Centre for Public Education and Pedagogy, National University of Ireland at Maynooth, and Professor of Educational Theory and Pedagogy at the Moray House School of Education and Sport, University of Edinburgh.

Since 2020 he is a member of the scientific curriculum committee in the Netherlands which is tasked with advising the government on curriculum frameworks for primary and secondary education.

Sibel Erduran



Sibel Erduran is Professor of Science Education, Director of Research in the Department of Education and Fellow of St Cross College at University of Oxford. She is also Professor II at University of Oslo, Norway. She serves as the President of the *European Science Education Research Association*; Editor-in-Chief of *Science & Education* and an Editor for *International Journal of Science*.

Her work experience includes positions in the USA, Ireland as well as the UK. Her research interests focus on the infusion of epistemic practices of science in science education and she has a keen interest in the professional development of science teachers. Her work on argumentation has received international recognition through awards from NARST and EASE.

She is currently working on two funded projects: FEDORA (EU Horizon 2020) and SciKids (UAEU). Her recent books published in 2019 are entitled *Argumentation in Chemistry Education: Research, Policy and Practice* (Royal Society of Chemistry) and *Transforming Teacher Education through the Epistemic Core of Chemistry: Empirical Evidence and Practical Strategies* (Springer).

Martyn Pickersgill



Martyn Pickersgill is Personal Chair of the Sociology of Science and Medicine at The University of Edinburgh. His research, teaching, and engagement is concerned with the social dimensions of biomedicine (in particular, the sociologies of psychiatric, neuroscientific, and epigenetic knowledge).

Martyn is Director of Research in Edinburgh Medical School's Usher Institute, Co-Director of the Wellcome Trust PhD Programme in 'One Health Animal Models of Disease: Science, Ethics and Society', and Associate Director of the Wellcome Trust-supported Centre for Biomedicine, Self and Society.

He is an elected Fellow of the Academy of Social Sciences, a member of the ESRC Strategic Advisory Network, and a recipient of the Royal Society of Edinburgh Henry Duncan Medal.

LIST OF KEYNOTES AND PRESENTATIONS

KEYNOTES

Jonathan Barnes

Education4Diversity

Cross-curricular Learning; Discovering Meaning in a Hostile Environment.

The idea of curriculum includes the whole culture of a school. Schools should consider the messages, attitudes and relationships within that culture very carefully. Currently much potential is lost through the alienation or lack of engagement of rising percentages of children and young people. In primary schools hundreds of thousands each year are excluded. Absenteeism or disaffection affects millions more. Heightened attention to a narrowed core curriculum, a relentless focus on knowledge alone, and increased rigour have benefitted some, but have made school more alien to others. Across the country the 'long tail of underachievement' remains relatively unchanged despite heightened inspection standards, silent corridors and relentless calls for raised standards. Large percentages of children – largely poor or with additional needs and/or from Black, Asian and mixed heritage backgrounds - do not see their lives, experience and families represented, acknowledged, let alone affirmed, in their schooling.

Jonathan will argue that changes to curriculum content are not enough. Curriculum needs to be relevant and reflect the world of today. He will offer thoughts based on his international research, on a connected, inclusive and positive curriculum, compliant with the current requirements, but engaging to all through sensitive pedagogy and emotional and cultural relevance. He proposes an integrated primary curriculum based upon knowledge yes, but also on cross-culturally recognised values, authentic experience and the belief that every child has creative and moral potential that education should help release. Arising from the experience of global pandemic, the cross-curricular themes that characterise this positive and principled curriculum might be:

- the reality of global interdependence
- the human desire to find meaning
- the universal importance of community
- the gift of diversity
- the benefits of personal and collective creativity

Gert Biesta

Maynooth University, University of Edinburgh

Curriculum as course of study: On content, knowledge, and the purposes of education.

It is encouraging to see a resurgence of interest in the curriculum, both from the side of educational research and the side of education policy. Unfortunately, this has also led to the return of the old and rather unhelpful idea that curriculum is the content of education which students simply need to master. Recent developments that emphasise the importance of knowledge and cognition seem to go in a similar direction, also 'supported' by the global education measurement industry. The simple idea of curriculum as a 'course of study' offers a way out of this predicament because it keeps the focus on the purposes of such a trajectory and thus sees curriculum content as a means rather than an end in itself. In my presentation I will explore the interrelationship between curriculum, knowledge, and the purposes of education, also with the help of Wolfgang Klafki's distinction between 'Bildungsinhalt' and 'Bildungsgehalt.' I will indicate what this means for discussions about the curriculum and will explore the implications for educational practice.

Sibel Erduran

University of Oxford

Fostering Epistemic Insight in Science and Religious Education through Argumentation.

