Learning Maps & Libraries of the Future

Mek, Open Library @ Internet Archive

Keywords

Libraries of the future, memex, associative trails, knowledge maps, collaboration, edtech, syllabus, tools for thought, learning maps, curriculum design, open source intelligence (OSINT)

Synopsis

On planet earth, we turn to Google Maps to get directions from San Francisco to Mexico City. In real-time, computer systems and human travelers work in tandem to warn us of road closures and slowdowns, present us with potentially better routes as they become known, and give us opportunities to add stops or adjust our routes along the way; the scenic route, the environmental route, the fastest route. We've done well in mapping the physical world, but we've hardly charted the digital world. At best, we've created a searchable index of digital places[1]. We haven't yet put in the work to beat useful [associative] trails through them. That is to say, whereas researchers of old used to have to thumb through files in a catalog, one may now teleport directly to a google result, a recommended netflix video, or a relevant academic paper. But we've yet to encode how these resources all sensibly link together, as interdependent puzzle pieces, to yield complex learning outcomes.

What does the Google Map look like for learning Chinese or Particle Physics? What sequences of resources [i.e. curriculum] have others taken and how might it be improved upon? How might each of our independent learning journeys be informed or served by a Universal Learning Map (Danny Hillis, 2012) which helps us discover reputable, relevant sources at our skill level and the optimal path [progression] for *us* to weave through these resources. Most importantly, how might our collaborative, independent usage of such a Universal Learning Map compound returns for everyone's benefit, so we're not redundantly repeating each other's research process and costly mistakes; so we're not stuck at the same dead ends or caught in traffic slowdowns.

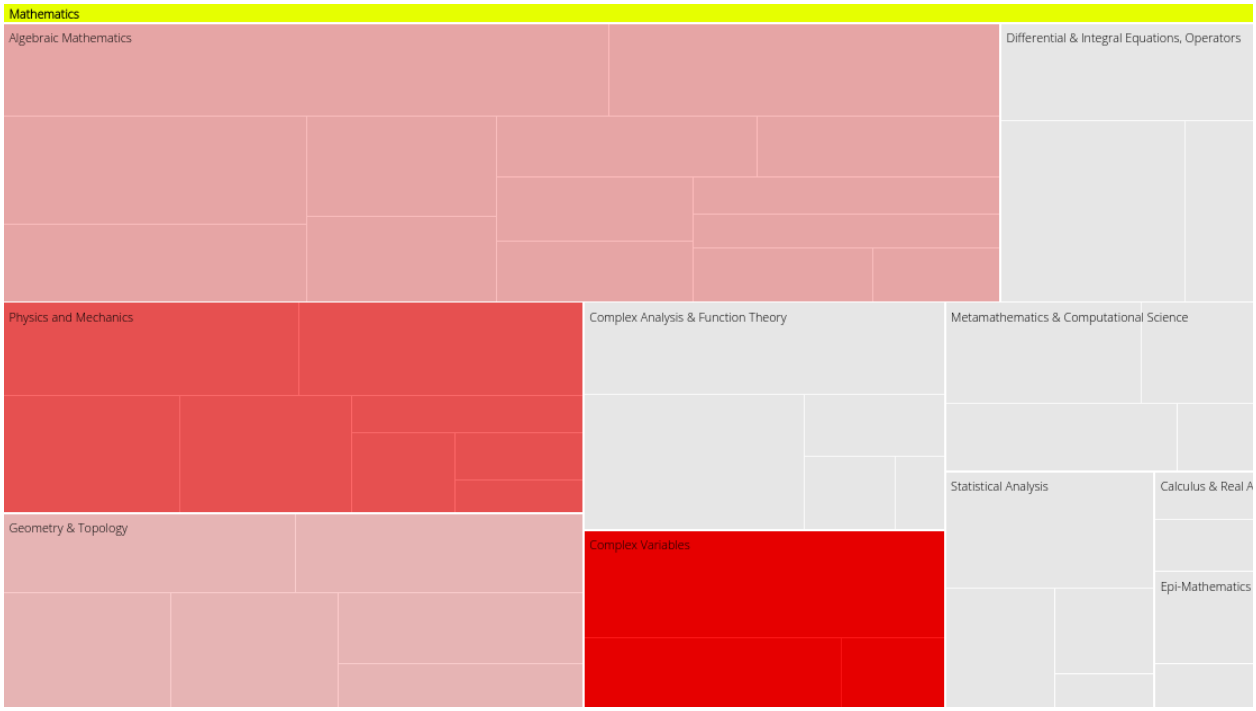
In Neal Stephenson's SciFi novel, "The Diamond Age, or A Young Lady's Illustrated Primer", we are told of a magical book called the "Primer" which constructs and presents perfectly tailored learning paths and explanations to its reader, as it's needed. Explanations which are uniquely sensitive to the reader's experiences, capabilities, and preferences, and which may dynamically adapt with the reader's understanding avoid speed traps and slowdowns.

