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# The Relevance of Ivan Illich’s Learning Webs 50 Years On

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## ABSTRACT

In 1971, social critic Ivan Illich published *Deschooling Society*, a controversial work that critiqued mainstream education systems and proposed a radical alternative. While his work remains controversial, re-examining his ideas might advance efforts to design for learning at scale. First, we examine three design principles that emerge from Illich’s writing on learning webs: (1) a holistic perspective that incorporates multidisciplinary thinking (in Illich’s case, blending philosophy, politics, sociology, economics, theology, and cybernetics), (2) learning webs as a framework for thinking about learning beyond the limitations of school, and (3) broadening our view of what should be scaled (e.g., scaling opportunities rather than content). Second, we discuss three tensions in Illich’s work that relate to scaling learning: (1) decentralization vs. centralization, (2) place-based vs. online learning at scale, and (3) serving the advantaged vs. the disadvantaged. In discussing these ideas and tensions, we discuss contemporary technologies and models, which may be seen as similar to learning webs. Finally, we suggest that Illich’s work offers an opportunity to further connect work that sits across two related research communities: Learning @ Scale and connected learning.

## CCS CONCEPTS

• **Applied computing** → **Education**; *Collaborative learning*; • **Networks**; • **Social and professional topics** → *Historical people*;

## KEYWORDS

Ivan Illich; connected learning; peer learning; learning exchanges

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I believe that no more than four—possibly even three—distinct “channels” or learning exchanges could contain all the resources needed for real learning. The child grows up in a world of things, surrounded by people who serve as models for skills and values. He finds peers who challenge him to argue, to compete, to cooperate, and to understand; and if the child is lucky, he is exposed to confrontation or criticism by an experienced elder who really cares. Things, models, peers, and elders are four resources each of which requires a different type of arrangement to ensure that everybody has ample access to them.

Ivan Illich, *Deschooling Society*

## 1 INTRODUCTION

Ivan Illich was a renowned critic of schooling whose work has important underexplored implications for the Learning @ Scale community. This paper explores his ideas for how we might organize learning at scale, tensions that we should consider, and broader implications for learning at scale.

Illich is a difficult figure to pin down. Born in 1926 in Austria to a Catholic family with Slavic and Jewish roots, Illich went on to study chemistry and crystallography in Florence [8]<sup>1</sup> before earning a doctorate from the University of Salzburg in history. He then pursued studies in philosophy and theology while becoming an ordained priest. In 1951, he made his way to the US where he served as a parish priest in Upper Manhattan. In 1956, he was appointed vice-rector of a Catholic university in Puerto Rico. During that time, he served on a committee that oversaw public education in Puerto Rico, an experience that profoundly shaped his thinking [4].

Disagreements with Church leadership soon forced him to leave his position in 1961. He moved to Cuernavaca, Mexico where he founded the Centro Intercultural de Documentación (CIDOC). In addition to training missionaries, CIDOC became a nexus for debate, hosting the likes of Paolo Freire, John Holt, and Paul Goodman. He left the active priesthood in 1968 (although he remained a devout Catholic and a priest) and his criticism of the Catholic Church influenced his attitude toward bureaucracies. This culminated in a series of influential critiques of bureaucracies such as educational, medical, and transportation systems. His influence peaked in the 1970s, when he was regularly invited to speak across the world, his writing appeared in prominent outlets such as *The New York Review of Books*, and he was profiled by outlets such as *The New Yorker*. However, this fame was short-lived, as his critiques of medicine and (later) shifting gender roles alienated him [4].

The focus of this paper is the sixth chapter of *Deschooling Society*, “Learning Webs.”<sup>2</sup> Much of *Deschooling Society* is concerned with

<sup>1</sup>We use Hartch’s work [8] to inform the entire biographical account presented in this paragraph.

<sup>2</sup>This chapter was first published in *The New York Review of Books* in 1971 under the title “Education Without School: How It Can Be Done.”

existing education systems. His language is harsh and his critiques are controversial, but what we find most valuable in Illich's work are his provocations for how one might design better systems for education and learning—which is the focus of “Learning Webs”. In this chapter, he argues that education systems should be redesigned around networks that amplify a person's agency and deepens their relationships to others and the world around them. He asserts that a network approach better empowers people to learn what they want to with the right support. As alluded to in the epigraph, he suggests the need for four distinct networks to deliver different kinds of education resources. First, “reference services to educational objects” provide learners access to *things*—both “special access to ordinary things” (e.g., factory equipment) and “dependable access to special things made for educational purposes” (e.g., abacuses and books). Second, “skill exchanges” provide access to people (or “skill models”) who are willing to teach or demonstrate certain skills that learners want to learn. Third, “peer-matching” networks connect learners with peers who are interested in learning the same topic or skill. Finally, “reference services to educators-at-large” provide directories to professional educators who can offer pedagogical wisdom or domain-specific intellectual mentorship, beyond that of a skill model.

Over fifty years after Illich introduced the idea of learning webs, his work has been largely unexplored by contemporary researchers who design for learning at scale. Illich is not mentioned in any of the proceedings of the Learning @ Scale (L@S) conferences, with the exception of Reich's [23] synthesis of different genres of Learning @ Scale. One of the reasons Illich's work may have been ignored in the L@S community could be the lack of attention paid to peer-guided learning at scale, compared to the instructor-guided and algorithm-guided genres. Reich's reference to “Learning Webs” as the main way to introduce the concept of “Peer-Guided Learning @ Scale,” offers a powerful reminder of the relevance of Illich's ideas:

A student who has picked up Greek before her vacation would like to discuss in Greek Cretan politics when she returns. A Mexican in New York wants to find other readers of the paper *Siempre*—or of “Los Agachados,” the most popular comic book. Somebody else wants to meet peers who, like himself, would like to increase their interest in the work of James Baldwin or of Bolivar. The operation of a peer-matching network would be simple. The user would identify himself by name and address and describe the activity for which he sought a peer. A computer would send him back the names and addresses of all those who had inserted the same description. It is amazing that such a simple utility has never been used on a broad scale for publicly valued activity.

