

# Supporting Sociable Literacy in the International Children's Digital Library

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## ABSTRACT

As each generation of children grows up in a world shaped by the affordances available to them in both physical and digital environments, their expectations of tools to support changing literacy practices make new demands on technologists and designers. To ensure that digital libraries for young people support their understandings of libraries and reading (and not just adults' conceptions), an intergenerational design team at the University of Baltimore used contextual inquiry and participatory design to develop concepts for augmenting the International Children's Digital Library to make it more appropriate for 10-14 year olds. Our prototype aims to support "sociable literacy," a set of practices made possible by digital storage, retrieval and use of texts.

## Keywords

Children, digital libraries, cooperative inquiry, contextual inquiry, participatory design, sociable literacy

## 1. INTRODUCTION

Technologies developed after those of us in our 20s, 30s, 40s, and 50s grew up provide different experiences for today's young readers than they did for us. Thus today's younger readers expect different forms of interaction with many aspects of their world, including books. The meaning of some terms and institutions, like "libraries" and "reading," seem to be undergoing change as a result [10; 12]. Children's expectations for their encounters with texts evolve as the nature of their particular lived experiences changes. Thus developing digital libraries (DLs) and online reading environments for children challenges technologists not only because children differ from adults both cognitively and physically but also because today's children live in a world that is substantially different from the world in which today's adults grew up.

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*IDC 2004*, June 1-3, 2004, College Park, Maryland, USA  
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It is vital to research both the changing practices and the enduring needs of children at various stages of their social, cognitive and cultural development and to design tools that reconstruct the conditions of online literacy as each generation of children comes along. Employing principles of user-centered and participatory design, both the research and the on-going design work are best conducted with children as full research and design partners [5].

This paper documents the results of contextual inquiry into the reading practices of today's tweens and teens (children 10-14 years old), describes the process of designing and prototyping new interactions and interfaces for the existing International Children's Digital Library (ICDL) based on the findings of the contextual research, and discusses directions for future research and development of DLs for young adults.

We argue that the conditions and practices of literacy for today's tweens and young teens reveal significant changes from even the recent past. These changes have important implications for the development of DLs serving young adults and may have equally important implications for the development of DLs designed to serve the adults they will soon become. Today's young adults have new expectations for texts they encounter online. They want online services to support both reading and writing activities and they expect both reading and writing to take place in a sociable space that includes adults and other children in their age cohort. To be both useful and attractive to young adults, DLs must be designed to meet these needs and desires.

### 1.1 Libraries and Children

Traditional libraries are well aware of the need to tailor user services for young adults. Several recent studies [14; 15; 29] highlight the need for traditional libraries to work harder to be "cool" and to validate their users' ideas and input by providing collections and services that support young people's interests, even when those interests appear to clash with established definitions of culture. Although these studies do not directly address DLs for young adults, they reaffirm the importance of beginning with a deepened understanding of and respect for the ideas and input of the children themselves.

Starting our investigations with the child means understanding the complex ecology of children's lives, especially the micro system of people and institutions with which the child has direct contact. The library participates in the ecology of the micro system in much the same way the education system does. Planning future library services, whether for bricks-and-mortar buildings or for online spaces, requires mapping the library's role in relation to the child's whole experience [14].

## 1.2 Reading and Writing Environments

Our work is framed not only by the research on DLs but also by the history of literacy, especially online. Unlike physical libraries, DLs conflate functions associated with buildings (housing collections and tools for finding materials) with functions we associate with books (providing interfaces for reading and often for writing).

Experiments with readers' experiences are not entirely novel. Elaborately engineered children's books, perhaps the first "dynamic" texts, became available in the 19<sup>th</sup> century in the form of "pop-up" books, a format that still delights young children [19]. Since the early 20<sup>th</sup> century, a wide range of products have tried to augment children's experiences with books by adding sounds and even animations. Early examples involved phonograph records that taught children to read along and to turn the page when they heard a special sound. More recent examples include LeapPad™ and several innovative efforts exhibited in "XFR: eXperiments in the Future of Reading" [1; 7] at the Tech Museum of Innovation, including the Reading Eye Dog (RED) and the Listen Reader (LR). RED experiments with a form of social reading, while LR provides ambient sound as the reader moves her hands over the book. These examples illustrate how developers have added new interactions to the physical artifact.

