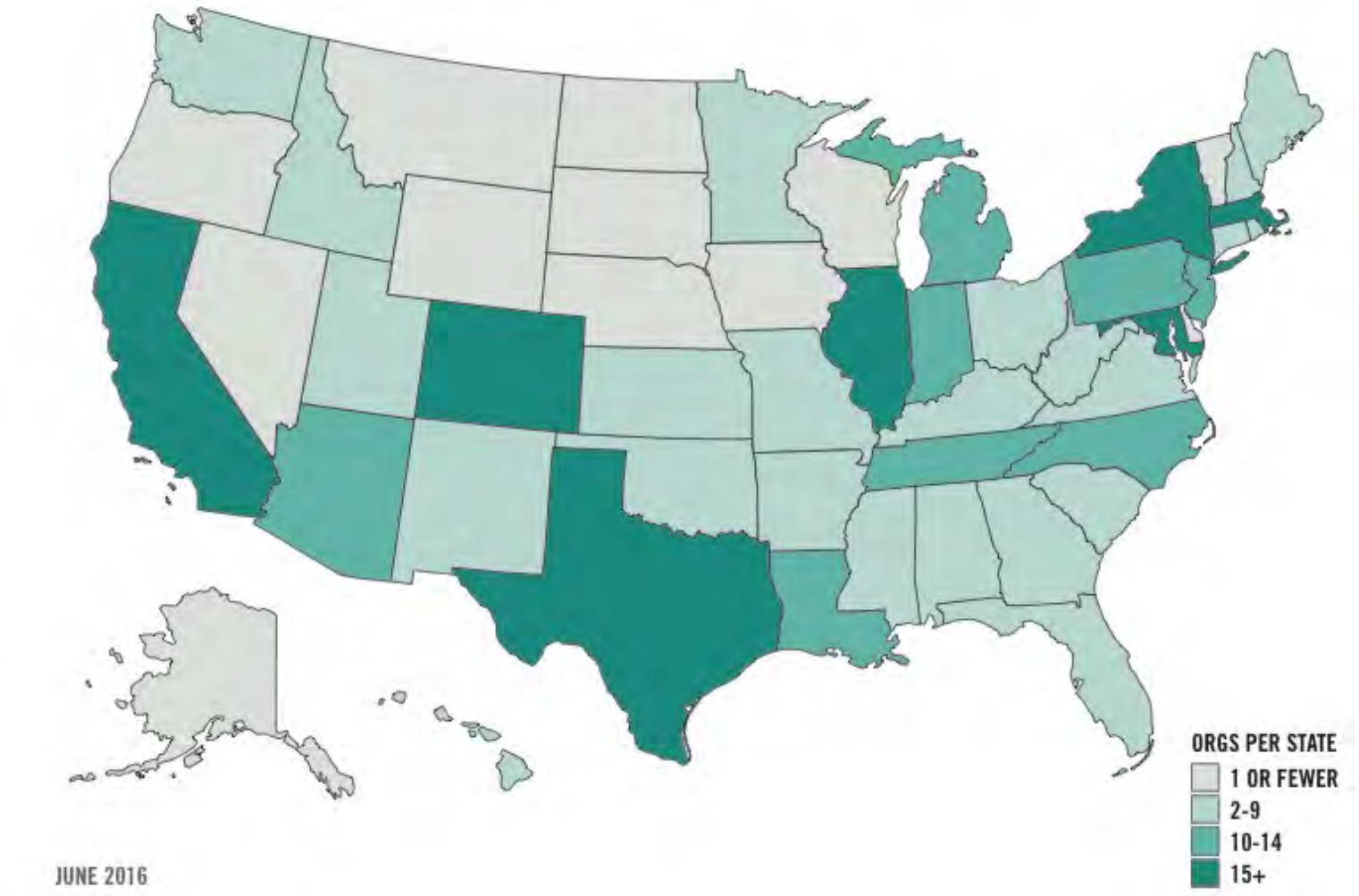
ANALYSIS OF 100Kin10 2015 SHARED MEASURES SURVEY

SURVEY OVERVIEW AND PROCESS

ALL 100Kin10 PARTNERS



WHO WE ARE

As of February 2016, 100Kin10 includes over 280 best-in-class partner organizations.

13
School Districts & Charter Management Organizations

9
Professional Associations

13
Government Agencies / Elected Officials

6
Media Organizations

73
Institutions of Higher Education

42
Foundations & Corporations

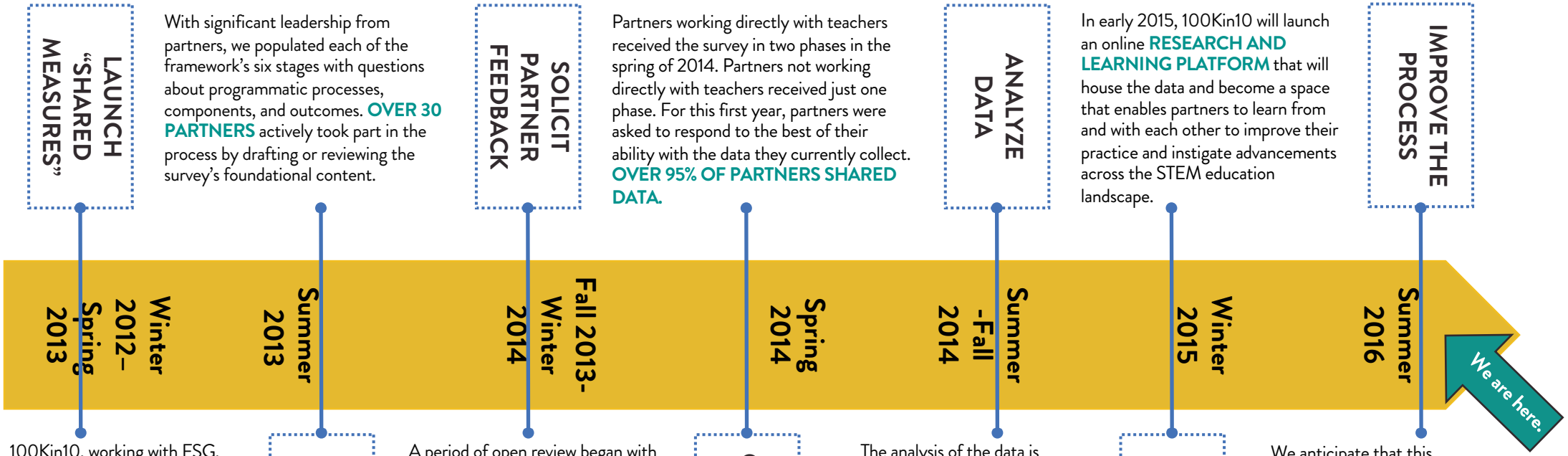
11
Teacher Residencies / Alternative Teacher Preparation Programs

113
Nonprofits (including Museums and Science-Rich Institutions)

SURVEY DESIGN AND DISTRIBUTION

- We administered our second annual survey to all 100Kin10 Partners (excluding funding partners and government agencies) in the summer of 2015
- Designed to gather deep, comparable information from our Partners about strategy, context, practices, research, and outcomes related to their programs designed to address the needs of K-12 STEM teachers
- Organized to follow the six phases of a K-12 STEM teacher's professional life—recruitment, preparation, hiring, induction, development, and advancement
- Over 80% of eligible Partners responded, creating a nearly unprecedented body of data on 270+ programs offered by 165 unique organizations
- Survey data was analyzed with extensive support by American Institutes for Research. Analyses included descriptive and correlational analyses across focus areas, programmatic elements, and background characteristics

THE PROCESS



100Kin10, working with FSG, engaged partners in distilling a **COMMON FRAMEWORK** of the network's shared measurement system that captures a STEM teacher's professional life cycle. With participation by **85% OF PARTNERS,** we shaped the Framework, which depicts the **SIX STAGES OF A STEM TEACHER'S PROFESSIONAL LIFE CYCLE**.

With significant leadership from partners, we populated each of the framework's six stages with questions about programmatic processes, components, and outcomes. **OVER 30 PARTNERS** actively took part in the process by drafting or reviewing the survey's foundational content.

A period of open review began with a **PARTNER CONVENING** in New York City in October 2013; over 100 partners **ENGAGED** with and **PROVIDED FEEDBACK** on the drafts. 100Kin10 (with the assistance of survey expert – and 100Kin10 partner – WestEd) incorporated all **PARTNER INPUT** to finalize the questions and build the **SURVEY**.

Partners working directly with teachers received the survey in two phases in the spring of 2014. Partners not working directly with teachers received just one phase. For this first year, partners were asked to respond to the best of their ability with the data they currently collect. **OVER 95% OF PARTNERS SHARED DATA.**

The analysis of the data is yielding **TRENDS** across the network, significant opportunities for partners to **LEARN FROM** and work with one another in new and interesting ways, and deep and specific **RESEARCH QUESTIONS**.

In early 2015, 100Kin10 will launch an online **RESEARCH AND LEARNING PLATFORM** that will house the data and become a space that enables partners to learn from and with each other to improve their practice and instigate advancements across the STEM education landscape.

We anticipate that this will be an annual data collection and learning process. Future versions will reflect lessons learned as **WE LISTEN TO FEEDBACK** and **DEVELOP MORE SOPHISTICATED AND INFORMED** surveys. Going forward, our expectation is that all partners will collect the data necessary to respond to the full survey.

BIG TAKEAWAYS

- Elementary teachers tend to get far less STEM subject matter in their training than their secondary counterparts. Research shows elementary teachers are uncomfortable with their understanding of STEM subjects and often feel anxious about teaching them. The end result can be that elementary teachers avoid these topics to some extent, even though research shows that the best long-term student outcomes happen when students begin to study STEM topics in elementary school. **In 100Kin10 partners' programs, we find that secondary teachers are getting more training in STEM content and pedagogy than their counterparts in elementary schools. We need to give elementary teachers more support – and increase expectations – around both STEM content and pedagogy, both within 100Kin10 and nationally.**

- Active learning– putting students at the center of the learning with project-based activities rather than passive listening or reading– is widely acknowledged as an effective way to teach STEM skills, and also improve STEM student diversity and retention rates. However, implementation of this approach is still lagging in classrooms across the country. **In 100Kin10 partners' programs, we find that a focus on active learning is on the rise– but we also see that there is still room to increase this focus on active learning, especially in the development of STEM teachers at earlier stages of their careers. Not only is this the case for 100Kin10 partners' programs, but we expect there is also room to increase the focus on active learning nationally.**