Today, perhaps it is more amazing that Illich was shocked about the lack of such a tool in the pre-Internet 1970s. As Reich states, “his vision of ‘learning webs’ offers an uncanny description of the essential features of networked learning in the internet era.” But this may give the impression that the relevance of Illich is limited to the “uncanny” anticipation of networked learning today (and the ways in which his anticipation fell short). As such it may suggest we

can relegate Illich's work as an object of inquiry for what Audrey Watters calls “the history of the future of education” [31]. While some of Illich's predictions are surprisingly accurate, others can be criticized for completely missing the mark: “The disestablishment of schools will inevitably happen—and it will happen surprisingly fast.” [10]; predictions like this were indeed a source of controversy [22].

However, regardless of the accuracy of Illich's predictions—and regardless of the extent to which we (dis)agree with his conclusions—we believe a deeper reading of Illich offers powerful ideas that can guide the development of learning at scale systems. In this paper, we explore three such ideas: (1) a holistic perspective that incorporates multidisciplinary thinking (in Illich's case, blending philosophy, politics, sociology, economics, theology, and cybernetics), (2) learning webs as a framework for thinking about learning beyond the limitations of school, and (3) broadening our view of what should be scaled (e.g., scaling opportunities rather than content). We also explore three design tensions that are important for most (if not all) learning at scale systems to consider: (1) decentralization vs. centralization, (2) place-based vs. online learning at scale, and (3) serving the advantaged vs. the disadvantaged.

In what follows, we begin by briefly describing attempts to implement Illich's ideas in the form of learning exchanges, both prior to the formation of the Internet and in the present day. We then discuss the three powerful ideas followed by the three design tensions. Finally, we explore how the themes explored by Illich emphasize the overlap between two disconnected communities: Learning @ Scale and connected learning.

We view our paper as a companion piece to “Learning Webs” and have quoted extensively from it to authentically depict how Illich expressed his ideas.<sup>3</sup> To make the ideas more concrete, we use a passage from “Learning Webs” as “object-to-think-with” [20]—that is, it serves as a quotation we can dissect as we delve into the key principles and tensions raised; we have underlined text that we will refer to later. This passage can be viewed as a microcosm for many of the points Illich raises in the chapter, even though its educational relevance may not be immediately obvious:

To illustrate my point, let me present a model: By spending ten million dollars it would be possible to connect forty thousand hamlets in a country like Peru with a spiderweb of six-foot-wide trails and maintain these, and, in addition, provide the country with 200,000 three-wheeled mechanical donkeys—five on the average for each hamlet. Few poor countries of this size spend less than this yearly on cars and roads, both of which are now restricted mainly to the rich and their employees, while poor people remain trapped in their villages. Each of these simple but durable little vehicles would cost \$125—half of which would pay for transmission and a six-horsepower motor. A “donkey” could make 15 mph, and it can carry loads of 850 pounds (that is, most things besides tree trunks and steel beams which are ordinarily moved).

<sup>3</sup>We encourage readers who have not read “Learning Webs” to read it and reflect on Illich's ideas before reading the rest of this article.

The political appeal of such a transportation system to a peasantry is obvious. Equally obvious is the reason why those who hold power—and thereby automatically have a car—are not interested in spending money on trails and in clogging roads with engine-driven donkeys. The universal donkey could work only if a country's leaders were willing to impose a national speed limit of, say, twenty-five miles an hour and adapt its public institutions to this. The model could not work if conceived only as a stopgap.

This is not the place to elaborate on the political, social, economic, financial, and technical feasibility of this model. I wish only to indicate that educational considerations may be of prime importance when choosing such an alternative to capital-intensive transport. By raising the unit cost per donkey by some 20 percent it would become possible to plan the production of all its parts in such a manner that, as far as possible, each future owner would spend a month or two making and understanding his machine, and would be able to repair it. With this additional cost it would also be possible to decentralize production into dispersed plants. The added benefits would result not only from including educational costs in the construction process. Even more significantly, a durable motor which practically anyone could learn to repair and which could be used as a plow and pump by somebody who understood it would provide much higher educational benefits than the inscrutable engines of the advanced countries.

## 2 LEARNING EXCHANGES: PAST AND PRESENT

In this section, we review past attempts to implement Illich's ideas. As we describe below, there have been a number of efforts to implement Illich's ideas in the 1970s with some success, but these efforts faced technical barriers in the pre-Internet era. More recent learning at scale systems resonate with some aspects of Illich's learning exchanges, but we argue that a deeper engagement with the ideas and tensions in his work—which we explore in subsequent sections—would benefit the design of L@S systems.

In 1971, shortly after *Deschooling Society* was published, two Northwestern University students formed The Learning Exchange, based on Illich's idea of peer matching [3]. It was a non-profit organization that would share the contact information of people who expressed similar interests, so they could get together at a time and place of their choosing to teach, learn, or discuss their interests. In one year, they had 1,000 participants in the Greater Chicago Area, and in three years, they had 30,000. As Brake [3] describes it,

The amazing technology they used consisted of 3×5 handwritten notecards and a telephone. The individuals' information was kept on notecards to keep track of what skills they can teach and what they want to learn, and members would call in to search or update.

Thousands on thousands of matches were made, all matched individually by hand.

This shows that a powerful learning at scale infrastructure can be built on simple technologies, even simpler than the ones Illich had envisioned. Figure 1 shows snippets from a pamphlet of the Learning Exchange in 1973. It shows a sample of the variety of topics that people could learn (L), teach (T), or discuss with others (I). For example, Tai Chi, Urdu, and vegetarianism all had people willing to teach and learn it, so presumably those individuals held meetings to exchange knowledge. Perhaps a group of individuals also got together to discuss “symbols as resources.” Individuals were also interested in meeting to discuss specific people such as G.W.F. Hegel, Ayn Rand, and—not surprisingly—Ivan Illich himself.

