Expected and Emerging Requirements for Digital Learning Platforms as Research Infrastructure

Co-Authors: Jeremy Roschelle, Amanda Wortman, Stefani Pautz Stephenson

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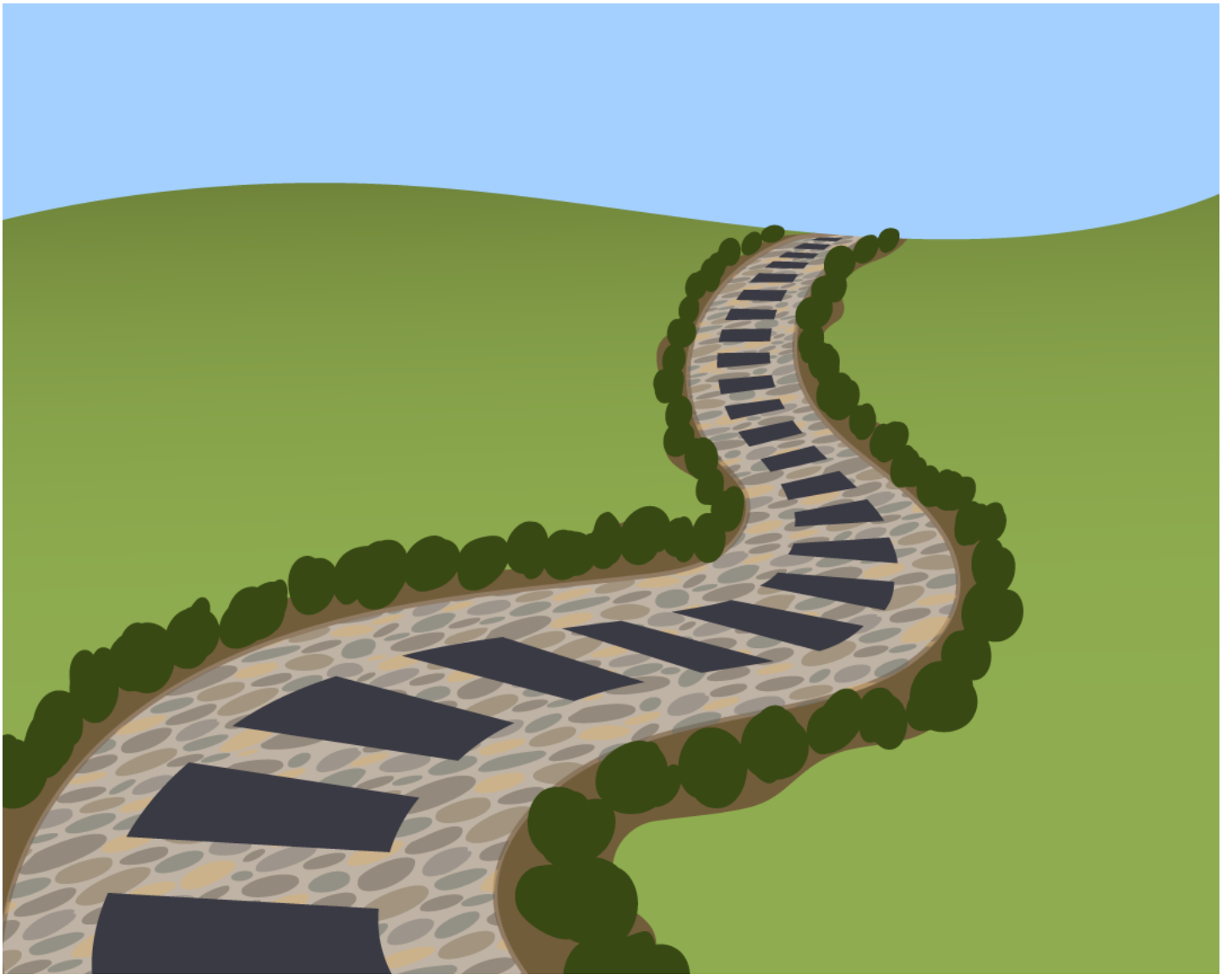