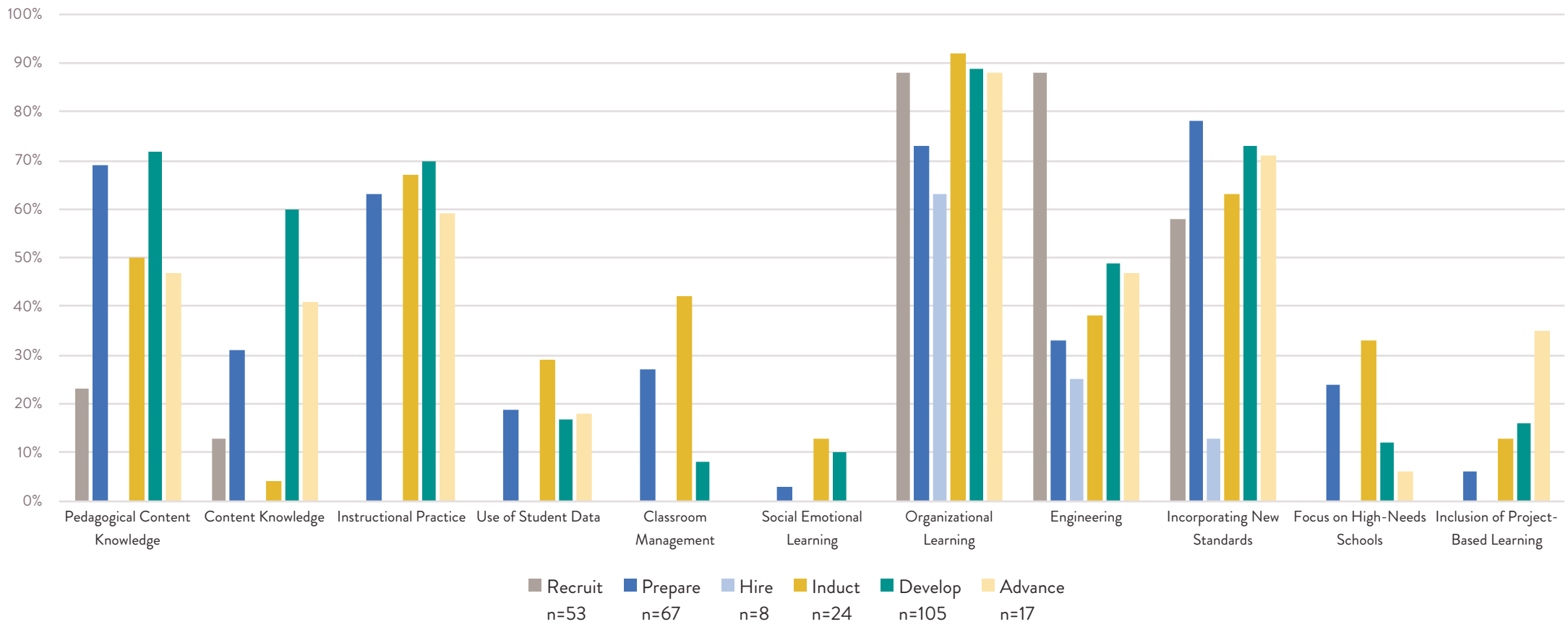
- Engineering is one specific approach to supporting active learning in the classroom and is explicit in the Next Generation Science Standards as a way to contextualize science and math for deeper learning. **100Kin10 partners are seeing positive outcomes with engineering. Teachers at multiple stages of training and development are receiving pedagogical training in engineering, with practice teaching often incorporated into this training. Teachers in 100Kin10 partners' programs that focus on engineering appear to have better professional outcomes – showing higher hiring and retention rates. We might expect these same positive outcomes nationally from a focus on engineering.**

FOCUS ON FOCUS AREAS

FINDINGS:
FOCUS ON FOCUS AREAS

- 100kin10 partners exhibit a strong focus on pedagogical content knowledge.
- Little focus on social-emotional learning.
- There is room for engineering to become more of a focus among 100Kin10 Partners.
- 100kin10 Partners do not exhibit much focus on serving high-needs schools.
- There is room to make active learning a priority in STEM teacher prep and development.
- Organizational improvement is the most common focus area among 100kin10 partners.

PROPORTION OF RESPONDENTS IDENTIFYING DIFFERENT AREAS OF FOCUS FOR THEIR PROGRAMS, BY PHASE



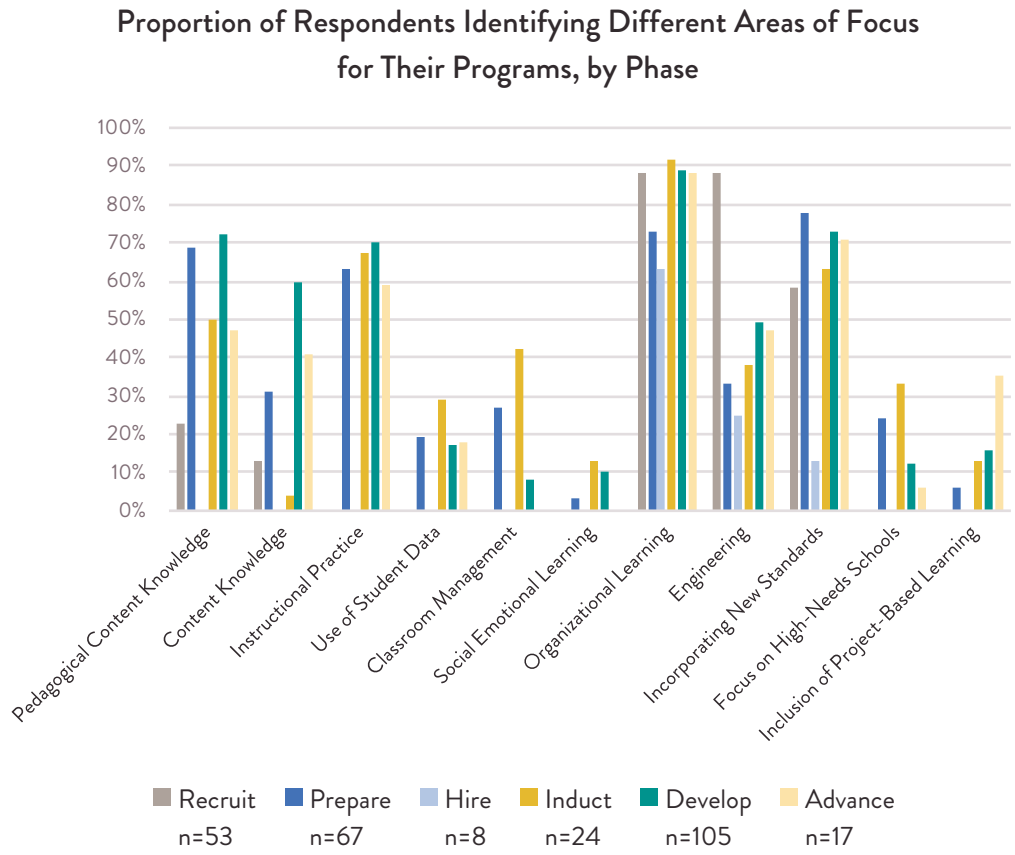
FOCUS AREA COHERENCE

100Kin10 Partners primarily focus their programs on Pedagogical Content Knowledge, Content Knowledge, Instructional Practice, and Incorporating New Standards.

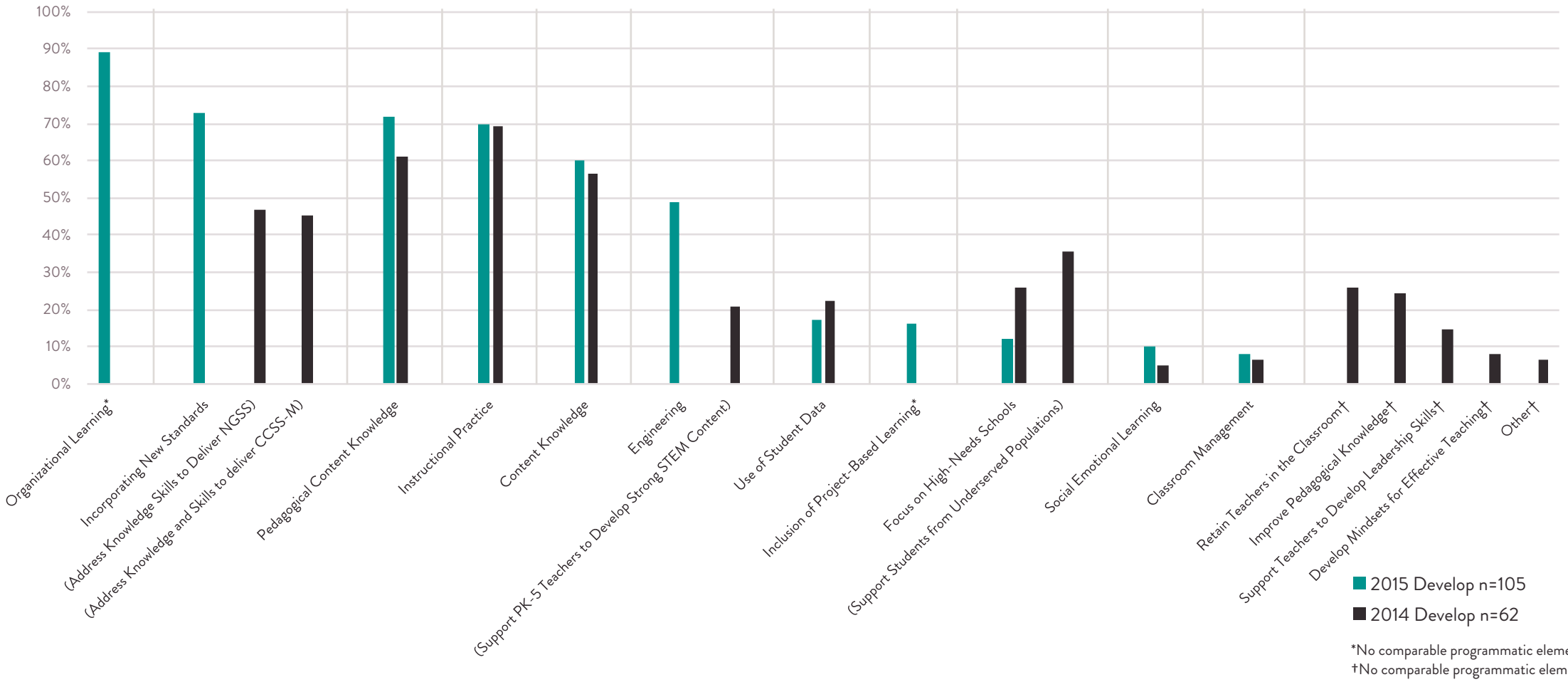
- Pedagogical Content Knowledge, Instructional Practice, and Incorporating New Standards remain a focus at a similar degree between pre-service training and in-service development. This is what the field prioritizes.
- Content Knowledge becomes much more of a focus in in-service development. This may be an intentional prioritization or a response to this having been less of a focus in pre-service training.

Classroom Management, Social-Emotional Learning, High-needs Schools, and Active Learning were found to be lesser areas of focus for 100Kin10 Partners.

- The focus on Social-Emotional Learning and Active Learning increases a bit between pre-service training and in-service development.
- The focus on Classroom Management and High-needs Schools decreases more significantly between pre-service training and in-service development.