Here are a few examples of its successes as described in a 1973 progress report [9]:

A Chinese woman is improving her English and learning business economics through The Learning Exchange. She is also teaching Chinese to three people. A blind woman was helped toward her college degree because of music theory tutoring she obtained through The Learning Exchange. She also taught Braille to an older man who was losing his sight.

A 25-year old community worker in the Uptown Area noticed that many unemployed youths were interested in auto mechanics. The Learning Exchange helped him find another mechanic to assist him in starting an auto mechanics workshop and referred several students to them. The Learning Exchange also helped them find a heated garage and is currently assisting them in obtaining a small grant for an extra set of tools.

After a few years, The Learning Exchange began charging membership fees for learners who wanted to receive their catalog and receive faster telephone service [9], generating around \$100,000 each year [3]. Despite its apparent success, “it was discontinued after ten years and sold to a classroom outfit called The Learning Center” [3]. In some respects, The Learning Exchange was ahead of its time: a networked learning community before the network age of personal computing and the Internet.

The Learning Exchange was not alone in its time. A similar organization, The Free Learning Exchange (FLEX), started in 1971 in New York City. Illich was on the Board of Trustees, as was Everett Reimer, Ivan's co-conspirator behind the ideas in *Deschooling Society* [15]. By 1976, John Holt claimed that forty such learning exchanges had formed [9]; Paul Knatz argued that this number approached at least 72 by 1974 [14]. In the United States, they could be found in California, Kansas, Massachusetts, Minnesota, Missouri, Washington, and internationally, in British Columbia, London, and Paris [14, 27]. Learning webs were clearly in the air in 1970 despite technological barriers.

Although networking technology has greatly advanced over the past five decades, Illich's ideas have not emerged as a powerful force for thinking about how to scale learning. Some modern learning environments mimic learning exchanges, though in most cases they were not explicitly motivated by Illich's vision. Skillshare and Udemu are examples of skill exchanges where people can make

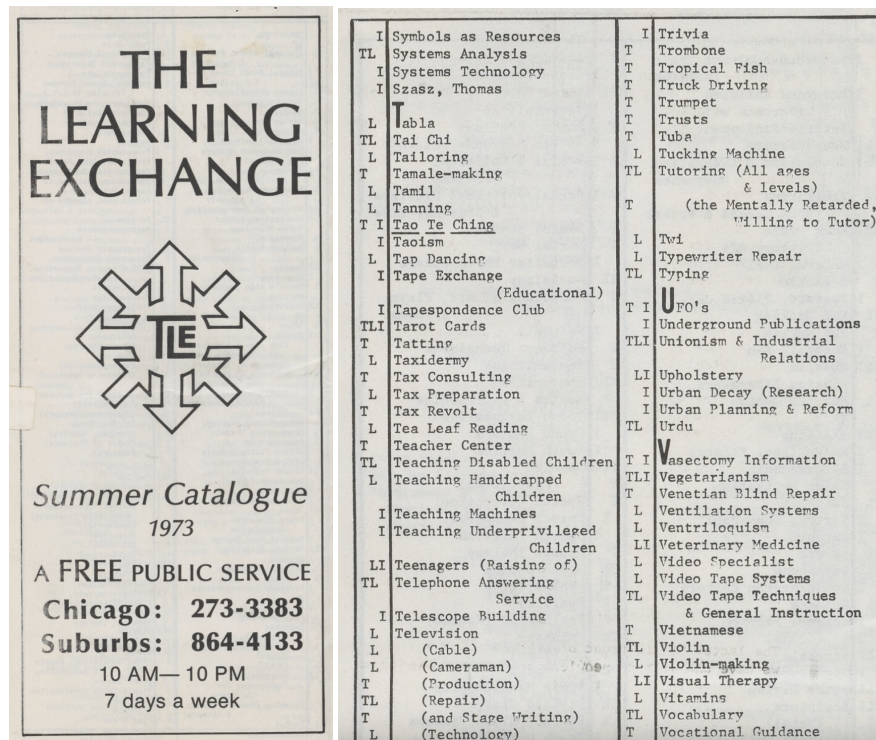


Figure 1: Images of The Learning Exchange's 1973 Summer Catalogue. On the right is a snippet of some of the topics that learners had expressed interest in. T stands for someone willing to teach the topic, L stands for someone who wants to learn it, and I stands for someone interested in the topic (e.g., “people seeking partners for games and sports, people interested in discussion groups or action projects, people who want to practice speaking foreign languages, and people who want to meet other people in their own field.”). These images were specifically from Heinz von Foerster’s copy of the catalogue and were obtained The Cybernetics Thought Collective (Digital Surrogates) managed by the University of Illinois Archives [30]. The copyrighted images are reproduced here under permission for educational use.

courses based on skills that they have and attract learners interested in their content. Meetup.com implements a peer-matching service where individuals with shared interests can form in-person or virtual meetups based on their shared interests, though not necessarily explicitly focused on learning together. In some sense, search engines also act as peer-matching services as learners can use them to find discussion forums—and associated peer communities—based on their interests. Connectivist massive open online courses (cMOOCs) implement some of Illich’s ideas by enacting networked learning, where the relationships between participants (peers and professional educators) are paramount to learning. Cohort-based courses form a similar emerging trend where the emphasis is not only on the content but also on the cohort of peers who take a course together. These modern-day exchanges can provide useful case studies to analyze the degree to which Illich’s vision is being enacted upon (or not) and the degree to which learning webs form a feasible (or not) future for education. However, we argue there is additional value in studying Illich’s work that goes beyond guidelines for how to implement learning exchanges. The focus of the present paper is to outline some powerful ideas and design tensions for learning at scale that come from our reading of Illich’s

work. Importantly, we frame these ideas as being relevant to a variety of learning at scale systems, not just learning exchanges or peer-guided learning at scale.