Many issues facing everyday citizens require understanding of how knowledge works in different disciplines. For example, the Covid-19 pandemic has created a context that demands understanding not only of science but also of ethics, economics and politics, for example. It is increasingly becoming more important to foster cross-subject teaching and learning in schools in order to ensure that future citizens can effectively engage in meaning making around key issues facing them in their lives. One cross-curricular scenario involves science and religious education. Both subjects address big questions such as "what is the origin of the universe and life?" and as such, both subjects lend themselves for cross-curricular consideration. Argumentation, or the justification of knowledge claims with evidence and reasons, is one example that applies to the curricula and syllabi of both science and religious education in England. The purpose of this presentation is to share some research from the OARS Project funded by the Templeton World Charity Foundation which focused on argumentation in the context of science and religious education (RE). The 3-year project engaged science and RE teachers in a continuous professional development programme about argumentation. Data from the teachers as well as their Key Stage 3 students have been collected to investigate through qualitative and quantitative methods how argumentation can help cross-curricular collaboration in schools. Findings will be shared which will include how teachers and students interpret argumentation in both science and RE contexts.

Martyn Pickersgill

University of Edinburgh

Neuroscience, Epigenetics, and Society: The Imagined Biological within the Professions and Everyday Life.

Asking Google 'are we are brains?' brings up a lot of answers, some of which articulate closely with philosophical and neurobiological research and reflection. Sociologists and anthropologists too have spent time dealing with questions around the brain and the psyche, the sciences orientated towards it, and the relationships of these with identity. In this talk, I will present an overview of some of the sociological research on the social dimensions of neuroscience, and more recently epigenetics, that I have been engaged in over the 15 years. This includes focus group research with scientists, neurological patients and members of a range of professions – as well as interview-based work with psychiatrists, clinical psychologists, policy makers and advisors, and a range of professionals and wider publics. The projects emerge from work funded by, in particular, the AHRC, ESRC, Leverhulme Trust and Wellcome Trust, and help to cast light on the social life of what I call 'the imagined biological' within societies. I hope to show that whilst neuroscience - and ideas about the brain more broadly – have considerable traction in a range of spheres, engagements with these by (mental health and other) professionals, patients and wider publics is also often ironic, cautious, or antagonistic. This pattern of (dis)engagements has, I suggest, implications for the response of scholars concerned with the ethical, legal and policy implications of science.

PRESENTATION ABSTRACTS

Hannah Bapty

University of Oxford

Must genetics education start with Mendel? Two attempts to do otherwise in the 1970s and 80s.

It is 156 years since Mendel's presentation of his results on hybridization in peas to the Brunn Society for Natural Science. Yet even now, when multifactorial causation and trait variability are mainstays of research, teaching in genetics typically starts with Mendel and his peas, where seemingly none of that complexity matters. Must genetics always start from such a simplistic, determinist beginning? A number of recent studies have made the case for emphasizing the complexity of genetics from the beginning and throughout. In this talk I'll examine the origins and fate of two earlier attempts at reform, from the 1970s and 80s. One was from Steven Rose, a biochemist in London and founder of the British Society for Social Responsibility in Science, who developed a genetics course for distant teaching at the Open University. The other was from Garland Allen, a historian of science and influential writer of biology textbooks, including four editions of *Study of Biology*. Both tried to depart from the standard start-with-Mendel script, and in ways that aimed to help students better appreciate not only the complexities of genetics but the embeddedness of genetics – and genetic knowledge – in the social world. And both met significant resistance, touching on everything from concerns about placing unrealistic demands on students to the impossibility of making large-scale changes given previous investment in materials. In closing I'll suggest that the experiences of Rose and Allen hold valuable lessons for would-be reformers of the genetics curriculum today.

Robert Campbell¹, Agnieszka J. Gordon², Lee Hazeldine², Leigh Hoath³, Paul Hopkins⁴, Adrian Warhurst⁵

¹ St. Mary's University, Twickenham, ² LASAR Canterbury Christ Church University, ³ Leeds Trinity University, ⁴ University of Hull, ⁵ University of Leicester

Embedding a research-informed epistemically insightful curriculum within Initial Teacher Education (ITE).

Students live in a globally connected society which is constantly changing. The development of technology and artificial intelligence forces society to respond to big questions about personhood and the nature of reality. Thus, the curriculum of the future requires a broad curriculum that develops an understanding of both substantive and disciplinary knowledge in order to develop global citizens capable of critical thinking and a compassionate response to the needs of society.