Digital Promise
Accelerating Innovation in Education

Empirical Education

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Abstract

Digital learning platforms (DLPs) can transform educational research by serving as infrastructure that bridges the gap between practice and research. This white paper examines the progress of DLPs in SEERNet, a multi-year initiative funded by the Institute of Education Sciences (IES), which aims to advance research infrastructure. Through coordinated efforts among platform developers, researchers, and practitioners, SEERNet members have addressed both expected and emerging challenges. The paper seeks to support others who are seeking to share platform data with researchers by clarifying the range of requirements.

Some requirements were expected; others were emergent. Expected requirements, such as enhancing platform data capabilities, enabling experimental research designs, and protecting data privacy, have focused on technical improvements to support scalable and rigorous research. Emerging needs included the creation of standardized workflows, development of researcher outreach strategies, and establishment of templates for institutional review board (IRB) approvals and data-sharing agreements. In addition, fostering a peer review community attuned to the unique affordances and constraints of DLP-based research has emerged as a shared priority. This working paper reflects on lessons learned from SEERNet's efforts, highlighting innovations in data documentation, experimental workflows, and collaborative relationship building.

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Introduction

Learning scientists have always pursued their work as an applied, impact-oriented science. In contrast to some research, which is conducted in highly controlled settings, the "lab" for learning sciences has been school classrooms and other practical educational settings. Now, researchers, developers, practitioners and funders are working together to integrate the technologies that students use in the "lab" to enable more researchers to get involved.

Digital learning platforms (DLPs) are already in use by teachers and students, and that use makes it possible to collect research data that more strongly connects to practice. By collecting data and comparing alternative supports for learning on DLPs, research could at once be grounded in realistic classroom data and also be applicable to classroom improvement. However, it is difficult for each individual researcher or research project to establish ways of working with a DLP. Thus, a key enabler for this work is developing *digital learning platforms as research infrastructure*, to serve multiple researchers and projects in similar ways.

In this working paper, we reflect on SEERNet's progress toward a "DLPs as research infrastructure" vision. SEERNet, as we will elaborate later, is one of several funded initiatives to connect platforms, researchers, and practitioners around shared infrastructure. After three years of effort among 12 separately funded teams who coordinate through SEERNet, we now have lessons learned about what it means to build this type of infrastructure.

Specifically, this paper articulates two kinds of infrastructure-building work: (1) the work SEERNet members *expected* and (2) the *emergent* work that was either less salient or not as obvious.

The expected work involved the technical requirements for sharing data. For example, the platforms needed to be extended with dashboards and other supports for researchers to access platform data. Further, some platforms added capabilities for comparative research (for example, the capability to vary particular student learning experiences in the platform and use an A/B testing apparatus to evaluate the impacts of student learning). As expected, much of the first three years of SEERNet's DLP work has gone into engineering these necessary capabilities.

Emerging requirements included:

1. **Conducting outreach to researchers** to stimulate their engagement with DLPs as research infrastructure.
2. **Clarifying opportunities and limits** so researchers know what to propose.

3. **Standardizing workflows and processes** to streamline the interactions among researchers, platforms, and educational settings.
4. Creating **necessary documentation to enable research**, like school data sharing agreements, memoranda of understanding, and institutional review board packages.
5. Building **relationships** among partners as they seek support in order to conduct this new type of research, including researcher-to-researcher relationships in the network.
6. Growing a **peer review** community because expectations from other research traditions can potentially get in the way of proposing, conducting, and reporting on the kinds of research that will be conducted with DLPs as research infrastructure.

Below, we first provide a short overview of SEERNet and the related initiatives occurring elsewhere. Then we elaborate and reflect on the expected and unexpected kinds of work that has been completed to date. We close with an invitation for communities beyond SEERNet who are investing in DLPs as research infrastructure to benefit from SEERNet's lessons learned.