### 3 THREE POWERFUL IDEAS

#### 3.1 Holistic Multidisciplinary Approach to Studying Learning at Scale

The L@S community is inherently interdisciplinary, spanning computer science and the learning sciences. However, designing systems for learning requires not just working across disciplines, but integrating them in a holistic fashion. In *Deschooling Society*, Illich takes a holistic multidisciplinary approach to challenging schools and designing a new learning infrastructure; his approach is simultaneously rooted in philosophy, sociology, politics, economics, theology, and cybernetics. Anyone can pay lip service to a variety of fields, so we can look to external cues to see how the text is regarded in different disciplines. According to Open Syllabus, *Deschooling Society* is assigned in over 390 education classes as well as at least 40 classes in each of sociology, political science, and theology, and at least 10 in each of history, philosophy, architecture, computer science, and English literature.

His approach is grounded in political philosophy, including US first amendment rights: “It should use modern technology to make free speech, free assembly, and a free press truly universal and, therefore, fully educational.” An example of the prevalence of political, sociological, and economic dimensions to Illich's vision can be seen in the mechanical donkeys passage. While sociology of education and economics of education are major areas of education research, they do not seem to interact much with the community of researchers interested in designing new modes of learning at scale. The design and scale-up of a learning infrastructure cannot be complete if it is not attuned to how much it will cost, and how it will (differentially) impact or be accessed by the poor and rich. Systems designed for learning at scale must be attuned to economic concerns, both how they potentially impact the economy and the costs of scaling learning.

Theology is also part-and-parcel of Illich's writing. While theological considerations are not explicit in “Learning Webs” in particular, they may be key for a deeper interpretation of Illich's ideas. Illich can be criticized for being “charismatic,” a term originally used by Morgan Ames [2] and adopted by Justin Reich [23] to describe technologists who “adopted the rhetoric of ‘disruptive innovation’ to describe how emerging technologies can offer a new value proposition that leads to the wholesale transformation of existing systems.” However, as David Cayley, a biographer of Illich, points out, “What the critics miss I think is that Illich is a Christian” [4]. He goes on further to state that:

It was Illich's view that, in his time, his world had reached and exceeded every proper and natural and human scale: this was reflected in atomic weapons, in “development” driving inexorably toward eco-cide, and in institutions too ambitious and invasive as to amount to an “engineered messiah.” It was in this perspective, that he proposed deschooling as “the root of any movement for human liberation.” He did not see his times as ordinary ones calling only for mild and carefully mapped out measures. He saw them in apocalyptic perspective: as a moment of unprecedented peril and of an opportunity precisely proportional to this peril: “The mood of 1971 is propitious for a major change of direction in search of hopeful future.” One can take issue with this perspective, but I don't think *Deschooling Society* can be properly interpreted without taking it into account.

In this way, Illich viewed the deschooling of society as a moral imperative. As Illich saw it, society had reached a tipping point. It could either engineer a “mechanical messiah” to try to save itself—only to lead to further doom—or attain liberation and salvation from the tyranny of schools and other bureaucratic institutions. This turn to teleology brings us to the cybernetic influence on Illich, which was also not explicit in his writings. While science had withdrawn from teleological explanations, cybernetics had brought a return of teleology to science. Cybernetics influenced the notion of feedback loops, which could account for Illich's view on the state of society.

The notion of self-organizing systems in cybernetics appears to have been particularly relevant to Illich's learning webs, where

goal-directed learning behaviors could create a more liberating self-organized educational system than one governed by a centralized authority; Section 4.1 explores the nature of decentralization (and centralization) in Illich's vision further. Indeed, in the summer of 1971, Ivan Illich invited some of the world's most renowned cyberneticians (Heinz von Foerster, Gordon Pask, Humberto Maturana, and Herbert Brün) to his institute at Cuernavaca for a research seminar on “Interpersonal Relational Networks.” At this seminar, Illich presented his recently published paper on learning webs. In his introduction to the collected essays of this seminar, von Foerster explains the problem with society that Illich is trying to tackle in cybernetic terms: “Society, as any other organism with distributed sensors and effectors, may become trapped in undesirable states in which the cause aggravates [sic] the effect, and the effect, in turn, aggravates the cause” [29]. On the four types of educational networks that Illich proposes, von Foerster states: “These educational networks are to act as sensors of society and by their self-organizing and self-repairing properties help to structure a more just and viable society” [29]. While Illich wrote his book before inviting this group of cyberneticians, he likely drew on cybernetic ideas when describing educational networks.

Notably absent from Illich's writing are references to psychological learning theory, one of the areas that is central to Learning @ Scale today. This may seem surprising, but it is likely because contemporary theories of learning (e.g., behaviorism and cognitivism) were simply not relevant to Illich's proposal, and perhaps counter to what he was trying to challenge. Behaviorist and cognitivist theories could be seen as supporting the notion of a sanctioned curriculum (i.e., the behavior the expert wants to reinforce or what an expert knows that a novice does not yet know), which is what Illich was fighting against.<sup>4</sup> The theories that resonate most with Illich's writings (i.e., situated cognition, distributed cognition, and constructionism) had not yet been developed; in fact, it may be said that Illich anticipated certain aspects of these theories and perhaps helped inform the theorists who would develop them in the coming decades. For example, the following passage seems to anticipate the notion of legitimate peripheral participation [17]:

[The] purpose [of new educational institutions] must be to facilitate access for the learner: to allow him to look into the windows of the control room or the parliament, if he cannot get in by the door. Moreover, such new institutions should be channels to which the learner would have access without credentials or pedigree—public spaces in which peers and elders outside his immediate horizon would become available.

We explore the connection of Illich's work to constructionism in the Section 3.3.