The Epistemic Insight (EI) Initiative provides a framework to support the next generation of teachers to develop a detailed understanding of the distinctive features of discrete disciplines and how they interact. It further supports trainee teachers, qualified teachers and school students to develop epistemic curiosity that challenges a perception of scientific knowledge as limitless, and thus recognises the dangers of uncritical scientism. Research conducted by the Epistemic Insight Initiative across a consortium university based Initial Teacher Education (ITE) institutions, challenges a culture of entrenched disciplinary compartmentalisation, associated with the pressures and barriers within schools that often neglects discipline-specific methods and norms of thought affiliated within the curriculum. This presentation offers a unique insight into how a group of ITE lecturers in the wider consortium have used a research informed approach to develop an EI informed curriculum in their ITE provision. By exploring the common and divergent experiences of using EI we aim to encapsulate the impact it has on trainee teachers epistemic understanding of disciplines.

The presentation will close by exploring how EI informs our discipline specific approaches to teacher education, highlighting opportunities to shatter subject silos and develop collaborative interdisciplinary teaching.

Henry Coates, Anna Hooper
Astor School

“It’s Just a Rock” – How interdisciplinary research projects can support the development of students’ critical thinking and curriculum engagement.

This paper presents a case study of the development of an Epistemic Insight Scheme of Work for Year 9 students in a coastal comprehensive school in England. We discuss the process of re-imagining a humanities curriculum space to challenge students’ expectations and experiences of the school curriculum. The students are in their first year of fully “in school” teaching following the pandemic and are taught in mixed ability classes for Epistemic Insight lessons for one hour a week.

Structured around termly Big Questions, the Scheme of Work has provided a markedly different learning experience for students than their experience of curriculum subjects. In its first year of delivery we discuss how the complex task of gaining “knowledge about knowledge” has been navigated and differentiated for a breadth of learners, the role of co-creation in this process, and challenge of responding “on the fly” to a newly developed/developing curriculum.

Moving beyond the context and content of this programme we discuss how the introduction of a “mini-project” assessment created a pivotal point in the development of the scheme of work and our approach to delivery. Providing students with the opportunity to take ownership of their learning and draw on their wider experiences/knowledge to answer the same key question enabled many to ground the relevance of and interdisciplinary programme of study to their experience. The programme is providing a space for students to develop their criticality without the pressure of external assessment, however as each unit has a summative assessment, we discuss the process of developing assessments for “knowledge about knowledge” and the methods for ensuring the lessons don’t become “just” discussion, whilst recognising the importance of this informal change to “test out” argumentation skills.

Finally, we set out our vision for the role and place for Epistemic Insight in our school based on a “classroom up” approach to developing the curriculum and suggest how subject teachers and leaders can create opportunities for the development of epistemic insight experiences in their own classrooms.

Stefan Colley¹ and Finley Lawson²

¹ KAMCOP, Canterbury Christ Church University, ² LASAR, Canterbury Christ Church University

Inspiring Minds Research-Engaged STEAM Outreach: Affecting attitudinal and attainment change through interdisciplinary outreach.

There is agreement within the UK and internationally that our economy and workforce will be increasingly dependent on STEM-related opportunities and skills. However, there is a lack of agreement on the best ways to improve diversity and recruitment into these fields. It would be naive to think that any one solution would work for all students (or indeed for all sectors) however this alone is no reason to maintain the status quo and hope that the situation will be resolved.

The barrier to STEM engagement at post-16 and Higher Education is twofold firstly engaging students with STEM in formal learning contexts in a manner that explicitly develops their understanding of the nature, power, and limitations of science in real-world and multidisciplinary contexts. Secondly students from underrepresented backgrounds frequently have little or no science capital. These barriers combined mean that students from “economically disadvantaged backgrounds” are said to have poorer science attainment than their more advantaged peers, with the divide appearing as early as Key Stage 1 (age 5-7 years) , and continuing through to GCSE choices where they are three times less likely to take triple science at GCSE level therefore influencing the opportunities open to them in STEM at post-16 and in HE.

This paper examines how an epistemic insight pedagogy has been used to underpin a sustained engagement programme of informal science learning (ISL) – Inspiring Minds. Inspiring Minds has been running since 2017 and was developed with the aim of engaging students who have become disengaged with the content-heavy formal science curriculum by engaging them with STEM through Big Questions related to the interaction of STEM and society and developing their epistemic agency by undertaking interdisciplinary STEAM research projects that challenged their perception of the role and relevance of STEM for society. Further the paper reports on the impact that the programme has had in producing statistically significant shifts in aspiration and attitudes towards STEM and for cohort one, where public examination data is available, leading to significant shifts in academic achievement in relation to a matched comparator group. We conclude by looking forwards to the next steps for research engaged practice in STEM outreach and Widening Participation work.

Marianne Cutler

The Association for Science Education

Exploring the potential of multidisciplinary approaches to primary education.