Moving away from the physical book and into digital environments, many experiments—radical transformations like hypertext fictions [16] as well as more utilitarian approaches like the XLibris project at Xerox PARC [24] and commercially available *eBooks*™—have made important contributions to the research literature of the past 30 years if not to novel reading environments widely used today. Most of these ventures focus on adult readers and feature functions to support annotations and/or collaborative reading and writing environments. Such work usually assumes that when literacy involves the social practices, it primarily supports adult work, such as studying or researching.

In addition, several projects over the past decade have studied collaborative learning spaces for children, most notably the CSILE system at the Ontario Institute for Studies in Education [22, 23, 28]. Work on CSILE demonstrates the value of collaborative learning spaces, including support for reading, annotations, and writing (including composing illustrations). More recently, [27] have begun developing a DL for young adults that supports collaborative writing. It permits children to submit their own stories and poems to a workspace for collaborative review by peers and teachers.

## 1.3 The Need for New Research

Most of the research to date on digital libraries, computer support for collaborative work, and computer support for active reading and writing have focused on adults. Children have been less prominent as research subjects, let alone as research and design partners [5; 6; 9; 11; 25; 27]. While much work has been done to understand the literacy practices of adults, both in the workplace and as students, much less work has revealed the distinctive needs of today's young adults, children who, in Donald Tapscott's phrase, are already growing up digital [26].

The CSILE project provides rich, well-researched foundations for further work with young adults that can extend our understanding beyond the confines of formal schooling. Suggestive work on one kind of collaborative writing practice in a DL for young adults [27] demonstrates the need for dynamic DLs for this age group. The observational work grounding the design of the collaborative writing tool, however, committed itself to a specific school-based assignment carried out while children are co-present in the classroom. As a Web-based DL, the ICDL must meet needs and desires that arise under other, more loosely constrained conditions: when children are reading for pleasure and doing homework, as well as when they are reading and writing at school.

## 2. RESEARCH METHODS

Working with a pre-existing DL delivered in two formats over the Web, the Intergenerational Design Team (IDT) at the University of Baltimore (UB) employed the cooperative inquiry methodology developed at the Human Computer Interaction Lab (HCIL) at the University of Maryland (UM) [5] to reach a deeper understanding of the literacy practices of today's young adults. The challenge for the IDT at UB has been to provide new design directions for the ICDL to enable the library to support children whose ages range from 10-14. Over the past 18 months, we have used cooperative inquiry, including contextual inquiry, participatory design, and technology immersion [5; 9], to explore the changing literacy needs of these children and to develop new strategies for online libraries for them.

The ICDL, a project of UM and the Internet Archive funded by NSF and IMLS, makes children's books available worldwide through two parallel interfaces, one that uses a Java-based zooming interface and one built on simpler-to-deliver HTML (see <http://www.icdlbooks.org/>). Originally designed to support early literacy for children aged 5-10 [7], the ICDL's collection currently includes 324 books in at least 18 languages from more than 20 countries [6; 7]. Most books currently available are suitable for pre-literate and beginning readers; a small proportion are suitable for older children and intermediate readers.

Our contextual inquiry explores the following key questions:

- What do the concepts "reading" and "library" mean to children in this age group?

- How do American tweens and teens enact reading in their everyday lives? What are its uses and rewards for them?
- How do their knowledge about digital technologies and their experiences with computers and the Internet shape their expectations of online texts?

In addition, we investigated questions about the existing ICDL, including

- What do children like and dislike about the current interface?
- What would make the library “cool” and attractive?

Based on emerging answers to our questions, we prototyped more age-appropriate “skins” and new functions and interfaces for the ICDL to support some of the more dynamic features intermediate readers and young adults need. Through these prototypes we suggest future directions and challenges for the ICDL and for other efforts to support tweens and teens as readers through online texts.

In addition to the six children on our Intergenerational Design Team, we garnered input from 40 children in a variety of settings using a range of methods for contextual inquiry. The children on our team participated as co-researchers throughout these activities.

Like most qualitative and exploratory inquiries, the generalizability of our results may be somewhat limited. Although the children who participated in our inquiry and design activities ranged in age from 9 to 15 and were diverse both racially and socio-economically, the set does not constitute a representative sample of American youngsters. Our methods and findings are also constrained by their focus on distinctly American contexts and habits.