All of this is not to suggest that learning at scale researchers should bring theology or politics into their work, but that a holistic approach encourages one to confront political and normative assumptions that are often implicit in learning at scale projects; we discuss an example of this in Section 4.3. Moreover, a broader multidisciplinary framing is needed to develop a cohesive vision of

<sup>4</sup>Interestingly, Illich actually does seem to suggest there is value in programmed instruction—which is rooted in behaviorism—but only when a learner wants to efficiently learn a specific body of knowledge, not as curriculum that must be delivered to everyone.



learning at scale. There are two ways in which this could be done. First, researchers could work in interdisciplinary teams that bring in individuals from the variety of backgrounds needed to inform the design of new learning infrastructures. Surely learning at scale researchers already do this to some extent, but the range of disciplines drawn on can certainly be expanded. Second, individual researchers can view learning and the systems that support it from a more holistic perspective. This requires training in a variety of areas, but in the spirit of Illich's vision, such training need not necessarily be in terms of formal degrees or certificates! Both of these naturally intersect in Illich's work. He was certainly a polymath who was well-versed in a variety of fields, but he also situated himself in a network of leading thinkers and researchers from fields that expanded his horizon. At CIDOC, he invited notable educational critics, such as Paolo Freire, John Holt, and Paul Goodman. But he also invited the world's leading cyberneticians, who were themselves experts in fields ranging from physics, biology, psychology, and music. The learning at scale field is already interdisciplinary, but by further widening its disciplinary boundaries, it can foster the development of richer (if more controversial) theories and infrastructures for learning as well as (indirectly) training individual researchers to view the complex phenomena of learning and educational systems from diverse perspectives.

### 3.2 Thinking Outside the Box of School

Discussion around the future of education is limited by assumptions about what school has been in the past. Scholars sometimes call this the “grammar of schooling”: core elements about the design of school that include batch processing of students, segregating learning by age-grades, teaching as information transfer, and segregating academic learning from real-world contexts [19, 28]. Breaking from this grammar is difficult—as Tyack and Cuban [28] argue in their seminal *Tinkering Toward Utopia*. This grammar persists in school design and in how educators, researchers, and technologists build systems for learning.

Adhering to the grammar of school severely constrains our ability to design better systems for learning—ones that are not limited by the assumptions of the past. Illich argues that this is partially due to a lack of imagination: although many people have learned valuable skills and knowledge outside of school, it remains hard for them to imagine educational institutions that do not resemble current versions of school.

Illich's learning webs offer a provocative example of how to design systems that break from the grammar of school. He argues that designing any learning system begins by enhancing the relationships between a person and the environment around them. The goal is to cultivate self-direction (what he calls self-motivated learning) and links to the world that a learner can direct (instead of being directed by others on how to interact with the world). Critically, Illich's approach to self-direction is grounded in relationships: humans develop their agency in relation to others.

In trying to articulate the purpose of education, Illich establishes three first principles:

A good educational system should have three purposes: it should provide all who want to learn with access to available resources at any time in their lives;

empower all who want to share what they know to find those who want to learn it from them; and, finally, furnish all who want to present an issue to the public with the opportunity to make their challenge known.

The problem of education becomes not “What should someone learn?” but instead “What kinds of things and people might learners want to be in contact with in order to learn?” The goal, therefore, of a learning system (local or at scale) is not the transmission of knowledge but rather to connect a person with things, resources, and people. Put simply, the challenge is to design a network.

In our view, working from a framework like Illich's does not mean abandoning our existing public education systems or only working outside of them. Rather, it enables us to better center the needs of learners, the real constraints in which we work, and then to design systems that can navigate those constraints in service of powerful learning.

The Scratch online community is one example of a system influenced by Illich's Learning Webs [5, 18]—one that has shaped learning both outside of school and in schools. The Scratch community centers the kinds of things a child might want to interact with (what Illich calls objects). It supports a range of interactions with peers (other Scratchers), elders (Scratchers who might be more experienced through structured programs like Scratch camp and other interactions on the platform), and models (example projects a Scratcher can remix, videos made by other Scratchers demonstrating how to do certain things). And it does so in a way that could be integrated into schools (e.g. as an expressive tool for a biology project or a math simulation) without reproducing the assumptions of traditional forms of schooling (e.g. Scratch centers constructing knowledge through creating an external artifact, not transferring information).

In an era with increasing recognition that education systems need to be redesigned, Illich offers an approach grounded in first principles—one that offers a better departure point for thinking about what to scale.

### 3.3 Broadening Our Notion of What to Scale

Many systems that claim to scale learning focus on scaling content. For example, massive open online courses (MOOCs) promise to deliver high-quality content to users around the world for free or low cost. Some systems scale up grading, certification, and/or the personalization of content. Broadly, all of these learning at scale systems can be said to scale *learning experiences*, which can be conceived of as ready-made (although perhaps personalized and optimized) experiences that are delivered to learners and constructed by some combination of domain experts, instructors, algorithms, or peers.<sup>5</sup>

While the term “learning experience” is quite broad and can begin to push us away from merely scaling the delivery of content, we posit that Illich pushes us toward an even broader notion of what to scale—scaling organic *learning opportunities*: “What are needed are new networks, readily available to the public and designed to spread equal opportunity for learning and teaching.” The

<sup>5</sup>The phrase “learning experience” could be interpreted as anything a learner experiences on their own, but typically discussion around learning experiences are about the experiences that educators or others create for the learners.

term opportunity suggests that the learner has access to something and can choose to partake in it. Of course, one dimension of this is “equal opportunity”—that all learners have equal access to the same resources—which we return to in Section 4.3. Here, we examine what it means to expand “access” to learning opportunities. In particular, we focus on one of Illich's four networks that has perhaps been least considered by learning at scale: the network of educational objects. We differentiate between two forms of access.

The first notion of access is simply to make learning more readily available and *visible* to all learners. Illich describes how everyday objects and things that are typically confined to workplaces could be made available to learners, opening up innumerable educational opportunities:

In American society, children are excluded from most things and places on the grounds that they are private. But even in societies which have declared an end to private property children are kept away from the same places and things because they are considered the special domain of professionals and dangerous to the uninitiated. Since the last generation the railroad yard has become as inaccessible as the fire station. Yet with a little ingenuity it should not be difficult to provide for safety in such places. To deschool the artifacts of education will require making the artifacts and processes available—and recognizing their educational value. Certainly, some workers would find it inconvenient to be accessible to learners; but this inconvenience must be balanced against the educational gains.