This interactive seminar draws on key findings from ASE’s award winning ‘Key moments in history and science – a fossil hunter’s story’ project for 9-11 year olds on:

Children’s understanding of:

- a. the nature of science and its interconnection with other forms of knowledge
- b. what is involved in scientific enquiry
- c. the significance of fossils in our knowledge of evolution.

Teachers’ understanding and confidence relating to:

- a. the nature of science and scientific enquiry
- b. various aspects of teaching through enquiry
- c. using a cross-disciplinary approach to enhance teaching in science.

Using example resources for teachers and for children from this project, we will invite discussion around 1) the factors enabling, and measuring, effective multidisciplinary approaches for learning in primary schools, extending into secondary schools, and 2) the implications for initial teacher education and early career teacher development.

‘Key moments in history and science – a fossil hunter’s story’ was developed through a grant from Big Questions in Classrooms, an initiative of the Templeton World Charity Foundation

Mandy Dhaliwal, Sarah Jones, and Michelle Lawson

Wilmington Grammar School for Girls

Research-Informed Curricula: Developing Student and Staff Epistemic Agency.

For anyone engaged in education there is an all too present challenge of balancing the limited curriculum time to deliver the assessed content and providing enough space to take students beyond the assessment content to develop their wider understanding of the nature and purpose of academic disciplines beyond the classroom walls. Ofsted now want both students and teachers to be able to understand and explain the curriculum intent and be clear about how learning relates between classrooms and years but building this “additional” learning into an already full timetable can seem daunting and a challenge for student engagement. However, providing opportunities for students to gain the skills to be “epistemically insightful” across the curriculum with shared language and opportunities for independent investigation of disciplinary boundaries but develops their awareness of curriculum intent (regarding relationships between disciplines), and their criticality around the powers and limitations of individual disciplines to respond to complex real-world problems. In this interactive seminar we discuss how, in partnership with CCCU, we developed a research-informed (and research engaged) curriculum for year 7 students. We share the lessons we learnt in the first year of delivery (including the demands of independent research through home learning), and the impacts we are starting to see in this second year, both in terms of student development and our confidence to teach “off topic”. We then share the process for how the same curriculum was adapted for use with year 12 students to encourage their development as epistemic agents (independent learners) and the spaces we have used within the existing curriculum to build the epistemic insight of our students. Finally, we invite you to explore with us the opportunities for staff to build epistemically insightful opportunities in your schools (e.g., through CPD and curriculum planning) sharing our experiences as senior and middle leaders.

Arthur Galamba

King’s College London

Epistemic Insight: bridging physics and history.

Epistemic Insight is an initiative that seeks to build bridges between subjects and to develop an appreciation of how they can be used concomitantly to make sense of the world. In this presentation, I will address ways that teachers could bridge the epistemology of physics and historiography in secondary school. The reasons for my choices are: a) both subjects are well established representatives of the natural sciences and the humanities; b) both build understanding based on empirical evidence; c) and physics does not share the same methods and ways of thinking with all other natural sciences. I will not compare their research methods, which are clearly very different. Physics is known for highly controlled experimentation, predictability, testing and control of variables, which are not used in history or in historical sciences (e.g. evolutionary biology, natural history and geology). Instead, I will address forms of reasoning used across physics and history because, as we will see, there are many similarities that can be used by teachers to build cross-disciplinary teaching. In fact, historians use historical methods that are also used in the natural sciences, such as in natural history and in evolutionary biology. The presentation will focus on the forms of reasoning used by physicists and historians and how they identify and interpret evidence thus appreciate the distinctiveness and approximations of science with other ways of knowing. I will address some similarities and differences about how physicists reason and how historians reason when they are ‘doing physics’ and ‘doing history’. I will argue that there are many similarities in the epistemology of physics and history that teachers of those subjects could use to challenge scientism and to build cross-subject understanding and cross-curricula collaboration. The comparison between physics and history will be made with the understanding that inquiry in the social sciences are as rigorous as in the natural sciences.

Agnieszka J. Gordon

LASAR, Canterbury Christ Church University

Leading transformation in ITE teaching within the EI consortium.

Interdisciplinary teaching and learning has become a key aspect in developing innovative 21st century education. Ofsted and OECD stress the importance of using knowledge across disciplines when solving current global problems and trying to answer Big Questions. Epistemic insight or 'knowledge about knowledge', and how disciplines work and interact, is an effective and innovative pedagogy to develop knowledge about nature of disciplines, critical thinking and effective use of knowledge across them. The Epistemic Insight (EI) consortium was formed and developed as a part of Epistemic Insight Initiative in 2019 and has grown to a collaboration of 10 universities providing initial teacher education (ITE). The consortium partners have co-created research and research-informed, interactive teaching and learning resources to aid a holistic approach to Big Questions and solving real-world problems. As consortium leader, I will share my experience of leading this transformation, as well as research findings gathered collectively through working with tutors and ITE students across the consortium (Primary and Secondary). The research within the consortium has led to the development of EI among teacher trainees through participation in a variety of innovative workshops. The presentation will share successful examples of implementation of EI into ITE curricula, using bespoke strategies and resources, which developed teachers' EI, curiosity, critical thinking and appreciation of how linking sciences with humanities may inform our thinking.