YEAR-TO-YEAR CHANGES IN FOCUS AREA COHERENCE



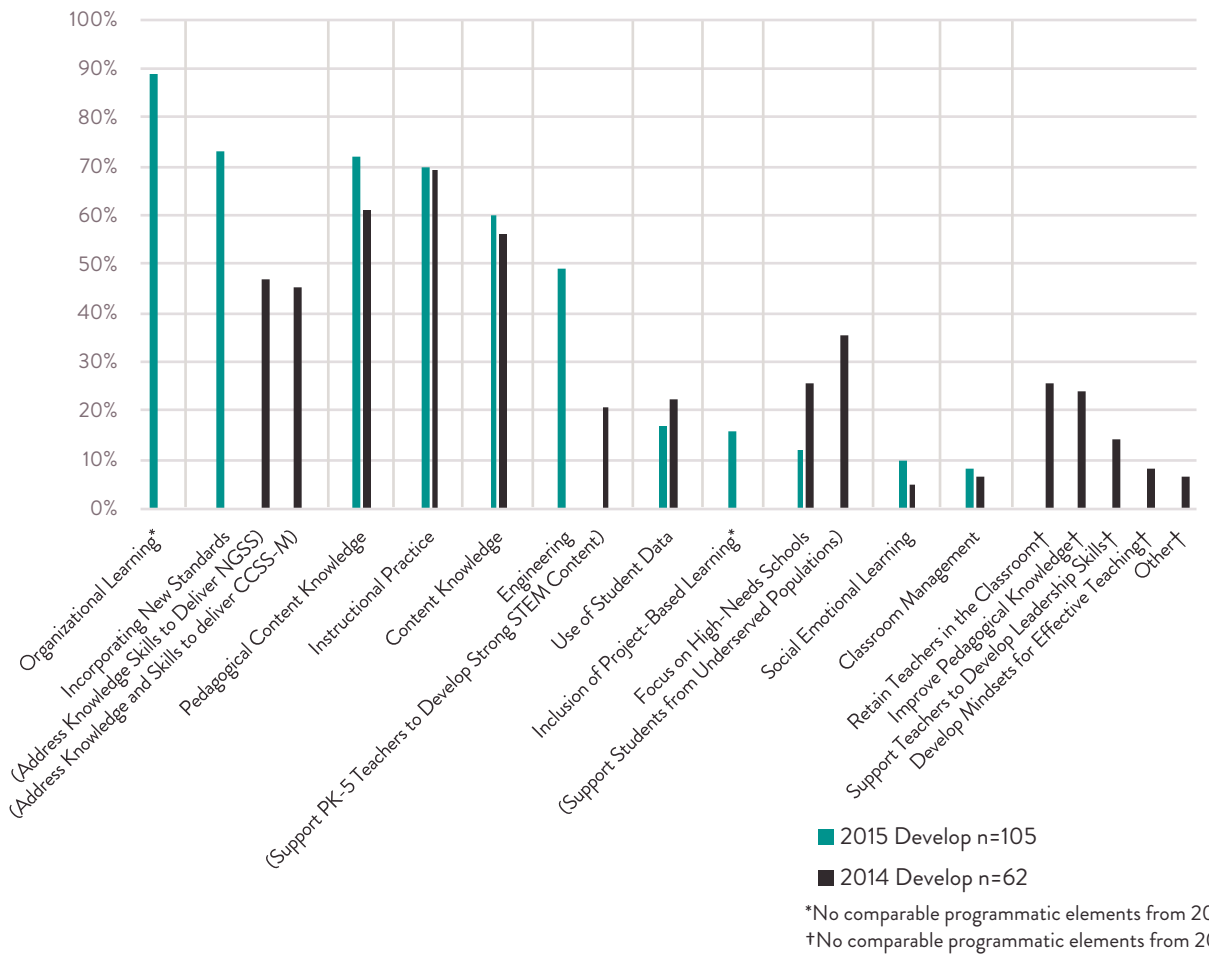
*No comparable programmatic elements from 2014
†No comparable programmatic elements from 2015

YEAR-TO-YEAR CHANGES IN FOCUS AREA COHERENCE

Comparison to last year's Develop survey data as shown. The top 5 priorities are very similar from 2014 to 2015 – programs still prioritize pedagogical content knowledge, standards-aligned instruction, and content knowledge. As related to organizational improvement, partner organizations are still collecting feedback from participating teachers at similar levels.

Few programs prioritize or indicate strength in supporting STEM teachers to foster their students' social-emotional skills – this was the case for 2014 and 2015. Classroom management also remains a low priority.

Changes made to the responses available in the Prepare survey between 2014 and 2015 preclude a similar analysis of year-to-year changes in focus area coherence in teacher preparation.



*No comparable programmatic elements from 2014
†No comparable programmatic elements from 2015

FINDINGS BY FOCUS AREA

Included:

- Pedagogical Content Knowledge
- Social-Emotional Learning
- Engineering
- High-needs Schools
- Active Learning
- Organizational Improvement

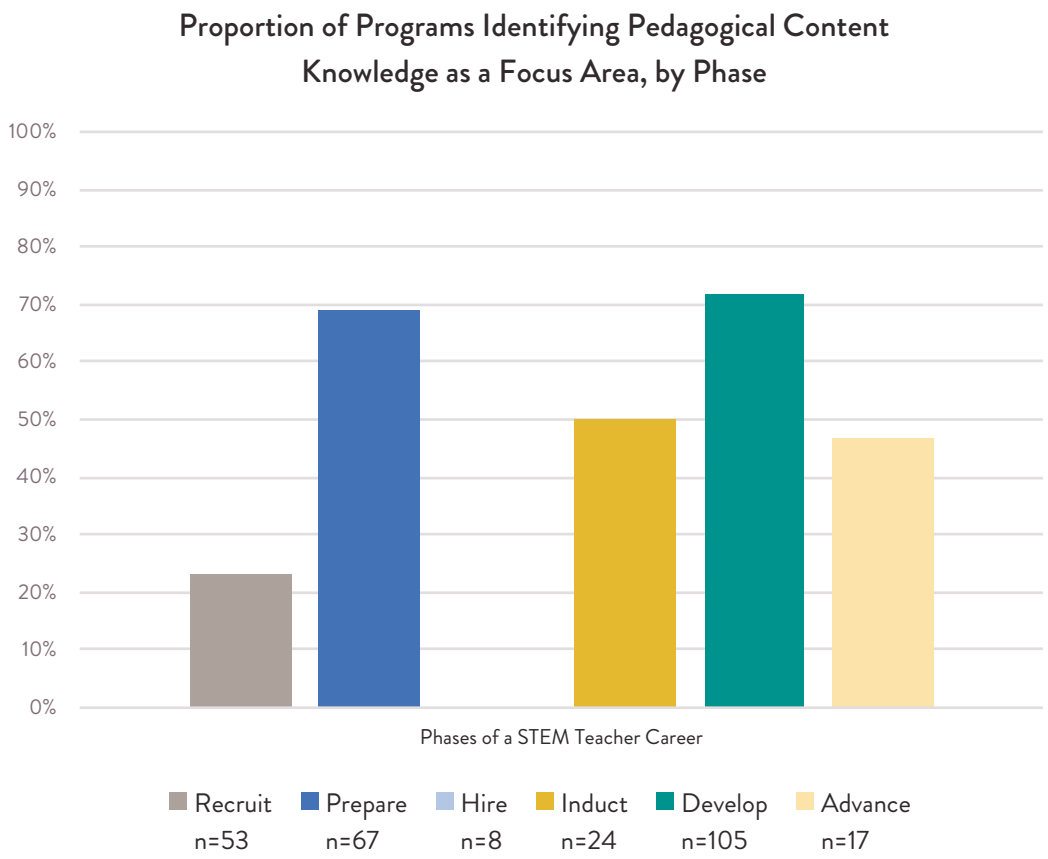
Not Included:

- Content Knowledge
- Instructional Practice
- Use of Student Data
- Classroom Management
- Incorporation of New Standards

FINDINGS SECTION A:
FOCUS AREA: PEDAGOGICAL CONTENT KNOWLEDGE

- 100kin10 partners exhibit a strong focus on pedagogical content knowledge.
- Observing participants' teaching may be a best practice when focusing on pedagogical content knowledge.
- Pedagogical content knowledge programs focus on preparing math and science teachers primarily at the secondary level.
- Addressing pedagogical content knowledge and content knowledge together may be a best practice.

A1: 100Kin10 PARTNERS EXHIBIT A STRONG FOCUS ON PEDAGOGICAL CONTENT KNOWLEDGE



100Kin10 Partners exhibit a strong focus on Pedagogical Content Knowledge in both STEM teacher preparation and in the further development of experienced STEM teachers.

Additional data would have to be collected to determine if this degree of focus is greater than the national average, but it might be due to the biased selection of high-quality programs/organizations into the 100Kin10 network.

A2: OBSERVING PARTICIPANTS' TEACHING MAY BE A BEST PRACTICE WHEN FOCUSING ON PCK

A majority of 100Kin10 partners' programs focus on PCK, and these programs typically employ the instructional practice of making observations of participants' teaching. Our outcomes analyses (data not shown) indicate that programs with dramatically better Prepare and Develop outcomes (hiring and retention rates, respectively) employ observation of participants more often than average. Observing participants' teaching may be a best practice when focusing on Pedagogical Content Knowledge.

Interestingly, we don't see the same results as related to providing feedback on participants' teaching, which is a surprise to us. We find no relationship between PCK and employing the instructional practice of providing feedback, or between providing feedback and improved outcomes.

Correlation between Focus on Pedagogical Content Knowledge and Programmatic Elements	Phases of a STEM Teacher Career			
Programmatic Element	**Prepare**	**Induct**	**Develop**	**Advance**
Teachers' work products	moderate positive	substantial positive	weak positive	negligible
Assess participants' growth	-	negligible	weak positive	moderate positive
Coursework	moderate positive	moderate positive	negligible	weak positive
Experiential learning opportunities	moderate positive	moderate positive	negligible	weak negative
Observations of participants	substantial positive	negligible	moderate positive	moderate positive
Observations by participants	moderate positive	negligible	negligible	negligible
Program provides feedback to participants	negligible	moderate positive	negligible	negligible
Uses student information	negligible	negligible	weak positive	moderate positive

A3: PCK PROGRAMS FOCUS ON PREPARING TEACHERS PRIMARILY AT THE SECONDARY LEVEL

100Kin10 Partners' programs exhibit a strong focus on preparing both Science and Math teachers in Pedagogical Content Knowledge, but primarily at the Secondary Level. This might be due to the stronger focus on content in general at the Secondary Level. However, we might want to see this as just as strong a focus in the Elementary grades to do more to introduce students into the STEM pipeline.

Correlation between Focus on Pedagogical Content Knowledge and Background Characteristics	Phases of a STEM Teacher Career				
Background Characteristics	**Recruit**	**Prepare**	**Induct**	**Develop**	**Advance**
Includes Early Childhood Educators	negligible	weak positive	negligible	weak positive	moderate negative
Includes High School Educators	negligible	substantial positive	moderate positive	weak positive	negligible
Middle School Educators	negligible	-	negligible	weak positive	weak negative
Includes Elementary Level Educators	moderate negative	weak negative	weak negative	negligible	moderate positive

A4: ADDRESSING PEDAGOGICAL CONTENT KNOWLEDGE AND CONTENT KNOWLEDGE TOGETHER MAY BE A BEST PRACTICE

A focus on Pedagogical Content Knowledge moderately correlates with a focus on Content Knowledge. This is found across most pre- and in-service phases. This finding may suggest that it is a best practice to address both PCK and CK together. One can argue from a theoretical perspective that it makes sense to build/develop teachers' PCK on a foundation of strong CK.

Our outcomes analyses (not shown) indicate that a much greater fraction of programs with dramatically better Prepare outcomes (hiring rates) and Develop outcomes (retention rates) focus on Pedagogical Content Knowledge (and Content Knowledge) moderately more so than average.

