Resultant

Toward a True Educator Pipeline: **A Radical Rethinking of Data Collection and Analytics**

CONTENTS

The current treatment of educator pipeline data may best be categorized as compliance-focused and episodic, and it leaves big ideas, true change, and collaborative effort out of the equation. Even in states that are beginning to analyze their educator pipeline data systems, outdated analytics capabilities and persistent data silos interfere as much as they facilitate. There's a lot of room for improvement, and now is an ideal time to undertake the shifts in thinking and systems that will facilitate education optimally now and offer scalability and adaptability for years to come.

Introduction

At present, educator preparation programs (EPPs) and vendors submit required data to the state education agency (SEA), which posts data on a public website. Mandated Title II reporting captures data in a more consistent manner, but it is delayed a couple of years, limited in scope, and lacks agreement on key terms from state to state. Local education agencies (LEAs) sometimes provide indirect feedback on their impressions of how well EPPs have prepared candidates through surveys and educator evaluation scores. Tying the various pieces of data together into a comprehensive picture of the educator pipeline is impossible or overlooked, as the current approach is not maximizing the collection and analysis of data for ongoing improvement. Data collection is often viewed as a chore, with little to no connection to ongoing improvement efforts in SEAs, LEAs, or EPPs.

What if we could design an educator pipeline data system from scratch? Would we build our current siloed and compliance-driven system, or would we choose a comprehensive data collection and sharing system that can answer complex policy questions and allows decision-makers to target resources to the areas of greatest need? Luckily, given numerous recent advances in the data-sharing landscape, we may not need to start over. We have the resources and know-how to build and strengthen a future-ready educator pipeline system today, even if we are starting with imperfect systems that were built for a different time.

With additional resources available through COVID-19 relief packages, some in the education field are taking important first steps to building a true educator pipeline. The purpose of this whitepaper is to propose the next steps for state agencies as they embark on this new phase of work.

Background

The current approach to educator data leaves untapped opportunity—for meaningful partnerships, efficient deployment of state resources, and improvements arising from best practices in other industries, to name but a few. State monitoring and reporting systems are essential components of local decision making. When data collection is robust and reporting is connected to ongoing local continuous improvement efforts, high-quality data becomes a useful tool in reconceiving support and resources that schools and programs may need. But when data collection is episodic and idiosyncratic, and reporting focuses only on compliance-based questions—as is the case in most jurisdictions—the decisions drawn from existing data are limited at best. Whenever conclusions are based on faulty or incomplete data, potential is lost and education suffers. The status quo persists, and it encourages a failure of imagination in state data systems that may potentially narrow thinking around the educator pipeline and unintentionally limit solutions. **Looking to other industries gives a hint at what education is missing out on.**

In their current state, education workforce initiatives do not quite qualify as pipelines; there is little connection among the various phases of a teacher's career and data systems.

COMPARING AN ESTABLISHED PIPELINE TO THE EDUCATOR PIPELINE

Over the past decade, significant energy and political capital have been devoted to analyzing the strength of what is often referred to as the *educator* pipeline—or, the process beginning when a candidate enters their preparation program and lasting through their placement in schools (although some may argue the true pipeline would begin with candidate recruitment and extend through retirement)—to the point where all states have some sort of educator pipeline initiative currently underway. The pipeline metaphor is ubiquitous, but is it apt?

At present, no. Compare what's happening in education to a more established version: Oil pipelines are resource-intensive, data-rich, complex systems that involve continuous processes of monitoring and adjustment before a product is treated and brought to the public. Our current models of the educator pipeline are not supported by, much less rich with, the kinds of data that would allow for continuous monitoring and adjustment. **Table 1** illustrates the differences between true pipelines and the current model of the educator pipeline.

Background, *continued*

TRUE PIPELINES VS THE CURRENT EDUCATOR PIPELINE MODEL

	EXPLORATION	TREATMENT AND REFINERY	TRANSPORTATION	DISTRIBUTION
OIL REFINERY PROCESS	**Finding Raw Materials** After areas are scouted, teams extract the desired raw materials. Local and non-local sources must adhere to the same quality standards.	**Making Materials Suitable** Treatments are added, typically under pressure, to turn raw materials into something new and useful.	**"Pipeline" in its Purest Sense** Product advances through pipeline, with constant monitoring, adjustments to the mechanism when needed, and multiple reinforcement spots where pressure tends to be highest.	**Product Sent to End Source** After quality of product is verified, the end source is identified. Once received, the product is added to a local system, with ongoing quality monitoring.
EDUCATOR DEVELOPMENT PROCESS	**Recruitment** Often limited resources for true exploration, tend to rely on self-selected "raw materials" (applicants to preparation programs).	**Preparation** Novice educators are trained at multiple locations using multiple methods. Quality and quantity of "treatment" (preparation) vary significantly.	**Certification and Placement** Quality and intensity of monitoring vary significantly. Little attention to "refinery" (quality of preparation) that may be needed for different locations or uses.	**Induction** Ongoing "refinement" (development) is assumed to be the responsibility of local consumers (LEAs), but minimal monitoring by central entity.

TABLE 1 | COMPARISON BETWEEN OIL REFINERY AND EDUCATOR DEVELOPMENT PROCESSES

> When oversight does not occur in education, we lose our ability to monitor and, when needed, adjust the quality of inputs, leading to inconsistent outputs and outcomes.

Background, *continued*

Where data and educator connections do exist, they tend to appear in isolated pockets that are difficult to analyze and connect, rather than within a larger system. The level of oversight in each field also varies. Agency oversight in oil exploration and refinery involves (or theoretically involves) establishing industry standards and external monitoring.

When oversight cannot or does not occur due to limited agency capacity, the result is disruptions in supply, and likely detrimental effects to local communities. An extreme example is BP's Deepwater Horizon oil spill. When oversight does not occur in education (as is the case to varying degrees in virtually all jurisdictions), we lose our ability to monitor and, when needed, adjust the quality of inputs, leading to inconsistent outputs and outcomes. The result, it could reasonably be argued, is detrimental effects to local communities. In both fields, insiders know the monitoring systems in which they operate, and they are skilled at understanding the gaps, even if those gaps are spoken about only in private.

THE CURRENT REALITY IS MORE LEAKY GARDEN HOSE THAN PIPELINE

Referring to teacher supply-and-demand issues as pipeline issues assumes that educator recruitment, preparation, certification, placement, induction, development, and ongoing career opportunities are aligned as part of a cohesive system. They are not.

States currently struggle to make do with a system where inputs are gathered (often passively), treatments are done to refine "products" (future teachers), many products are lost in the process (and we lack the ability to identify why this happens), and then a group of final products (prepared teachers) are moved to clients (schools) as if all are of equal quality. Rather than a pipeline, this is more like a series of connected, leaky garden hoses, illustrated in **Figure 1** on the next page.