Overview of SEERNet

In this working paper, we use "SEERNet" to refer to five platform teams, six research teams, and one network hub. The network hub connects the platform and research teams, and also links to practitioners and other stakeholders. Starting in late 2021, five platforms were funded by the Institute of Education Sciences to extend their capabilities so that researchers would be able to use their platforms to conduct research. At the same time, the SEERNet hub was funded to coordinate efforts among the teams. As of 2024, funding has extended to six research teams, each of which will use one specific platform to conduct a research study. These studies explore existing data available on the platforms and/or investigate whether a proposed enhancement to the platform increases student learning outcomes. The hub also has the responsibility for this working paper series, to document how the work is progressing and what is being learned. The SEERNet Digital Learning Platform teams are ASSISTments/E-TRIALS, OpenStax Kinetic, Terracotta/Canvas, UpGrade/MATHia, and ASU Learning@Scale. More information about SEERNet is available on the hub website: https://seernet.org.

Expected requirements	Emerging requirements
• Enhancing and documenting available data • Enabling researchers to author or modify curricular content • Protecting privacy and sharing data • Implementing supports for setting up, monitoring and analyzing an experiment • Enhancing user experience for students	• Conducting outreach to researchers • Clarifying opportunities and limits • Standardizing workflows and processes • Creating necessary documentation to enable research • Building relationships • Growing a peer review community

Table 1. Expected and emerging requirements for using DLPs as research infrastructure

Expected Requirements

The DLPs were each funded to make improvements to their platforms so that they could better support research. These platforms are heterogeneous in nature. For example, some serve higher education, while others focus on K-12. Some include curricular content (e.g., mathematics), while others enable experimentation with any curricular content. A good starting point for understanding the variety among the platforms is this web page.

As mentioned, the most obvious component of the work of building a research infrastructure is modifying the platform to support researchers and their work. Below we discuss the kinds of modifications that platforms have tackled.

1. Enhancing and Documenting Available Data

All the platforms have done work to better document their available data and, in many cases, have enhanced the available data. The most dramatic case of this is the ASU Learning@Scale initiative, which is newly making data available to researchers in all course offerings at ASU. For example, Learning@Scale has developed a data dictionary of available data for researchers to access (see Figure 1), and they are developing an AI chatbot that will answer researchers' questions.