Leigh Hoath and Lewis Morgan

Leeds Trinity University

Exploring Climate Justice through an Epistemic Insights Approach: a Vertically Integrated Project.

Following COP26 in November 2021 and the release of the DfE's Sustainability and Climate Change Education Strategy, there has been an increased focus on Sustainability and Climate Change in terms of teaching. Many schools are unaware of where to start with this and how they will implement final strategy documents and although there is an appetite for Sustainability and Climate Change Education to be covered within schools, as yet there is little structure in place to support this. Although the current thinking is that content should be taught within the primary science curriculum, we feel that this is a broader issue which should be addressed more holistically. As a result, we created the Vertically Integrated Project (VIP) exploring Climate Justice.

Numerous schools in the Yorkshire region undertook a project involving learners from across KS1 and KS2 focussing on exploring the issue of Climate Justice. The structure and content for the project were prepared and shared by Leeds Trinity University with the schools being free to adapt and amend the materials to suit their learners. The 11-week project culminated in the schools presenting their outcome (video, poster, leaflet) to a wider audience at the Great Science Share for Schools on June 14th.

The purpose of this presentation is to share how learners of different ages worked together through a range of Big Questions to create their own related to Climate Justice and their subsequent use of the Discipline Wheel to consider the different ways in which this topic could be approached. The schools each worked to their own agreed outcome which shared the issues of Climate Justice to their peers, parents and beyond the school. This presentation summarises the successes of these projects and ways in which the Epistemic Insights approach enabled the learners and teachers to seek alternative ways of thinking and knowing.

Michelle Lawson¹ and Finley Lawson²

¹Wilmington Grammar School for Girls, ²LASAR, Canterbury Christ Church University

A Case Study of how research co-creation is supporting the development of 'epistemically insightful' curriculum transformation in English Secondary Schools.

This paper explores the tension between finding an approach to curriculum design that best fits the needs and experiences of individual students and teachers and implementing the findings of generalised evidence-based research. Big questions about personhood and the nature of reality are intertwined with real-world problems that affect individuals, societies and global communities – such as artificial intelligence, mental and physical health, the environment, and space travel. They are also questions that bridge science, religion and the wider humanities. Equipping school students with the insight and skills they need to ask and explore Big Questions is a recognised curriculum priority nationally and internationally.

In the case study reported in this paper, teachers, researchers and senior leaders grapple with where and how to provide opportunities for a cohort of secondary school students to become 'epistemically insightful' – in response to research that emphasises that students should be equipped and eager to work with different types of knowledge within and across their curriculum subjects. The paper discusses the process and impact of establishing a research-led co-creation partnership designed to transform curriculum practice and policy whilst maintaining teachers' agency within a whole school approach to curriculum transformation. Drawing on our findings we argue that "best practice" for researcher-participant relationship is one where the research actively involves the participants, as a community, rather than the research being "done on" them.

Furthermore, there is a complex balance to be struck between practitioner co-creation and maintaining the integrity, in this instance, of the findings of published research. After setting out the role of the LASAR (Learning about Science and Religion) Centre at Canterbury Christ Church University in establishing the Epistemic Insight Initiative (and the projects' research aims), we explain how the co-creation process between university research and school practitioners has provided a context in which the key success criteria for a research-engaged school are provided by this collaboration.

Moreover, we describe and discuss the practices that enabled participating teachers to develop their epistemic agency so that they were co-creators of research within a whole school approach. Existing practitioner literature highlights the benefits of research engagement in individual schools and the importance of access to mentoring and research expertise (see Sharp et al., 2006) alongside similar guidance for the role the researcher should take in offering a 'guiding light'. However, this places research engagement within the framework of school improvement plans over a sustained ethos. A decade later Nelson and Sharples (2017) highlight that evidence-informed practice is often divided between desk based "research" by teachers as separate from "academic research" conducted by 'universities or professional research organisations' a model which emphasises the teachers' role as a consumer rather than creator of rigorous research. Indeed, McAleavy goes as far as to say even where teachers and schools are able to have "research leads" they are 'in uncharted waters without a compass. There is no blueprint for the work of the Research Lead and the coordination of research activities in schools is not necessarily straightforward'. The process is still relatively under-discussed, although Godfrey (2016) has provided a valuable framework to developing a co-creation model (although he focuses on the creation of a research ecosystem within a school, led by the senior team). Whilst this paper focuses on work within one case study school, some of the findings relate to setting up a research ecosystem that includes a variety of schools.

