Teaching for Synthesis at The London Interdisciplinary School

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The London Interdisciplinary School (LIS) is a British higher-education institution that opened in 2021, with a base in Whitechapel, London. It seeks to advance higher education through innovation in curriculum, with the creation of two new degrees: the Bachelor's in Arts and Science (BASc) and Master's in Arts and Science (MASc). While a traditional liberal arts degree might expose students to a wide range of fields of knowledge, a particularly unique part of degrees at LIS is an explicit focus on knowledge synthesis across different disciplines and methods, allowing us to understand and tackle complex problems. In this essay, we describe the founding of LIS and then briefly detail three distinct aspects of teaching for synthesis. In contrast to a "bottom up" approach – which relies on interdisciplinarity to result incidentally from disciplinary combinations – this technique is part of a series of coherent actions that synthesize knowledge broadly across different disciplines and methods.

The London Interdisciplinary School (LIS) is a British higher-education institution that opened in 2021 with a base in Whitechapel, London. It is a publicly regulated private institution, underpinned by a group of individual funders but with students who are able to attend due to the public student loan system. Now serving undergraduate, master's, and professional students, its aim is to tackle three key barriers in higher education:

- *Barriers between different subjects*: UK university courses are organized almost exclusively in single disciplines. For liberal arts degrees in the United States and internationally, curriculum design is organized in separate faculties.[1] Despite a growing demand for courses that cut across disciplines, traditional universities find it organizationally and culturally difficult to break out of these silos.
- *Barriers to innovation in learning and teaching*: The funding structures and pay scales of research universities push creative academics toward research rather than teaching. Academics are given little time or incentive for innovative curriculum design or communicating advances in their fields.

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- *Barriers between the classroom and the world*: Only in certain more vocational undergraduate courses do universities consistently link students to employers. Most undergraduate courses have not evolved in line with the problems and opportunities that students face upon graduation.

Combined, these barriers have limited the chances for universities to teach students how to tackle our most important and complex problems. The current pace of crises and change poses a severe challenge to the diffuse cycle of typical research institutions: research, learning, action. To rise to these challenges, LIS presents a means to shorten the loop between innovation and teaching, developing students who are more fully equipped to grasp the challenges and opportunities of their time.

The LIS approach was shaped by its founders: Ed Fidoe, a former McKinsey consultant turned K–12 school leader who cofounded School 21, an innovative and highly successful "free school" (charter school) in Stratford, East London. He was supported by Chris Persson and Andrew Mullinger, both successful tech entrepreneurs with experience of the challenges of hiring young employees with diverse skill sets. Together they brought in the founding faculty director, Carl Gombrich, who had created the United Kingdom's first Bachelor's in Arts and Science (BASc) degree at University College London (UCL) in 2010. The vision for LIS was set: extend the BASc project, and combine it with a focus on complex problem-based learning, centering the curriculum on "wicked problems" and remaining as "porous" as possible to the real-world challenges faced by external organizations.

The enabling policy window came in the form of the UK Higher Education and Research Act 2017. This legislation created a new university regulator, the Office for Students, with the power to grant degree-awarding powers to new institutions. With backing from supportive investors, the initial team was able to bring together a small founding faculty to write the full curriculum for the three-year BASc degree. This faculty was hired to represent the widest possible range of disciplinary perspectives, from contemporary art to applied mathematics. The hiring process required candidates to present on an interdisciplinary topic, teach a live session, and participate in a day of group activities, setting the foundations for faculty roles that prioritize teaching and collaboration. In 2020, LIS became the first entirely new institution under the 2017 Act to be granted degree-awarding powers and the ability to enroll undergraduate students.

As with all universities, LIS is shaped by its students as well as its faculty. For UK students, undergraduate student fees are capped at the national norm of £9,000 per year, and students can take out loans through the government-owned Student Loans Company. This, coupled with additional support from a separate scholar-

ship foundation to support living costs, makes LIS accessible to UK students financially. Since its inception, the LIS team has organized hundreds of school visits and events to spread awareness of interdisciplinary learning and the potential of an interdisciplinary degree. In September 2021, LIS opened its doors to the first cohort of undergraduate students. This group of sixty-five students represented a wide variety of academic and social backgrounds, including scientists, artists, students with flawless exam results, and some who had dropped out of education and were returning after periods of work. Collectively, they embarked on the first iteration of the LIS BASc degree.