Illich goes on to give examples of the kinds of environments that can be made available:

There could be tool shops, libraries, laboratories, and gaming rooms. Photo labs and offset presses would allow neighborhood newspapers to flourish. Some storefront learning centers could contain viewing booths for closed-circuit television, others could feature office equipment for use and for repair. The jukebox or the record player would be commonplace, with some specializing in classical music, others in international folk tunes, others in jazz. Film clubs would compete with each other and with commercial television. Museum outlets could be networks for circulating exhibits of works of art, both old and new, originals and reproductions, perhaps administered by the various metropolitan museums.

While learning at scale infrastructures typically do not consider how to make physical artifacts and spaces available and visible to the general public, we think this is an important question at the intersection of urban design and learning at scale; we return to this when discussing community-based learning at scale in Section 4.2.

The second way in which access must be increased to educational objects is providing access to fully understand and manipulate the objects themselves. According to Illich,

Industry has surrounded people with artifacts whose inner workings only specialists are allowed to understand. The nonspecialist is discouraged from figuring

out what makes a watch tick, or a telephone ring, or an electric typewriter work, by being warned that it will break if he tries. He can be told what makes a transistor radio work, but he cannot find out for himself. This type of design tends to reinforce a noninventive society in which the experts find it progressively easier to hide behind their expertise and beyond evaluation.

Indeed, this was addressed in the third paragraph of the mechanical donkeys passage (solid underlined section), and was actually the whole purpose of Illich discussing that example. Illich explains that inexpensive, but transparent, everyday objects can provide more educational value than expensive and possibly powerful, but opaque, objects. Smartphones that are bigger but hackable by an end user are better than small, polished iPhones that are difficult to tinker with or even repair. While the latter may be fine for consumption, the former is ideal for making the learner a producer in society—and for creating a culture where innovation and creation is truly democratized.

We see this theme picked up in the work of constructionists [7], who claim that people learn best by manipulating and constructing tangible objects (whether physical or digital) to facilitate their mental constructions. Building on ideas introduced by Illich and Papert, the Beyond Black Box project led by Mitch Resnick explored these ideas further through their work on developing robotics kits and, later, programming languages:

Both the power and the problem with modern scientific instrumentation are reflected in the term “black box” that is commonly used to describe the equipment. Today's blackbox instruments are highly effective in making measurements and collecting data – enabling even novices to perform advanced scientific experiments. But, at the same time, these black boxes are “opaque” (in that their inner workings are often hidden and thus poorly understood by their users) and they are bland in appearance (making it difficult for users to feel a sense of personal connection with scientific activity). [24]

## 4 THREE DESIGN TENSIONS

### 4.1 Decentralization vs. Centralization

Technology can be used to reinforce centralized, top-down structures; or it can be used to nourish decentralized networks that are less hierarchical. The former tends to place agency in the hands of the few, making the many consumers of information, media, and technology. The latter empowers more people as creators, creating a vision for a society where knowledge and power are more evenly distributed.

Illich makes this point using multiple examples, including the mechanical donkey anecdote. However, the desire to decentralize learning can sometimes feel at odds with his emphasis on exchanges—seemingly centralized places to find peers, objects, or educators-at-large. Perhaps ironically, a learning exchange is a centralized mechanism that works to support decentralized learning and personalized learning paths that learners craft for themselves.

Probing deeper, the tension becomes easier to resolve: Illich made this argument before the networked age we live in. He was not



grappling with the challenges of large scale networks with millions of people. Rather, he was concerned with creating places where people could find enough of a critical mass of educational objects, peers, or elders. This is reflected in the localized nature of the exchanges that emerged in the 1970s in response to Illich's work. In this sense, centralized tools (e.g. exchanges that bring people together) remain rooted in a place and context. The implication? When designing for learning at scale, Illich's work pushes us to think about the ways in which a large-scale system can both (a) support localization and (b) empower participants of a system as active agents, not simply consumers. In other words, how might scale support decentralized, locally-owned, and appropriable environments?

The Wildflower Foundation, a decentralized network of Montessori schools, offers a compelling example for this tension that Illich balances. On the one hand, each member of the Wildflower network is deeply rooted in a place: the design of each school emerges from community members and is unique based on the particular needs of that community and the vision of its members. However, these diverse nodes are unified by shared support, technology tools that enhance learning at each school site, and the benefits of being part of a large diverse network of city-based partner schools. The approach taken by Wildflower contrasts starkly with more centralized approaches to scale (something we see in many other school networks).

Illich's ideas about decentralization have even more relevance in the era we live in now. Blockchain technologies enable new kinds of decentralized organization and community-based ownership that build on many of the ideas Illich introduces. A number of Decentralized Autonomous Organizations (DAOs) are experimenting with forms of community governance and ownership related to learning, work that might yield promising breakthroughs in how people discover, participate, and credential learning of skills and knowledge. We do not claim blockchain is the solution for how to decentralize education; rather, it *may* serve as a modern model for how to implement some of Illich's ideas without relying heavily on a centralized authority.

## 4.2 Scaling Place-Based vs. Online Communities

Most work in L@S focuses on online or digital technologies (such as MOOCs, intelligent tutoring systems, and online communities like Scratch). This is natural as "The Learning at Scale community investigates large-scale, technology-mediated learning environments" [1]. However, we note that learning can also be scaled in physical spaces and in local communities, and that the scaling of such learning can still be technology-mediated. For example, Meetup.com provides learners the opportunity to find like-minded individuals whom they can subsequently meet with in person.

As discussed earlier, Illich's vision describes the potential value of designing physical communities (especially in urban settings) where learning opportunities abound. We posit such "place-based learning at scale" is an understudied mode of learning at scale. Adequate design of physical communities that scale learning requires drawing on multiple fields, including urban planning and urban design, community-based design research, grassroots (perhaps political) organizing, economics, and crowdsourcing. This again reflects the importance of multidisciplinary in designing comprehensive

infrastructures for learning at scale. The Chicago City of Learning (CCoL) is a great example of such a project [21]; Nichole Pinkard spoke about this community-centered design project in a keynote address at the 2018 Learning @ Scale conference. According to Pinkard [21],

[CCoL] was based upon the assumption that given Chicago's robust transportation system and network of [out-of-school] organizations, if opportunities were clearly organized and presented in an accessible way then youth and families would find and participate in desirable programming within and outside of their community... all enrolled children have a profile homepage revealing what they're working on now, a history of what they have done through a collection of records of participation, formulating a portfolio of participation that spans across years and locations... The system makes recommendations based on where they live, prior experiences, and self-selected interests.