The final part of this paper presents interim results from staff and student data that evidences the impact participation has had on the research ethos and learning experiences within the school. We discuss the ways in which the partnership has equipped teachers to investigate their own related practice enquiry and point towards the next steps for developing a whole school research-engaged ethos.

Eri Mountbatten-O'Malley

Bath Spa University

An exploration of conceptual insight through wonder-filled pedagogy.

The concept of wonder is related to other concepts such as curiosity, awe and exploration. Recent research suggests that the concept is also related to openness to novel experience, intrinsic motivation to learn and a willingness to suspend judgement. Because these are useful concepts to deploy within educational settings, we are often happy and encouraged to support students to be immersed in the experience of wonder. Yet, as I will suggest, in speaking of wonder, 'understanding' is the real target. Understanding is a complex concept more closely related to the concepts of knowledge and doubt. Despite conceptual confusions which suggest that knowledge can be 'transferred' between teacher and student, concepts like 'understanding' are normative concepts which become mastered through the development of certain conceptual abilities in students, within communities of dialogue, discussion, and induction. Because concepts are often complex, rich and not at all a one-dimensional thing that may be understood easily outside of a context, it helps to explore them from many angles or perspectives. Thus, achieving a transformative depth in our understanding for students comes about when we get truly get a grasp for their rich interconnections and their embeddedness within our complex conceptual schemes and human form of life.

The pedagogic implications seem to be that despite what we might think of the positive experience of wonder, the process of coming to a sense of understanding is often not experientially comfortable or positive at all. Taking Wittgenstein's therapeutic approach to philosophy, the teacher's role should arguably be to help individuate concepts, dispel confusions and guide students from confusion to clarity; namely, to show the fly the way 'out of the fly-bottle'. Therefore, being reminded of the complexity of what it is to learn, this paper will explore the implications of a shift in focus favouring wonder as inquisition rather than experience and understanding over knowledge.

Jacqueline Perrin

Oxford Brookes University

Research Study: A sense of purpose: Perspectives of autistic young people.

My participatory PhD research, midway through, considers 'a sense of purpose', specifically as it has been experienced and described by autistic young people (AYP). A search for 'meaning and purpose' (words often conflated), was formerly referred to in the cross-curricular SMSC (Spiritual, Moral, Social and Cultural) education curriculum for England and in guidance to schools (e.g., Ofsted, 2004). This is no longer the case. Yet experiencing purpose has been associated with important life benefits for people, such as a longer life span and greater life satisfaction, identified particularly in US-based research (eg Damon and Bronk, 2003). It is recognised to be an important predictive variable of physical and mental health (McKnight and Kashdan, 2009). Perspectives relating to purpose are sought from approximately ten AYP aged 16+ years, from two specialist ASD (autistic spectrum disorder) school and college settings, in Southern England. A presentation is given to students to introduce purpose as a concept. Over two stages, a choice of engagement is suggested: In stage one, semi-structured (or written interviews), although methods are properly decided after consultation with AYP. The term, 'a sense of purpose' is explored by applying it to daily life ('micro purpose'), then consideration is given to how purpose may be experienced over years or decades ('macro purpose'). In stage two, focus groups or follow-up interviews take up the analysis of where participants have encountered and engaged with purpose. AYP's perspectives are invited on curriculum development in the field, or where participants prefer, insights are sought into potential barriers to purpose for AYP and how to overcome these. Acknowledging the higher risk of mental health challenges for AYP, the research engages participants in philosophical conversations, by drawing upon positive emotional experiences and it aspires to foster agency. The research aims to contribute to the nascent area of purpose with AYP in Britain and AYP's views may reveal whether there could be an advantage to accommodating work on purpose within the school curriculum for autistic secondary/Post 16 students. The proposed presentation for the conference will focus upon data collection so far from one setting.

Richard Pountney
Sheffield Hallam University

The design of the school curriculum for climate education and climate literacy.