Background, *continued*

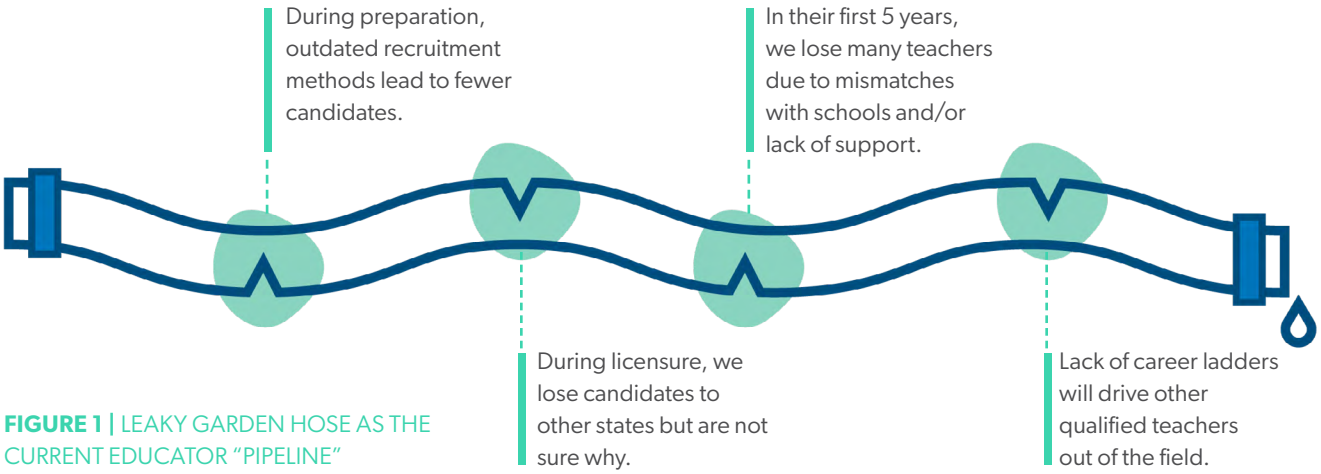


FIGURE 1 | LEAKY GARDEN HOSE AS THE CURRENT EDUCATOR "PIPELINE"

Problem State/**Current State**

State agencies need access to a greater quantity and quality of data to make informed decisions on the educator pipeline. Jurisdictions are beginning to recognize that current data systems related to the educator pipeline were designed for different purposes and answer different questions than agencies are asking today. Current state systems across jurisdictions are isolated and focused on one specialization area; for example, licensing systems focus only on the licensing of educators and licensure data is collected through that system; personnel systems collect and possess data on personnel evaluation, etc. Data silos create analytical silos, as well. Figure 2 illustrates most current educator pipeline systems.

PREPARATION	LICENSURE	EVALUATION	DEVELOPMENT	PLACEMENT
↓	↓	↓	↓	↓
EPPs, testing vendor, and LEAs submit data	Candidates, testing vendor, and EPPs submit data	LEAs submit data	Educators submit plans	Isolated, piecemeal system (tied to LEAs)
↓	↓	↓	↓	↓
Results (matrices) posted on SEA site; Title II site for completers	Information available upon request (no regular reporting)	EPPs report aggregate data (when n>10) through matrices	No current analyses conducted	Only analysis regarding supply/ demand (limited)

FIGURE 2 | CURRENT EDUCATOR PIPELINE SYSTEM

Problem State/**Current State**, *continued*

AN OUTDATED, SILOED DATA ENVIRONMENT

These systems were developed to address basic, compliance-focused questions from agencies, and they not only aren't up to the task of present-day analytics, they limit states' progress. States have tried to pull data from different systems and speak across those systems (represented by dotted lines in Figure 2 above) to begin analyzing the strength of the educator pipeline. However, these systems lack a true comprehensive data system that can adequately inform decision making. Current systems, with siloed designs, were not intended to address complex questions of effectiveness or larger questions beyond a "yes/no" determination of compliance. Additionally, legacy data systems are rarely flexible enough to add or include new components, features, or data systems based on changing needs.

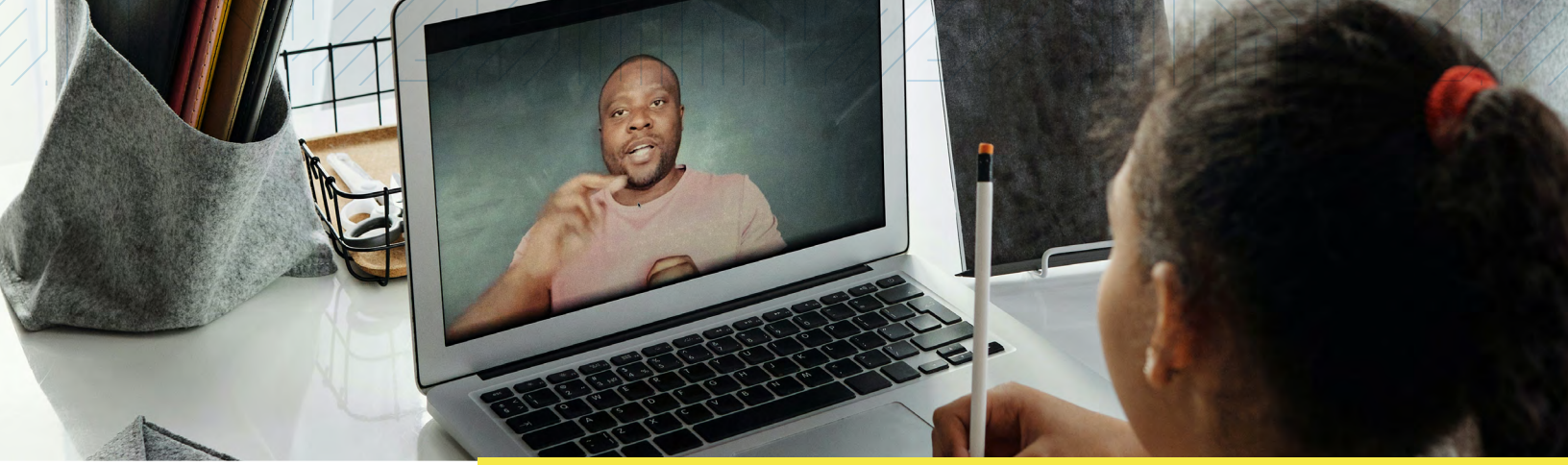
> States urgently need relevant, high-quality information on the education workforce, but existing systems limit the judgments that may be made from data analysis, as well as the possible solutions.

Current state data systems tend to be isolated from one another, with data collection driven by compliance. As states turn their attention to the educator pipeline, they are learning that data systems for the pipeline are flawed. Even those states that publish analyses of the teaching workforce (examples may be found in Massachusetts, California, and Nevada) tend to emphasize the judgments that may be responsibly made from current data systems are limited. For example, the National Council on Teacher Quality analyzed the current state of teacher workforce data systems and found that although over half of the states that responded to their survey provide information about their current teaching workforce, only 11 states possess data on teaching positions. These states focus their data systems on tracking individuals rather than specific positions. The lack of this particular data hampers an understanding of the genuine demand for teachers (Saenz-Armstrong, 2022).