Correlation between Focus on Pedagogical Content Knowledge and other Focus Area	Phases of a STEM Teacher Career				
Focus Area	**Recruit**	**Prepare**	**Induct**	**Develop**	**Advance**
Focus on Content Knowledge	weak positive	moderate positive	weak positive	weak positive	weak positive
Focus on Classroom Management	-	negligible	moderate negative	negligible	-
Focus on Data Driven Instruction	-	negligible	negligible	negligible	weak negative
Focus on Engineering	moderate positive	moderate positive	negligible	negligible	moderate positive
Focus on High-Need Schools	negligible	weak positive	weak negative	negligible	weak negative
Focus on Instructional Practice	-	substantial positive	weak positive	weak positive	negligible
Focus on Organizational Learning	weak positive	substantial positive	negligible	negligible	moderate positive
Focus on Project-Based Learning	-	weak positive	moderate positive	negligible	negligible
Focus on Social Emotional Learning	-	moderate negative	negligible	negligible	-
Focus on New Academic Standards	weak positive	weak negative	negligible	weak positive	moderate positive

A4 (cont.): ADDRESSING PEDAGOGICAL CONTENT KNOWLEDGE AND CONTENT KNOWLEDGE TOGETHER MAY BE A BEST PRACTICE

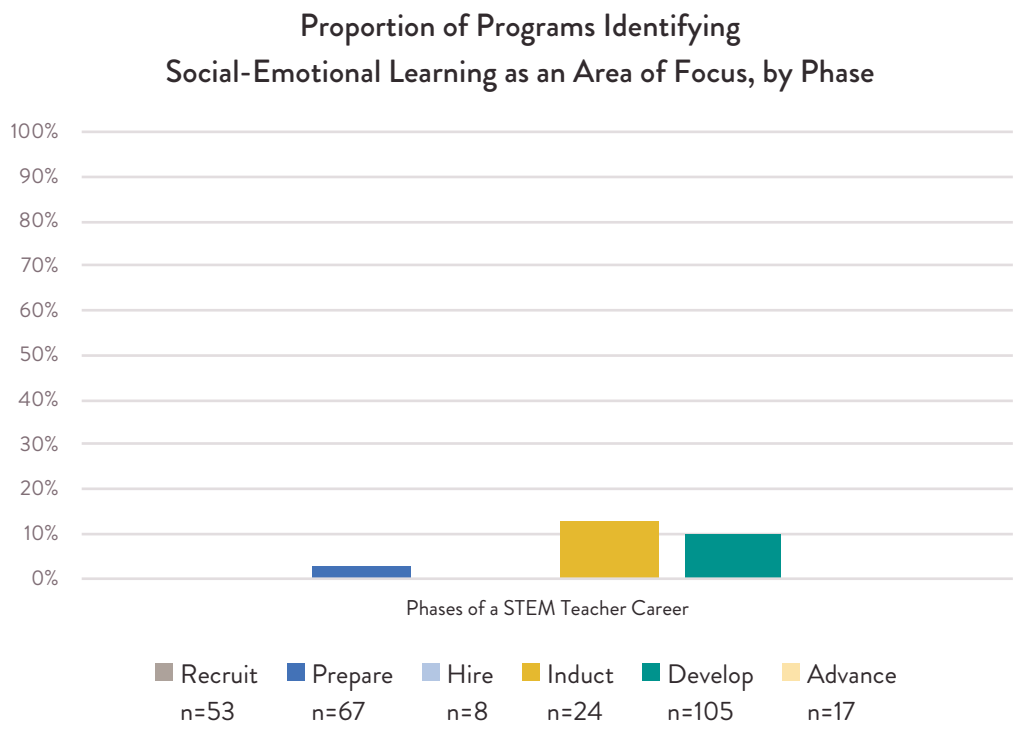
Organizations with teacher Preparation programs that focus on PCK and CK and have better than average outcomes are places to look for insight:

- Florida International University
- Xavier University of Louisiana
- Montclair State University
- Amgen Biotech Experience at EDC
- National Center for STEM Elementary Education
- WestEd
- Bank Street College
- Community Resources for Science
- University of Arizona STEM Learning Center
- LessonSketch - University of Michigan: School of Education
- WestEd
- Torrance Unified School District
- New Jersey Center for Teaching and Learning
- NYU School of Engineering
- Center for Science Teaching and Learning
- Exploratorium

FINDINGS SECTION B:
FOCUS AREA: SOCIAL-EMOTIONAL LEARNING

- Little focus on social-emotional learning.
- Prep (but not development) programs with a focus on social-emotional learning use teacher networks.
- Preparation addressing social-emotional learning is more common for early childhood educators.
- Pre-service programs tend to focus on social-emotional learning or high-needs schools – not both.

B1: LITTLE FOCUS ON SOCIAL-EMOTIONAL LEARNING



100Kin10 partners exhibit little focus on Social-Emotional Learning in both STEM teacher preparation and in the development of experienced STEM teachers. More investigation would have to be done to determine why other foci take precedence over this one.

Better Prepare outcomes (hiring rates) and Develop outcomes (retention rates) were not correlated to programs focusing on Social-Emotional Learning (data not shown).

B2: PREP (BUT NOT DEVELOPMENT) PROGRAMS WITH A FOCUS ON SOCIAL-EMOTIONAL LEARNING USE TEACHER NETWORKS

The programs that report having a focus on Social-Emotional Learning in the Preparation phase are somewhat likely to employ the instructional practice of creating professional learning communities or communities of practice for their participants.

However, Develop programs having a focus on Social-Emotional Learning are actually unlikely to use this instructional practice. More investigation would have to be done to understand why this instructional practice is valuable in pre-service, but not in in-service, for those focused on Social-Emotional Learning. More than 40% of Develop programs do utilize this instructional practice (data not shown), so it is interesting to find that it is preferentially not used by Develop programs that focus on Social-Emotional Learning.

Correlation between Focus on Social-Emotional Learning and Programmatic Element	Phases of a STEM Teacher Career			
Programmatic Element	**Prepare**	**Induct**	**Develop**	**Advance**
Coursework	weak negative	moderate positive	negligible	-
Experiential learning opportunities	negligible	negligible	weak positive	-
Networks with fellow teachers	moderate positive	negligible	weak negative	-
Coaching or other supports to participants	moderate positive	weak negative	negligible	-

B3: PREPARATION ADDRESSING SOCIAL-EMOTIONAL LEARNING IS MORE COMMON FOR EARLY CHILDHOOD EDUCATORS

100Kin10 Partners' programs focus somewhat on preparing early childhood (preschool) educators in Social-Emotional Learning. However, we see in our data an early indication that this might not be an emphasis in programs that prepare secondary educators. This might be due to a belief that Social-Emotional Learning is only important in the early grades. (We will ask SSN if they see this, too.)

Should this bear out, this seems like a missed opportunity to train secondary teachers to address Social-Emotional Learning as may be necessary to retain students in the STEM pipeline, especially students from groups underrepresented in the STEM workforce.

Correlation between Social-Emotional Learning and Background Characteristic	Phases of a STEM Teacher Career				
Background Characteristic	**Recruit**	**Prepare**	**Induct**	**Develop**	**Advance**
Includes Early Childhood Educators	-	weak positive	weak negative	negligible	-
Includes High School Educators	-	negligible	negligible	negligible	-
Includes Middle School Educators	-	-	negligible	weak negative	-
Includes Elementary Level Educators	-	negligible	weak negative	negligible	-

B4: PRE-SERVICE PROGRAMS TEND TO FOCUS ON SOCIAL-EMOTIONAL LEARNING OR HIGH-NEEDS SCHOOLS – NOT BOTH

A focus on Social-Emotional learning phase does not correlate positively with many other focus areas, notably a focus on High-needs Schools (no correlation in Prepare, weak positive correlation in Develop).

It seems like it would also help in the (pre-service) Prepare phase to focus on both Social-Emotional learning and High-needs Schools.

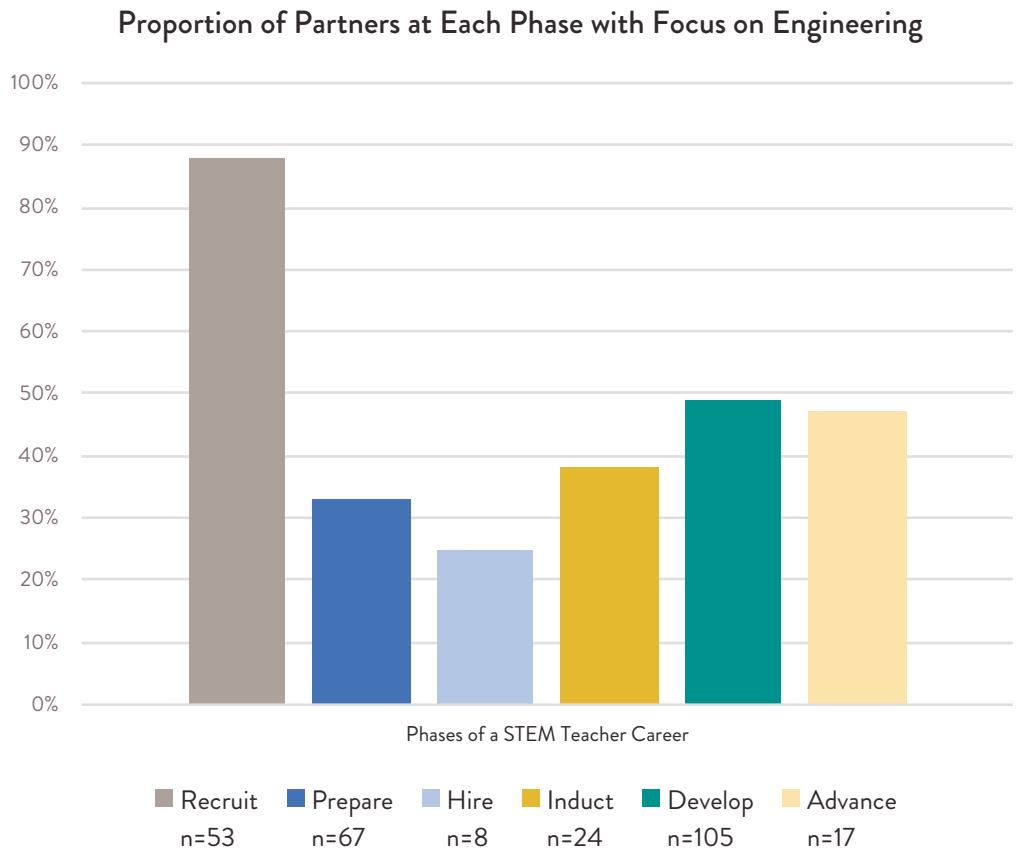
More investigation is required to learn why some pre-service programs focus on one, but do not tend to focus on the other.

Correlation between Social-Emotional Learning and Focus Area	Phases of a STEM Teacher Career		
Focus Area	**Prepare**	**Induct**	**Develop**
Focus on Content Knowledge	negligible	negligible	negligible
Focus on Classroom Management	negligible	negligible	negligible
Focus on Data Driven Instruction	negligible	weak negative	weak negative
Focus on Engineering	negligible	moderate negative	negligible
Focus on High-need schools	negligible	moderate negative	weak positive
Focus on Instructional Practice	negligible	negligible	weak negative
Focus on Organizational Learning	negligible	negligible	negligible
Focus on Project-Based Learning	negligible	negligible	moderate positive
Focus on Pedagogical Content Knowledge	moderate negative	negligible	negligible
Focus on New Academic Standards	negligible	moderate positive	negligible

FINDINGS SECTION C:
FOCUS AREA: ENGINEERING

- There is room for engineering to become more of a focus among 100Kin10 Partners.
- Experiential learning opportunities may be best practice in learning how to teach engineering.
- Possible missed opportunity to train elementary educators in engineering instruction.
- A shared focus of engineering and project-based learning.

C1: THERE IS ROOM FOR ENGINEERING TO BECOME MORE OF A FOCUS AMONG 100Kin10 PARTNERS



100Kin10 partners do exhibit some focus on Engineering in both STEM teacher preparation and in the development of experienced STEM teachers. This may be an artifact based on the particular organizations in the 100Kin10 network. Recruitment aside, this is not one of the top five most popular focus areas, so there is room for Engineering to become more of a focus.

