Understanding Teacher Learning About HyperDocs Through the Lens of Professional Learning Networks

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Abstract

In recent decades, digital technologies have facilitated new opportunities for educators to share and co-construct teaching and learning ideas and resources. One largely unresearched example of this phenomena is HyperDocs, which are interactive, digital teaching and learning materials created, disseminated, and remixed by educators. Despite indications of significant HyperDoc use, little is known regarding how educators learn about and develop in their use of HyperDocs. To address this gap in the literature, we collected self-report survey data from 261 HyperDoc-using educators. Participants learned about HyperDocs in both traditional professional development contexts and in more informal and self-directed activities. Different people, spaces, and tools played roles in the participants becoming knowledgeable about and refining their use of HyperDocs. We discuss our findings in relation to research on professional learning networks and crowdsourced approaches to teaching and learning.

Keywords: *HyperDocs, professional learning network, PLN, professional development, teacher agency,* pedagogy, PD, depth of knowledge

Introduction

Determining how to integrate digital technologies effectively into teaching is not always obvious or intuitive, and much remains to be learned regarding how educators discover and learn to use new technologies. Teachers can benefit from professional learning experiences that help them navigate opportunities and challenges associated with technology integration (Lawless &

Pellegrino, 2007; Xie et al., 2017). Some such professional learning occurs in formal professional development (PD) workshops, trainings, conferences, or courses. Teachers' access to PD varies and professional learning can occur in many settings, including informal and self-directed contexts (Greenhalgh et al., 2020; Kyndt et al., 2016). In this study, we take a holistic look at educator learning experiences associated with a particular under-researched use of technology in education: HyperDocs.

Background

The HyperDoc concept was pioneered by K-12 educators Lisa Highfill, Kelly Hilton, and Sarah Landis (2016), who have described HyperDocs as:

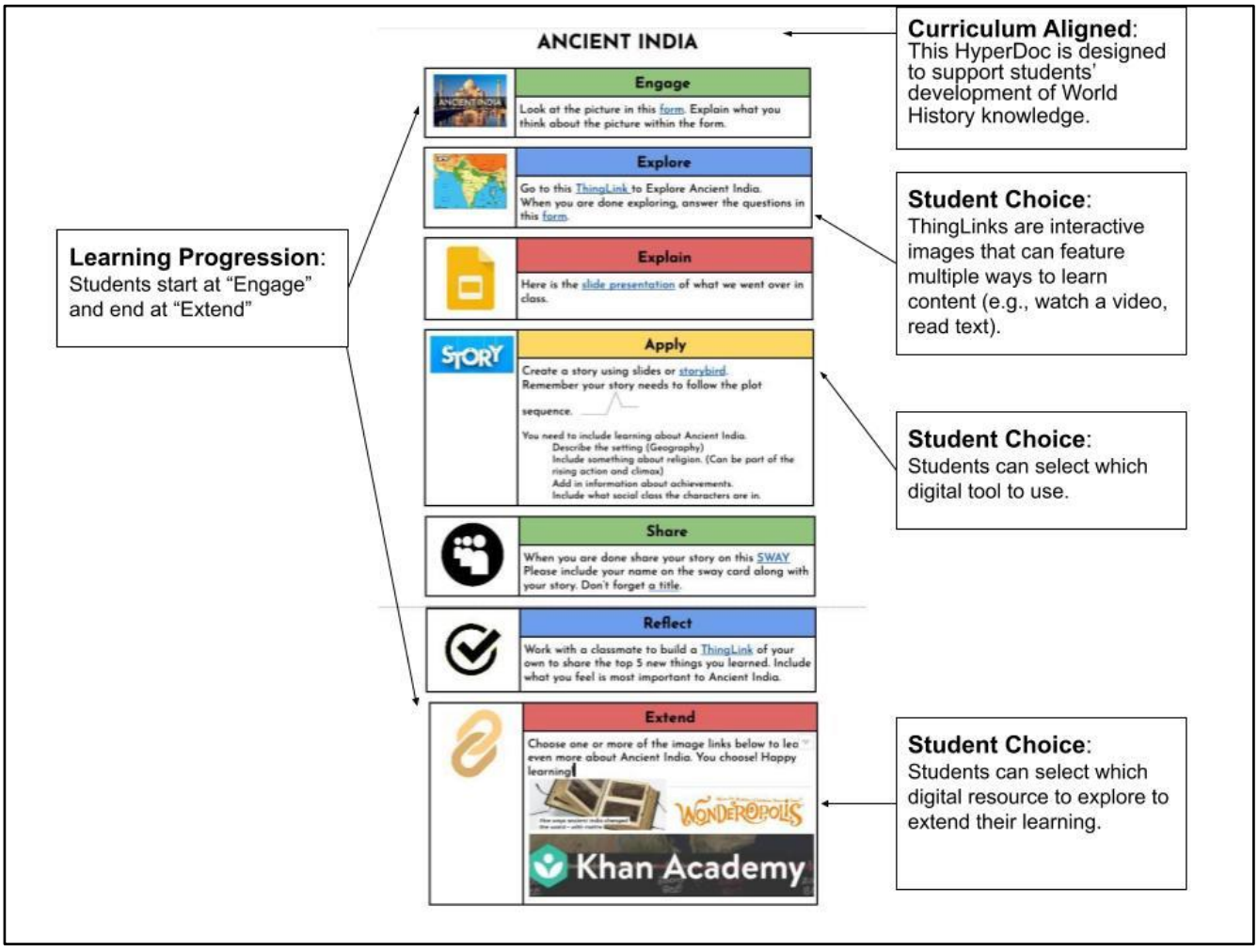
Digital lesson plans that are designed by teachers and given to students. They provide access for students to all content and learning in one organized digital space. HyperDocs shift instruction by giving students the content to explore before direct instruction, and by asking students to apply their learning using the 4 C's: critical thinking, communication, collaboration, and creativity. (para. 1)

HyperDocs are teacher-designed learning experiences that guide student thinking, motivate engagement, and facilitate student-centered discovery and learning. In contrast to digital platforms such as learning management systems and intelligent tutoring systems—which are often designed and controlled by people and organizations external to K-12 schools—HyperDocs are learning platforms that are uniquely created by the teacher for the students. Any teacher can create, remix, and use HyperDocs that align with curriculum standards and learning objectives. Teachers can design HyperDocs that guide students through a content-specific lesson during class or they can create HyperDocs that serve as enrichment for students to continue developing their content knowledge outside of class time. HyperDocs are similar to other teacher-designed digital learning platforms that feature student choice, such as Choice Boards, Playlists, and Menus (Tucker, 2022), however, HyperDocs have more structure to guide the student's learning. A choice board, playlist, or menu allows students to openly choose what to do and what not to do, while HyperDocs often feature a learning progression (see Figure 1) that scaffolds student learning such that they develop the knowledge and skills to meet the specific objectives or standards (Highfill et al., 2016). Choice is still built into HyperDocs, often in a way that supports Universal Design for Learning (CAST, 2018). That is, while students move from one section to the next in a structured manner, within each section they might have multiple ways to access information (e.g., read, listen, or watch; see Figure 2), multiple ways to engage in learning by choosing which digital tools and apps to use and/or drawing connections to their own lives (see Figure 1), and multiple ways to show their understanding (e.g., selecting a digital tool to solve a math problem; see Figure 3).

HyperDocs also share some similarities with WebQuests, an inquiry-oriented activity developed in the 1990s in which students explore resources on the Internet (Chang, et al., 2011; Dodge, 1995) (see Figure 1). Akin to WebQuests, HyperDocs facilitate students' exploration of curated sets of digital content and can support social learning and constructivist knowledge building. However, while WebQuests tend to have a prescriptive approach to the inquiry process (Dodge, 1997), educators design and use HyperDocs in myriad ways (Carpenter et al., 2020) (see Figures 2 and 3). Additionally, the development of WebQuests preceded the advent of Web 2.0 tools, social media, and the Google Apps for Education suite, which can facilitate flexible, interest-driven, collaborative learning experiences. Highfill, Hilton, and Landis (2016) envisioned HyperDocs as interactive lessons that transformed how educators design and deliver instruction by encouraging a shift away from digital worksheets and toward student-centered content exploration.