CURRENT STRATEGIES FALL SHORT

Various groups have advocated for new strategies related to the teacher pipeline. However, the nature of those recommendations tends to reinforce how siloed our data systems have become.

- The Center for American Progress (Partelow & Baumgardner, 2016; Partelow, 2019), Bellwether Education Partners (Aldeman, 2018), Council of Chief State School Officers (Gill, 2017), and Learning Policy Institute (Sutcher, Darling-Hammond, & Carver-Thomas, 2016) analyzed teacher supply and demand by reviewing state-reported shortage areas and classroom vacancies. While valuable, such analyses use traditional supply-and-demand calculations that have themselves been called inadequate and limited (also reviewed in Ross, 2018).
- Education Commission of the States produces a series of policy reports and recommendations for the educator pipeline; like other organizations, their recommendations are grouped around existing data silos.
- For years, the National Council on Teacher Quality (2021) has produced policy papers analyzing the relationship between licensure tests and teacher quality or student outcomes; this type of narrow view of licensure requirements is valuable when specifically discussing educator licensure, but it tends to overlook the more systemic solutions that educator pipeline challenges demand.



Problem State/**Current State**, *continued*

The standard literature on the educator pipeline typically neglects the idiosyncratic nature of data collection and recording around the educator pipeline across different jurisdictions. More recently, there has been an increasing amount of advocacy concerning improvements on the data systems that inform decision-makers about the educator pipeline. *Phi Delta Kappan* (Holden & Goldhaber, 2021), National Center for Analysis of Longitudinal Data in Education Research (Goldhaber & Holden, 2020), and the Southern Region Education Board (2018), as well as state level organizations such as those in Massachusetts (Dillon, 2014) and Texas (Pfannenstiel, 2017) all noted limitations to current educator pipeline data systems.

Recommendations across organizations and jurisdictions for the design (and redesign) of state data systems include:

1. Increasing the quantity and quality of data collected on educator preparation and standardizing data collection procedures
2. Bridging data silos, either by reconfiguring systems to eliminate silos or by building connections across existing silos
3. Collaborating with stakeholders (EPPs, LEAs, educator candidates, etc.) to review the data measures that are used in decision making and determine their appropriateness
4. Using multiple measures to understand the complexities of various components of the educator pipeline and build opportunities for direct stakeholder input (e.g., student surveys)
5. Collecting data to confirm minimum expectations are being met, but also go beyond minimums to include data that will allow EPPs and LEAs to share best practices and adopt a continuous improvement mindset
6. Providing public, transparent reporting mechanisms across various points of the educator career continuum

Even these recommendations are largely based on current practices. National groups like TNTP (2017), who purport to "disrupt" educator preparation, have made recommendations around data systems that largely assume maintaining current procedures while making minor tweaks to how information is reported.

Given the known limitations of our data systems, should we consider that perhaps our ability to ask deep questions and reconceive ongoing challenges has been hampered? If we are truly building a future-ready data system to equip decision-makers with high-quality data on the educator pipeline, we need to start with the premise that more is needed than is currently being done, and as a result we may not yet know the extent of what is possible or available.

We need to build systems that are flexible enough to adapt to the unknowns of the future and that will inspire us to ask different, better questions.

DATA COLLECTION PRACTICES VARY, AND FEW FUNCTION ADEQUATELY

Problem State/**Current State**, *continued*

Most jurisdictions currently collect data on the educator pipeline from EPPs, testing vendors, LEAs, and from educators themselves in the licensing system. Typically, the following steps are involved:

- EPPs submit data on admission requirements, program completers, attrition and retention rates (sometimes, but not as often as the other requirements), and candidate results from licensure tests to the SEA. This data is then often inputted by SEA staff.
- LEAs send data to SEA on educator evaluation (typically reported in aggregate), retention and placement information, as well as survey responses completed by administrators about their perceptions of the preparation of novice teachers.
- Testing vendors submit data on results from mandated licensing tests.
- Candidates and teachers submit demographic data and new teachers often complete an end-of-program survey regarding their experience in an EPP.

That process is typical but not universal. Some states do not have standardized systems—or even common requirements—for collecting survey information, others do not collect the same EPP information, and still others have rules that govern the reporting of evaluation data. Additionally, a wide range of relevant data on the educator pipeline is rarely, if ever, collected by SEAs. **This overlooked data includes but is not limited to:**

1. Recruitment strategies being used and their relative effectiveness
2. Information on student teachers' mentors
3. District partnerships with EPPs
4. Availability of retired teachers who may still be interested in short-term teaching
5. Job application data
6. Scores and feedback given on program-level performance assessments during preparation
7. Institutional highlights and/or innovative programs, as well as faculty highlights
8. Availability of coursework and/or professional development in specific focus areas, such as online instruction, classroom management, assessment development, data analysis, etc.
9. Types of professional development requested and completed by educators of various experience levels

APPROACHES TO DATA SYSTEMS FACILITATE OR LIMIT INSIGHT

Problem State/**Current State**, *continued*

As SEAs develop the educator pipeline, a key step is documenting all available data and data sources that may be related to the educator pipeline. As SEAs dedicate resources and strategize how to grow and strengthen the educator pipeline, new data that can inform decision making will almost certainly be identified. The systems of the future need to be flexible and adaptable to unknowns that may occur.

As currently configured, educator pipeline data systems are set up to provide answers to the following policy questions:

- How many licenses are issued a year in various content areas?
- How many teachers have been produced through in-state educator preparation programs in recent years?
- What is the average educator evaluation score in certain districts?
- Are educator preparation programs meeting the minimum requirements for program review?
- How many unlicensed teachers were granted a waiver in recent years?
- Do candidates from certain EPPs retake required licensing tests more than others?

Questions like these have value, especially for the accountability function that state agencies must serve. However, these questions do little for continuous improvement purposes, nor do they allow for complex analyses of indicators of effectiveness or strategic planning around the educator pipeline. Current data systems were not designed to provide support to schools or preparation programs. With some meaningful changes, SEAs can begin to build new partnerships across the state and transform its approach to emphasize a collaborative culture of high quality data and data-informed decision making.

Solution/**Future State**

The modern policy environment requires answers to more complex questions than are supported by the current configuration of data systems, such as:

- How can the state provide targeted resources to strengthen the educator pipeline in areas of anticipated upcoming need?
- How are teachers with advanced skills distributed across the state?
- Do novice teachers need a particular type of support as they begin their careers?
- Do certain professional development experiences lead to greater instructional improvement than others?
- Are residency-style preparation models more effective in preparing teachers who are ready for certain schools?
- Are current program requirements around educator preparation appropriate for the needs of modern schools?
- What unique features distinguish the state's educator preparation programs from one another, and how can

> Modern education systems will be built on foundations of high-quality, useful data that can provide accurate views of the education workforce in real time and lead to targeted policy and financial decisions.