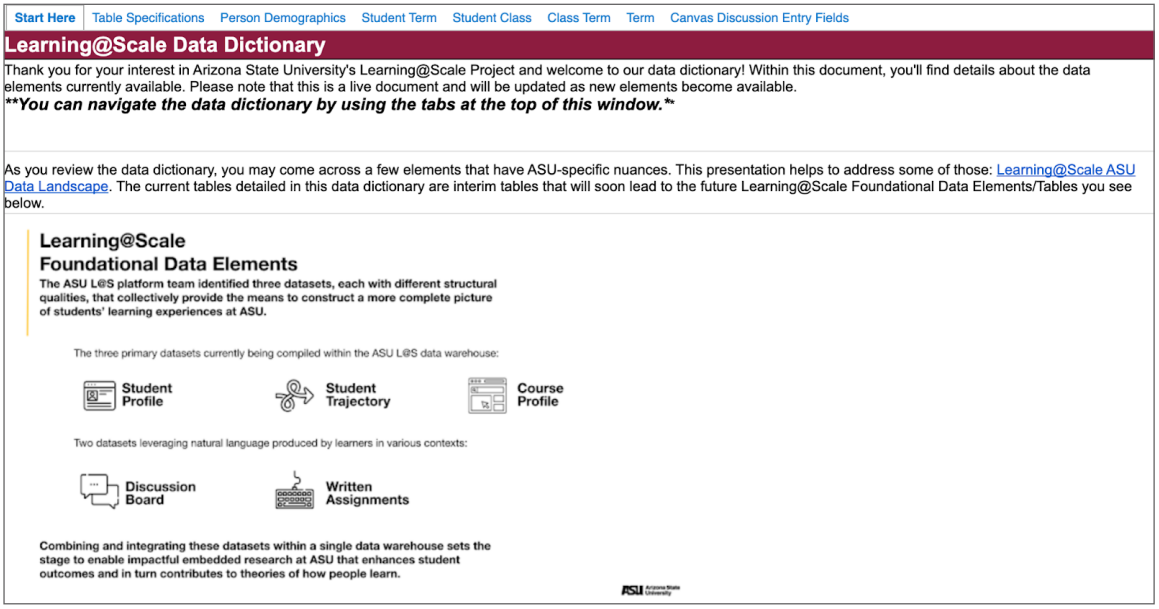

Figure 1. Screenshot of Learning@Scale's data dictionary

Creating anonymized sample data has also been important, as this enables researchers to directly see the nature of the data without full data-sharing agreements. Some teams have also worked on making it easier to connect or merge data sets. Another important aspect of the data enhancement has been defining clear outcome variables that can be used to evaluate short-term impacts on student learning. E-TRIALS has also focused on how data can be shared in an open science platform after the research is complete. An outside network, the AIMS Collaboratory, has now developed a catalog to document DLPs that invite outside researchers and the data provided by those DLPs.

To conduct research, researchers need to know what variables are available and what they mean—but even before that, student data needs to be available for research. Because studies in OpenStax Kinetic are opt-in, the team has worked to incentivize students to participate in studies on the platform to enhance their corpus of learner characteristics data. For example, a standard survey study of resilience might be labeled with a catchy title like "Do you survive or thrive?" on the platform.

2. Enabling Researchers to Author or Modify Curricular Content

In some cases, researchers want to test whether modified or enhanced curricular resources lead to greater learning and can do so by conducting A/B tests. For example, Dr. Avery Closser's SEERNet study adjusts the way that symbolic math is presented to help students visualize the structure of the expressions. To support this and other content modifications, the E-TRIALS/ASSISTments platform developed better tools for researchers and others to modify content. In particular, E-TRIALS can randomize whether students see a new presentation of mathematical symbols or the existing presentation of the same symbols. In another case, researchers worked with the E-TRIALS team to solve a content challenge relating to school firewalls, which can block YouTube content. Thus, when studies delivered in E-TRIALS use videos to modify supports for students, researchers are able to use the ASSISTments YouTube channel to deliver content that may otherwise be blocked on school servers. This solution was discovered as part of a collaboration between researchers supporting E-TRIALS and ASSISTments team members who work with teachers in schools.

Terracotta takes a different approach: It can work with any content that can be entered into the Canvas Learning Management System (LMS); researchers can test alternative versions of the same assigned content. OpenStax Kinetic enables researchers to create different kinds of surveys or interventional activities in Qualtrics that students can choose to explore from within their Kinetic dashboards. Qualtrics was strategically selected as the development tool for different research studies for Kinetic because many learning science researchers are familiar with and often use the tool.

3. Protecting Privacy and Sharing Data

SEERNet DLPs are intentional when it comes to protecting privacy and confidentiality of user data. They all emphasize strategies for enhancing data protection and compliance with privacy laws. For instance, ASSISTments has established a workflow that allows researchers to create and deliver different versions of content to students and receive de-identified data once their study is complete. Learning@Scale has spent considerable time and effort determining how to handle the security of personally identifiable information (PII) they collect, such as working to redact PII on discussion board data. All SEERNet DLPs discussed the importance of encrypting sensitive information to maintain user confidentiality.

In terms of data sharing, DLPs consider how user consent is built into their platforms and the privacy implications of sharing data. Each DLP has terms and policies governing data sharing with other platforms. Terracotta allows researchers to create an informed consent assignment in an LMS course site so that individual participants have agency to decide whether to participate in an experiment, while UpGrade/MATHia and ASSISTments rely on data sharing agreements to be used with other researchers. In particular, UpGrade/MATHia's data sharing agreements can be categorized into three groups: 1) districts who have explicitly agreed to take part in a certain research study, 2) a larger pool of districts that allow deidentified data to be shared with third parties, and 3) an even larger pool of districts that have agreements in place with Carnegie Learning, UpGrade/MATHia's umbrella organization.