Figure 1

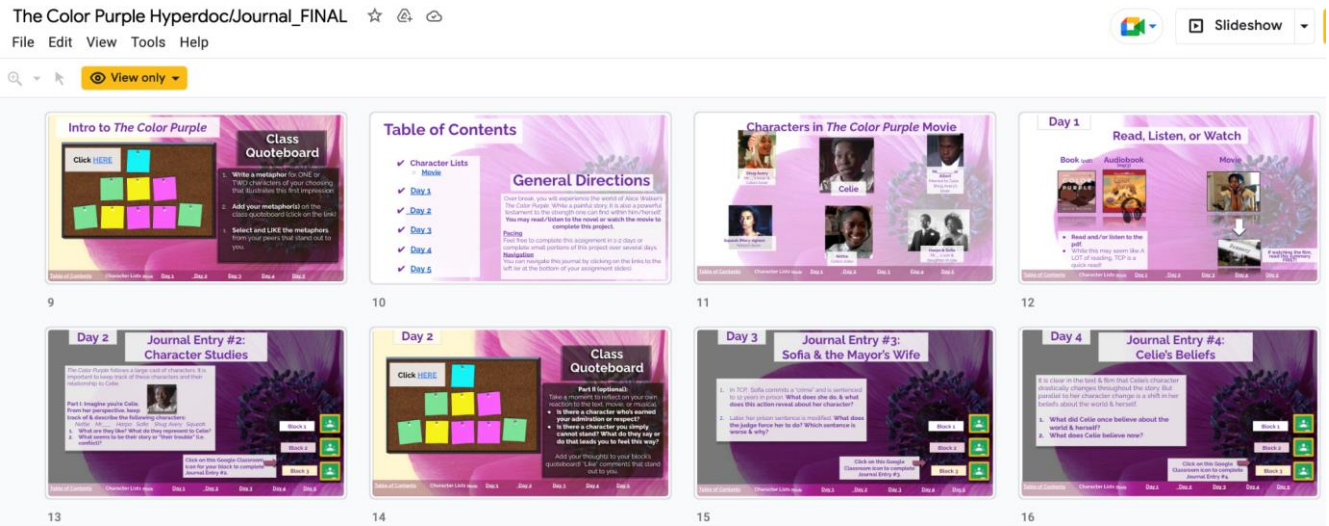
Annotated Image: Ancient India HyperDoc



Note: Ancient India HyperDoc image included with permission from Lisa Highfill

Figure 2

Screenshot of slides from The Color Purple HyperDoc created by Stella Onochie



Note: Figure included with permission from Stella Amaka. HyperDoc was used as an independent or exploratory reading assignment.

Figure 3

Proportional Reasoning HyperDoc created by Kelly Hilton

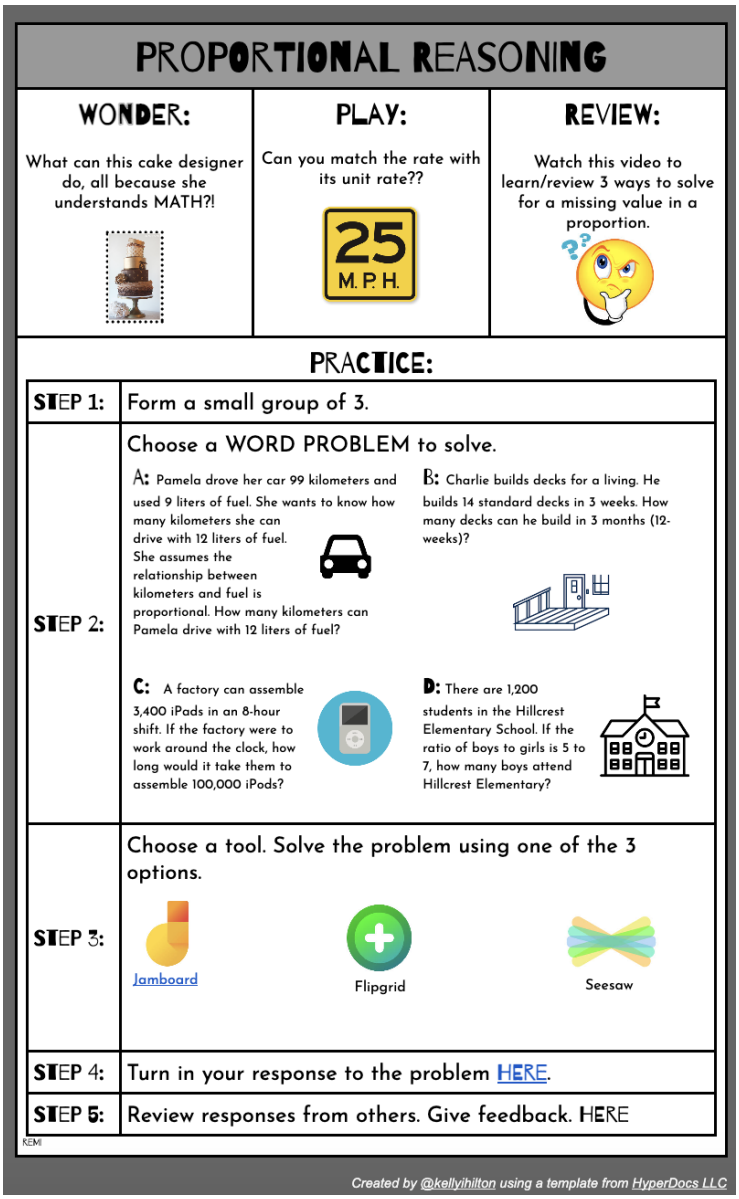


Figure included with permission from Lisa Highfill

In an earlier stage of this research project, data was gathered on educators' uses of and perceptions regarding HyperDocs (Carpenter et al., 2020). Analysis of survey data suggested varied definitions of, purposes for, and approaches to HyperDoc use. Participants identified a number of benefits to HyperDocs use, including increased student engagement and learning, shifts in instructional design and delivery, and changes in their own dispositions. However, analysis of sample HyperDocs shared by a subset of participants suggested some mismatch between rhetoric

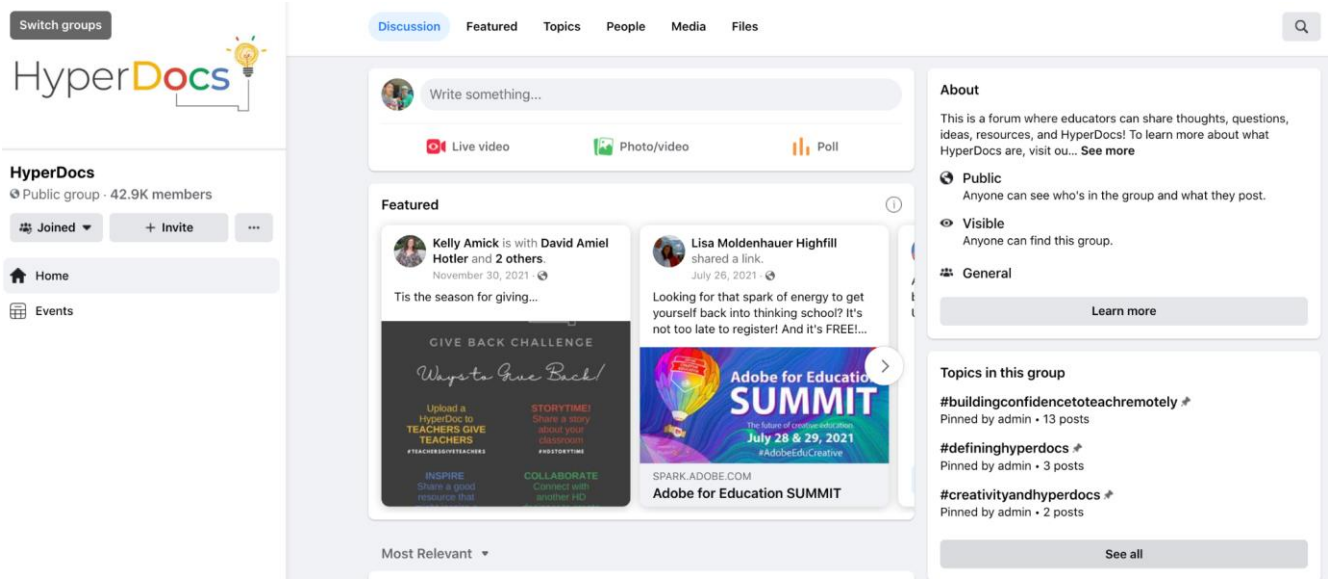
about HyperDocs and what was actually incorporated into them. These findings highlighted the need to examine how educators develop their understanding of, and practice with, HyperDocs.

HyperDocs exemplify some of the opportunities and challenges of teacher learning and co-creation of educational content utilizing social technologies. Prior to the development of the HyperDoc concept, Zhang (2009) suggested that social technologies were often being used in ways that were "weak in commitment to the sustained progress of ideas" and asserted that such sustained progress "requires creating and continually improving knowledge objects in the form of ideas, theories, designs, work plans, and so forth" (p. 275). HyperDocs may represent such knowledge objects as they offer a concrete focus and product of teachers being connected and collaborating online. In the same way that Wikipedia pages are knowledge resources that are gradually developed and improved through crowdsourcing of expertise, HyperDocs could be teaching and learning materials that are intentionally refined and improved over time.