More programs with better Prepare outcomes (hiring rates; n=29) and Develop outcomes (retention rates;n=32) focused on Engineering than was the average across all programs (data not shown). A focus on Engineering goes hand-in-hand with better programmatic outcomes, although this relationship may not be causal.

C2: EXPERIENTIAL LEARNING OPPORTUNITIES MAY BE BEST PRACTICE IN LEARNING HOW TO TEACH ENGINEERING

The programs that report having a focus on Engineering instruction are reasonably likely to employ the instructional practice of providing participants with opportunities to actually do teaching in the classroom. The fact that we see this across phases suggests that this may be a best practice for learning/developing in how to teach engineering.

Providing opportunities for participants to experience the doing of teaching is in general fairly common, used in 67% of 100Kin10's Prepare programs (vs. 77% for those who focus on Engineering) and 58% of 100Kin10's Develop programs (vs. 74% for those who focus on Engineering).

Correlation between Focus on Engineering and Programmatic Element	Phases of a STEM Teacher Career			
Programmatic Element	Prepare	Induct	Develop	Advance
Teachers' Work Products	negligible	weak positive	negligible	moderate positive
Assess Participants' Growth	-	moderate positive	weak positive	moderate positive
Coursework	negligible	moderate positive	negligible	moderate positive
Experiential Learning Opportunities	weak positive	moderate positive	weak positive	moderate positive
Networks with Fellow Teachers	negligible	weak negative	negligible	negligible
Observations of Participants	-	weak negative	weak negative	moderate positive
Observations by Participants	negligible	negligible	negligible	negligible
Program Provides Feedback to Participants	negligible	negligible	weak negative	negligible
Uses Student Information	negligible	negligible	weak negative	moderate negative
Coaching or Other Support to Participants	negligible	moderate positive	negligible	weak negative
Provides Support to Alumni	negligible	weak positive	negligible	-

C3: POSSIBLE MISSED OPPORTUNITY TO TRAIN ELEMENTARY EDUCATORS IN ENGINEERING INSTRUCTION

Correlation between Focus on Engineering and Programmatic Element	Phases of a STEM Teacher Career				
Programmatic Element	**Recruit**	**Prepare**	**Induct**	**Develop**	**Advance**
Includes Early Childhood Educators	moderate negative	negligible	weak positive	negligible	weak negative
Includes High School Educators	negligible	weak positive	weak positive	negligible	negligible
Includes Middle School Educators	weak negative	-	weak positive	-	moderate negative
Includes Elementary Level Educators	negligible	negligible	moderate positive	negligible	weak positive

100Kin10 Partners' programs that focus on preparing new teachers in Engineering instruction do so somewhat preferentially with secondary educators, but not with elementary educators.

This may be a missed opportunity to train elementary educators to provide Engineering instruction that can positively impact students' attitudes in the earliest years as may be necessary to retain students in the STEM pipeline, especially students from groups underrepresented in the STEM workforce.

C4: A SHARED FOCUS OF ENGINEERING AND PROJECT-BASED LEARNING

A focus on Engineering correlates moderately positively with a focus on Project-based Learning in both pre- and in-service phases. This makes sense that in order to focus on Engineering, a program is likely to also focus on Project-based Learning, as both foci emphasize the doing of projects.

During teacher preparation only, there is a moderate positive correlation between a focus on Engineering and a focus on Pedagogical Content Knowledge.

There is a hard-to-explain finding of teacher preparation programs that focus on Engineering tending not to focus on new Academic Standards, e.g. the Next Generation Science Standards. It might be that these programs were already focused on engineering before the NGSS. Or it might be that these programs are committed to promoting the ideas around Engineering from the standards, but find it problematic to be seen as promoting the Standards per se and/or are not in NGSS adoption states.

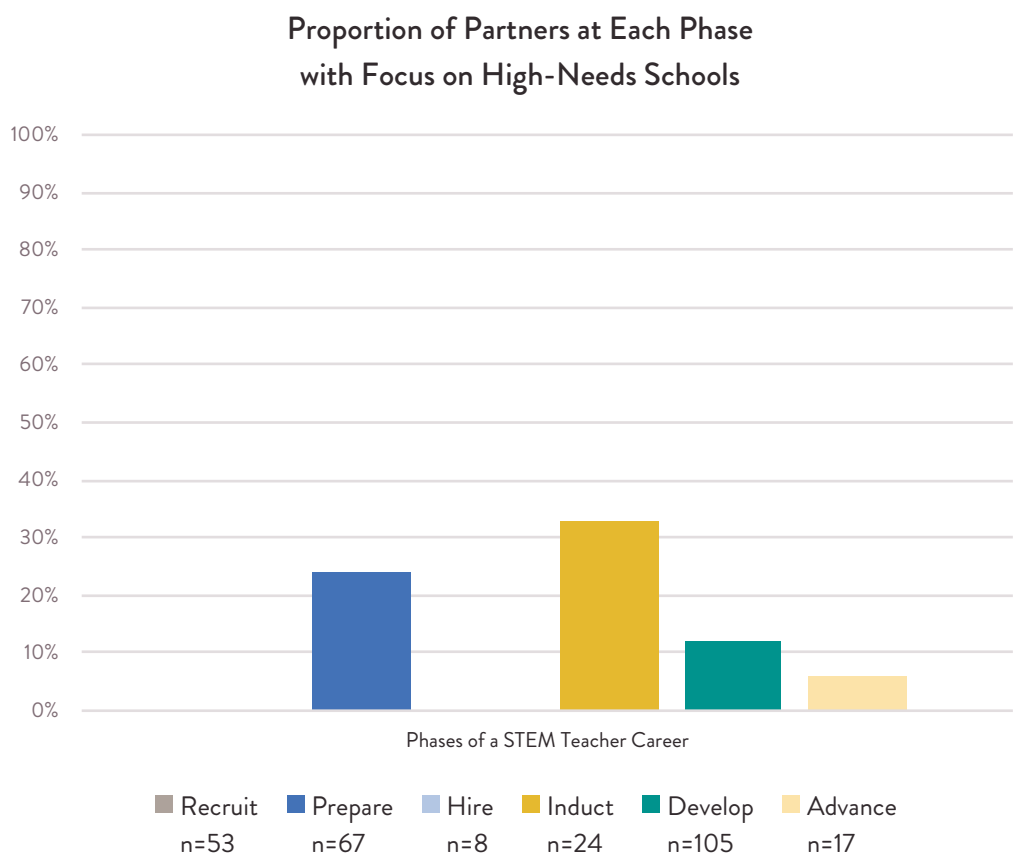
[12 engineering-focused Prep programs are from NGSS-adopting states (CA, DC, MI, NJ); 8 are from non-NGSS-adopting states (AZ, CO, MA, NC, TN, TX)

Correlation between Focus on Engineering and Focus Area	Phases of a STEM Teacher Career				
Focus Area	**Recruit**	**Prepare**	**Induct**	**Develop**	**Advance**
Focus on Content Knowledge	moderate positive	negligible	weak negative	weak positive	weak positive
Focus on Classroom Management	-	negligible	weak positive	negligible	-
Focus on Data Driven Instruction	-	negligible	negligible	negligible	weak positive
Focus on High-need schools	weak positive	negligible	weak positive	negligible	moderate positive
Focus on Instructional Practice	-	moderate positive	moderate negative	negligible	moderate positive
Focus on Organizational Learning	negligible	moderate positive	negligible	negligible	moderate positive
Focus on Project-Based Learning	-	weak positive	weak positive	weak positive	negligible
Focus on Pedagogical Content Knowledge	moderate positive	moderate positive	negligible	negligible	moderate positive
Focus on Social Emotional Learning	-	negligible	moderate negative	negligible	-
Focus on New Academic Standards	negligible	moderate negative	negligible	negligible	negligible

FINDINGS SECTION D:
FOCUS AREA: HIGH-NEEDS SCHOOLS

- 100kin10 Partners do not exhibit much focus on serving high-needs schools.
- Teacher networks may be best practice in programs with a focus on high-needs schools.
- Possible missed opportunity to focus on high-needs schools when preparing elementary educators.
- A possible connection between focus on high-needs schools and focus on instructional practice.
- Programs focused on high-needs schools tend not to focus on content knowledge.
- Instead, those focused on high-needs schools also focus on instructional practice and new standards.

D1: 100Kin10 PARTNERS DO NOT EXHIBIT MUCH FOCUS ON SERVING HIGH-NEEDS SCHOOLS



Despite being a priority in our network, 100Kin10 partners do not exhibit much focus on serving High-needs Schools. This finding is fairly consistent across both pre-service and in-service phases. Additional data would have to be collected to determine if this degree of focus is less than the national average, and it may be due to the fact that the organizations that focus on serving High-needs Schools are predominately outside of the 100Kin10 network.

Programs with the best Prepare outcomes (hiring rates; n=29) and Develop outcomes (retention rates; n=32) focused on serving High-needs Schools much less than average (data not shown). This finding merits further investigation, as it might de-incentivize organizations from adding this much-needed focus.

D2: TEACHER NETWORKS MAY BE BEST PRACTICE IN PROGRAMS WITH A FOCUS ON HIGH-NEEDS SCHOOLS

The programs that report having a focus on High-needs Schools are likely to employ the instructional practice of providing participants with professional learning communities or communities of practice. This is true across both pre- and in-service and may suggest a best practice in teaching about how to work in High-needs Schools.

Correlation between Focus on High-Needs Schools and Programmatic Element	Phases of a STEM Teacher Career			
Programmatic Element	**Prepare**	**Induct**	**Develop**	**Advance**
Teachers' work products	moderate positive	negligible	negligible	weak negative
Assess participants' growth	-	weak negative	weak positive	moderate negative
Coursework	weak positive	moderate negative	negligible	weak negative
Experiential learning opportunities	negligible	negligible	weak negative	moderate positive
Networks with fellow teachers	moderate positive	weak negative	weak positive	weak negative
Observations of participants	weak negative	moderate negative	negligible	moderate positive
Observations by participants	negligible	moderate positive	negligible	negligible
Program provides feedback to participants	negligible	moderate negative	negligible	moderate negative
Uses student information	negligible	moderate positive	negligible	negligible
Coaching or other supports to participants	moderate positive	moderate positive	negligible	weak positive
Provides support to alumni	weak positive	weak positive	negligible	-

D3: POSSIBLE MISSED OPPORTUNITY TO FOCUS ON HIGH-NEEDS SCHOOLS WHEN PREPARING ELEMENTARY EDUCATORS

Correlation between Focus on High-Needs Schools and Background Characteristic	Phases of a STEM Teacher Career				
Background Characteristic	**Recruit**	**Prepare**	**Induct**	**Develop**	**Advance**
Includes Early Childhood Educators	negligible	negligible	negligible	negligible	-
Includes High School Educators	negligible	moderate positive	negligible	negligible	-
Includes Middle School Educators	negligible	-	negligible	negligible	-
Includes Elementary Level Educators	negligible	negligible	negligible	negligible	-

100Kin10 Partners' programs that focus on preparing teachers for High-needs Schools also focus preferentially on preparing Secondary educators, but not Elementary educators. What is going on that this is the case?

This may be a missed opportunity to train elementary educators to work in High-needs Schools where they can provide STEM instruction to students in their earliest years, as may be necessary to retain them in the STEM pipeline, especially students from groups underrepresented in the STEM workforce.

D4: A POSSIBLE CONNECTION BETWEEN FOCUS ON HIGH-NEEDS SCHOOLS AND FOCUS ON INSTRUCTIONAL PRACTICE

A focus on High-needs Schools during teacher Preparation correlates moderately positively with a focus on Instructional Practices.