This sounds quite similar to the kind of community-based learning that Illich was advocating for and incidentally it is being undertaken in the same city where one of the first learning exchanges was formed based on Illich's work several decades earlier.

Other examples of powerful location-based learning networks include the Remake Learning Network, a community of innovative educators and organizations devoted to improving learning in Pittsburgh; the Clubhouse Network, an international community of after-school STEM clubhouses that are deeply rooted in physical communities; and the aforementioned Wildflower Foundation, which provides a network of shopfront Montessori schools. There are many opportunities to scale support for in-person place-based communities. Perhaps these models can inspire other communities to implement similar infrastructures.

Place-based learning experiences can take advantage of existing community capital, the visibility of physical spaces, and the roles that different people organically play in neighborhoods. Imagine if our neighborhoods were structured to be more like Mr. Roger's Neighborhood, where learning opportunities abound. Indeed, when Doroudi (the first author of this paper) was walking through Chicago with his wife, they stumbled upon the YOUmedia space in the Chicago Public Library which is very visible to the public through large glass windows. They were immediately interested in checking out this innovative learning environment. YOUmedia was an earlier project by the Digital Youth Network that spearheaded the Chicago City of Learning.

As an example of a digitally-mediated neighborhood-centered learning environment, in the 1990s, Alan Shaw created MUSIC (Multi-User Sessions In Community). Rather than connecting people nationally or globally, MUSIC was designed as a local neighborhood infrastructure to allow people in the same neighborhood to communicate, organize, and collaborate on local initiatives and activism. Participants can navigate a digital version of their neighborhood, enter buildings, send messages, and engage in real-time conversations with one another. Shaw, who was a student of Seymour Papert, used MUSIC as a tool to develop his theory of social constructionism, which was rooted in Papert's constructionism but was also explicitly motivated by Illich's ideas; Shaw cited Illich's

work (both *Deschooling Society* and *Tools for Conviviality*) in his dissertation [26]. Although local neighborhood infrastructures are customized specifically for the context of a particular neighborhood, the general concept can be scaled up. Indeed, Shaw and his wife extended this work through “Linking Urban Villages,” a project that tried to connect different urban communities interested in using MUSIC [26]. While initially focusing on African American communities in Boston, they eventually expanded to other cities like Newark, Harlem, Brooklyn, Cincinnati, and Jackson [25]. In this sense, MUSIC serves as an interesting case study in place-based learning at scale.

Interestingly however, Illich was not promoting local initiatives wholesale; while he acknowledged the advantages of place-based learning at scale, he also acknowledged limitations:

Some people become genuinely agitated when one suggests the setting up of *ad hoc* encounters which are not rooted in the life of a local community. Others react when one suggests using a computer to sort and match client-identified interests. People cannot be drawn together in such an impersonal manner, they say. Common inquiry must be rooted in a history of shared experience at many levels, and must grow out of this experience—the development of neighborhood institutions, for example.

I sympathize with these objections, but I think they miss my point as well as their own. In the first place, the return to neighborhood life as the primary center of creative expression might actually work against the re-establishment of neighborhoods as political units. Centering demands on the neighborhood may, in fact, neglect an important liberating aspect of urban life—the ability of a person to participate simultaneously in several peer groups. Also, there is an important sense in which people who have never lived together in a physical community, may occasionally have far more experiences to share than those who have known each other from childhood.

Thus, Illich would likely have advocated for online communities that bring together like-minded peers and bring them into contact with educational artifacts, mentors, and other resources they need to learn. Interestingly, Illich saw this kind of “online” networking as not removing us from local community, but “encourag[ing] the restoration of local life to cities from which it is now disappearing;” “Having once seen that doing things together depends on deciding to do so, men may even insist that their local communities become more open to creative political exchange.” Thus, effective learning at scale (as Illich sees it) involves both local efforts and cross-pollination across neighborhood boundaries. Indeed, this is how human beings naturally interact. In designing learning at scale systems, we should see how we can effectively foster both kinds of learning and how they can feed into one another.

### 4.3 Serving the Advantaged vs. the Disadvantaged

A key challenge for learning at scale is designing equitable systems. Although MOOCs are often perceived as “democratizing education,”

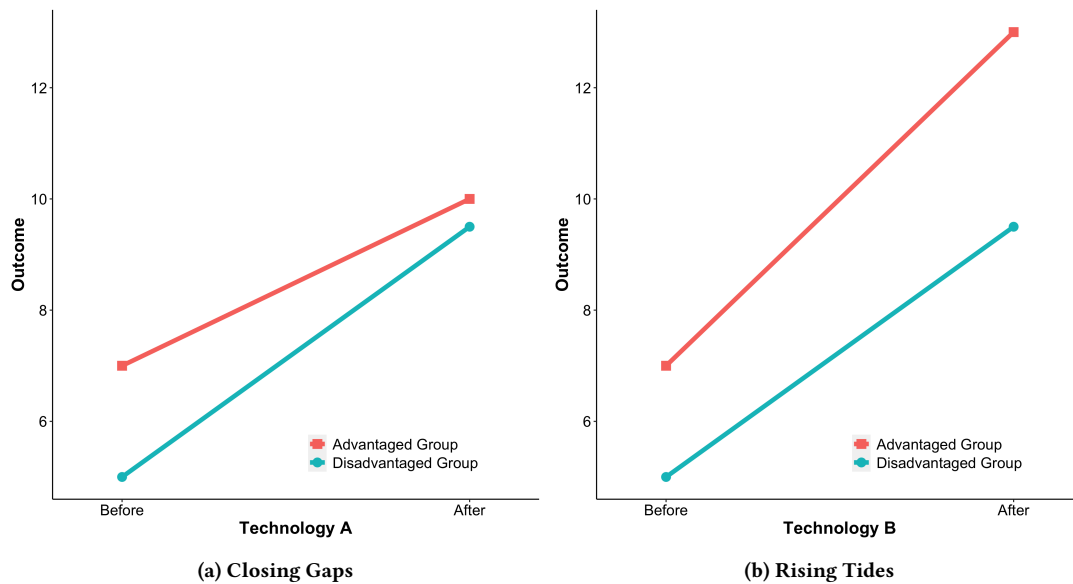
those who access MOOCs tend to be from more affluent and more educated neighborhoods [6] and socioeconomic (SES) backgrounds [6, 13]. Hansen and Reich [6] used this to motivate two possible scenarios for how a technology might differently affect students from low-SES and high-SES backgrounds. We replicate a modified version of their figure here in Figure 2. The scenario on the left (a) shows an educational technology that would close achievement gaps between disadvantaged and advantaged students while the scenario on the right (b) shows a “rising tides” scenario where both groups benefit, but the advantaged students benefit disproportionately more. Reich [23] claims that educational technology often falls under scenario (b), which he calls the “edtech Matthew effect.”