4. Implementing Supports for Setting Up, Monitoring and Analyzing an Experiment

Platforms also have worked on the apparatus for researchers to conduct experiments that compare a changed student learning experience to the original experience. The basics of supporting this comparative research may seem obvious, but there are many details to work out. For example, in the E-TRIALS platform, a "support comparison study" allows researchers to compare two or more types of supports students access to increase their understanding as they complete their math assignments. In addition to random assignment, E-TRIALS has also created a conditional approach to participant assignment, where assignment is based on student response to a specific question. This can enable researchers to focus their evaluation of an intervention to support students who could most benefit. The E-TRIALS team monitors study development to ensure the supports vary by a single factor. In one such study created by Dr. Veronica Yan and Dr. Allison Zengilowski in E-TRIALS, students completing a problem set are randomly assigned to either 1) receive typical ASSISTments support, or 2) receive a prompt to complete a task before obtaining ASSISTments support.

Platforms have created dashboards or other tools for researchers to monitor their experiments, for example, to find out how many students have been enrolled so far, which condition they have been assigned to, and how many have completed the experiment. In their study, Dr. Yan and Dr. Zengilowski are able to see that over 2,000 students have participated in their study through the E-TRIALS platform. This number of students is not typical for educational research (which typically has small student samples available); yet nearly 20% of the studies conducted in E-TRIALS have enrolled over 1,000 participants.

Multiple SEERNet DLPs have focused on workflows to help researchers with data analysis, including methods for data cleaning, the selection of appropriate analytical tools, and preliminary data exploration techniques. Both OpenStax Kinetic and Terracotta have developed data dashboards to provide researchers and teachers with just-in-time information on studies they are running in an easy-to-interpret, user-friendly way. OpenStax Kinetic has two main components: a researcher experience that provides the researcher the ability to create a Kinetic study, link to their Qualtrics study, and monitor study progress; and a learner experience that enables the participants to view different studies available to them and, recently, the ability to view the digital badges they earned as well as the feedback that they received at the end of their participation. All the features in the researcher and learner experiences have been iteratively refined over time based on extensive user research. Terracotta has carried out two expansive user research studies of teachers and researchers to evaluate the DLP's range and quality of support for education experimentation research, using the results to forward development improvements and identifying needs for additional support documentation.

The hub has facilitated conversations about the implementation of such analysis supports and dashboards—and there is a clear tension. Researchers have very specific analysis needs, and supporting every need in a "dashboard" or platform-based interface quickly becomes too much work. Therefore, platforms typically only provide a simple, standardized analysis of the data, if any analysis is provided at all.

Discussions in the hub have also included how researchers can contribute to open science, such as by publishing their datasets in repositories. For example, researchers using the E-TRIALS platform are required to preregister their study with the Center for Open Science prior to receiving their data. However, the platforms have not yet standardized a pathway from analysis to data sharing; the details likely require handling this on a case-by-case basis.

5. Enhancing User Experience for Students

Platforms expected that supporting researchers would require improving the user experience for students. For example, OpenStax Kinetic designed ways to encourage students to participate in research, which required significant user research to understand what incentives are important to adult learners and what would motivate them to participate in learning research. The design has now undergone three iterations from MVP to beta versions with attention to messaging. OpenStax Kinetic also focused on how recruitment can be conducted in the platform (many OpenStax Kinetic users are adult learners) and how incentives could be incorporated into the experience. Transitioning from a previous strategy to offer a small number of gift cards, OpenStax Kinetic has moved toward a scalable strategy to incentivize students to participate in studies by offering digital badges that can be shared with their professional networks, providing learners with tangible evidence of their accomplishments.

Another example of enhancing the student user experience comes from Terracotta, which built support for multiple submission options in the learning management system. Even when students complete an assignment in the LMS, they often want to go back and complete it again to see if they can improve their score. To account for this, Terracotta built a workflow where the teacher can specify the number of attempts allowed in an experimentally manipulated assignment (or they can allow unlimited attempts), and students can review their feedback before deciding to initiate another submission.