Organizations may believe that teachers need to be prepared with strong Instructional Practices in order to be successful in High-needs School environments.

This correlation between a focus on High-needs Schools and Instructional Practices can also be found in programs designed for teacher Advancement.

Correlation between High-Needs Schools Focus and Focus Area	Phases of a STEM Teacher Career				
Focus Area	**Recruit**	**Prepare**	**Induct**	**Develop**	**Advance**
Focus on Content Knowledge	weak negative	weak negative	weak negative	weak negative	moderate positive
Focus on Classroom Management	-	negligible	negligible	negligible	-
Focus on Data Driven Instruction	-	negligible	negligible	negligible	negligible
Focus on Engineering	weak positive	negligible	weak positive	negligible	moderate positive
Focus on Instructional Practice	-	moderate positive	negligible	negligible	weak positive
Focus on Organizational Learning	weak positive	moderate positive	weak positive	negligible	negligible
Focus on Project-Based Learning	-	negligible	moderate negative	negligible	moderate positive
Focus on Pedagogical Content Knowledge	negligible	weak positive	weak negative	negligible	weak negative
Focus on Social Emotional Learning	-	negligible	moderate negative	weak positive	-
Focus on New Academic Standards	moderate positive	weak negative	moderate negative	negligible	weak positive

D5: PROGRAMS FOCUSED ON HIGH-NEEDS SCHOOLS TEND NOT TO FOCUS ON CONTENT KNOWLEDGE

The 100Kin10 programs that focus on High-needs Schools tend not to focus on Content Knowledge. This is a trend across pre- and in-service programs. Programs with this focus may not feel academic rigor is the highest priority (i.e. the soft bigotry of low expectations). This may be a missed opportunity to train/develop educators to work in High-needs Schools and focus on STEM Content Knowledge with students, as may be necessary to retain them in the STEM pipeline, especially students from groups underrepresented in the STEM workforce, who are overrepresented in High-needs Schools.

A significant majority of these organizations are instead focusing on Instructional Practices (see previous slide) and New Standards.

Correlation between Focus on High-Needs Schools and Background Characteristic	Phases of a STEM Teacher Career				
Focus Area	**Recruit**	**Prepare**	**Induct**	**Develop**	**Advance**
Focus on Content Knowledge	weak negative	weak negative	weak negative	weak negative	moderate positive
Focus on Classroom Management	-	negligible	negligible	negligible	-
Focus on Data Driven Instruction	-	negligible	negligible	negligible	negligible
Focus on Engineering	weak positive	negligible	weak positive	negligible	moderate positive
Focus on Instructional Practice	-	moderate positive	negligible	negligible	weak positive
Focus on Organizational Learning	weak positive	moderate positive	weak positive	negligible	negligible
Focus on Project-Based Learning	-	negligible	moderate negative	negligible	moderate positive
Focus on Pedagogical Content Knowledge	negligible	moderate positive	weak negative	negligible	weak negative
Focus on Social Emotional Learning	-	negligible	moderate negative	weak positive	-
Focus on New Academic Standards	moderate positive	weak negative	moderate negative	negligible	weak positive

D6: INSTEAD, THOSE FOCUSED ON HIGH-NEEDS SCHOOLS ALSO FOCUS ON INSTRUCTIONAL PRACTICE AND NEW STANDARDS

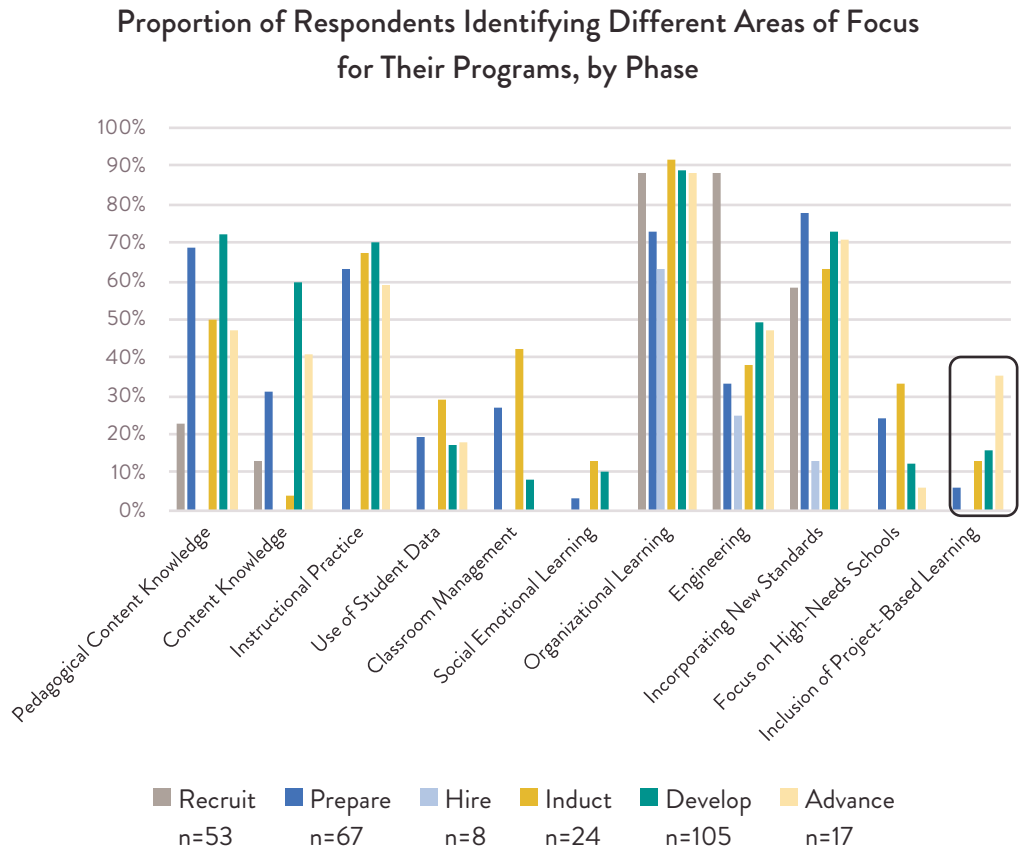
A significant majority of the organizations who are focused on High-needs Schools but not Content Knowledge are instead focused on Instructional Practices and New Standards. This is encouraging that teachers being prepared/developed for more challenged schools are in programs designed to build strengths around Instructional Practices, but not at the expense of Content Knowledge.

FINDINGS SECTION E:
FOCUS AREA: ACTIVE LEARNING

- There is room to make active learning a priority in stem teacher prep and development.
- Focus on active learning increases from pre-service training to in-service training.
- No evidence that programs with the best ‘prepare’ or ‘develop’ outcomes focused on active learning.
- ‘Develop’ programs focused on active learning are more likely to use experiential learning opportunities.
- Post-secondary institutions are the top provider of programs with a focus on active learning.

E1: THERE IS ROOM TO MAKE ACTIVE LEARNING A PRIORITY IN STEM TEACHER PREP AND DEVELOPMENT

Few 100Kin10 Partners chose Active Learning as one of their top three areas of programmatic focus as compared to other focus areas. Believing that 100Kin10 partners would be more likely than average to focus on Active Learning, we would expect even fewer organizations to be focusing on Active Learning across all the nation's organizations. Thus, there would appear to be ample room for organizations to make Active Learning much more of a priority in STEM teacher preparation and development

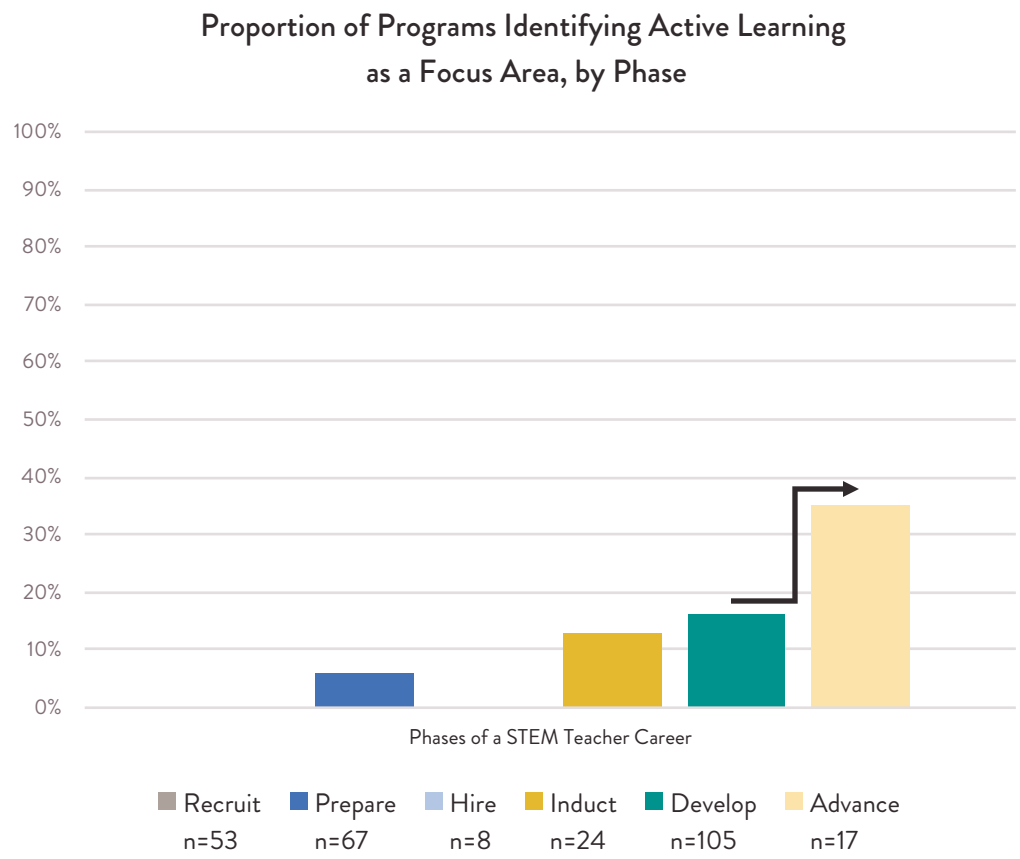


E2: FOCUS ON ACTIVE LEARNING INCREASES FROM PRE-SERVICE TRAINING TO IN-SERVICE TRAINING

More 100Kin10 partners focus on Active Learning as we move from pre-service training to in-service development of STEM teachers (Prepare = 6%; Induct = 11%; Develop = 16%; Advance = 35%). The percentage of partners who focus on Active Learning more than doubles from the Develop to the Advance phase. This finding may indicate Active Learning is more commonly a focus in advanced teachers' programs while programs for teachers at earlier stages in their careers are much more commonly focused on such areas as instructional practices (70% of programs) and content knowledge (60% of programs) than on Active Learning (16% of programs).

We might wish to follow up with these specific 100Kin10 Partner organizations with teacher Preparation programs that focus on Active Learning:

- University of Indianapolis
- University of Texas - Pan American
- Montclair State University



E3: NO EVIDENCE THAT PROGRAMS WITH THE BEST 'PREPARE' OR 'DEVELOP' OUTCOMES FOCUSED ON ACTIVE LEARNING

In our small sample, we were not able to find evidence that programs with the best Prepare outcomes (STEM teacher hiring rates) and Develop outcomes (STEM teacher retention rates) focused on Active Learning significantly more frequently than the average for all programs.