This compendium permits us to suspend disbelief and envision a grand Universal Learning Map; a Primer which aids us in publicly indexing and mapping the world's scholarly information, charting communal trails through this information, and building technology which aids us in navigating and extending these trails. It's much the same vision Vannevar Bush conceived of more than 70 years ago, when he introduced the world to the idea of a Memex in his landmark 1945 Atlantic article, "As We May Think".

The examples to follow explore the Internet as a **Library of the Future**. For context, it is recommended to watch this history talk and this primer:

Math.mx

A zoomable treemap for exploring the fields of mathematics.



What problem does Math.mx solve?
What is the anatomy of a field of research? How can humanity work together to create an evolving taxonomy to help researchers discover connections and currently. Math.mx (Mathematics) is a prototype which aims to explore this concept.

What is the vision?
Imagine your own personalized learning graph which showed you a visual map of the topics you wished to learn. When fully zoomed out, you see a map of top level concepts, represented as rectangles. And each rectangle in the map may be colored with hue and saturation whose intensity varies from gray to pink to red (not implemented), indicating an average representation of how many subtopics in this field you have learned. Each topic's rectangle may be clicked, entered, and zoomed in to, revealing it's related child subtopics. In a recursive manner, each of these topical rectangles too are colored, giving the learning an understanding of their knowledge or familiarity of this topic's sub-topics. And in clicking any given topic, eventually the learner will reach a base case where there is no sub-topic, but instead a resource -- a wikipedia article, a khan academy quiz, a youtube video, a book chapter -- capable of informing or challenging your