Similarly, E-TRIALS researchers were interested in developing a new dependent measure of problems that were similar, but not exactly the same to one another, and could be delivered if a student completed a problem incorrectly on their first attempt. ASSISTments therefore created a Redo feature, which teachers can employ to provide students with a more adaptive experience. When Redo is turned on and students encounter difficulty, students are able to then solve a similar problem while reviewing the supports from the original problem they struggled with.

Emerging Requirements

Within SEERNet, teams of platform developers have now started working with researchers. This has led to discussion of additional requirements beyond the changes in platform technology discussed above.

1. Conducting Outreach to Potential Researchers

Each of the SEERNet platforms have discussed the importance of outreach to encourage researchers to utilize their DLPs. They have used a variety of outreach mechanisms including social media, industry newsletters, and academic conferences. These targeted outreach processes help build awareness and help new researchers to learn about the affordances and limitations of each DLP, including what each can and can't do in terms of research studies. In addition, the network as a whole has learned that a "build it and they will come" attitude is not sufficient; it makes sense to more actively recruit researchers who could benefit from the SEERNet DLPs.

One way this outreach has occurred is through the annual series of "A/B Testing Workshops" that have occurred at the ACM Learning@Scale conference (Ritter et al., 2024). Additional conferences for promoting SEERNet have included the Society for Research on Educational Effectiveness, Educational Data Mining, and the Society for Learning Analytics Research. Across multiple years, Terracotta has sponsored Psychonomics, InstructureCon, and ISSOTL conferences. The IES PI meeting is also a venue, and the SEERNet team has reached out to both IES-funded and NSF-funded training workshops. One closely related workshop series is the Penn Graduate School of Education's Data Science Methods for Digital Learning Platforms training program, led by Dr. Ryan Baker, in collaboration with University of Pennsylvania's Dr. Bodong Chen, University of Florida's Dr. Anthony Botelho, Tampere University's Dr. Elizabeth Cloude, and Digital Promise's Dr. Jeremy Roschelle and Dr. Stefani Pautz Stephenson. The 16-week online program addresses such topics as data and measurement validity; data visualization; ethics and algorithmic bias; cluster, network, and temporal analysis; neural networks and deep learning; and natural language processing. Participants work with real-world data that is representative of the data that comes from digital learning platforms. By the conclusion of the three-year program, six cohorts and more than 150 researchers will have engaged with the training.

2. Clarifying Opportunities and Limits

The platforms found they also had to clearly document what kinds of studies could or could not be done with their platforms. They found that clearly scoping possible, desirable, or impractical research ideas was important so that the collaborations between a DLP and a research team would be feasible and reasonable.

For example, ASU Learning@Scale supports workflows for multiple types of research, including efficacy studies, replication studies, rapid A/B testing, and design studies with the overarching objective of contributing to theories of how people learn. However, these types are very broad and some specific studies still might not be feasible.

Other DLPs have their specific foci as well. E-TRIALS focuses on changes to the feedback (e.g., hints) provided to students as they solve math problems, as well as changes to the content of the math problems that students receive. Most of the SEERNet DLPs support experimental manipulation of student assignments, such as the way Terracotta supports changing the kinds of assignments that can be posted in Canvas. OpenStax Kinetic supports changes in "labs" but not in its core textbooks.

It is also important to recognize that some DLPs have a brand and market presence that is important to their sustainability. Some studies might be possible to do on the platform but not a good fit to the platform's current brand. A simple example would be experimenting with content created by students in a platform that has a brand for professionally authored content.

More generally, the network has slowly shifted from leaving what research is possible as very open-ended to describing more targeted, desirable opportunities. There are several reasons for this. First, when the possibilities are too open-ended, researchers have difficulties knowing what to propose. Second, the DLPs have knowledge of what kinds of studies have more potential to strengthen the platform. Third, building an infrastructure involves making choices, and those choices will typically support some kinds of studies better than others.