The United Nations (UN) Action for Climate Empowerment has the overarching goal to empower all members of society to engage in climate action through education, training, public awareness, public participation, public access to information, and international cooperation on these issues. The UN's 17 sustainable development goals and UNESCO's 'Education for Sustainable Development (ESD) for 2030' sets out the key role of education in the successful achievement of the goals. However, the idea of climate emergency as a problem that schools and the curriculum need to respond to is challenged by a view of environmental and climate change as distant or future problems, rather than immediate and local ones. Adding to this, is the complication of climate change as a 'socioscientific issue', one that requires specialised scientific knowledge and a critical interpretation of the issues

In England, the Department for Education's recent policy paper strategy for education identifies climate education as an action area for schools and colleges. However, it is not clear how schools will develop curriculum resources, or how children will not only learn about climate and sustainability but will be able to put that knowledge into action. Furthermore, what constitutes the knowledge and skills of a curriculum for sustainability and climate change remains weakly defined. This presentation sets out the work of the global Climate Action Project and examines the design of the curriculum for sustainable development and how children can be actively engaged in learning about climate change. A case study of the schemes of work for sustainability education in the primary and secondary schools in a small multi-academy trust, XP in Doncaster in the United Kingdom is set out. The schools follow a curriculum based on cross-curricular, project-based learning, where the curriculum is taught via 'expeditions', that last 6-12 weeks. In recent curriculum planning, the schools have decided that climate change is an existential threat and an imperative part of the curriculum. They have identified 'Climate Emergency' as one of 3 key 'strands' in their curriculum, and teachers have designed expeditions that address this theme.

This case of curriculum integration, in which schools make longer-lasting and more far-reaching changes to what is taught, is analysed to identify how the systems of meaning can be made accessible, and how the sustainable development goals (SDGs) of quality education (SDG4) and climate action (SDG13) can be achieved, in an activist curriculum. It offers insights and examples for teachers on the design of the curriculum and the means of evaluating it. Here, the preparation of students to learn through and from an integrated, or embedded, environmental curriculum approach invokes the idea of citizens informed by a curriculum that is deep, as well as broad. It raises the question of whether education is preparation to take action that emerges, not from a common-sense understanding of everyday life, but rather from a deep political understanding of the world - one that is underpinned by a level of civics knowledge that provides the intellectual basis for engaging in public discussions and planning citizen action.

Alice Sheridan

University College London

Interdisciplinarity and Academic development.

New lecturer academic development programmes can be seminal moments in the transition from developing one's own discipline epistemology to fostering the development of that of the learner. These programmes involve interdisciplinarity on two levels. Firstly, the lecturer's own discipline may be dissected from contact with those from other disciplines, including those from other knowledge paradigms. Each lecturer also comes into contact with what could be termed 'higher education pedagogy', or Education more generally. Whereas it might be expected in the creative and free-thinking world of the academy, that institutional dedication to epistemology understanding and development, that this contact with other disciplines would foster productive, creative and transcendent insights regarding the nature of knowledge itself? Does this contact inevitably provide a creative thrust? This paper will explore how this contact is sometimes used fruitfully, the rationale behind avoidance of transgression of disciplinary frameworks and the conflict between the cognitive component and lived experience within departmental structures.

Stephen Thompson

Fulston Manor School

Critical consideration of the role of imagination in epistemically insightful teaching and learning in secondary science.

In Key stage 4 Chemistry/ Physics, students learn 'the curriculum basics' of the structure of the atom, the periodic table, isotopes and radioactive decay. This may well include related concepts such as stellar evolution and even the idea of quantum theory. The presentation of current theories of the atom that are used to convey understanding of atomic structure and the behaviours of matter is not only didactic, but also includes the language of scientific models and how these change through history. Students' understanding of the way scientific ideas and theorising develop is given a 'case study' treatment in the AQA KS4 science curriculum when teaching 'The History of the Atom', from Democritus and Dalton to Bohr and Schrodinger.

In examinations, a variety of approaches are taken in order to assess students' knowledge and understanding, including factual recall of KS4 prescribed science concepts and facts, understanding of some historical aspects of the development of science and scientific ideas, and even the grasp that students have of the technological and empirical steps that have been taken to generate experimental data from which theories are generated and appraised. This teacher has been attempting an EI approach to teaching this topic for three years and here reflects on the way in which the EI toolkit (bubble tool and discipline wheel) could be extended by a consideration of the role of imagination, in the minds of individual students, and as an explicit part of classroom dialogue. This is, I suggest, important as a part of the process of developing understanding about the questions that weren't/became/are/might be/are not amenable to science in big questions such as the nature of matter and the potential of science to understand the composition of atoms and elements, and how they work, in an interdisciplinary context (especially with regard to origins questions which overlap with RS).

Responses, dialogue and feedback (including exam outcomes) from Year 9 mixed ability classes taught these introductory Chemistry topics is considered as the evidence for this presentation, along with more formal individual written reflections which allow me to assess the extent to which individual students made sense of the learning journey as required by the examination syllabus, and also to what extent they adopted the modes of thought of EI that were encouraged by me as their teacher. This is an 'action research' type of study, given that I am making assessment of the performance and development of my students with my teaching. Colleagues are invited to reflect on how we teach big ideas effectively and facilitate critical thinking while, in parallel, we encourage imagination and creativity in learners, perhaps emulating the scientists and thinkers whose fundamental work is the focus of our studies.