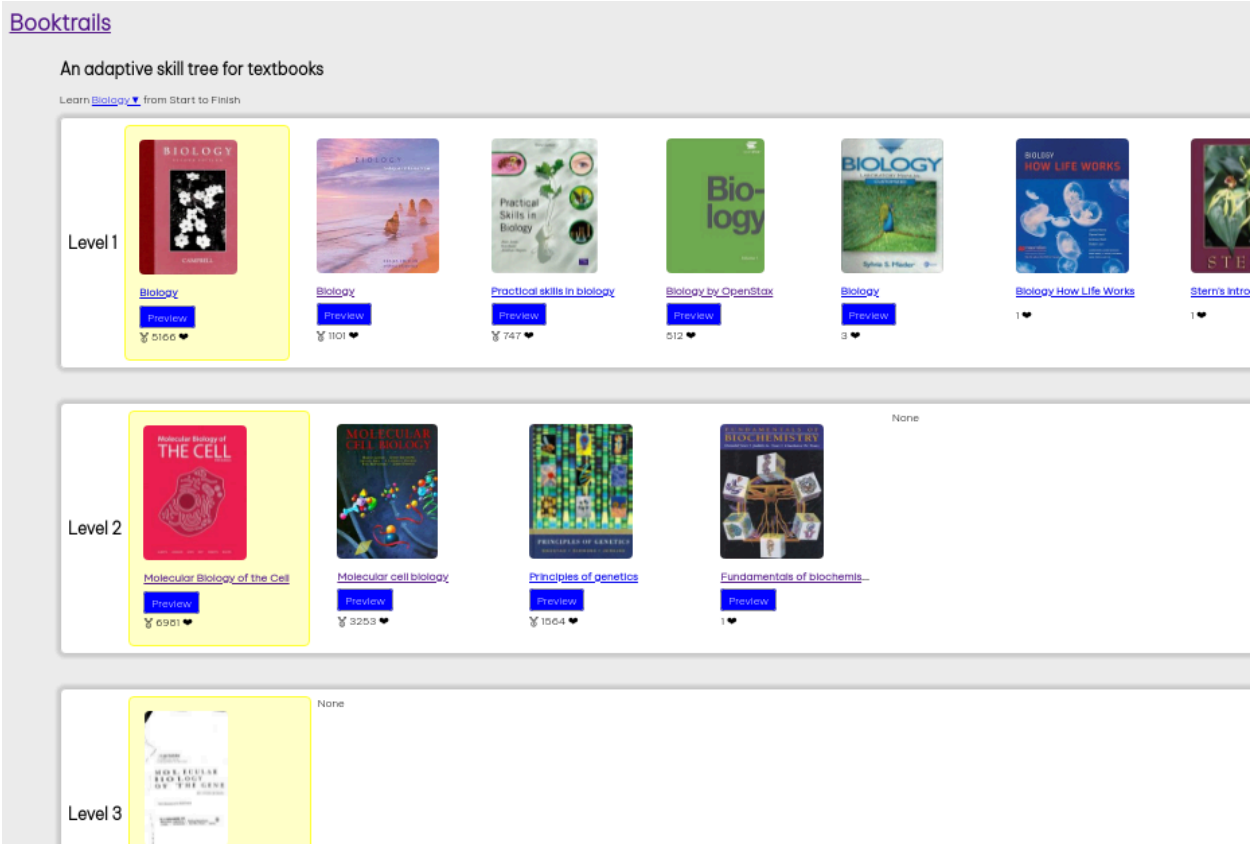
understanding.. And upon learning this material, your learning graph becomes updated and through this process, the colors of the map update at each level.

On top of this map, similar to google maps, researchers can plan a trail towards learning a specific discipline of math or perhaps the shortest path to acquiring the knowledge dependent on solving a specific problem. And with each learner who uses the map, the map may evolve and learn, providing better resources, predictions, and feedback to all who might enjoy it.

Read more about Math.mx

Book Trails

An adaptive, universal curriculum & wiki skill-tree for textbooks.



What problem does BookTrails solve?
For a self learner interested in exploring a new academic field, a good first step may be to find a course syllabi online. This alone may be a challenge as universities vary in focus and quality. The process is also exacerbated by the fact that courses are often taught by different faculty and so finding a coherent sequence of curriculum on a subject can be a time consuming

challenge. Assuming the learner is able to access a coherent sequence of syllabi for a school on a topic, then they need to identify source material from within the curriculum which may be used for learning, such as papers or books. And finally, these books need to be looked up and accessed, one at a time, either at a library, from a friend, or at some expense through a vendor like BookShop.

Even having completed all these steps, a multi-hour process, there are several additional caveats. First, the learner is seeing just one path, one school's interpretation of a sequence and choice of source material. It would be better if the learner could somehow consider the average of all curriculum sequences on the topic across schools. The Open Syllabus project collects syllabi data which can help us achieve a solution. Secondly and thirdly, syllabi are statically published online, can go out of date, and only certain people can contribute. A wiki which prioritized the votes of hundreds of thousands of syllabi from the Open Syllabus project but which also considers suggestions from informed patrons online would drastically improve the diversity and freshness of the results. Fourthly, while syllabi only allow one view, a graph interface would allow learners to select or prefer different books and visualize how their learning journey would change based on the dependency information available between books. Fifthly, APIs through OpenLibrary.org may be used to immediately show which of the textbooks in a sequence are accessible online for free borrow.