### 2.1 The IDT at the University of BALTIMORE

In its first year, the IDT at UB included six 10-14 year old children, three UB faculty, and three graduate students (two from UB and one from UM). In its second year, the team consists of seven children, three UB faculty, two UB graduate students and a member of the HCIL staff. The team meets at UB in a dedicated lab and an adjacent classroom for three hours most Saturday mornings during the children’s school year.

After a period of team-building and practicing methods for conducting contextual inquiry [11; 25], including observation, note-taking, and interviewing skills, the IDT at UB made three visits to public libraries and eight visits to the homes of children who are not members of the IDT. In addition, children on our team each invited a friend to a Design Team session to help explore the ICDL’s interfaces and to help us understand what they liked and did not like as of November 2002 [researcher’s notes].

We observed and interviewed children engaged in the following tasks:

- locating reading materials in public libraries
- reading for pleasure at home
- doing reading assignments at home

- doing reading assignments as part of class work in a public library

We encouraged all members of the design team to use digital technologies, in addition to sticky notes, crayons and markers, and physical art supplies to externalize and refine their design ideas. We helped our young partners learn Dreamweaver™ and Flash™ so that they could have a direct experience of crafting materials for the screen and to provide them with some of the technology immersion experiences that seem central to the methods pioneered by Druin but not easily replicable in our own setting.

Through individual reflection, sticky note sessions, group brainstorming, and low-tech prototyping, the IDT began to create a shared understanding of how young adults enact reading, what motivates them to read, when and where they read now, and what they imagine a digital library could offer them.

### 2.2 How the ICDL Supports Young Children

Because our development work builds on the existing ICDL, its functions and interfaces supplied the starting point for our work with young adults. In the classification scheme developed by [27], the current ICDL represents an instance of a *static* library: it supports browsing, searching, retrieving, and reading materials but does not support user-initiated additions to the collection such as annotations, reviews, or tools for collaborative work.

It exists in two forms. The Enhanced ICDL uses the Jazz toolkit for Zoomable User Interfaces. The Basic ICDL is delivered via standard HTML technologies. Both versions represent books as scanned page images, primarily as unencrypted JPEG images. In accordance with publishers’ requests, a few are encrypted and served with Adobe Content Server [6]. Although there are differences between the two forms, the developers have tried to provide similar user experiences in both.

#### *Browsing, Searching, and Displaying Search Results*

Both Enhanced and Basic versions of the ICDL support browsing and searching primarily through hierarchical categories developed through contextual inquiry with young children. As a secondary method, both versions support text-based search through metadata (title, author, illustrator, language, publication date).

#### *Reading Books*

The ICDL offers children three distinctive interfaces for interacting with books they wish to read: a standard reader, a comic strip reader, and a spiral reader [7]. The comic strip reader and the spiral reader offer different synoptic views, allowing readers to see some portion of all the pages and to navigate by clicking on any page. The standard reader does not offer a synoptic view and it simulates the activity of turning pages in a physical book and displays either a two-page spread or a single page at a time with left and right arrows to turn the page [6; 7].

In addition, the Basic ICDL provides a book “overview” mode that resembles the comic strip reader in the Enhanced ICDL. It displays a thumbnail of each two-page spread in

the book and allows the reader to click on a spread that attracts her. Unlike the comic strip reader in the Enhanced library, however, the overview mode accommodates only 12 images per screen. For any book longer than 12 pages, the page views are divided across multiple screens and do not offer a full synoptic view.

In all reading interfaces, once a reader has clicked on a page or spread, that single page or spread is then displayed on the full screen so that it can be read. All interfaces for reading provide forward and back arrows for “turning” the virtual pages.

### 3. FINDINGS FROM CONTEXTUAL RESEARCH: WHAT KIDS WANT

Our inquiries around the ICDL examined questions about how the library looks; what visitors to the library can do there; how the library supports browsing, searching and displaying search results; how the library (or the books there) support reading; and how reading fits into a larger picture of literacy practices. The most interesting findings point beyond prior research into factors that enhance the library’s general attractiveness to children and those that enhance the usefulness and usability of its methods for making books available to children, although both the look and the basic functionality are surely important gatekeepers. Children won’t use a library that’s uninviting and they can’t use one that does not support their search and retrieval strategies and abilities.