3. Standardizing Processes and Workflows

Doing research using a platform as infrastructure requires a collaboration that moves back and forth between the researchers and platform developers. Part of the SEERNet network effort has been finding ways to standardize aspects of these collaborations. In particular, the platforms have found that developing standardized processes and workflows allows the DLPs to determine researcher fit and feasibility of research projects, and helps to scaffold each step of the research process to ensure successful research projects and outcomes.

One major example of standardizing processes in SEERNet has been the feasibility process. Working with IES in advance of the competition for research awards, the SEERNet platforms and hub discussed how researchers would be able to ascertain that their research plan was likely to be feasible before submitting a research application to IES and before funds were fully committed. This led to two new phases:

1. Before a proposal was submitted to IES, a feasibility letter was required from the platform for the research, discussing the platform's view of whether the proposed research would be feasible to conduct. Researchers and platforms could iterate to resolve feasibility issues. The final letters were then submitted as part of the research applications.
2. After a proposal was awarded, it was required to have a six-month feasibility phase in which kinks could be worked out before all the funds were committed to the project.

Some other areas of standardized process and workflow can include:

- Formalizing agreements needed between the DLP and researchers.
- Agreeing on how students will be recruited for the study.
- Specifying when the study will occur in the school year.
- Discussing how additional data can be linked (by the researcher) to DLP data.

Unique to ASU's Learning@Scale was standardizing the workflows of getting and combining access to the various available datasets at the university. Some data may sit with the registrar's office, some with the institutional research department, etc., and much work took place to identify which departments owned what data and how to get access to the data while maintaining student privacy.

4. Creating Necessary Documentation to Enable Research

Conducting research in DLPs requires not only a mindset shift on the part of the researcher (Schellinger et al., 2024), but also numerous approval agreements such as memorandums of understanding, data sharing agreements, and IRB review.

Conducting research on DLPs and with DLPs can sometimes require researchers or DLPs to educate IRBs on the research purposes and participant rights. Because much of the data collected by DLPs is secondary, deidentified data, some platforms have articulated a strong position that research conducted on the platform should be exempt. ASSISTments and the research team from Vanderbilt conducting research on ASSISTments worked tirelessly to ensure Vanderbilt's IRB understood why the research study could be considered exempt, even though it involved human subjects research. Other platforms such as Learning@Scale have created documentation of the procedures necessary to conduct research within the university context to ensure safe, equitable research studies. Terracotta has created public documentation for all aspects of its use, ranging from experimental design guides to consent templates, helping researchers understand what to communicate to their respective IRBs to gain approval. OpenStax, as part of the SafeInsights project recently funded by NSF, will pioneer the use of data enclaves in which researchers can access aggregate data but never see PII to ensure data privacy and compliance.

Overall, a growing trend in the SEERNet community is the realization that standardized language and documentation of procedures for the documents that need to be created or approved to enable research would be very helpful to all.

5. Building Relationships

A different type of engineering advancement occurred on the more interpersonal level with relationship building, where the network continued to develop a supportive research community, and where DLPs developed partnership processes with researchers.

Growing a community of knowledge was a cross-cutting theme in the engineering advancements. For example, researcher Avery Closser shared her MOU document and her experiences with IRB so that others in the network could learn from her experiences. The group also explored resources from the Federal Demonstration Partnership. The sentiment was that sharing resources can help make the process less intimidating for new researchers joining the network. The network is working on a location to internally store templates, example language, etc., so that different examples from across the network can be easily accessed.

Teams shared insights into how they were building relationships with researchers and supporting them on the flow of approval requests from their institutions and to the district. For example, MATHia now has a Research Partner Facilitator who does the paperwork with school districts, creates collateral, and sets meetings. The Research Partner Facilitator also works with external researchers to support developing and getting signatures on data sharing agreements needed for conducting research with MATHia customer districts. Learning@Scale is working on improving portions of the feasibility request/review process to be more streamlined. OpenStax Kinetic convened a working group of higher education professionals with representation from minority-serving institutions to draft a research agenda to guide study proposals. Each of these tactics addresses the process of evaluating potential research partnerships or collaborations, assessing the feasibility of proposed research projects and the onboarding of new researchers or partners.