All undergraduates at LIS pursue the same degree. Entitled "Interdisciplinary Problems and Methods," its name speaks to the core units of study: Problem modules and Methods modules. Problems modules form the conceptual core of student learning, in which students focus on major complex problem fields such as inequality, climate change and technology, and ethics, each approached from a variety of disciplinary perspectives. Different faculty members lead the disciplinary teaching, while a module leader creates a problem-based throughline, supporting students to draw on their disciplinary learning and apply key skills such as problem framing, stakeholder management, and critical thinking. Although this global conception of the curriculum is, indeed, radical, with no majors or minors or large blocks of siloed disciplinary studies at all, in some ways, it is a return to classical ideas of human endeavor. In the words of philosopher Karl Popper, "We are not students of some subject matter, but students of problems. And problems may cut right across the borders of any subject matter or discipline."[2]

Methods modules are divided into quantitative and qualitative strands. Following a foundation year of exposure to a wide range of methods in each field, students engage in specialized study through a variety of more focused modules on methods such as Design Thinking and Visual Methods, Natural Language Processing, and Data Science. All students must retain some balance of quantitative and qualitative methods in their studies. In the final term of each year, students are required to apply their methods learning to an individual project of their choice, focused on a specific complex problem.

LIS provides students with an education that is liberal – in the liberal arts sense that it does not prepare them for any single domain or career – but more uniquely, one that is explicitly interdisciplinary. Students learn not just key concepts and methods from a variety of fields but also ways to make fields speak to each other, and to condense and transform the variety of knowledge relevant to a problem into something that can be understood, used, or acted upon. These practices of *integration* and *synthesis* are vital to interdisciplinary work.[3] Yet,

as observed by psychologist Howard Gardner, there is surprisingly little codified knowledge on how these practices take place.[4] While integration can be approximated by constructs such as integrative thinking – or, at an organizational level, methods of integration and implementation science – many widely used approaches to synthesis are not recognized as such.[5]

At LIS, various platforms and occasions for integration and synthesis are built into the curriculum and pedagogy (indeed, the largest teaching room is named *synthesis*). Synthesis and integration are taught as skills and practices in two main ways: coaching and superconcepts.

Coaching at LIS takes the form of a weekly hour-long session in which students meet in groups of five with their coach, a faculty member who guides and facilitates their learning. The LIS coaching model, led by faculty member Isaiah Wellington-Lynn, draws on both professional and sports approaches to coaching, as well as academic traditions of cognitive apprenticeship, such as the Oxbridge tutorial.[6] Where it differs from teaching or mentoring is that the aim of coaching is for the individual student to gain a clearer understanding of themselves and their identity as an interdisciplinarian.

This role of coaching is particularly important in the context of interdisciplinary education, where, unlike in monodisciplinary programs, students do not have a ready-made field against or within which they can develop an academic identity.[7] Alongside this personal development role, coaching provides the environment in which students can practice integration with faculty members who are skilled in interdisciplinary thinking. Supported by visual tools, faculty members work with students on seemingly simple questions such as, "How might the disciplinary perspective X help you to tackle this problem? How might the skills you have learned in Method Y relate to the assessment based on Z?"

While coaching provides regular practice in integration, Mental Models and Superconcepts is a discrete module that introduces students to key conceptual material that can aid their interdisciplinary thinking. Briefly, superconcepts are ideas that facilitate *conceptual transfer* and thus new and creative thinking. Superconcepts originated in a distinct discipline, but have transcended their origins and now provide for fruitful applications in different fields.[8] For example, evolution (from biology), entropy (from thermodynamics), or system (from engineering) are all superconcepts at LIS, studied both within and beyond their original disciplines. LIS students research superconcepts as vehicles for integration of knowledge, whether through creating narratives or testable mathematical models. They learn that this range from narratives to mathematical models can be mapped onto a spectrum from "analogizing" through to "modeling" and discussing "isomorphism" as an example of "the perfect model."

Explicit teaching of superconcepts provides students with examples to scaffold the high cognitive demand of interdisciplinary work. Applying different concep-

tual techniques from varied fields to a given complex problem requires the ability to move between the very abstract and the very concrete, across different contexts and knowledge paradigms. From the perspective of adult developmental theories, this is a level of conception and cognition that few adults habitually reach.[9] As LIS develops as an institution, we hope to contribute to the small body of empirical literature on the ways this capacity can be taught and developed.[10]

In their final year as undergraduates, alongside their electives, LIS students take part in one discrete course in which they consolidate what they have learned about the theory and practice of interdisciplinarity. This module draws from the fields of mixed-methods research, philosophy of science, interdisciplinary studies, complexity science, and indigenous philosophies to examine different ways of combining and integrating diverse forms of knowledge. The first founding cohort brought together their work by creating a vast visual annotated bibliography of the field, linking the concepts of interdisciplinarity, mixed methods, complexity, and synthesis with real-world cases of these concepts in action. This cohort drew from their range of sources to define synthesis as "the combination of multiple and distinct representations into a coherent and novel whole."[11] We hope their mapping efforts will be a strong foundation for more systematic collective research on responsible and impactful synthesis.