Highfill, Hilton, and Landis have generated a large following of educators who use HyperDocs, and they have shared their understanding and expertise via a practitioner-oriented book, *The HyperDoc Handbook*, their website (http://www.hyperdocs.co), and an online HyperDoc bootcamp class. These three educators have, however, also been full-time employees of a U.S. school district over the years that they developed the HyperDoc concept, and thus were not able to provide the kind of support for and marketing of the HyperDoc concept that a for-profit education technology company might pour into a new product, application, or service. As a result, organic word-of-mouth recommendations, serendipitous exposure, and social media buzz have been important to the spread of the HyperDoc concept. For example, the HyperDoc Facebook group boasts more than 42,000 members and features several daily posts from educators who ask for and share HyperDocs (see Figure 4). While some instances of educators' use of online spaces may fall victim to the same offline "discussion culture" that Huberman (1995, p. 195) observed among teachers—wherein change is talked about quite a lot but only rarely enacted—educators' engagement in online spaces for HyperDocs, such as the HyperDocs Facebook Group, appear to represent movement beyond idle online chatter (Rosenberg et al., 2020) to the production, sharing, and remixing of actual knowledge objects for teaching and learning (Carpenter et al., 2022).

Figure 4

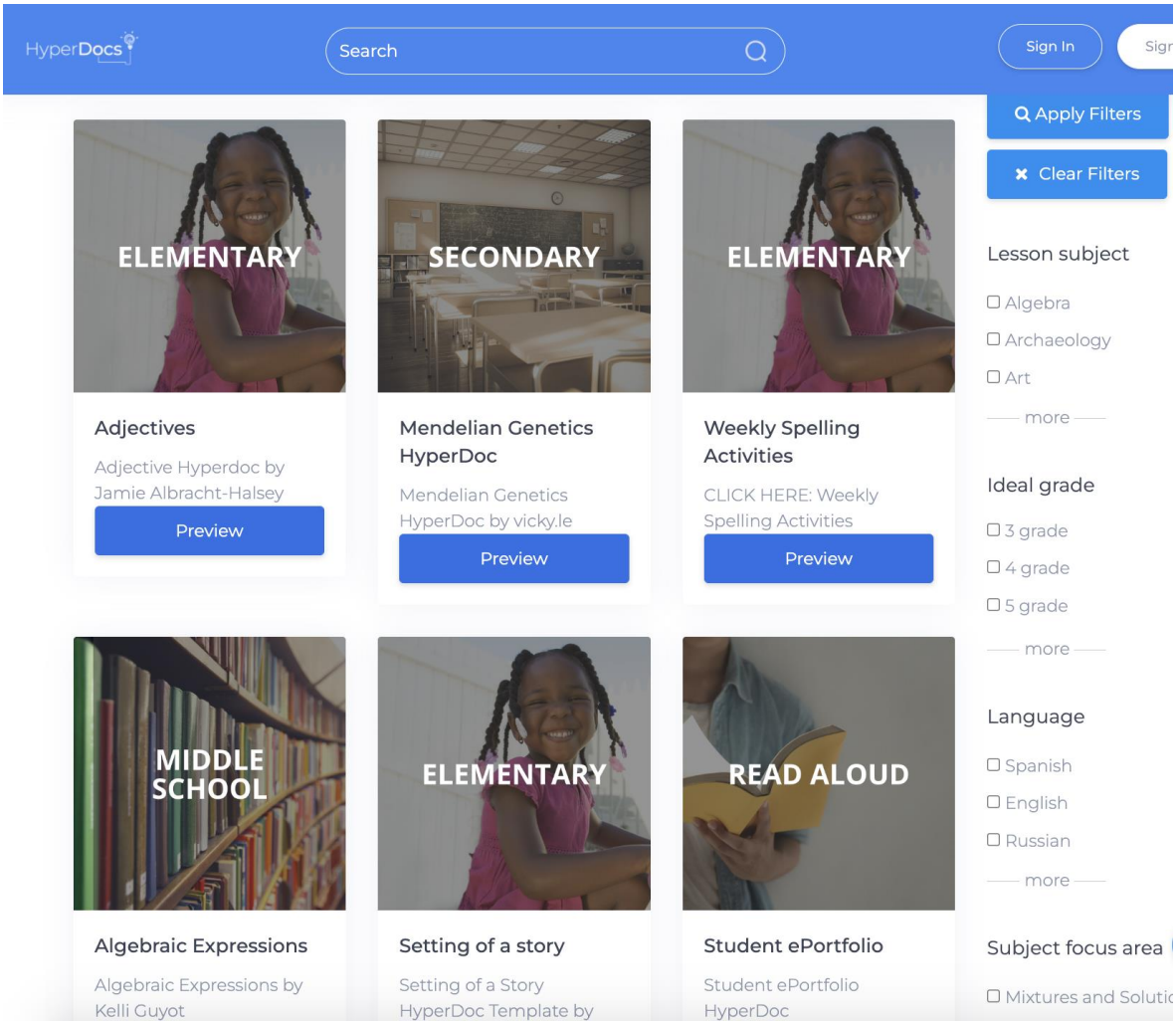
Screenshot of the HyperDocs Facebook Group



In contrast to publishers that produce scripted curricula and online educational marketplaces, such as TeachersPayTeachers.com – which encourage the buying and selling of teaching and learning materials (Author et al., 2020, 2022b; Shelton & Archambault, 2020) – HyperDocs are generally shared freely, co-constructed, and remixed. For instance, the HyperDocs website hosts a free *Teachers Give Teachers* repository with more than 800 HyperDocs that have been submitted by educators and vetted by Highfill and colleagues (see Figure 5). Many other HyperDocs are shared via social media.

Figure 5

Screenshot of the TeachersGiveTeachers Repository of HyperDocs



There appears to be a substantial number of educators who use HyperDocs and who have leveraged social technologies to collaborate in creating, remixing, and disseminating HyperDocs. We therefore aimed to examine how educators became aware of HyperDocs and how they learned how to integrate them into their teaching practice. To date, HyperDocs has received limited attention in the peer-reviewed literature (Carpenter et al, 2020). This study offers initial insights from HyperDoc-using educators that expand the conceptual understanding of teaching and learning with HyperDocs. In this study, we address the following research questions:

RQ1: How do educators first learn about HyperDocs?

RQ2: How do educators learn to integrate HyperDocs into their teaching?

RQ3: How do educators locate HyperDocs to use in their practice?

RQ4: What obstacles influence educators' use of HyperDocs?

Literature Review

Technology Integration in Education

The education field has seen repeated waves of enthusiasm for new digital technologies with the purported potential to transform learning, followed by frustration and disappointment when the hoped-for transformation never materializes, or falls short of expectations (Cuban, 2009). Instead of taking advantage of the innovative pedagogical affordances of digital technologies, educators can, in many instances, use such technologies as part of existing, relatively traditional practices, such as lecturing, grading, and communicating with students and families (Kormos, 2019; Tondeur et al., 2013; Vega & Robb, 2019). Various factors contribute to such outcomes, including educational policies, school cultures, issues with the technologies, technical and administrative support, and educators' own beliefs and existing practices (e.g., Rogers, 2000; Kopcha, 2012; Tarman et al., 2019). Ertmer (1999) described two types of barriers that hinder educator adoption and integration of technology: 1) External (first-order) and 2) internal (second-order). First-order barriers "include lack of access to computers and software, insufficient time to plan instruction, and inadequate technical and administrative support" (Ertmer, 1999, p. 48). Second-order barriers relate to an educator's own "beliefs about teaching, beliefs about computers, established classroom practices, and unwillingness to change" (p. 48). Both first- and second-order barriers can influence how educators adopt technologies in their practice and how these technologies shape student learning (Ertmer & Ottenbreit-Leftwich, 2013).

Teacher Professional Development and Learning

For decades, research has drawn attention to issues with the quality and quantity of PD meant to support teachers' use of digital technologies (Lawless & Pellegrino, 2007; Schrum, 1999; Tondeur et al., 2016). How teachers become aware of, learn to use, and navigate challenges associated with new educational technologies is therefore a matter of importance to the education field. Teacher learning is an ongoing, complex process involving various motivations, concerns, needs, beliefs, knowledge types, actions, and interactions at the level of the individual, as well as external and social factors associated with institutions and cultures (Carpenter et al., 2021; Keay et al., 2019). Becoming aware of a pedagogical or technological innovation is often just the first step in a complicated journey towards eventual changes in teaching practice. Teachers may need opportunities to think through and experiment with new practices to determine how they fit with their existing teaching practices.

Teachers can learn about technology-enhanced approaches to curriculum and instruction in various ways. During their pre-service teacher education, they may be introduced to novel digital pedagogies (Howard, et al., 2021). In-service teachers typically participate in various required PD activities that may address technology integration. Schools and districts can also buy particular apps, platforms, and services that have associated support and PD. Educators may, therefore, learn about and develop their use of digital technologies in different formal spaces and structured experiences with predetermined goals. Such formal learning is often associated with specific PD programs, hosted or directed by administrators, outside experts, or for-profit actors, and occurs at scheduled times and places (see Borko, 2004).