These are the advancements which Booktrails.us features in its prototype.

How does it work?
By selecting any starting subject or a starting book within the graph, a learner sees a curriculum manifest, informed by dependencies submitted by the community and weighted by the number of times edges between books have been endorsed by hundreds of thousands of online syllabi.

The initial row (level) of results shows books on the topic which have no matching dependencies. At each level, one book may be selected at a time as a waypoint to constrain the path, just like one may insert a via point in Google Maps. Selecting a book will show at the next level the list of books which become accessible, sorted by the most endorsed first.

Anyone may add an edge to the graph between two books and this counts as an endorsement. So the more people who verify that two books are connected in a sequence the more those books are favored. I also have the open syllabus project data for the top 5,000 most assigned textbooks in math biology computer science chemistry physics

Get the code for Booktrails

Skillsera

A community-powered encyclopedia which teaches educational concepts by connecting youtube video explanations.

What problem does Skillsera solve?

Wikipedia has become one of the world's most valuable websites, a shining example of community and large-scale collaboration, and a top source for encyclopedic knowledge. It's perhaps the best first-stop reference on the web for obtaining an overview of an unfamiliar topic. But it's seldom sufficient by itself to lead a learner to understanding. Where wikipedia ends, books, academic papers, and youtube videos provide paths toward comprehension. Books and academic papers are wonderful sources of structured learning but publishers lock them up and package them as individual units. Their format also misses an opportunity to capitalize on the full bandwidth of the human experience which the web now makes possible (audio, visual, personal connection, interactivity). Youtube, on the other hand, has created an open culture around rapidly publishing thousands of hours of valuable educational video. There currently isn't anything like wikipedia for rich, educational video explanations. There's no reason a universal educational curriculum of the best linked video segments can't be made available to everyone,

regardless of their circumstances. Moving beyond books, what if there was a Wikipedia for interconnecting education youtube video explanations? This is the opportunity Skillsera sees.

Why Now & Imperative

More and more of our cultural heritage is being siloed, locked up, and sold and accessed piecemeal. This is true for books. For academic papers. And with coursera and others, it's becoming true with lectures. We live in a world where textbooks are $200 a unit and our ability to continue learning is artificially held back by our wallets and the friction of paywalls. Children not blessed with wealthy parents are presented with dead-ends and turn directionless to the web. Wikipedia tries to fill this gap with a unique paradigm which empowers us to browse unrestricted, "As We May Think" and at the speed of imagination, limited only by the quality of the content and our lack of curriculum. These are serious limitations and most of us who use Wikipedia regularly understand it to be an incredible reference source and not a silver bullet. I see Khan Academy challenging this status quo, generating quality content and creating a free directed curriculum of core content. I think there's more we can do.

Wikipedia set an important precedent of unlocking the genre of encyclopedic information open to the world. Sillsera has a fleeting opportunity to set the same precedent for the genre of educational video content by leveraging YouTubeand (for now) it's open ecosystem. By focusing on educational content, similar to that found on Wikipedia and Khan Academy, and encouraging the community to organize it using a non-profit, wiki-like platform, we can build a community expectation that educational videos are as essential to life as a google search, and should be and kept open.

Read more about Skillsera

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Footnotes

[1] *The real heart of the matter of selection, however, goes deeper than a lag in the adoption of mechanisms by libraries, or a lack of development of devices for their use. Our ineptitude in getting at the record is largely caused by the artificiality of systems of indexing. When data of any sort are placed in storage, they are filed alphabetically or numerically, and information is found (when it is) by tracing it down from subclass to subclass. It can be in only one place, unless duplicates are used; one has to have rules as to which path will locate it, and the rules are cumbersome. Having found one item, moreover, one has to emerge from the system and re-enter on a new path* – As We May Think