E4: 'DEVELOP' PROGRAMS FOCUSED ON ACTIVE LEARNING ARE MORE LIKELY TO USE EXPERIENTIAL LEARNING OPPORTUNITIES

In-service STEM teacher Develop programs that report having a focus on Active Learning are slightly more likely than average to employ the instructional practice of Experiential Learning Opportunities with in-service STEM teachers.

We could discuss with the following Partners about if/how they use this important instructional practice to support Active Learning:

- National Center for Technological Literacy
- Merrimack College
- Tiger Woods Learning Center
- International Technology and Engineering Educators Association
- THE ALGEBRA PROJECT INC.
- D.C. Public Schools
- University of New Hampshire
- Bay Area Discovery Museum
- SRI International
- Tufts Center for Engineering Education and Outreach
- U.S. Department of Energy
- NYU School of Engineering

Correlation between Focus on Project-Based Learning and Programmatic Element	Phases of a STEM Teacher Career			
Programmatic Element	Prepare	Induct	Develop	Advance
Teachers' Work Products	weak positive	weak positive	negligible	moderate negative
Assess Participants' Growth	-	negligible	negligible	negligible
Coursework	negligible	negligible	weak negative	negligible
Experiential Learning Opportunities	negligible	moderate positive	weak positive	weak positive
Networks With Fellow Teachers	negligible	negligible	negligible	moderate negative
Observations Of Participants	negligible	negligible	negligible	weak positive
Observations By Participants	moderate positive	negligible	negligible	negligible
Program Provides Feedback To Participants	negligible	negligible	weak negative	moderate negative
Uses Student Information	weak negative	moderate negative	negligible	negligible
Coaching Or Other Supports To Participants	weak positive	weak positive	negligible	negligible
Provides Support To Alumni	negligible	negligible	negligible	-

E5: POST-SECONDARY INSTITUTIONS ARE THE TOP PROVIDER OF PROGRAMS WITH A FOCUS ON ACTIVE LEARNING

The breakdown of institution type of all the 21 100Kin10 organizations offering programs with a focus on Active Learning is as follows. These programs are offered primarily:

- by a post-secondary institution (38%) or,
- by an "other institution" (28%) = other than a school, school district, or CMO; a federal or state agency; a not-for-profit entity; an alternative certification program; or a museum or other science-rich institution.

It is somewhat surprising that aside from post-secondary institutions, no single institution type stood out more than "other" as commonly offering STEM teacher preparation or development programs with a focus on Active Learning. One might expect that institutions like museums would have expertise on Active Learning that would make them a stand-out provider, especially in STEM teacher development, and maybe even in STEM teacher preparation (e.g. the American Museum of Natural History's Master of Arts in Teaching program).

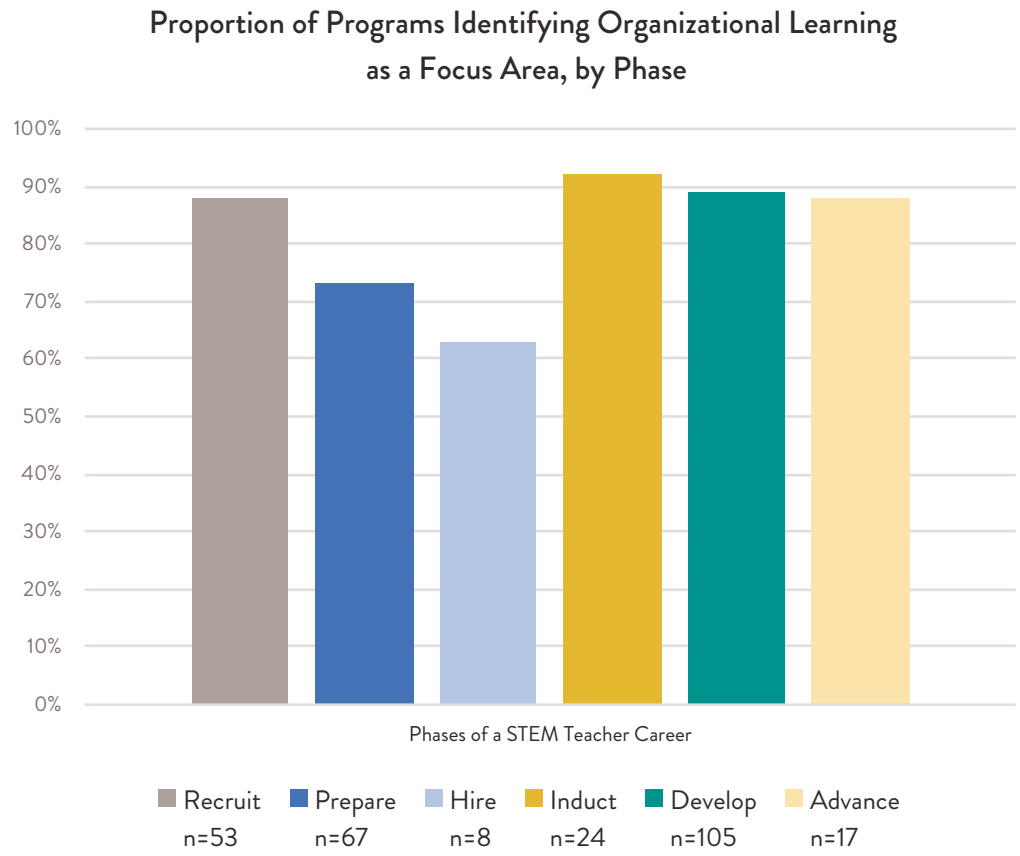
FINDINGS SECTION F:
FOCUS AREA: ORGANIZATIONAL IMPROVEMENT

- Organizational improvement is the most common focus area among 100kin10 partners.
- Programs focused on organizational improvement use similar combinations of instructional practices.
- No relationship between focus on organizational improvement and type or size of organization.

F1: ORGANIZATIONAL IMPROVEMENT IS THE MOST COMMON FOCUS AREA AMONG 100Kin10 PARTNERS

100Kin10 partners report a significant focus on Organizational Improvement. This is the most common focus area among partners across pre-service and in-service phases. Most programs in our sample are self-reflective in this way. Additional data would have to be collected to determine if this degree of focus is greater than the national average due to the unique sample who are the 100Kin10 partners.

Programs with the best Prepare outcomes (hiring rates; n=29) and Develop outcomes (retention rates; n=32) report only a slightly increased focus on Organizational Improvement than average (results not shown). We see little support for a connection between being a self-reflective organization and outcomes. This finding may be an artifact of how many organizations in our sample already focus on Organizational Improvement.



F2: PROGRAMS FOCUSED ON ORGANIZATIONAL IMPROVEMENT USE SIMILAR COMBINATIONS OF INSTRUCTIONAL PRACTICES

The programs that report having a focus on Organizational Improvement are likely to employ the instructional practices of having participants generate work products, complete coursework, make observations of participants, and provide feedback to participants.

This is the case across pre- and in-service programs. It is likely that these instructional practices are employed in part because they result in the raw materials that organizations need to use to support Organizational Improvement. We would have to discuss with the individual partners about if these instructional practices were included for this reason.

Correlation between Focus on Organizational Learning and Programmatic Element	Phases of a STEM Teacher Career			
Programmatic Element	**Prepare**	**Induct**	**Develop**	**Advance**
Teachers' Work Products	substantial positive	weak positive	weak positive	moderate positive
Assess Participants' Growth	-	weak negative	weak positive	moderate positive
Coursework	moderate positive	weak positive	weak negative	moderate positive
Experiential Learning Opportunities	moderate positive	negligible	negligible	weak positive
Networks with Fellow Teachers	negligible	moderate positive	negligible	negligible
Observations of Participants	substantial positive	weak positive	weak positive	weak positive
Observations by Participants	weak positive	negligible	negligible	negligible
Program Provides Feedback to Participants	moderate positive	negligible	weak positive	moderate positive
Uses Student Information	weak positive	moderate positive	negligible	weak positive
Coaching or Other Supports to Participants	moderate positive	moderate positive	weak positive	negligible
Provides Support to Alumni	weak positive	negligible	negligible	-

F3: NO RELATIONSHIP BETWEEN FOCUS ON ORGANIZATIONAL IMPROVEMENT AND TYPE OR SIZE OF ORGANIZATION

The programs that report having a focus on Organizational Improvement do not obviously correlate with any particular type or size of organization.

Correlation between Focus on Organizational Learning and Background Characteristic	Phases of a STEM Teacher Career				
Background Characteristic	**Recruit**	**Prepare**	**Induct**	**Develop**	**Advance**
Local Education Entity	-	negligible	moderate negative	negligible	-
State or Federal Agency	-	-	-	moderate negative	-
Postsecondary Institutions	negligible	negligible	weak negative	negligible	negligible
Non-Profit Entity	-	-	-	negligible	negligible
Other Institution	negligible	negligible	moderate positive	weak positive	negligible
Alternative Teacher Certification Program	weak positive	-	-	-	-
Museum, or Science-rich Institution	negligible	negligible	negligible	weak negative	weak negative

FOCUS ON BACKGROUND CHARACTERISTICS

FINDINGS:
FOCUS ON BACKGROUND CHARACTERISTICS

- Level of focus on content knowledge varies among programs for elementary educators.

FINDINGS BY BACKGROUND CHARACTERISTICS

Included:

- Elementary Level Educators

Not Included:

- Includes Early Childhood Educators
- Includes Middle School Educators
- Includes Secondary Educators
- Includes Science Educators
- Includes Math Educators
- Includes Engineering Educators
- Includes Technology Educators
- Program Size
- Local Education Entity
- State/Federal Agency
- Postsecondary Institution
- Non-profit Entity
- Alternative Teacher Certification Program
- Museum, or other Science-rich Institution
- Other Institution

FINDINGS SECTION G: BACKGROUND CHARACTERISTIC: ELEMENTARY LEVEL EDUCATORS

- Level of focus on content knowledge varies among programs for elementary educators.
- Learning to work with student data may be relevant for secondary educators but not elementary educators.
- Observations by participants may be too logistically challenging for most elementary educator programs.

G1: LEVEL OF FOCUS ON CONTENT KNOWLEDGE VARIES AMONG PROGRAMS FOR ELEMENTARY EDUCATORS

Correlation between Focus on Content Knowledge and Background Characteristic	Phases of a STEM Teacher Career				
Background Characteristic	**Recruit**	**Prepare**	**Induct**	**Develop**	**Advance**
Includes Early Childhood Educators	weak negative	weak positive	substantial positive	negligible	negligible
Includes High School Educators	weak positive	weak positive	negligible	negligible	negligible
Includes Middle School Educators	negligible	-	negligible	negligible	negligible
Includes Elementary Level Educators	moderate negative	negligible	moderate positive	moderate positive	moderate positive

Recruiting programs working with elementary-level educators do not tend to focus on Content Knowledge, while in-service programs for elementary-level educators do tend to focus on Content Knowledge. It might be that the need to focus on Content Knowledge in in-service is the result of not recruiting with enough of an emphasis on candidates' Content Knowledge.

G2: LEARNING TO WORK WITH STUDENT DATA MAY BE RELEVANT FOR SECONDARY EDUCATORS BUT NOT ELEMENTARY EDUCATORS

Preparation programs that emphasize working with elementary-level educators do not tend to focus on training teachers how to work with student data, while Preparation programs that emphasize working with secondary-level educators do tend to focus on training teachers how to work with student data.

We would have to interview individual programs to determine if there is consensus that learning to work with student data is not relevant for elementary teachers, or if there is another reason that underlies this difference.