Nicola Tierney

St. Mary's University Twickenham

Thinking Like a Mathematician – The curriculum content-intent gap in primary education.

Mathematics is ubiquitous, but not often at the forefront of our minds as a disciplinary tool in its own right. The recognition that mathematics enables work in range of areas from scientific inquiry to economic analysis to computer modelling to cartography and beyond appears to overshadow the contribution that the ability to think like a mathematician makes to solving problems in all fields of human inquiry. The preparation for an Epistemic Insight lecture in an ITE module on developing mathematical minds required an articulate description of what it means to think like a mathematician. This talk will discuss how conversations around this idea led to three interconnected outcomes which have impacted on my professional practice as a primary mathematics teacher educator. Firstly, on a personal level, clarity about exactly what I want trainee maths teachers to take with them into classrooms. Secondly, an insight into how a lack of understanding of what it means to think like a mathematician has led to the gap between curriculum intent and the content which finds its way into maths lessons. Thirdly, a conjecture into why national efforts to improve mathematics education in primary schools are not having the intended impact in many settings.

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Anthropomorphism and Robots: A New and Understated Topic in the Humanities.

This essay intends to explore how an interdisciplinary perspective can be developed in order to understand anthropomorphism in the age of AI and robots. Though anthropomorphism has been studied in multiple disciplines, with the special subject – humanoid robots – a new form of collaboration is expected. Recently, anthropomorphism has been discussed in many robotic-related domains like human-robot interaction (HRI), the ethics of AI and robots, representations of robots and AI in the media, etc. However, we argue that these studies, though expanding the realm of anthropomorphism, do not treat it in depth. We therefore propose two ways to explore this topic in depth. First, a categorization of the human prototype is needed. For instance, there are many science-fiction works featuring humanoid robots created in the image of children. Some roboticists also label AI and robots as our “mind children”. Turning to reality, many humanoid robots and AI are created with gendered and racial features. What implications do these human-like images of AI and robots have regarding the human-AI/robot relationship and social imaginary? Which elements are missed in these analogical images compared with humans? Thus, the second way is towards a revival of interdisciplinary research in the humanities which intends to answer these questions. Compared with research on anthropomorphism from psychology and cognitive science, which intend to explain how anthropomorphism occurs, the humanity matrix can incorporate anthropomorphism into its own framework. For instance, from a theological perspective, anthropomorphism can be understood as a form of idolatry and fetishism. From a psychoanalytic perspective, a further examination of “projection” can also benefit research on anthropomorphism in AI and robots. From a philosophical perspective, anthropomorphism can be included into the discussion of the distinction between “togetherness” and “belongingness”. From a social theory perspective, anthropomorphism involves classification and material culture, social imaginary and epistemics. Nevertheless, these potential topics have neither received enough attention from humanities scholars, nor have they been adapted to collaborate with discussions of AI and robots. Therefore, we believe that a temporary solution to this situation is to learn how to ask the right questions within the domain of humanities studies.

Sophie Wilson

St. Mary's University Twickenham

The Disciplinary Wheel: a Lens for Epistemological Insight. Why does this matter?

The aim of this short paper is to explore the potential power that disciplinary subjects have for providing a series of different and specialist lenses which can be used to explore Big Questions. It is therefore important to recognise the difference between the subjects and be able to identify their distinctive view on the world. I would like to suggest that rather than address the real-world problems in general, or by drawing on just two different subjects, which presents a somewhat binary view of the world – a them and us debate, it would be more insightful if the Big Questions were first debated within the boundaries of the disciplines separately. In this way foundational knowledge would be established, which would provide a strong basis for real debate about the issues being discussed when the subjects are brought together.

The justification for this approach lies in the communities of practice from which the disciplinary subjects draw their knowledge, with ideas being contested and debated by the experts within the boundaries of the discipline. Although widely criticised for working in silos, I believe that this Powerful Disciplinary Knowledge can then be drawn on, to debate the Big Questions, which due to their different lenses and world views should support a much richer debate and lead to more creative ideas being developed for these real-world problems.

In order to gain a better insight into this, I would like to suggest that we need to identify more specifically how the disciplinary lenses will vary. Initially I did this by looking at the programme of study for each subject, by drawing on the work of Mary Myatt and Ruth Ashby, to identify what their view point was likely to be. In this short presentation I will share my initial findings, using a table to compare the main characteristics of each subject's lens. For example, History, presents key information about our past in chronological order. In contrast Geography explores the spatial and relative locations of different places.