Solution/**Future State**, *continued*

the SEA help programs collaborate around promising practices?

Such questions require more complex data analyses than are currently available, which points to the need to modernize data collection related to the educator pipeline. **Figure 3** illustrates a de-siloed system architecture, one where numerous data sources feed into one centralized system. At that point, data can be pulled through various reporting mechanisms. By combining data into a centralized system, decision-makers will have a more comprehensive view of student performance, staff development, and resource allocation. With an enhanced data landscape, more nuanced policy questions can be explored, and targeted solutions can be crafted to address specific needs.

Figure 4 imagines a transformed approach to data collection, analysis, and reporting.

With this type of arrangement, multiple users input data

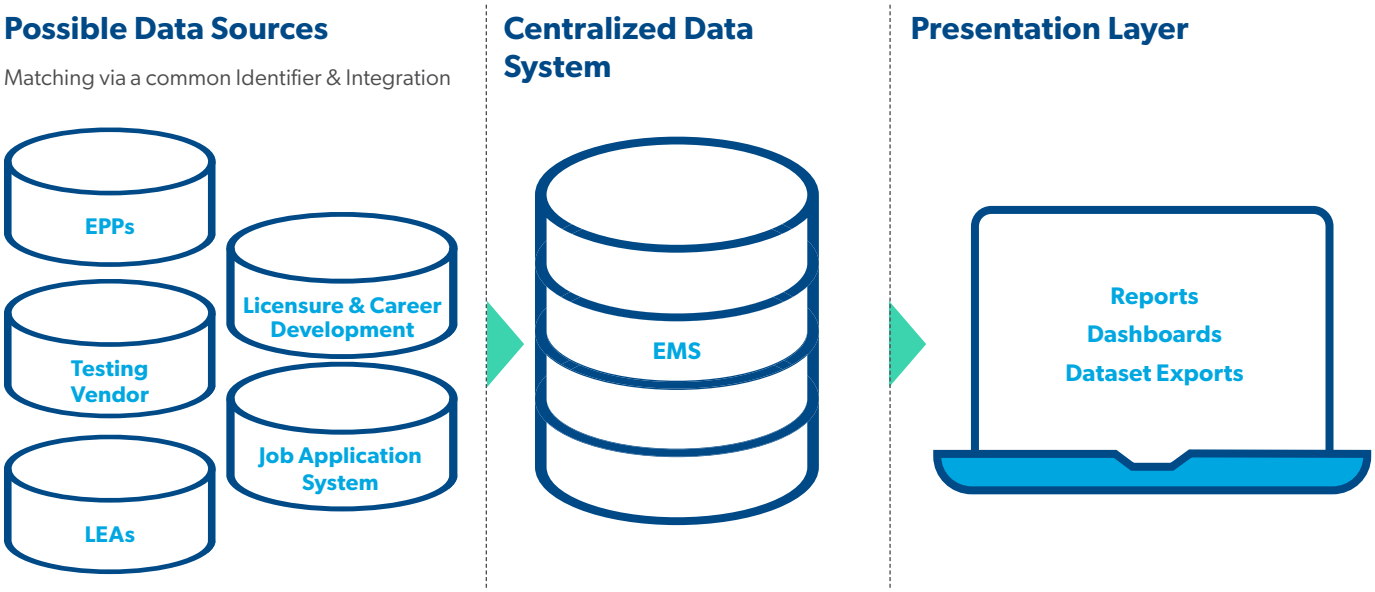


FIGURE 3 | APPROACH TO DATA COLLECTION, ANALYSIS, AND REPORTING

Solution/**Future State**, *continued*

that will be used to populate an educator's profile. Figure 4 illustrates how various entities interact with the proposed Educator Management System (EMS). With data regularly updating the educator profile, and once the state has reinforced policies and practices that emphasize using high quality data for decision-making purposes, data collection shifts from a compliance-driven activity to one focused on continuous improvement. Reporting becomes an engaging activity, and the state can produce different reports for various stakeholders.

To avoid replicating past mistakes, where systems were created without considering whether they should speak to one another, we recommend any new approach taken by SEAs with educator pipeline systems adhere to data interoperability standards, such as the Ed-Fi data model. Expertise in the interoperability and standards space will future-proof and ensure that a new EMS will be implemented in a manner that enables the state to take full advantage of any future Ed-Fi components that are developed within the nationwide communities.