However, teacher learning does not occur solely in PD programs; forms of workplace learning that are more informal and self-directed are also common for many educators (Kyndt et al., 2016). Such self-directed learning is valued by many educators (Kennedy, 2016; Trust et al., 2016), although it can have drawbacks as well, as it may feature less planning and intention and suffer from a lack of support, instruction, or curriculum (Kyndt et al., 2014). Research that focuses solely on formal PD may miss important elements of teachers' professional learning and runs the risk of overlooking innovations in teaching and learning that are more bottom-up or grassroots in nature (Holme, Schofield, & Lakin, 2020). Research is needed on the opportunities and challenges that emerge when teachers attempt to integrate technology into their practice without the sponsorship or support of more traditional forms of PD.

Teacher learning that is informal and self-directed has likely existed as long as teaching. More recently, many educators have employed social technologies, including social media platforms and Web 2.0 tools, to connect and learn with other educators from outside their schools, districts, states, and nations (Greenhalgh et al., 2020; Rosenberg et al., 2020; Trust et al., 2016). Teacher communities often help with the spread of new teaching approaches, and social technologies have expanded opportunities for such communities to extend beyond physically proximal educators (Goatley & Johnston, 2013). Educators today can more easily learn with and from each other across geographical and institutional boundaries. Some educators have taken advantage of these new forms of connectivity to create teaching and learning activities for use with students. For instance, in the Global Read Aloud, a program organized by U.S. educator Pernille Ripp, teachers from around the world use social technologies to pair up their classrooms and co-create activities for their students to engage with as they read a common text (Carpenter et al., 2022). Such co-creation of teaching and learning activities by educators can involve elements of crowdsourcing (Brabham, 2013) and remixing (Navas, 2014) of content. It may also serve as a rich source for teacher learning, as educators have more windows into the teaching of their peers and opportunities to engage in co-creation of curriculum and instruction (Carpenter et al., 2022).

However, not enough is known about teachers' professional learning experiences given this broadened access to ideas and other educators. In particular, it remains unclear how educators learn about innovative approaches like HyperDocs that are more open and grassroots in nature. Without the sponsorship or support of policy makers, school districts, professional organizations, or educational technology companies, how do educators become aware of and develop in their use of HyperDocs? For example, what factors impact educator decision-making about the selection and use of HyperDocs (cf. Tang et al., 2020)? Although the extant PD literature may be helpful in understanding some aspects of teacher learning around HyperDocs, some of the concerns that arise around formal PD, such as diffusion models, scalability, and fidelity of implementation (e.g., Tondeur et al., 2016), may be less relevant to the context of informal and self-directed teacher learning.

Conceptual Framework

The concept of a *professional learning network* (PLN; Trust et al., 2016) is helpful in understanding how educators learn about and develop in their use of HyperDocs. PLNs are uniquely personalized networks that support continuous and participatory professional learning. Every educator has a unique PLN cultivated based on a variety of personal factors (e.g., time, relationships), professional goals and needs, and contexts (Trust & Prestridge, 2021). While PLNs are individualized, they are generally composed of the people, spaces, and tools that support each educator's learning and professional growth (Krutka et al., 2017). PLNs consist of various people or groups of individuals, including local and online colleagues, professional development coaches, course instructors, mentors, students, friends, and family, who offer insights, ideas, feedback, and encouragement that facilitates ongoing professional learning. Educators' PLNs also traditionally consist of an amalgam of in-person and digital spaces of varying levels of formality; educators go to these spaces to learn, build their network, and share their expertise. Spaces range from in-person formal gatherings (e.g., school or district workshops) to digital platforms that foster communication, collaboration, and/or knowledge building with peers located across spatial and temporal boundaries (e.g., Twitter hashtags, Facebook groups). Educators' actions within these spaces can vary from space-to-space and time-to-time (Trust & Prestridge, 2021). For instance, an educator might engage as a self-directed learner who explores ideas and engages in conversations during a Twitter chat, but in a conference setting, they might simply sit back and listen to a presenter. Educators' varied actions can influence how and what they learn in any given setting. Additionally, educators' PLNs include the digital and physical tools that support professional knowledge development, including printed materials (e.g., textbooks, curriculum resources),

Internet search tools (Cavanaugh & DeWeese, 2020), social bookmarking tools, blogs, and online databases.

Teacher learning within PLNs is situated, social, and distributed (Trust et al., 2016). That is, PLNs support educator learning specific to the contexts within which they work. Additionally, PLNs facilitate social learning through interactions with systems of people and tools where knowledge is distributed across spatial and temporal boundaries. Situated, social, and distributed learning experiences "provide powerful lenses for examining teaching, teacher learning, and the practices of teacher education (both preservice and in-service) in new ways" (Putnam & Borko, 2000, p. 12). Since prior research on educators' technology-enhanced PLNs has described their role in making teachers aware of the latest technology trends and in supporting their ongoing development of their teaching skills (Trust et al., 2016; Butler & Schnellert, 2020), in this study, we used PLNs as a lens for examining teacher learning about HyperDocs.

Methods

To address our research questions, we developed a survey protocol, guided by quality criteria for electronic survey design (Dillman et al., 2014), to collect data from educators who were familiar with HyperDocs. We solicited expert feedback (Olson, 2010) on an early survey draft from Highfill, Hilton, and Landis, and then from scholars familiar with HyperDocs. Based on feedback from eight individuals, we made revisions to the survey. The final survey included 15 items about the participants and their work contexts, and five close-ended and six open-ended items about HyperDocs. In a previous paper, we reported on the survey results pertaining to how educators conceptualize and use HyperDocs in their practice (Carpenter et al., 2020). In this paper, we focus on participants' responses to four open-ended prompts that addressed educators' learning related to HyperDocs: "How did you first hear about HyperDocs?" "Please indicate where you find HyperDocs that you have used," "Please tell us about any professional development activities you have engaged in that have helped you teach with HyperDocs," and "What is the biggest obstacle you have experienced as you used HyperDocs?"

Data Collection

We obtained approval to conduct this research from the Institutional Review Board (IRB; [Blinded for peer review] #2018-123) at the second author's institution and subsequently arranged IRB Authorization Agreements with the other authors' institutions. We created a digital version of the survey using the Qualtrics commercial survey platform. The first page of the digital survey featured the IRB-approved consent form. An invitation to participate in the study, including a link

to the Qualtrics survey, was posted on multiple social media channels for approximately one month. For example, we posted the invitation to the main HyperDocs Facebook group page and tweeted various invitations using relevant education hashtags on Twitter. Highfill, Hilton, and Landis also sent an email invitation to educators in their online HyperDocs course. Data were therefore collected by convenience sampling.

Participants

The 261 survey respondents were mostly from the United States (85%), with 5% from unidentified locations and the remaining responses coming from 11 different countries. Participants overwhelmingly (92.7%) reported having more than five years of experience as educators. In terms of academic subjects, the largest numbers of participants reported that they taught English/Language Arts (57%), Social Studies/History (43%), Science (38%), Technology (38%) and Math (36%). Table 1 provides an overview of additional background information about the participants' jobs.

Table 1

Profile of Participants (*N*=261)

Current Professional Role	*n*	%
General education teacher	150	58
Instructional technology facilitator	37	14
Instructional coach	25	10
Other	21	8
Special education teacher	9	3
Media specialist/librarian	8	3
Administrator	8	3
Higher Education Instructor	3	1
Grade Level focus of current professional role	*n*	%
Elementary	84	32
Middle School/Jr. High School	72	28
High School	55	21
K-12	33	12
Post-Secondary	2	1
Other	15	6
Educational institution type	*n*	%
Public K-12 (non-charter) school	214	82
Public K-12 charter school	11	4
Independent K-12 (private) school	24	9
College/university	5	2
Other	7	3

Data Analysis

We generated descriptive statistics for the quantitative prompts and engaged in a thematic analysis of the qualitative data from the four open-ended prompts (Braun & Clarke, 2006). To enhance credibility and trustworthiness, we employed investigator triangulation by including two or more researchers in all analyses of qualitative data (Elliott et al., 1999; Nowell et al., 2017; Twining et al., 2017). Two members of the research team separately reviewed the first 50 responses for each open-ended prompt and identified initial codes that represented common or interesting patterns across the dataset (Saldaña, 2016). For instance, participants frequently mentioned discovering HyperDocs at Computer-Using Educators (CUE) conference or Google Summits. Thus, the initial code "conferences" was selected to indicate this pattern. All three research team members then discussed the list of initial codes and identified a consolidated list of codes for each prompt. We also engaged in member checking of our findings with a sample of participants (n = 12).