Which of the scenarios in Figure 2 is more desirable? We suspect many would claim the closing gaps scenario is ideal because it seems to capture a reasonable notion of equity. However, notice that the disadvantaged group performs equally well under both scenarios while the advantaged group performs strictly worse on average in the closing gaps scenario than in the rising tides scenario. Therefore by preferring outcome (a) we are implicitly claiming that we are willing to have some students improve less than they could have otherwise improved in order to attain equity. Regardless of which scenario a researcher or practitioner prefers, the importance of this discussion is that such claims and trade-offs are rarely made explicit. Illich, on the other hand, is not afraid to make explicit his values around equity and the necessary sacrifices to attain equitable outcomes. This is evident in the mechanical donkey example (dashed underlined section). Throughout his work, Illich repeats this claim: we should prioritize the needs of the disadvantaged when designing learning systems, even when it might negatively impact the more advantaged. Designers call this practice “designing from the margins” because it centers the needs of the most vulnerable and uses that as a departure point for designing systems that work well for more people [16]. But like all design decisions, there are trade-offs. In Illich’s case, providing mechanical donkeys to the poor requires designing roads that are suitable for those donkeys, not for cars; the wealthy and powerful have to be comfortable with a reduced speed limit.

Prioritizing the disadvantaged in the ways suggested by Illich might require significant shifts in how we design for learning at scale. Simply adapting technologies used by the rich and designed for wealthy contexts will likely reproduce the Matthew Effect described by Reich. A different approach would start with the contexts of the most disadvantaged and consider the ways in which learning systems might be designed to center their needs. Examples include the Indaba Foundation’s work to adapt Montessori methods in the Western Cape of South Africa or Pratham’s work scaling out-of-school learning opportunities throughout India.

Of course, this is not to say that designing for disadvantaged populations can never benefit others as well. While there is a trade-off in some cases, Illich recognizes that the status quo is sometimes sub par for both the rich and the poor:

At present, attention is focused on the disparity between rich and poor children in their access to things and in the manner in which they can learn from them. OEO and other agencies, following this approach, concentrate on equalizing chances, by trying to provide



**Figure 2: Two hypothetical scenarios depicting the differential impact that educational technologies might have on advantaged and disadvantaged students.**

more educational equipment for the poor. A more radical point of departure would be to recognize that in the city rich and poor alike are artificially kept away from most of the things that surround them.

By trying to provide the disadvantaged access to the same resources as the advantaged—resources that they may not use even if they are given access to them—we may forgo the opportunity to rethink how we design equitable and powerful learning environments from the ground up, building on themes we discussed in Sections 3.2 and 3.3.

## 5 A BRIDGE BETWEEN LEARNING AT SCALE AND CONNECTED LEARNING

In addition to L@S, Illich’s ideas relate to the connected learning (CL) community of education researchers and practitioners. Connected learning environments support youths in following their interests, forming relationships with peers and mentors, and learning in ways that enable academic success, career opportunities, or civic engagement [11, 12]. Connected learning research was originally established to study the role that digital media can play in interest-driven learning—through digital media production and/or connecting individuals using digital networking tools—but connected learning environments need not always involve the use of digital tools (as in arts summer camps or athletics programs) [11].

As Reich notes, the “Peer-Guided Learning @ Scale” genre is where the CL and L@S communities intersect [23]. However, this genre has been less prevalent in Learning @ Scale until recently. Seemingly to increase representation of this genre in the conference, the 2022 L@S conference initiated a new track called “Informal Learning @ Scale” (championed by Reich).

We view Illich’s work as an example of “Connected Learning @ Scale” that could potentially serve as a bridge between the L@S and

CL research communities. In addition to the powerful ideas and design tensions outlined above, which can be taken into consideration for a variety of learning at scale systems, Illich’s learning webs can give design guidelines for how to design connected learning systems at scale. The Chicago City of Learning and YOUmedia spaces mentioned earlier (both part of the Digital Youth Network) provide interesting studies of connected learning environments that can be viewed as compatible with aspects of Illich’s vision. How do we scale up the YOUmedia model to expand to libraries across the country? How can we design peer exchanges to incorporate the best practices of what we know about how youth benefit from CL environments? How can we enable connected learning by opening up access to educational objects and mentors across various workplaces in urban environments? We believe the L@S and CL communities could work together—taking inspiration from Illich—in attempting to answer such questions.

## 6 CONCLUSION

We feel it is timely to revisit Illich’s work as it can offer provocations to advance work on learning at scale in a networked age. Although the concept of learning webs was impactful in the 1970s, it has seemingly been underexplored by some of the education research communities that might have the most to benefit from Illich’s vision (L@S and CL). We suspect one reason for Illich’s work being ignored is because it is radically controversial; almost anyone who reads his vision is sure to disagree with some of it. But we do not think that is reason not to engage with Illich’s views. Even if we disagree with Illich’s conclusions, we can benefit from the process by which he reaches them, the passion with which he sets them forth, and the insights they provide for how to make learning available to all.

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