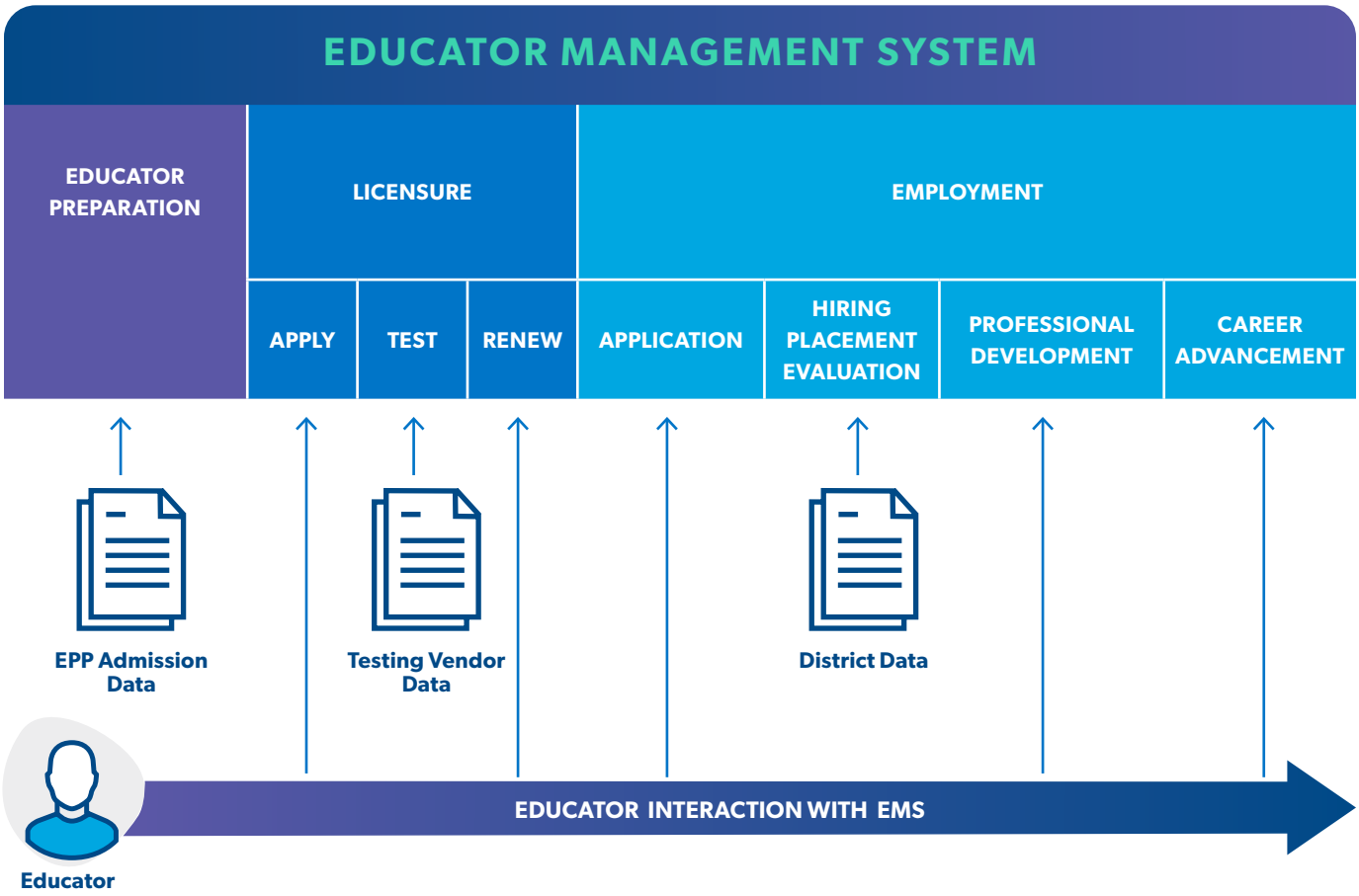


FIGURE 4 | EDUCATOR MANAGEMENT SYSTEM (SOURCE: MSF&W)

Solution/**Future State**, *continued*

RECOMMENDATIONS FOR DESIGNING THE EDUCATOR PIPELINE SYSTEM OF THE FUTURE

Building a sustainable system means all data that needs to be collected, processed, and distributed in the EMS would adhere to the Ed-Fi data model, and any new systems that are introduced would adhere to Ed-Fi standards. The Ed-Fi Alliance maintains its core data model and ensures that any modifications to the core will either have backward compatibility or provide a path to upgrade. The design approach follows:

- Begin with a detailed analysis of the EMS requirements and map the required data elements to the Ed-Fi data standard.
- Any data elements that cannot be mapped to the Ed-Fi data standard will be identified as candidates for extensions.
- The entire mapping document will be reviewed with the Ed-Fi Alliance team members to ensure the EMS data model design adheres to Ed-Fi best practices and the possibility of merging extensions into the future Ed-Fi data standard.
- During the implementation phase, extensions will be created using the Ed-Fi MetaEd tool. This best practice approach allows the extensions to be reused in future Ed-Fi data model upgrade process.
- Any SEA Ed-Fi implementation is expected to include integration with other systems, Ed-Fi API customizations (authorizations, identities, etc.), and database customizations. Such integrations and customizations would be adequately documented, and source code checked into source control, so they can be merged into future Ed-Fi API versions.

UTILIZING EDUCATOR PROFILES

Once the new system is live, an educator profile is created upon their entry to an EPP. In the future, we recommend SEAs begin earlier and create an entry point for high school students who are interested in joining an in-state EPP to support candidate recruitment efforts. Educator profiles will function as follows:

- Once the educator profile has been created, it will continue to be populated with data that is pulled from various systems.
- Results from required licensure tests will be sent from testing vendors and EPPs will add a designation to an educator's profile once he or she has successfully completed their program.
- As educators apply for positions, their preparation information and anticipated completion data can help LEAs identify candidates for prospective openings.
- Once hired, employment information may be added to an educator's profile by the school, including salary history, evaluation results, service time and staffing assignments, induction and professional development activities, and additional licenses sought by the educator.

If a comprehensive reporting function is built into the new system, then EPPs and LEAs will have the ability to pull personalized reports on the performance of their programs and schools as well as reports of publicly available data from the state or other programs and schools. Likewise, SEA staff will be able to produce ad hoc reports as needed. By applying the Ed-Fi standard of data interoperability in the development of a new EMS, SEAs will ensure a seamless and secure exchange of data both within the EMS and externally with other data sources.

Solution/**Future State**, *continued*

FEATURES OF A MODERNIZED AND FUTURE-READY EDUCATOR PIPELINE DATA SYSTEM

A system that truly functions as an educator pipeline brings benefits at every stage, improving data collection and analytics, facilitating relationships, and building best practices.

Streamlined, trustworthy, and standardized data collection

Regardless of whether SEAs update and connect current systems or build a comprehensive EMS from scratch, the end goal will remain the same: the Ed-Fi community will apply the Ed-Fi Data Standard so that data collection is standardized and reliable, and SEAs will have greater ability to analyze data across different sources. SEAs can also create new use cases for the Ed-Fi community. For example, the community continues to develop use cases addressing educator preparation, early warning systems, vendor accessibility, data visualization, to name only a few.

SEAs may decide to update their licensure systems and other components that are connected to it, such as EPP reporting and program review and LEA evaluation of teachers. This would likely involve maintaining many of the processes that are currently in place, such as annual data submission requirements for EPPs, while seeking connection points between systems so they can easily speak to one another.

Alternatively, SEAs may transform their entire approach by designing an EMS, creating a core educator profile that grows over the course of an educator's career, while also designing inputs for EPPs and LEAs to enter their data about candidates and teachers directly into the system. With either approach, linkages will need to be created between the new licensure system and educator personnel and student information systems, but this decision is an important first step that will dictate the next steps.

The distinction between updating versus transforming is explained in **Table 2** below and on the next page.

UPDATING COMPONENTS	TRANSFORMING SYSTEM
Create more complete educator profiles to track courses taught and other relevant events	Create new user interfaces and position the EMS as a central source of truth (data collection and analysis) on the educator pipeline
Modernize licensure system for easier transactions and better user experience	Streamline data collection processes from EPPs, LEAs, educators, and vendors
Create job board and applicant tracking system	Make connections between preparation, placement, and development, and improve the quality of student teaching placements

TABLE 2 | UPDATING VERSUS TRANSFORMING

Solution/**Future State**, *continued*

UPDATING COMPONENTS	TRANSFORMING SYSTEM
Create interactive searchable database of courses that may be taught with certain licenses	Users can pull their own reports on their programs and schools, while also accessing public dashboards
Public reporting via dashboards and ad hoc reporting mechanism	Crowdsourcing the evaluation of professional development programs
Use data to rethink forecasting teacher demand	Rethinking standard approaches to analyzing educator supply and demand
Analyze data around links between supply of talent and pathway attainment	State uses data to identify best practices and encourages EPP to share with others

TABLE 2 | UPDATING VERSUS TRANSFORMING, *continued*

A new EMS may not only change how data is collected and reported, but it can serve as a useful symbol of a state building a new data culture. Having one central system in which educator pipeline data is collected—across all points on the career continuum from recruitment into a program through retirement—will add consistency to data collection, reduce the need for manual re-entry of data, and reduce the anticipated amount of human error, as educator records will not need to be re-entered at each career stage. In addition, new reporting features will demonstrate the central position that data holds as the one source of truth in decision making and can transform the relationships that SEAs have with stakeholder groups, LEAs, and preparation programs.