Guided by prior literature, we organized the codes into broader themes. For the open-ended prompt related to the obstacles that influenced the use of HyperDocs, we organized the codes into first- and second-order barrier themes (Ertmer, 1999). Codes for the two open-ended prompts related to teacher learning were categorized into three main themes: people, spaces, and tools (Krutka et al., 2017). For example, participants mentioned discovering HyperDocs at conferences, on social media, or in formal PD trainings, which are places for professional learning, and therefore, we organized these initial codes into the broader theme "spaces." Through repeated rounds of coding and discussions, we agreed upon a final set of 13 codes that fit within the 3 main themes. Each prompt was then coded using the final set of 13 codes and reviewed by at least one other member of the research team.

Findings

RQ1: How do educators first learn about HyperDocs?

A total of 261 participants shared how they first discovered the concept of HyperDocs. Participants identified between 1 and 4 ways they learned about HyperDocs, with an average of 1.49, indicating that it was common for educators to learn about HyperDocs from multiple sources (see Table 2). Responses fell within three main themes (spaces, tools, and people) which we will detail in the following section.

Table 2
Participants' reported ways in which they discovered HyperDocs

Theme	People, Space, or Tool	Total (*n*)	%
Conference	Space	68	27%
Twitter	Space	56	21%
Other online space (e.g., Facebook, online forums, Instagram)	Space	31	12%
Colleagues	People	28	11%
Formal course/training	Space	26	10%
Other tools (e.g., webinars, podcasts)	Tool	25	10%
HyperDoc Handbook	Tool	14	5%
Other people (e.g., friends, "HyperDoc ladies")	People	13	5%
Independent reading	Tool	12	5%
School or district training	Space	12	5%
HyperDoc bootcamp	Space	10	4%

Spaces

Nearly three-quarters of the participants (*n*=194; 74%) listed at least one formal or informal learning space where they discovered HyperDocs. Many participants (*n*=109; 42%) pointed to formal learning spaces as their first introduction to HyperDocs, including conferences (*n*=68; 27%) and courses or external PD trainings (*n*=26; 10%). Multiple participants specifically mentioned the CUE (Computer-Using Educators) conference (*n*=17; 7%) and Google Summits hosted by the EdTechTeam (*n*=13; 5%). For instance, one teacher wrote, "I first learned about HyperDocs at Spring CUE 2015 when Lisa Highfill was presenting about using YouTube in the classroom and referenced/showed how to incorporate them into HyperDocs. I was instantly hooked." Another participant noted that they found out about HyperDocs at the "Google EdTech Summit, Dainfern

College in South Africa, 2016." A few participants listed other formal learning spaces, such as school or district-sponsored learning opportunities (*n*=12; 5%) or the HyperDocs Bootcamp online course run by Highfill, Hilton, and Landis (*n*=10; 4%). These findings indicate that formal professional learning experiences offered both within and beyond schools and districts can serve as spaces where teachers discover new technology-based approaches to teaching.

Slightly more than one-third of the participants (*n*=91; 35%) identified informal learning spaces that lead to the discovery of HyperDocs, including Twitter (*n*=56; 21%), Facebook (*n*=9; 3%), Pinterest (*n*=5; 2%), Edcamp unconferences (*n*=4; 2%), or other online spaces (*n*=17; 7%). In one such example, an educator wrote that they learned about HyperDocs "through Twitter and then through EdCamp East Bay." Twitter seemed to enable serendipitous discovery of HyperDocs, as one participant noted, "I created an educational Twitter account and started browsing. I saw all this buzz about HyperDocs, then I bought the book and I've been using them for years," and another teacher wrote, "I stumbled across it purely by accident on Twitter." A few participants mentioned learning about HyperDocs in online forums or discussions. For example, one teacher commented: "an online teacher group I participate in was discussing them a few years ago." Ultimately, engagement in social media spaces, online forums, and informal learning opportunities (i.e., Edcamp unconferences) facilitated many participants' initial introduction to HyperDocs.

Tools & People

Slightly more participants learned about HyperDocs from tools (*n*=49; 19%) compared to people (*n*=42; 16%). Respondents mentioned several different tools that lead to their discovery of HyperDocs, including websites (e.g., Google training site, *Teachers Give Teachers* repository), blogs (e.g., Cult of Pedagogy), podcasts (e.g., Google Teacher Tribe podcast), social bookmarking tools (e.g., LiveBinders), and books (e.g., *The HyperDoc Handbook*; *Ditch That Textbook*). Two participants specifically mentioned discovering *The HyperDoc Handbook* serendipitously after "Amazon suggested it." One of these individuals wrote: "purchased the book, *The Hyperdoc Handbook*, when it popped up on amazon [sic] and loved it!!" A few respondents (*n*=12; 5%) indicated that their discovery of HyperDocs surfaced during independent reading or self-directed exploration. For instance, one teacher shared that they, "found a HyperDoc online and then dug deeper by going to the website." This individual's learning was two-fold; first they saw a HyperDoc, which piqued their interest and led to further exploration and discovery.

Some of the teachers in the study also identified the people who introduced them to HyperDocs. Most commonly, respondents (*n*=28; 11%) mentioned learning about HyperDocs from colleagues, including school and district technology specialists, librarians, and teaching team members. For instance, one participant commented, "Our tech Teacher on Special Assignment told me about it." Participants also noted that conversations with friends, the "HyperDoc Ladies" (i.e.,

Highfill, Landis, & Hilton), and even family members ("My sister-in-law, a teacher who was in an earlier cohort") resulted in a new or expanded awareness about HyperDocs.

In summary, participants' discovery of HyperDocs was often a social process that happened in diverse ways, including listening to presentations or podcasts, reading books or social media posts, conversing with others in-person or through synchronous Twitter Chats, or observing sample HyperDocs created by other educators. These instances of discovery occurred in formal professional development activities, informal self-directed explorations, and even serendipitously with the people, spaces, and/or tools in the participants' PLNs.

RQ2: How do educators learn to integrate HyperDocs into their teaching?

In addition to exploring how teachers became aware of HyperDocs, we also sought to learn about the types of professional development and professional learning activities that shaped educators' HyperDoc use. A total of 164 respondents shared between 1 and 5 professional development activities that helped them teach with HyperDocs, with an average of 1.5 activities, indicating that many educators engaged in multiple learning experiences to grow their knowledge about HyperDocs. Similar to the findings from the previous research question, participants pointed to the people, spaces, and tools in their PLNs as influential elements of their learning how to use HyperDocs. In the following section, we will detail each of these three themes.

Spaces

Slightly more than three-quarters of the 164 participants who described how they learned to integrate HyperDocs into their teaching (n=122; 76%) listed spaces that supported that learning. One-third of these participants (n=55; 34%) specifically mentioned the HyperDoc Bootcamp, a multi-week online course designed by Highfill, Hilton, and Landis, which featured a book study, HyperDoc design activities, and collaboration opportunities. Multiple participants praised the HyperDoc Bootcamp for providing opportunities to "dive into the learning, have conversations, and create/apply learning." One participant wrote: "The online course taught by Lisa, Sarah, and Kelly was extremely well-designed and thought out. The opportunities to learn more through the [Google] hangouts and the practical 'doing' activities designed in the course were engaging and really helped to deepen my understanding of HyperDocs." The HyperDoc Bootcamp provided a collaborative space for exploring, designing, and discussing ways to incorporate HyperDocs into teaching. However, one participant pointed out that the one-shot, structured formal professional development of the HyperDoc Bootcamp did not support their ongoing learning:

I actually feel the training was great, but without sustained support it's fallen off my radar and I've resorted to previous habits. I also feel like I am bouncing back and forth between

HyperDoc and digital worksheet with links. I would benefit from a more vibrant and active community where I could test drive ideas and get feedback on my thinking and work.
This individual highlighted the need for learning spaces that can be accessed anytime to support continual social learning.

In addition to the HyperDoc Bootcamp, almost one-third of the participants (*n*=50; 30%) identified conference sessions as spaces that supported their learning about how to use HyperDocs. The International Society for Technology in Education (ISTE) conference, CUE conference, and Google Summits by the EdTechTeam were the most popular conference spaces listed by participants. Conference sessions with and about HyperDocs seemed to serve many different roles, including introducing participants to HyperDocs, "reigniting" interest in HyperDocs, showcasing how to use HyperDocs for learning, and supporting ongoing learning about HyperDocs. One individual commented: "Any time Lisa, Kelly, or Sarah are presenting, I go to their session. I always pick up some new tip or trick I hadn't thought of before." Another participant wrote: "I went to an educational photography session at a tech conference and we used HyperDocs to go through activities in the workshop." These quotes exemplify the myriad ways that conference sessions can be spaces for continuing professional development about HyperDocs.