But beyond the front doors, as it were, lies a domain of new thinking and new expectations about the uses and the pleasures of digital texts. Both in the ways they support solitary reading activities and in their ability to resituate reading and writing in a highly social and communicative space, libraries for today’s young adults may need to re-examine their structures and offerings.

#### 3.1 How the ICDL Looks: Making It Cool



Figure 1: Fantasy skin.

Confirming [15]’s work, our contextual inquiries quickly determined that the current ICDL doesn’t meet the coolness test for our age cohort who perceived the icons and buttons as aimed at a younger audience. Having a look that is too young means having a library that is uninteresting. Recognizing that children at each age level need to “have their definition of culture accepted” and “to have their ...

interests recognized and catered for” [15], our IDT is developing multiple skins for the ICDL—with themes like space, food, fantasy, and jungle—so that the library can cater to different ideas of “cool.” Figure 1, showing an early themed interface in the fantasy set, features dragons drawn by the children on our design team.

But cool must be more than skin deep; it must include functionality and fit with daily life. In an early “bags of stuff” activity during which small teams of adults and children used low-tech prototyping to explore concepts for the digital library [November 2002, researcher’s notes], one team tried to work out ways to combine book-like features, screen-like features, and something like a game controller through which various actions could be initiated. Another team focused on a portable design.

Although we do not yet have ways to realize both dimensions, we have determined that “cool” needs to include both what the library looks like and what tweens and teens can do. Even if the collections focus on traditional books and do not include music and videos, today’s young adults expect augmentation—highly engaging, interactive features to accompany the books they are reading, especially when they are reading for fun.

#### 3.2 Browsing, Searching, Displaying Results

As earlier research on children’s browsing, and using keyword searching has shown [3], text-based searching is both appropriate for young adults and necessary to support the multifaceted purposes for which they use libraries and read books. In particular, we found that children in this cohort are likely to know the name of a book or an author, especially when they are fulfilling a reading assignment from school. They need quick ways of finding and retrieving the specific material they are seeking, especially once they have decided which book to read. Because children in this cohort read longer books (chapter books), they would prefer not to have to recall a sequence of clicks through a hierarchical category system to retrieve the book a second time.



Figure 2: Paper prototype for search with dictionary, note space, and bookshelf.

Two design suggestions for meeting their needs emerged from contextual inquiry into how children browse and/or search for things to read and what they need to support them once they have chosen a text: a personal bookshelf for

storing books they are interested in and the ability to search for a book by title or author. Development of a personalized storage space was deferred because currently there is no system for registering a user's identity with the library, and therefore there is no way to store information about an individual's selections so that that information is available to that user for a subsequent library visit.

To further develop design directions for text-based searching, we conducted a design session at the HCIL with the adults on Druin's design team [February 2003, researcher's notes]. The combined IDT used low-tech prototyping techniques and group brainstorming to work on search concepts that would support our tweens and teens (see Figure 2). In formulating constructs for "what should happen when ...," one of our young partners helped the team focus on what she saw as a difference between a search she initiates by "guessing" and one she initiates by "knowing." She theorized that if she could signal the computer that she was only "guessing" about what she was looking for, either because she was uncertain of spelling or because she was uncertain about which term she might want to use, the computer could return not lists of books or screens of thumbnails but rather various cues for clarifying her search strategy: alternative spellings, word collocations and synonyms, and other forms of assistance.

### 3.3 Retrieving and Reading Books

Other ideas for interactions within the digital library included a desire to search within a book, not just within the whole collection. Several children considered a utility that would create a list of links to every instance of a particular word, phrase or character's name a useful support for reading. During the design session in which the IDT elaborated on this idea through group brainstorming and drawing, it became clear that our younger designers were seeking enhanced ways to use library materials to support school assignments. A list of links would facilitate finding passages relevant to answering questions posed by teachers or to writing their book reports. In this instance, the functionality the team wanted to develop would support a variety of solitary reading activities that shade over into writing activities. Such a feature would help them complete their "reading logs," a device commonly used in the literacy curricula of American middle schools.