Several proposed activities could support this feature. The bulk of effort would be devoted to system design and development. In addition to technical development, we recommend devoting resources to human development. To begin, stakeholder engagement should generate a series of use cases that will inform system design and the resources that will be needed throughout the project. SEAs can use these engagements as opportunities to thoroughly describe current and future system user experiences; users may anticipate a new system will require more work on their parts, when in fact, the system may result in a streamlining of data reporting which ultimately is a time saver.

Training for stakeholders who are accustomed to submitting data through old systems will help to ensure users are equipped to realize the full potential of new systems. Users will require an introduction to the new system, as well as a targeted guide that they can use as reference material when they submit data through the new system. It would be useful for EPPs to have stand-alone sessions where they can learn about an SEA's intentions for the new system and the new possibilities around reporting that the system will provide. If EPPs are aware of how reporting and program review processes will transition, they are more likely to buy into the project goals from the beginning. Similarly, LEAs may need training if principal surveys on new teachers are to be collected through the system.

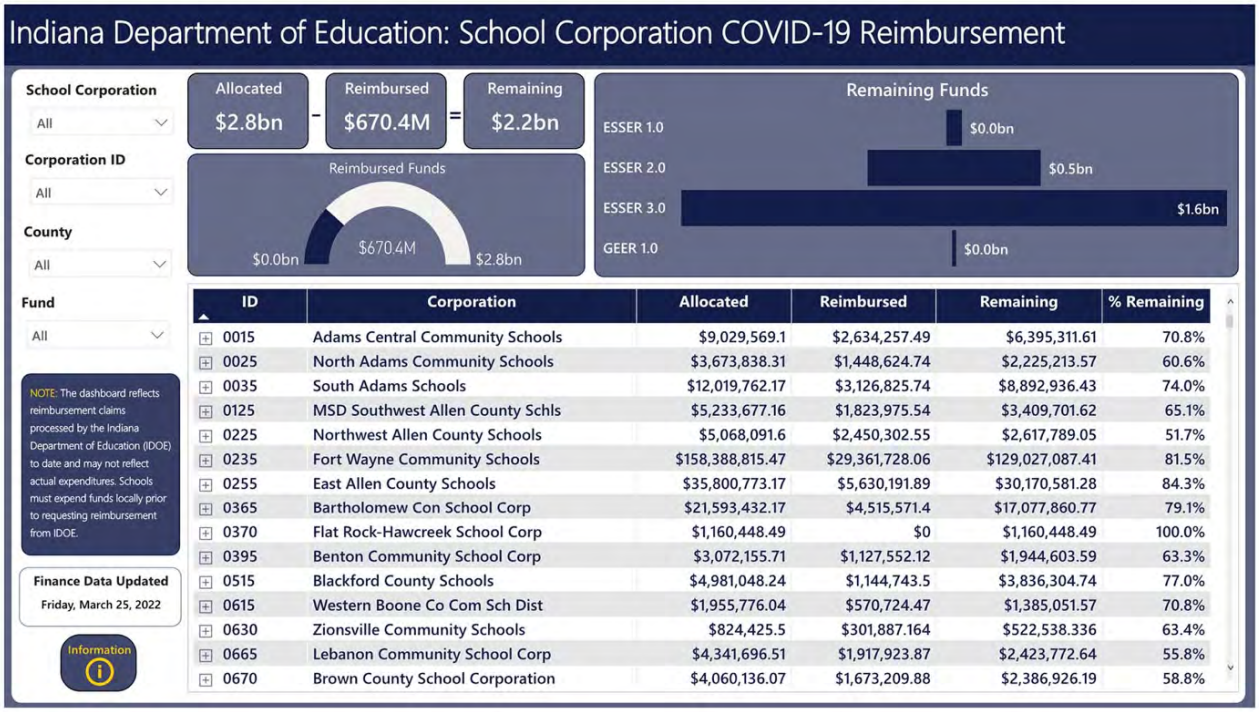
Solution/**Future State**, *continued*

New, robust reporting mechanisms

As discussed, current systems reinforce a compliance-driven approach to data collection and passive reporting structures. The minimum required data is collected by the SEA, who will typically post the collected data on a public website. While serving basic transparency and accountability purposes, this approach has been shown to have limitations in terms of the types of judgments and decisions that may appropriately be made from the data. The ultimate power in data systems lies in users' ability to access and use data for decision making. Once the Ed-Fi data standard has been applied and a new system is created for the collection of data around educator preparation, licensure, placement, induction, class assignments, salary, development, career advancement, and evaluation, then a suite of dashboards and ad hoc reporting mechanisms may be created for use by the many stakeholders who are interested in educator pipeline initiatives.

Figure 5 shows an example of how a public dashboard can succinctly display a significant amount of public-facing data. Dashboards are useful for gathering large amounts of data and presenting them in easily digestible, typically interactive formats. In the example below, any public user could click on a particular LEA for a more detailed view of spending, or they can compare data across LEAs. Any number of dashboard designs could be powered with educator pipeline data, and part of the local development process should include engagements with local decision makers and stakeholders to determine the types and content of dashboards that will be accessible by various users.

To deliver long-term value, the most successful approaches to business intelligence (BI) solutions are built on an expertly structured, implemented, and integrated BI platform. This includes integration with source systems via ETL services,



ID	Corporation	Allocated	Reimbursed	Remaining	% Remaining
0015	Adams Central Community Schools	$9,029,569.1	$2,634,257.49	$6,395,311.61	70.8%
0025	North Adams Community Schools	$3,673,838.31	$1,448,624.74	$2,225,213.57	60.6%
0035	South Adams Schools	$12,019,762.17	$3,126,825.74	$8,892,936.43	74.0%
0125	MSD Southwest Allen County Schls	$5,233,677.16	$1,823,975.54	$3,409,701.62	65.1%
0225	Northwest Allen County Schools	$5,068,091.6	$2,450,302.55	$2,617,789.05	51.7%
0235	Fort Wayne Community Schools	$158,388,815.47	$29,361,728.06	$129,027,087.41	81.5%
0255	East Allen County Schools	$35,800,773.17	$5,630,191.89	$30,170,581.28	84.3%
0365	Bartholomew Con School Corp	$21,593,432.17	$4,515,571.4	$17,077,860.77	79.1%
0370	Flat Rock-Hawcreek School Corp	$1,160,448.49	$0	$1,160,448.49	100.0%
0395	Benton Community School Corp	$3,072,155.71	$1,127,552.12	$1,944,603.59	63.3%
0515	Blackford County Schools	$4,981,048.24	$1,144,743.5	$3,836,304.74	77.0%
0615	Western Boone Co Com Sch Dist	$1,955,776.04	$570,724.47	$1,385,051.57	70.8%
0630	Zionsville Community Schools	$824,425.5	$301,887.164	$522,538.336	63.4%
0665	Lebanon Community School Corp	$4,341,696.51	$1,917,923.87	$2,423,772.64	55.8%
0670	Brown County School Corporation	$4,060,136.07	$1,673,209.88	$2,386,926.19	58.8%