Participants also listed several other spaces, both in-person and digital, that supported their learning about how to use HyperDocs in their teaching practice, including formal courses and trainings (*n*=22; 13%), school/district learning activities (*n*=10; 6%), Twitter (*n*=14; 9%), and other online spaces (*n*=9; 5%). In some cases, respondents listed multiple spaces. For instance, one educator wrote: "When I taught at my former school, one of the teachers held an hour-long workshop on what HyperDocs were and how they can be used. I have also discussed them with other teachers in an online PLC group." This individual engaged in both in-person and online spaces to expand their HyperDocs knowledge. Interestingly, while more than one-third of participants reported discovering HyperDocs via informal learning spaces, such as social media and Edcamp unconferences, only 14% of the respondents identified informal learning spaces as supporting their learning about how to use HyperDocs. Participants who identified online groups and social media spaces as professional development activities tended to actively engage with others in those spaces (e.g., participating in a Twitter Chat) or follow specific people who actively shared HyperDoc resources and templates.

Twenty-nine participants (18%) reported that presenting about HyperDocs in various spaces, including conferences and school/district trainings, motivated and supported their ongoing learning about HyperDocs. For example, one educator shared, "I have gone to conferences and have presented HyperDocs to staff in my district. Prepping for running a workshop really helps you get down and dirty with the content," and another participant wrote: "I have also led several professional development opportunities. These have given me an opportunity to reflect deeply on

my practice." Through the design and facilitation of PD opportunities for others, these individuals learned to grow their own craft, as one participant noted, "Nothing teaches you better than having to teach."

Tools & People

Thirty-four (21%) of the 164 participants who shared how they learned to use HyperDocs identified tools that supported their learning, while 16 participants (10%) mentioned specific people. Seventeen educators (10%) identified *The HyperDoc Handbook* as a tool that supported the integration of HyperDocs into their practice. One participant noted that *The HyperDoc Handbook* provided a more flexible, self-directed learning experience than the HyperDoc Bootcamp: "I tried to take the HyperDoc course twice (with the authors) but Monday afternoons proved too difficult to make the screen time happen. I did get the gist of it and read the HyperDoc Handbook to teach myself." Another participant shared: "I have done nothing formal, but I have the HyperDoc Handbook and have done a lot of reading and research on my own." These two individuals engaged in independent informal learning aided by the HyperDoc Handbook. In addition to the HyperDoc Handbook, respondents (*n*=14; 9%) also listed digital tools including webinars, podcasts, websites, and blogs that supported their learning about HyperDocs as pedagogical tools. A handful of participants (*n*=8; 5%) mentioned engaging in self-directed online reading or examining HyperDocs created by others. One individual noted: "I have mostly learned about HyperDocs through exploration of those created by others."

Educators in the study also pointed out specific individuals who helped them learn to teach with HyperDocs. Most commonly, participants mentioned colleagues (*n*=10; 6%) or instructional coaches (*n*=4; 2%). Four participants (2%) noted that their engagement in collaborative co-creation of HyperDocs with colleagues was the main source of their learning. Interestingly, while only a handful of participants identified specific people that supported their professional growth, these individuals seemed to feel that their discussions and collaborations with people were the most beneficial learning opportunities. For instance, one educator wrote: "I was in the first HyperDocs Bootcamp cohort. However, the best professional development has been co-creating HyperDocs with others. That is where I learn the most."

In summary, participants reported learning how to use HyperDocs in diverse ways. Some participants learned from digital or in-person spaces, while others directed their own learning with physical or digital tools. Some educators engaged in conversations or collaborative design of HyperDocs with others, while others individually analyzed HyperDocs created by others to support their professional growth. Participants' responses were unique, with no two the exact same, indicating that there are a number of different entry points to supporting educators' learning about new pedagogical tools.

RQ3: How do educators locate HyperDocs to use in their practice?

The majority of participants (*n*=239; 92%) reported using HyperDocs created by others in their practice. In a multiple response prompt, participants were asked to identify where they found HyperDocs from a list of options (see Table 3). Participants reported finding HyperDocs from, on average, 3.4 different tools, spaces, or people.

Table 3
Participants' Reported Means of Locating HyperDocs

Multiple Response Option	People, Space, or Tool	Total (*n*)	%
Teachers Give Teachers Repository	Tool	208	80%
The HyperDoc Handbook	Tool	145	56%
Twitter	Space	126	48%
Facebook	Space	101	39%
Workshops or Conferences	Space	97	37%
Padlets	Tool	83	32%
Blogs	Tool	61	23%
Google+	Space	37	14%
Other		29	11%
Podcasts	Tool	10	4%

Participants most commonly indicated using tools that curated or presented multiple HyperDoc examples as a way to identify HyperDocs to remix and use in their own practice. More than three-quarters of the teachers reported turning to the *Teachers Give Teachers* repository to find HyperDocs for teaching. The *Teachers Give Teachers* repository is a digital crowdsourced database of hundreds of HyperDocs designed by educators and organized by subject, grade level, and topic. Padlet (virtual bulletin board) collections of HyperDocs were also a popular tool. Some educators have curated HyperDocs for specific subjects on open access Padlets for others, such as

Miss Enos's "English/ELA Hyperdoc Power" Padlet featuring hundreds of English Language Arts HyperDocs. *The HyperDoc Handbook*, blogs, podcasts, and other tools (e.g., TeachersPayTeachers, LiveBinders, Internet search tools) were also listed as ways of finding HyperDocs to remix and use.

Participants also reported turning to informal social media spaces and formal professional development places (e.g., workshops, conferences) as a means of identifying HyperDocs to use in their practice. Nearly half of the participants indicated discovering HyperDocs created by others on Twitter, while more than one-third found HyperDocs on Facebook. On the HyperDocs.co website, Highfill, Hilton, and Landis (2020) encourage educators to "ask the community - Our Facebook and Twitter communities are thriving with teachers using and experimenting with HyperDocs. Ask for exactly what you need and find it!" (para. 3). Social media spaces, conferences, and even workshops are spaces where educators can make specific requests that directly align with their professional needs and practice, as opposed to tools, where educators often have to browse and draw those connections on their own.

As part of the multiple response prompt, participants could write in alternative options that were not on the list. Five respondents (2%) mentioned that they discovered HyperDocs for use in their practice from colleagues in their schools or districts. This data seemed to indicate that educators were more likely to turn to their global networks, including social media spaces and tools featuring HyperDocs crowdsourced by educators across geographic and temporal boundaries, than to the people in their local contexts for examples of HyperDocs to remix and use in their practice.

RQ4: What obstacles influence educators' use of HyperDocs?

While the participants identified multiple ways to discover and learn how to use HyperDocs, they still reported facing several challenges when integrating them into their practice. A total of 246 participants identified at least one obstacle that impeded their use of HyperDocs for teaching. More than three-quarters of these educators (n=197; 80%) listed external obstacles (first-order barriers), while nearly one-quarter (n=55; 22%) identified internal obstacles (second-order barriers).

First-Order Barriers

Time was the most commonly cited first-order barrier with 83 participants (34%) mentioning it as the biggest obstacle to their use of HyperDocs. Several participants' comments focused on the time-consuming nature of designing HyperDocs from scratch or remixing ones created by other educators. For example, one participant wrote:

> First, creating a quality HyperDoc is time intensive, even if modifying an existing one. It's difficult to find that time while teaching all day, meetings after school into the evening, and still trying to find time for family and friends. Next, finding quality resources is very difficult … I don't have to completely reinvent the wheel (i.e., I can use some of the resources I have), but others take a lot of time to find, let alone vet, and add to a HyperDoc. Finally, the examples of HyperDocs that are available on the HyperDocs website and the other sources I use aren't always the best quality or they don't match what I need.

Feeling a lack of time to curate materials and create a high-quality, curriculum-aligned HyperDoc was a sentiment shared by many participants. In addition to the time needed to create HyperDocs for teaching, participants shared other examples of how time served as an obstacle, including a shortage of time for grading or providing feedback on students' HyperDoc submissions, limited time in class for using HyperDocs, and extra time spent submitting requests to information technology (IT) staff to unblock websites and tools featured in HyperDocs, such as Padlet, YouTube, or Nearpod.

Technology served as an obstacle for several participants (n=64; 26%). The majority of respondents who identified technology as a barrier focused on the use of hyperlinks and media in HyperDocs. Many participants mentioned "broken links" (hyperlinks that do not work) and blocked websites as their biggest frustration when using HyperDocs. For instance, one educator commented, "After spending HOURS creating my first HyperDoc I had to change it, because our district blocks everything. So links I had created for students to follow were blocked." In addition to broken links and blocked sites, other technology challenges mentioned by participants included managing student logins to different websites, the inability to embed videos into Google Docs, challenges with changing a Google Doc once it has been "pushed out to students," unreliable Internet at school and at students' homes, and inequitable access to devices.

Nearly one-quarter of the respondents (n=57; 23%) mentioned students' lack of technology skills or engagement with HyperDocs as a barrier to their use. Some of the educators noted that their "students are not tech savvy" and "lack digital skills" to successfully use HyperDocs for learning. While others felt that students were "not prepared to work on their own," "confused as to what they need to do because they are not used to reading the directions," or would "zoom through and skip to what they are supposed to turn in." Several educators also mentioned that pacing was a problem, with some students finishing a HyperDoc very fast, others diving deep into the materials, and a few falling behind due to poor time management skills. Ultimately, it seemed to surprise some participants that they had to teach students how to "learn to learn with HyperDocs."