Although these concepts for searching currently lie beyond the scope of the ICDL development plan, they illustrate some ways our young partners' expectations of technologies are formed out of their everyday experiences and routines. More than the adults on the team, the young people have internalized prior experiences with online texts. When she mistypes a word in a Google search, after all, the search results helpfully ask: "did you mean:" and provide a "guess" about the searcher's term. Why shouldn't the library of the future offer such services?

### 3.4 Sociable Literacy

Beyond utilities to support particular searching and reading activities for individuals acting alone, however, the most common themes to emerge from our IDT work revolve

around desires for dynamic and sociable functions for DLs for young adults. In particular, we explored interaction and interface possibilities for annotating books to support both solitary, active reading practices [13; 24; 27], and also to support other "sociable functions" [4; 18]. Our young adults want texts to be vehicles for sharing with friends and with "co-workers"—fellow students and teachers.



**Figure 3: Paper prototype for dynamic reading/writing.**

Our designers wanted the system to support communications with themselves as readers (active reading), with other students who might be reading the same book, and with teachers, whether their activities were occurring during the school day or whether they were working at home more or less on their own. They see these supports as appropriate both in their work and in their reading for pleasure.

These desires for sociable functions signal a conceptual repositioning of literacy practices, moving them away from the private and introspective activities depicted by most of the research literature on reading and writing throughout much of the 20<sup>th</sup> century and toward an interpersonal and social enactment of such practices.

## 4. PROTOTYPE FOR SHARED ANNOTATIONS

After considering a number of ways to support sociable literacy, the IDT settled on four familiar metaphors from the world of physical artifacts: the rubber stamp, the highlighter, the sticky note, and the bookmark (defined as an object that is visible to the reader when the book is closed, not the links found on a Bookmarks or Favorites list in a Web browser). The team identified two roles for library users: teachers, who could enter three types of markings for students, and young readers, who could enter three types of annotations for themselves, to share with others, or to communicate with teachers. Bookmarks indicate pages on which annotations have been entered, either by teachers or by readers. They have not yet been fully prototyped and will not be discussed further.

In the ICDL we want for young adults, screens that display book pages include three "rubber stamp" icons arranged along one edge of the screen with other navigation and interface devices for controlling the reading environment (see Figure 4). Each rubber stamp carries an icon representing its meaning and is color-coded so that its

marks can be easily differentiated from the marks made with other stamps. The general layout of the interface is the same for the two classes of users—children and teachers—but the nature of the stamps available depends on the role of the user. For example, teachers have a stamp to alert readers that a passage might be challenging and that readers might want to read more slowly through those parts. Children have a notation tool for registering surprise (exclamation point). Both have stamps for marking annotations as questions but the color associated with the question mark for teachers differs from the color associated with the one for children to distinguish between the meaning of a teacher-generated question and a student-generated one.

To open up a space (sticky note) for writing, the library user clicks on a stamp icon, mouses to a passage of text, and highlights the passage by drag-selecting. (See Figure 5.) When the user has completed the selection, a rectangle representing a sticky note and color-coded to match the stamp selected pops up and displays a blinking insertion point to signal that it is available for writing. At the same time, a mark appears in the margin of the page to indicate the kind of note and the highlighted passage acquires a background color matching the color of the stamp, note, and marginal mark. The marginal mark includes the iconic signifier for the kind of stamp the user employed. When the note is put away, the mark in the margin provides users with access to the note.



Figure 5: Team reviews annotation interface.

## 5. DISCUSSION: THE CHANGING DYNAMICS OF LITERACY

Children awaken us to changes in literacy practices as the technical arrangements they have encountered in their lived experiences prompt them to develop new ideas about what a text is and can be. Our design partners have had multiple experiences with Web search tools, including Google, Ask Jeeves, Yahoo, and Yahoo!igans. As researchers and designers, we wanted to understand how experiences with a wide range of digital artifacts—with favorite Web sites like Neopets, with massively multiplayer games, with console video games, with word processing, and with instant messaging—shape their desires for and expectations of texts in digital environments. We need, then, to work with children as research partners and as design partners to prototype, test, and build DLs that will support as wide a range of practices and needs as we can.

The ICDL's technical arrangements construct conditions for literacy that replicate our most common cultural image of reading [4; 9; 11; 18]. For example, the scanned images of pages and the interface elements for moving from one page to another once the child is "reading" rather than "viewing" the book's structure suggests a minimal translation of turning the page rather than a transformation of the reading space. Such technical foundations make it impossible for users to search the text for occurrences of a particular word or character's name. Although the ICDL visualizes the structure of books by laying them out as if they were long comic strips or clever, spiral-shaped flip-books, the activity of reading in all ICDL interfaces adheres closely to the physical book's affordances.