FIGURE 5 | INDIANA DEPARTMENT OF EDUCATION COVID-19 REIMBURSEMENT DASHBOARD

Solution/**Future State**, *continued*

eliminating the need for manual data extractions, and enabling real-time data flow. It includes robust data quality checks and improvements, so that SEAs can be confident the reporting is accurate. It also includes a well-designed data warehouse that integrates datasets from multiple areas and clearly prepares them for your organization's use. Finally, this includes an intuitive and powerful dashboard solution that makes it fast and simple to get the information needed to make proactive and impactful decisions.

A large and growing number of technology options are available, and a one-size-fits-all approach is quite often detrimental. The BI platform must integrate effectively with existing technology, align with the technology roadmap, and meet the requirements of an SEA. It is equally important that the technology is proven in the market and receives robust investment for future improvements.

A collaborative approach to creating or enhancing SEA's existing dashboards includes defining requirements for dashboards, identifying relevant data, creating wireframes and prototypes, and working with SEAs to iterate toward an optimal solution. It also includes working to identify areas where BI dashboards or reports can help to improve operations or achieve agency goals. A critical component of leveraging any BI platform is properly integrating the information with existing business process, including improvement processes where necessary to take advantage of this new capability.

Activities to support this feature include training plans targeted to various end users. In addition, we recommend a series of stakeholder engagements early in the process to determine the readiness of various users, to learn their pain points from past technology implementations, and to solicit their input on how they would like to use educator pipeline data for local planning purposes.

New opportunities for SEAs to work with stakeholders and decision-makers

With new reporting mechanisms in place, SEAs will increase their capacity for meaningful data-informed decision making. A thorough engagement plan must include senior leaders and staff to reinforce a shift—in approach, in mindset, and in practice—that will transform the culture of data across a state. This should change the structure and content of stakeholder convenings and will also likely change the very nature of relationships with, and within, SEAs.

Deep expertise in stakeholder convenings can help model engagements for SEAs that will encourage input from a range of perspectives, which are essential when designing systems that place equity at their center. Properly led convenings also help SEAs consider which questions cannot be answered with current systems, the consequences of the current limitations of systems, and the best methods to encourage broad buy-in and support. In addition, these convenings can be useful during program implementation to provide project updates and to collaboratively sketch out any changes to the plan that may be needed.

Throughout this type of project, reviews of existing state statutes and regulations determine whether new systems

Solution/**Future State**, *continued*

have changed their applicability and identify any changes to be recommended. Including this review as an agenda item throughout project update meetings gives SEAs advanced notice if the state regulatory framework may need attention. Stakeholder groups are valuable in reviewing statutes and regulations, as they are more likely to identify potential unintended consequences or capacity issues at the local level.

New role for SEA workers in supporting the needs of the education workforce

New data systems that enhance analysis and reporting functions enable SEAs to create a new data culture, but that requires training for SEA staff to better understand how the agency's approach to educator pipeline data will shift from a transactional process to something more akin to certification.

Analyzing the current workflow of the licensure office (or a larger educator effectiveness unit) and any potential knowledge gaps that may need to be addressed will be imperative. Using a skills matrix to review and analyze the licensure staff's comfort with and knowledge of a range of tasks sets a baseline for training that builds upon their strengths. The plan will also help staff understand any new processes associated with the new system and learn how they can best support education stakeholders. This includes knowledge of the data systems themselves, as well as extensive training on utilization of new dashboards and reporting.

Educator Management System—**Use Cases**

To detail the potential of new, linked data systems, this section presents a series of possible use cases. To highlight the necessary features and associated motivations driving them, the tables below use a "I want…So that…" format for the following user groups:

- Teacher candidates and current educators
- Schools and districts (LEAs)
- The SEA (including leadership and staff)
- Educator preparation programs

TEACHER CANDIDATES AND CURRENT EDUCATORS

I WANT…	SO THAT…
To know which skills and knowledge I need to develop most after completing my preparation.	I can share with my hiring district, and they can design my induction program.
To know which schools and districts have current and anticipated shortages.	I can apply to the LEAs that need me most.

Educator Management System—**Use Cases**, *continued*

TEACHER CANDIDATES AND CURRENT EDUCATORS, *continued*

I WANT...	SO THAT...
To know the location of nearby professional development that aligns with my needs.	I can take meaningful PD that helps me improve.
To upload artifacts related to licensure and career development in one location.	I can access and maintain my portfolio of career accomplishments.
To see my progress toward upgrading my license to the professional level, when appropriate.	I can plan accordingly and understand the requirements before it is time to apply.
To learn what I need to add a license in a new content area and/or grade level.	I am aware of available options and can identify new ways to contribute.
To learn about teacher leadership opportunities and whether I qualify for them.	I have career goals that will keep me in the profession longer.
To spotlight my advanced skills and knowledge.	LEAs can contact me if there is alignment between my background and their needs.

SEA—LEADERSHIP AND STAFF

I WANT...	SO THAT...
"One source of truth" related to the educator pipeline.	Decision-makers and policymakers have access to the best data when they design solutions.
The agency to be focused on how best to provide needed support and services to LEAs and EPPs.	Compliance questions are only a starting point to pipeline discussions, and we increase capacity across the state to serve stakeholders' needs.

Educator Management System—**Use Cases**, *continued*

SEA—LEADERSHIP AND STAFF, *continued*

I WANT...	SO THAT...
New ways to calculate and conceive supply and demand.	We can properly structure supports that are targeted to the most urgent needs.
Trends on PD with the greatest impact on instructional improvement.	We can begin recommending high-quality PD and identifying less-effective offerings.
To see what makes our EPPs unique.	The public can compare programs easily and prospective candidates can learn about their options.
To know if effective educators are inequitably distributed.	We can target new initiatives and incentives to the places with greatest need.
The state to be recognized as a leader in innovation and educator support.	Candidates from other states are drawn to teach and lead here.

EDUCATOR PREPARATION PROGRAMS

I WANT...	SO THAT...
To share innovative practices in our program and learn about innovations in other programs.	EPPs can work collaboratively to solve persistent issues with the educator pipeline.
A review by SEA that ensures minimum expectations are met *and* provides information for continuous improvement purposes.	Local improvement conversations can be centered on high-quality data.