In addition to time, technology, and student-related obstacles, respondents identified a few other barriers, including lack of support (*n*=20; 8%), lack of alignment with curriculum (*n*=8; 3%), and lack of training (*n*=1; 0.4%). In terms of lack of support, participants felt that their district or school IT staff did not provide support for unblocking blocked sites or managing Internet or device problems. Regarding curriculum alignment, even though there are several ways to access HyperDocs online, some participants felt that they could not find HyperDocs related to their specific content area, such as "culinary arts," "high school biology," or "secondary math." Interestingly, only one participant mentioned the lack of training available as an obstacle to their use of HyperDocs.

Second-Order Barriers

Internal obstacles (i.e., beliefs, knowledge, skills, or motivations) also played a role in shaping participants' use of HyperDocs. A few participants (*n*=5) mentioned that their prior beliefs and/or attitudes served as an obstacle. For instance, one educator commented, "I always manage to make my MMTS (Multi-Media Text Sets) into Hyperdocs, because I think I am always looking for a product or proof of learning. I need to learn to let that go sometimes and just allow students to explore without assessment driving them, their decisions and their learning." This individual, like a few others, noted that they had to learn to shift their belief about their role as an educator from an expert who distributes information and evaluates student knowledge to a coach who allows students to direct their own learning journey.

Other second-order barriers included lack of knowledge and/or skills regarding how to design, deliver, and assess learning with HyperDocs (*n*=51; 21%). Some participants struggled to figure out how to design high-quality HyperDocs that were visually appealing, developmentally appropriate, aligned to curriculum objectives, and would not overwhelm students. A few participants specifically mentioned that they struggled to figure out how to move beyond a digital worksheet. Additionally, some participants noted that they did not know how to monitor student progress and provide feedback when students were given choice in their pacing and learning pathway. For example, one educator wrote that it was difficult "keeping track of student work - monitoring students - maintaining records for grades which is required" while another respondent struggled to "provide timely, authentic feedback while students are working at their own pace." Both these individuals' lack of knowledge and skills regarding how to facilitate learning with HyperDocs served as a barrier to their use.

In summary, even though there are multiple avenues that support discovery of and professional learning about HyperDocs, educators reported facing several obstacles that impeded their ability to integrate HyperDocs effectively into their practice. The most commonly listed obstacles were external to the educator – time, technology, student use, support. However,

participants also identified internal barriers, including their own mindsets, knowledge, and skills, as obstacles to their use of HyperDocs.

Discussion

In this study, we sought to look holistically at educators' learning experiences with and about HyperDocs in order to understand how grassroots technologies make their way into educational settings. Through an analysis of participants' survey responses, we identified three key findings that build on prior literature: 1) There are multiple and diverse entry points to discovering HyperDocs as instructional tools; 2) Learning about HyperDocs is a social experience, situated in practice, that can be distributed across people, spaces, and tools; 3) Educators' report that their use of HyperDocs is influenced by several primarily first-order barriers.

While participants presented many entry points for learning about HyperDocs, there were common themes across the dataset. Namely, participants tended to discover HyperDocs from spaces, tools, and/or people. Participants reported becoming aware of HyperDocs via in-person and digital spaces, including informal professional learning events (e.g., unconferences), social media groups or chats, conferences, and formal workshops. These places supported a range of social learning experiences, including listening to or reading text from others, collaboratively constructing HyperDocs, and leading trainings. Participants also listed an array of tools that led to the discovery of HyperDocs, including *The HyperDoc Handbook*, podcasts, blogs, virtual bulletin boards, Internet searches, and the *Teachers Give Teachers* repository. It was less common for participants to identify specific people or groups of people who introduced them to HyperDocs, and those who did, tended to list people within their local contexts or people they had discussions with in-person. These findings align with previous research which indicates that the people, spaces, and tools within a PLN can all serve as entry points for discovering new technologies and pedagogical strategies (Authors, 2016, 2017; Butler & Schnellert, 2020). However, while previous studies have focused on the variety of skills and knowledge that educators gain from the people, spaces, and tools in their PLNs, this study showed that people, spaces, and tools can each facilitate learning about the same concept. That is, educators can discover the *same* technology from *different* people, spaces, and/or tools, as well as various combinations of these.

When asked how they learned to use HyperDocs, participants' responses highlighted the social, situated, and distributed nature of learning. Learning about HyperDocs was a social process that could be distributed across people, spaces, and tools within a network or context. For instance, participants' learning related to HyperDoc use happened through social interactions in formal and informal spaces, through self-directed exploration of HyperDocs created by others, and even

serendipitously with tools designed by others (e.g., *The HyperDoc Handbook*). Learning was also situated in practice – educators could find and remix HyperDocs based on their specific practice, context, and needs. These findings align with previous literature that has shown teacher learning to be social, situated, distributed, and not limited to formal school or district PD (Authors, 2020a; Keay et al., 2019; Kyndt et al., 2016; Putnam & Borko, 2000). In fact, only 5% of the respondents mentioned first hearing about HyperDocs in a formal school or district training, and only 6% reported learning about how to use HyperDocs from a school or district PD. None of the participants mentioned learning about HyperDocs via formal pre-service teacher preparation programs. This suggests that the vast majority of participants learned about HyperDocs through informal, serendipitous, or self-directed learning with people, spaces, or tools outside their local contexts.

This study also adds to prior literature by highlighting the role tools play in supporting professional learning. Prior studies about educators' PLNs and informal learning via social technologies have attended more to spaces and people than tools (Lantz-Andersson, Lundin, & Selwyn, 2018; Prestridge, 2019; Tour, 2017). In this study, it was more common for participants to discover and learn about HyperDocs from tools, including books, blogs, virtual bulletin boards, crowdsourced databases, and websites, compared to people. More of the participants also turned to tools than spaces or people for locating HyperDocs. Furthermore, HyperDocs themselves are tools (e.g., knowledge objects) that can support educator learning; a number of participants in this study mentioned engaging in self-directed learning by examining HyperDocs created by other educators. In our previous study, we found that by creating, remixing, and using HyperDocs in their practice, educators discovered new ways to teach (Authors, 2020). Thus, HyperDocs can serve as instructional tools for direct use with students, as well as tools for professional learning by serving as models of different teaching and learning design approaches and strategies that teachers can adapt or use as sources of inspiration.

Ultimately, participants identified multiple means of discovering and learning about HyperDocs. This may be due in part to the grassroots, word-of-mouth spread of the HyperDoc concept. It may also relate to the flexible nature of the HyperDoc concept. A HyperDoc is not a rigid, prepackaged curriculum or technology tethered to a single teaching approach or standard. Instead, it is a digital means of organizing, curating, delivering, and facilitating learning experiences (Carpenter et al., 2020; Highfill et al., 2016). As such, it can be adapted and used immediately in almost any context, and educators may therefore be more likely to share it with their networks. Yet, while having multiple ways to discover and learn about HyperDocs can support faster and wider diffusion of the concept, it also means that educators' depth of learning and understanding of HyperDocs can vary quite significantly. For instance, some educators might discover HyperDocs at an in-depth hands-on design workshop led by Highfill and colleagues,

others might first learn about HyperDocs by seeing them in the *Teachers Give Teachers* repository and independently trying to figure out what they are, and others could piece together their initial understanding of HyperDocs through a mix of informal discussions with online and face-to-face colleagues. This diversity in type and intensity of learning experiences might be why, in our previous study, we found that educators' conceptualizations and uses of HyperDocs were quite varied (Carpenter et al., 2020).

Even if opportunities to learn are available, teachers vary in their willingness to learn and their perceived need to learn. Not all teachers will actively look for informal and self-directed learning opportunities such as those available via social media. Some adult learners prefer more direction and structure when learning about particular topics and can become frustrated when expected to direct their own learning (Grow, 1991). In some cases, the very variety of sources of professional learning around HyperDocs could prove a hindrance for some educators who might benefit from the presence of a definitive source of HyperDocs information. And regardless of willingness, many contextual factors can impact teachers' technology use and their capacity to engage in informal learning, including individual characteristics, job characteristics, school culture, and the broader education context (Kyndt et al., 2016). For instance, mandates around curriculum materials and pacing in some schools may present challenges for the use of HyperDocs.

Despite the variety of people, spaces, and tools available to support educator professional learning experiences, many of the participants in the study still faced obstacles when incorporating HyperDocs into their practice. Participants identified several external (first-order) barriers that impeded their use of HyperDocs, including lack of time for designing and using HyperDocs, technology constraints, students' lack of experience with HyperDocs and technology, limited support, and lack of available HyperDocs aligned to specific curriculum. Some participants also listed internal (second-order) barriers, such as their own mindsets, knowledge, and skills. These findings indicate that technology integration in formal educational settings continues to be a challenge fraught with many obstacles (Ertmer, 1999).