As with many higher-education institutions, LIS now teaches not only undergraduate and graduate students, but also professional learners in the workforce. The interest from organizations, both public and private sector, illustrates that there is strong demand for explicit teaching in how to bring together diverse forms of knowledge in the context of complex problems. This demand poses challenges for a faculty: while LIS undergraduates are exposed to an array of overlapping but distinct faculty views on interdisciplinarity, integration, and synthesis, professional learners require something more codified to study around their work schedules. Yet codification could mean boiling down the variety inherent in an interdisciplinary faculty. This limitation would work against one of the core assumptions of LIS, which is a version of Ashby's Law of requisite variety: in order to be able to respond to complex problems with multiple interacting parts, our faculty needs to be equally multiple in its expertise and ways of operating.[12] Currently, the faculty is highly heterogeneous: while they all operate under the same contract type, which prioritizes teaching, a number of faculty are part-time to enable other roles as entrepreneurs, consultants, or makers. Maintaining requisite variety means pushing back against some tendencies to standardize or simplify.

Openness to ongoing innovation makes LIS well-placed to respond to the major questions posed by developments in artificial intelligence (AI). With specialists in large language models and AI regulation on our faculty, LIS has followed

this field closely, and in spring 2023, we offered our first open-cohort short course bringing together key perspectives for applying AI to complex problems. With faculty support, our students are currently experimenting critically with AI tools in research aggregation and speculative or creative production – with an awareness that the presence of these tools has raised the bar for the quality of thinking we expect of humans.

In the context of AI, our conviction is that the importance of understanding complex *problems* and the *methods* for interrogating them is no less urgent than before, but we acknowledge that some of the means to do so are changing. The details of the LIS curriculum may look quite different in three years but overall, the approach to tackling complex problems will remain guided by two deceptively simple principles: 1) Think in terms of networks and relationships, and 2) Pursue multiple perspectives. As our institution evolves, success will depend on the increasing ways we can spread the understanding, extension, and practice of these principles, across a wide range of problems and contexts.

ABOUT THE AUTHORS

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ENDNOTES

[1] In institutions of higher education in the United Kingdom, the term *faculties* refers to departments.

[2] Karl R. Popper, *Conjectures and Refutations: The Growth of Scientific Knowledge* (London: Routledge, 2002), 88; first published in 1963.

[3] Allen F. Repko and Rick Szostak, *Interdisciplinary Research: Process and Theory* 3rd ed. (Los Angeles: Sage Publishing, 2017); and Veronica Boix Mansilla, "Interdisciplinary Learning: A Cognitive-Epistemological Foundation," in *The Oxford Handbook of Interdisciplinarity*, ed. Robert Frodeman (Oxford: Oxford University Press, 2017), 261–275.

[4] Howard Gardner, *A Synthesizing Mind: A Memoir from the Creator of Multiple Intelligences Theory* (Cambridge, Mass.: The MIT Press, 2020).

[5] Roger L. Martin, *The Opposable Mind: Winning Through Integrative Thinking* (Boston: Harvard Business Press, 2009); Gabriele Bammer, Michael O'Rourke, Deborah O'Connell, et al., "Expertise in Research Integration and Implementation for Tackling Complex Problems: When Is It Needed, Where Can It Be Found and How Can It Be Strengthened?" *Palgrave Communications* 6 (1) (2020): 1–16, https://doi.org/10.1057/s41599-019-0380-0; and Geoff Mulgan, "The Synthesis Gap: Reducing the Imbalance between Advice and Absorption in Handling Big Challenges," December 1, 2021, International Public Policy Observatory (IPPO), https://theippo.co.uk/synthesis-gap-reducing-imbalance-advice-absorption-handling-big-challenges-pandemics-net-zero.

[6] See "The Oxford Tutorial," Oxford Study Abroad Program, https://www.osapabroad.com/academics/the-oxford-tutorial (accessed April 10, 2024).

[7] Carl Gombrich, "Implementing Interdisciplinary Curricula: Some Philosophical and Practical Remarks," *European Review* 26 (S2) (2018): S41–S54, https://doi.org/10.1017/s1062798718000315.

[8] Alan Wilson, *Knowledge Power: Interdisciplinary Education for a Complex World*, 1st ed. (London and New York: Routledge, 2010).

[9] Theo L. Dawson-Tunik, "The Shape of Development," *European Journal of Developmental Psychology* 2 (2) (2005): 163–195, https://doi.org/10.1080/17405620544000011.

[10] Sharon Daloz Parks, *Leadership Can Be Taught: A Bold Approach for a Complex World* (Boston: Harvard Business School Press, 2005); and Deborah Helsing, Annie Howell, Robert Kegan, and Lisa Lahey, "Putting the 'Development' in Professional Development: Understanding and Overturning Educational Leaders' Immunities to Change," *Harvard Educational Review* 78 (3) (2008): 437–465.

[11] The London Interdisciplinary School 2023 cohort, Mixed Methods and Interdisciplinarity course.

[12] W. Ross Ashby, "Requisite Variety and Its Implications for the Control of Complex Systems," *Cybernetica* 1 (2) (1958): 83–99.