Educator Management System—**Use Cases**, *continued*

EDUCATOR PREPARATION PROGRAMS, *continued*

I WANT...	SO THAT...
To know where teachers will be most needed in the coming years.	We transform student teacher placements, linking teacher skills with school needs.
To know which skills and knowledge are most in demand for professional development.	We can consider new delivery methods and ways to reach those in need.
To be partners with SEA in solving educator pipeline issues.	We serve as thought partners and our work is explicitly linked to ongoing initiatives to strengthen the educator pipeline.

SCHOOLS AND DISTRICTS

I WANT...	SO THAT...
To have one central data collection system for all educator personnel data.	I do not need to navigate different systems and can minimize the likelihood of errors.
To see a range of data on educator preparation programs throughout the state.	I better understand how the new teachers we hire were prepared.
A way for educators in my school and/or district to easily find professional develop opportunities that align with their development needs.	Educator evaluation is directly linked to ongoing improvement; and so that educators can easily find high-quality offerings.
To be able to see the anticipated number of newly licensed teachers by next school year.	I can connect with EPPs early in the recruitment process and identify potential talent.

Educator Management System—**Use Cases**, *continued*

SCHOOLS AND DISTRICTS, *continued*

I WANT...	SO THAT...
To recognize the knowledge, skills, and traits in which our newly hired teachers need the most support.	I can design a meaningful induction program that allows them to find early success and remain in teaching longer.
To monitor the distribution of effective educators throughout the district.	I can make better and more informed placement decisions for new hires.

Conclusion

A true educator pipeline cannot be based on siloed data systems that were designed to answer far less complex questions than the modern policy environment requires, yet for most states that's the current reality. Nor can it deliver anything less than robust monitoring across the full production/treatment/refinement continuum, the potential to align new products to consumer need, and the ability to make ongoing, meaningful adjustments when appropriate.

States should aspire to build an educator pipeline with connections across the full career continuum and mechanisms that allow for real-time monitoring. Doing so will require transformed data systems as well as the development of new data cultures that will positively change relationships with stakeholders.

The future state of educator pipeline systems tears down existing silos and focuses on using the best possible information to make decisions. Drawing data from across the career continuum allows SEAs to target resources to the areas of greatest need and with interventions that show the greatest potential. New partnerships between EPPs and LEAs, EPPs and SEA, and LEAs and SEA, as well as new partnership roles for local stakeholders would be fostered from a foundation of reviewing data

Conclusion, *continued*

for ongoing improvements. New reporting mechanisms will utilize dashboards for transparency purposes while also allowing stakeholders to pull specific reports that allow for local adjustments to be made on a continuous basis.

Transforming educator pipeline data systems brings numerous benefits:

- **For educators, a centralized system will track their ongoing development and allow them to know how they can advance in the profession.** The location of a teaching candidate's residency or student teaching would have been purposefully selected by their EPP to increase the alignment of candidate and LEA need, which should lead to shorter hiring windows for qualified candidates. Educators enter schools with a personalized induction plan, based on the results of performance assessments from their preparation. Over time, they will be able to review nearby professional development offerings and see the impressions of teachers who previously completed those offerings. As they develop new skills, LEAs will be able to see teachers' unique abilities and identify potential candidates for openings.

- **LEAs will have one centralized system for reporting data, which will reduce the reporting burden on local districts and minimize the amount of error due to fewer people inputting data.** Once educator profiles are in the system, there will be no need to re-enter them, and LEAs will simply update any needed placement and employment information. New partnerships will form between EPPs and LEAs, allowing EPPs to target anticipated openings with adequate notice. Professional development plans will be targeted to individual needs, which will dramatically increase the utility of Title II funds for educator quality and will enhance the value of educator evaluations. In addition, LEAs will be able to search for educators who possess certain skills in order to streamline recruitment efforts. New staffing models may emerge, in which collaborative teams are formed, based on educators' strengths.

- **EPPs will have access to local, real-time staffing**

> It's time to change the education field's relationship with data. States have long sought solutions to their most persistent educator pipeline issues, but the very systems that they deploy have resulted in skepticism around the value of data, distrust in the accuracy of what data tells us, but mostly a disconnect between resources and decision-making processes.

Conclusion, *continued*

information, allowing student teaching placements to target those schools with anticipated upcoming vacancies. Accreditation will become less burdensome for institutions, as data on candidates will be available through reporting mechanisms and/or provided by the SEA. Title II reporting will become automated, as SEAs will be able to provide this data to EPPs, and eventually delayed data reporting will seem antiquated. Survey completion rates will increase, resulting in timely information that can be used for program improvement, and since surveys will live in the central system, less time will be needed for follow-up. Public-facing dashboards will allow programs to highlight unique program features.

- **SEAs will be able to consult their "one source of truth" to determine the true strength of their state's educator pipeline.** They will be able to target resources to the areas of greatest need, and more quickly determine if their interventions are showing expected gains. States can monitor supply and demand of teachers in close to real time. Partners will no longer need to manually send spreadsheets to the state, which will minimize error in data entry. Legislators, stakeholders and the general public will have the ability to view data through dashboards, as well as run ad hoc reports of interest. States will be able to build partnerships around a new and improved data cutlure, which will transform the relationships LEAs and EPPs have with their SEA. States can transition from a sole focus on accountability and compliance to a new service orientation.

Enhanced data systems treat educators as the essential resource that they are, rather than as interchangeable, equal parts. New staffing models may be explored that reconsider how best to deploy expertise and build collaborative teaching and learning environments. Over time, we might reasonably expect local working conditions to improve and retention rates of effective educators to increase. Additionally, states will find themselves playing vital support roles, forming meaningful partnerships based on trust, rather than only compliance. State workers will be seen as active partners in the work happening in the field. Improved data systems with meaningful reporting structures will transform the SEA's relationships across the state, as SEA staff can model a new data culture.

Some states have expressed a desire to upgrade and modernize their approaches to the educator pipeline, seeking new ways to measure teacher supply and demand, to provide greater transparency to the public, and to connect educators with resources that will accelerate their development in a more timely manner. Resultant supports these goals and recommends taking steps that will transform relationships and help to nurture a larger culture of data throughout their state. To realize such a dramatic transformation requires a new system. Minor improvements to various components of current systems won't cut it. To

Conclusion, *continued*

expertly implement and integrate these new systems also requires convening regularly with various stakeholder groups to gather input, to develop new relationships, and to model within the offices of the SEA a culture centered on using high-quality data.

There's a better way. And building the integrated, transparent data environment that truly fosters educator development and provides better outcomes for students isn't a pipedream but an achievable—and worthy—pursuit made more attainable by current funding opportunities. Devoting resources now to building comprehensive data systems that allow ongoing monitoring and regular program-level adjustments can shift the educator pipeline from an aspirational metaphor to a legitimate organizational framework that unlocks the unrealized potential of policy, practice, and local imagination.

About **Resultant**

Our team believes solutions are more valuable, transformative, and meaningful when reached together. Through solutions rooted in data analytics, technology, and digital transformation, Resultant serves as a true partner by solving problems with our clients rather than for them.