For many books in the ICDL, especially those featuring elaborate illustrations and little verbal text, this strategy seems appropriate both to the content and to the needs and desires of young readers. For longer texts like chapter books, such representations can be supportive some of the time, but as the dynamics of literacy change for this generation, alternative representations of texts and reading might better serve them at least some of the time.



Figure 4: Annotation interface.

Although the prototype we developed significantly complicates the plan for developing the ICDL for older users by opening up a host of technical and social issues, it is faithful to the data we gathered through the contextual inquiry process and to the ideals for participatory design. The richest ideas for the prototype derived from interactions within the entire intergenerational team, with children helping adults understand how deeply situated in a nexus of social and educational activities reading is for them and therefore how vital it is that DLs support their social and educational needs.

## 6. CONCLUSIONS AND FUTURE WORK

Our contextual interviews developed a picture of reading for tweens and teens that is considerably more complex, more aligned with the agenda set for children by formal schooling, and more embedded in their social behaviors than we had predicted. The design concepts we prototyped enable children to incorporate active reading practices, like note-taking, into the digital library. But more importantly, they acknowledge the central role that sharing experiences plays for young adults. We learned that for tweens and teens, reading is more often associated with schooling than with free-time activities and pure pleasure. Like the adults they will become, they are beginning to differentiate between what, when, and how they read for fun and what, when and how they read for work (school). While they would like the digital library to house games and other forms of entertainment or edutainment, they recognize the limits of pure play and the value of learning and studying.

At the same time, they are accustomed to interacting with each other online through various chat utilities even while they are studying or keeping their reading logs for school. Indeed, even while they are co-present in our design lab, the young adults on our design team often use chat and IM to converse with each other. They have come to expect digital texts to be searchable and sharable in a number of different ways and they have no issues with moving back and forth between different applications—the ICDL and a chat window, for example—to accomplish their goals.

Four dominant themes emerge from our contextual inquiry and cooperative design work. These factors should help provide directions for future work both on the ICDL and on other DLs designed for young adults:

- personalization to address the visual aspects of the coolness factor;
- behavior of digital texts consonant with experiences of other online environments, including search sites;
- dynamic features supporting school assignments, especially the convergence of reading and writing activities characteristic of “active reading” strategies;
- sociable functions that help move literacy out of the sphere of individual activity and into a more complex social space.

Our prototype for supporting annotations in the ICDL provides a mechanism for further exploration of young readers’ changing expectations of reading in digital environments. It represents the way at least some of today’s young adults understand and enact the practices of reading, both for pleasure and for other purposes. In the coming year we will be revising and augmenting the annotation prototype to explore the sociable features in greater detail. In particular, we will be engaging teachers as well as children in developing new tools to enable the library to support this age cohort’s needs. As reading and writing both become shaped more by schooling than by personal desire and pleasure, the library will need to support more transformative activities.

Today’s young adults seem poised to welcome the transition from physical books to digital texts and to be

open new ways of blending reading and writing practices. Both reading and writing seem to be moving more decidedly out of the realm of solitary activities where most of today’s adults still tend to put them and into the realm of densely articulated social actions. DLs for today’s young adults are unlikely to succeed if they remain largely static collections in which the interactions are confined to browsing, searching, retrieving, and reading materials. Through dynamic functions for annotating and communicating, DLs for young adults will need to support the emerging practices of sociable literacy.

## ACKNOWLEDGEMENTS

Support for the University of Baltimore’s Intergenerational Design Team was provided by NSF grant EIA-0203323 and by gifts from the Robert W. Deutsch Foundation and IQ Solutions, Inc. We owe a special thanks to our co-PIs Ben Bederson, Director of the HCIL, and Allison Druin without whose wisdom and support this work would not have been possible. Our deepest gratitude, though, goes to the young people on our Intergenerational Design Team: Brian Alexander, Tanika Hooker, Leah McClinton, Deep Mahapatra, Ebony Short, Jasmynn Speight, Alex Spencer, Kaam Stenberg, and Steven Wilson-Gentry.

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