Learning@Scale's relationship building up to this point has predominantly involved internal trust building within the university administration, instead of with researchers or school districts. As more research studies occur using L@S's data, they expect that emphasis to shift from administration to researchers.

6. Growing a Peer Review Community

Another ongoing discussion in the SEERNet community is about the peer review process. Proposals always have a limited length, and thus proposal writers expect that "peers" bring appropriate background knowledge to their work as reviewers. But this background knowledge may not reflect the realities of research with DLPs as infrastructure, because so few researchers have done this kind of work to date. Research with a DLP is somewhat like secondary data analysis, but different because the data can be captured by the DLP just for this research project. Research with a DLP may also be somewhat like using a survey platform to host survey research, but also is different because of the ability to investigate modifications to curricular content.

In one hypothetical example, Subsection 2 above discussed opportunities and limits. The proposer will have crafted their research plan within these limits. However, a peer reviewer may be more familiar with situations in which educational researchers have greater control over their experiments. The peer reviewer may wonder why the proposal didn't instead use a different approach. Conversely, the peer reviewer may not appreciate the cleverness with which the researcher fit their study question into the DLP's limitations.

In another hypothetical example, using DLPs as research infrastructure may allow for doing some research at lower cost or with greater agility. Yet, it seems that peer reviewers do not always value the savings on the budgetary side or the value of getting findings more quickly and then iterating.

Overall, the success of the movement to use DLPs as research infrastructure will likely require building a peer review community with awareness of the expectations, background requirements, limits, and assumptions of this kind of research.

Conclusion: Supporting a Movement

The launch of the SEERNet initiative by the Institute of Education Sciences was a milestone because it was the first time in which a funding program specifically called for advancing the promise of digital learning platforms as research infrastructure. The idea itself was not new, and draws on many precedents (Schellinger & Roschelle, 2024). Since the launch of SEERNet with IES funding, the Gates Foundation has created a related initiative called the AIMS Collaboratory. And the National Science Foundation recently funded the SafeInsights infrastructure effort. Additional groups of researchers and platforms are considering how they can build their own initiatives related to the concept of digital learning platforms as research infrastructure. Given this movement, our SEERNet-based reflections may help others to anticipate the range of effort they will need to engage in.

We have highlighted two categories of effort. Most of the requirements in the "expected" category related to changes to the digital learning platform itself. Most of these were technical changes to the platform so that research could more easily occur. There is much for others in the movement to learn from how specific SEERNet DLPs designed and implemented these particular technical advances. The requirements in the "emerging" category are no less important to enabling researchers to succeed in their work with DLPs. These emerging considerations relate to the elements of doing research, such as the need for standardized workflows and processes, as well as template documents. They also relate to community aspects of conducting research, such as outreach to new researchers, building a healthy community among researchers who are using DLPs, and tuning the peer review process.

Overall, SEERNet members look forward to being part of a larger movement, and have launched a conversation about the movement called DL PRIMo. We look forward to supporting others in the movement and also learning from colleagues engaged in parallel efforts.

References

Ritter, S., Fancsali, S. E., Murphy, A., Heffernan, N., Motz, B., Basu Mallick, D., Roschelle, J., McNamara, D., & Williams, J. J. (2024). Fifth annual workshop on A/B testing and platform-enabled learning research. *Proceedings of the Eleventh ACM Conference on Learning @ Scale (L@S '24)*, 565–566. Association for Computing Machinery. https://doi.org/10.1145/3657604.3664642

Schellinger, A., & Roschelle, J. (2024, January). *Looking back to move forward.* Digital Promise. https://doi.org/10.51388/20.500.12265/203

Schellinger, A., Zacamy, J., Roschelle, J., Closser, A., & Zepeda, C. D. (2024, April). *Considerations for conducting research in digital learning platforms.* Digital Promise. https://doi.org/10.51388/20.500.12265/210