Our study also yielded new insights regarding barriers to the adoption of technology in education. In a noteworthy departure from the findings of research in other contexts (cf. Ertmer et al., 2012), far fewer individuals mentioned second-order barriers compared to first-order barriers. Second-orders barriers may be less salient because educators chose to integrate HyperDocs into their practices rather than being directed to do so. Or, the situated, social, and distributed means of discovering and learning about HyperDocs might have eased some of their internal concerns. Traditional PD has been criticized for failing to account for the agency, motivations, and needs of teachers (Kennedy, 2016), but professional learning related to HyperDocs typically occurred in a very different context. Educators primarily opted into HyperDoc use, and often learned about

HyperDocs in a self-directed fashion, so some degree of motivation and agency may have already been present, which might explain why second-order barriers were less commonly reported. Interestingly, only one participant identified lack of training about HyperDocs as a barrier, even though almost one-quarter of the participants reported that their lack of knowledge and/or skills regarding how to design, deliver, and assess learning with HyperDocs was an obstacle to their use of HyperDocs in their practice. This apparent contradiction may indicate that precisely because of the bottom-up nature of HyperDocs, participants did not expect there to be as much training or PD regarding HyperDocs. When top-down mandates require teachers to implement particular pedagogies, more educators may reasonably expect or wait for associated PD. But when teachers choose to take up a more grassroots, organically developed use of technology such as HyperDocs, they may recognize or assume that they will have to take greater responsibility for their own learning about that technology.

Implications for Practice

Based on the findings from this study, we offer insights and ideas that might improve how educators discover, learn about, and integrate grassroots technology-based pedagogical strategies and tools, such as HyperDocs, into practice. This study showed that educators can discover and learn about new teaching approaches and tools in a variety of ways, including through interactions with people, spaces, and tools within and beyond local contexts. Therefore, teacher educators and administrators might consider how to use a more holistic approach to supporting and advancing teacher learning, such as encouraging educators to expand their networks of people, spaces, and tools in ways that increase opportunities for discovering diverse ideas and new approaches to teaching (see Krutka et al., 2017; Kearney et al., 2020) and recognizing informal and self-directed learning as a means of professional development. However, it is also important to consider that simply having multiple means of learning about a new pedagogical tool or approach may not be enough to support adoption of that tool or approach into practice. Three decades of teacher PD research has shown that educators benefit from PD that is situated in their practice, active, social, supported by coaches or experts, and ongoing (Darling-Hammond, Hyler, & Gardner, 2017). Participants' learning experiences were social and situated, but the depth of social interactions, time spent learning, and intensity of learning likely varied from participant to participant depending on a variety of factors. Previous research has also found that time, relationships, goals, confidence, and space dynamics can collectively and individually influence teachers' actions and learning with people, spaces, and tools in their networks (Trust & Prestridge, 2021). Therefore, this study indicates that educators' informal and self-directed learning experiences might benefit from

ongoing formal support, such as coaching or interactive hands-on trainings that explore and build on what teachers learn from their PLNs.

This study also illuminated the need for teacher educators and administrators to provide assistance in addressing barriers that influence the use of grassroots pedagogical strategies and technologies, such as HyperDocs, for teaching and learning. Participants reported facing several first-order (external) barriers that negatively influenced their HyperDoc use, including insufficient technical support, time, and student technology competencies. These findings align with some prior research that has reported lack of technical and administrative support being perceived as a critical barrier to technology integration (Tarman et al., 2019). While second-order barriers were not as salient, nearly a quarter of participants identified knowledge, skills, or attitudes that served as obstacles to the integration of HyperDocs.

In order to support the adoption of grassroots ideas and technologies into teaching and learning, teacher educators and school administrators could work with teachers to identify and eliminate or mitigate external barriers. For instance, several participants mentioned frustration around finding HyperDocs featuring tools that were blocked by their school or district. School administrators could alleviate this issue by providing teachers with a list of approved tools as well as a list of commonly featured tools in HyperDocs (e.g., YouTube, Flipgrid) and approved alternatives. Participants also identified lack of time, specifically related to finding and remixing HyperDocs, as a significant barrier. Teacher educators could provide training and one-on-one support to help teachers learn how to find, evaluate, and remix HyperDocs to meet their professional needs. This could address the issue of time and also concerns teachers might have about the accuracy or expertise associated with materials that have been remixed and shared via social media (see Carpenter & Harvey, 2019; Sawyer et al., 2019). Several participants also identified students' lack of technology competencies and familiarity with HyperDocs as a barrier. This issue might be alleviated by providing teachers with opportunities to learn how to scaffold student learning with HyperDocs and by encouraging teachers to incorporate more technologies into their practice so that students are ready to engage in any digital learning experience featured in a HyperDoc. Finally, educators who are early adopters of digital technologies and who are intrinsically motivated to use HyperDocs may benefit from different kinds of support in their HyperDocs use than educators who are less comfortable using technologies or are extrinsically motivated or required to use HyperDocs. For the latter group, encouragement to develop in their HyperDoc use by engaging in self-directed learning via PLNs may not be particularly effective or well-received (see Grow, 1991).

Future Research

This study presents a number of potential avenues for future research about teacher learning and technology-based pedagogical strategies and tools, such as HyperDocs. Research could, for example, explore how teacher educators and school administrators alleviate first- and second-order barriers that shape the adoption of grassroots ideas, technologies, and strategies. Considering how prior research has emphasized the importance of second-order barriers (Ertmer, 1999; Ertmer et al., 2012; Sánchez-Prieto et al., 2019), researchers might explore whether, and if so why, second-order barriers are less salient than first-order barriers among the larger population of HyperDoc users. Scholars could investigate how the intensity and type of learning experience (e.g., reading social media posts vs. participating in a hands-on workshop) influences teachers' HyperDoc practice. Studies could investigate which spaces, tools, or people are most influential in shaping educators' practices and student learning with HyperDocs. How teachers remix and adapt HyperDocs is another topic worthy of exploration. For example, how do teachers tailor HyperDocs they did not originally create so that those HyperDocs are appropriate for their context and their students? Given research that suggests some teachers do not adequately vet some of the online resources they use in class (Fyfield et al., 2021), to what extent, and how, do teachers typically evaluate HyperDocs that they did not originally design before they decide to use them? In addition to lack of vetting, Tienken (2020) raises concerns about equity issues that could arise from providing students with digital materials, such as HyperDocs, without ensuring the necessary supports are in place to make effective use of those materials. Future research could explore the extent to which learners engage with HyperDocs in the hoped-for manner, how such engagement can be scaffolded most effectively, and how teachers learn to structure such engagement (cf. Kervin et al., 2019).

Future studies could also explore secondary benefits of educators' uses of HyperDocs, in particular for teachers who collaborate in the creation of HyperDocs and teachers whose HyperDocs are used and adapted by many other educators. For instance, in addition to the concrete learning that might result from collaboration on and sharing of HyperDocs among teachers, this collaboration and sharing may help mitigate the professional isolation that has often been associated with the teaching profession. Some teachers' sense of professional identity or esprit-de-corps may be strengthened through their work on HyperDocs, or the popularity of the HyperDocs they share with other teachers. Among our sample, co-construction of HyperDocs was relatively uncommon, and so future research could explore how educators co-construct HyperDocs, the opportunities and challenges they experience in doing so, and the teacher learning that can emerge from collaborative design (Carpenter et al., 2022; Voogt et al., 2015).

Additionally, in our sample, none of the participants mentioned becoming aware of HyperDocs as a part of their pre-service teacher education. This was likely to some extent related to the fact that HyperDocs are a relatively new phenomenon and most participants had completed their pre-service programs at least five years before responding to our survey, but it does suggest that future research could benefit the field by exploring how teacher education programs might engage with innovations in educational technology use such as HyperDocs.

Conclusion

Prior to this study, little research has been done to examine the professional learning experiences of educators who take part in self-directed and crowdsourced technology use for teaching and learning. This study demonstrated that educators can discover and learn about grassroots technology-based pedagogical strategies and tools, such as HyperDocs, through various combinations of formal, informal, self-directed, and even serendipitous interactions with people, spaces, and tools. However, even with multiple entry points to discovering and learning about HyperDocs, teachers still faced several barriers that negatively impacted their use of HyperDocs in their practice. Insights from the list of barriers identified by participants may inform the planning, design, or organization of PD or structures aimed at supporting bottom-up, crowd-sourced technology uses such as HyperDocs. Additionally, findings from this study highlight the need for further research on, improved support of, and holistic understandings of teacher learning.

Abbreviations

CUE: Computer-Using Educators

IRB: Institutional Review Board

ISTE: International Society for Technology in Education

IT: Information Technology

MMTS: Multi-Media Text Sets

OER: Open Educational Resource

PD: Professional Development

PLN: Professional Learning Network

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