Correlation between Focus on Student Data and Background Characteristic	Phases of a STEM Teacher Career			
Background Characteristic	**Prepare**	**Induct**	**Develop**	**Advance**
Majority Female Participants	negligible	negligible	negligible	-
Includes Early Childhood Educators	negligible	negligible	negligible	moderate negative
Includes High School Educators	moderate positive	weak positive	weak positive	negligible
Includes Middle School Educators	-	negligible	negligible	negligible
Includes Elementary Level Educators	moderate negative	negligible	negligible	negligible

G3: OBSERVATIONS BY PARTICIPANTS MAY BE TOO LOGISTICALLY CHALLENGING FOR MOST ELEMENTARY EDUCATOR PROGRAMS

Programs that prepare elementary-level educators do not use the Observations by Participants Instructional Practice, while this is moderately correlated with programs that prepare secondary-level educators (data not shown).

Observations by Participants is negatively correlated with larger programs, suggesting a logistical constraint in the use of this Instructional Practice. Elementary-level educators may be more likely than average to be in larger programs. As such, are they missing out on the chance to benefit from a helpful Instructional Practice?

Correlation between Programmatic Element of Observations by Participants and Background Characteristic	Phases of a STEM Teacher Career			
Background Characteristic	**Prepare**	**Induct**	**Develop**	**Advance**
Includes Early Childhood Educators	negligible	negligible	negligible	weak negative
Includes High School Educators	moderate positive	weak positive	negligible	weak positive
Includes Middle School Educators	-	negligible	negligible	substantial negative
Includes Elementary Level Educators	negligible	negligible	negligible	substantial negative

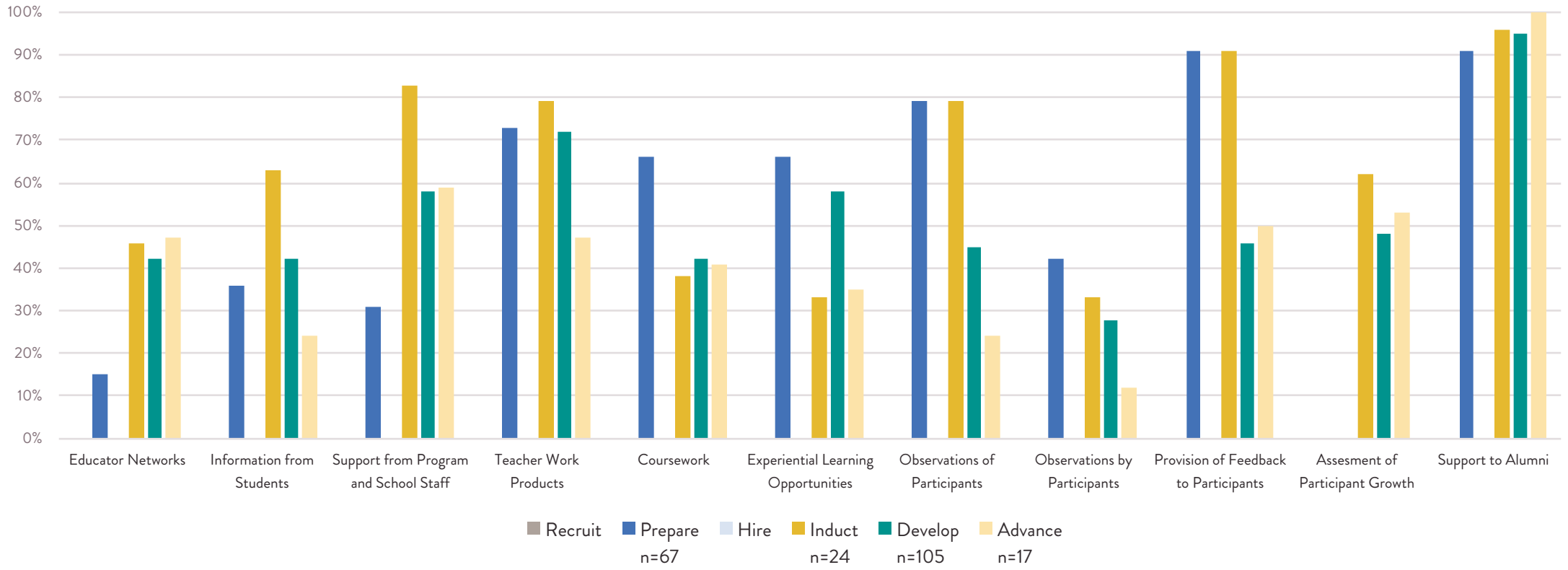
FOCUS ON EFFECTIVE PROGRAMMATIC ELEMENTS

FINDINGS:
FOCUS ON EFFECTIVE PROGRAMMATIC ELEMENTS

- Networking with fellow teachers is common in in-service programs, but doesn't guarantee success

TRENDS IN PROGRAMMATIC ELEMENTS, BY PHASE

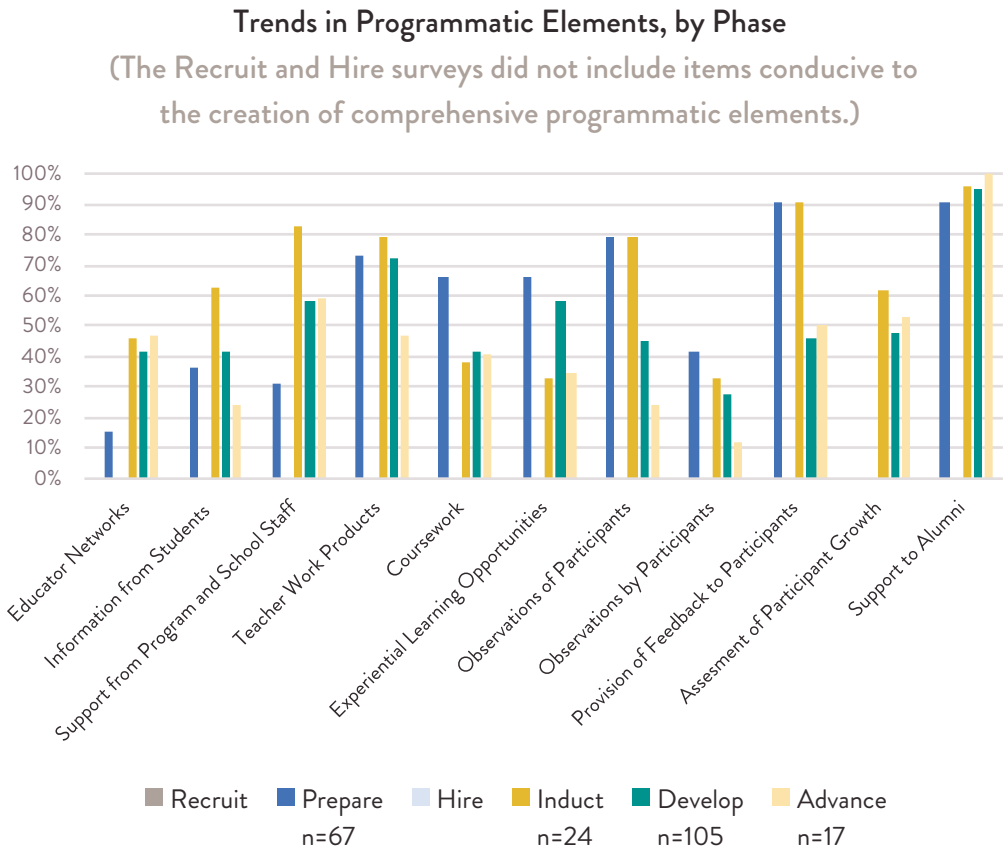
(The Recruit and Hire surveys did not include items conducive to the creation of comprehensive programmatic elements.)



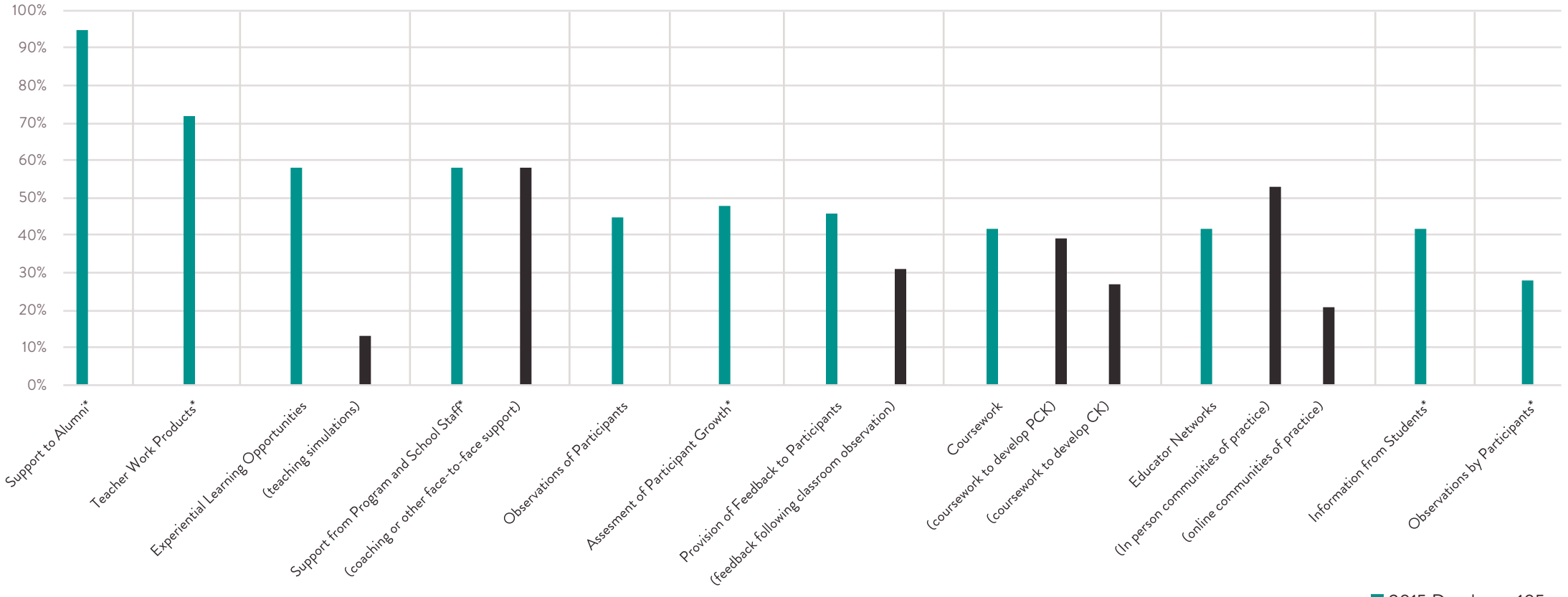
PROGRAMMATIC ELEMENT COHERENCE

100Kin10 Partners primarily use the Programmatic Elements of Teacher Work Products, Experiential Learning Opportunities, Observations by Participants, and Provision of Feedback to Participants. Teacher Work Products and Experiential Learning Opportunities are used to a similar degree between pre-service training and in-service development. Observations by Participants and Provision of Feedback to Participants drop off dramatically between pre-service training and in-service development. Does this show a response to a logistical constraint? Support to Alumni is the most commonly used Programmatic Element, but by definition this is only used in in-service development.

Educator Networks and Observations by Participants are used less frequently. The use of Educator Networks is infrequent in pre-service training, but jumps in-service development as one might expect. It is unexpected that organizations do not very frequently use Observation by Participants, and the use even goes down a bit between pre-service training and in-service development. This might be based on logistical constraints more so than based on perceived value of doing this.



YEAR-TO-YEAR CHANGES IN PROGRAMMATIC ELEMENT COHERENCE



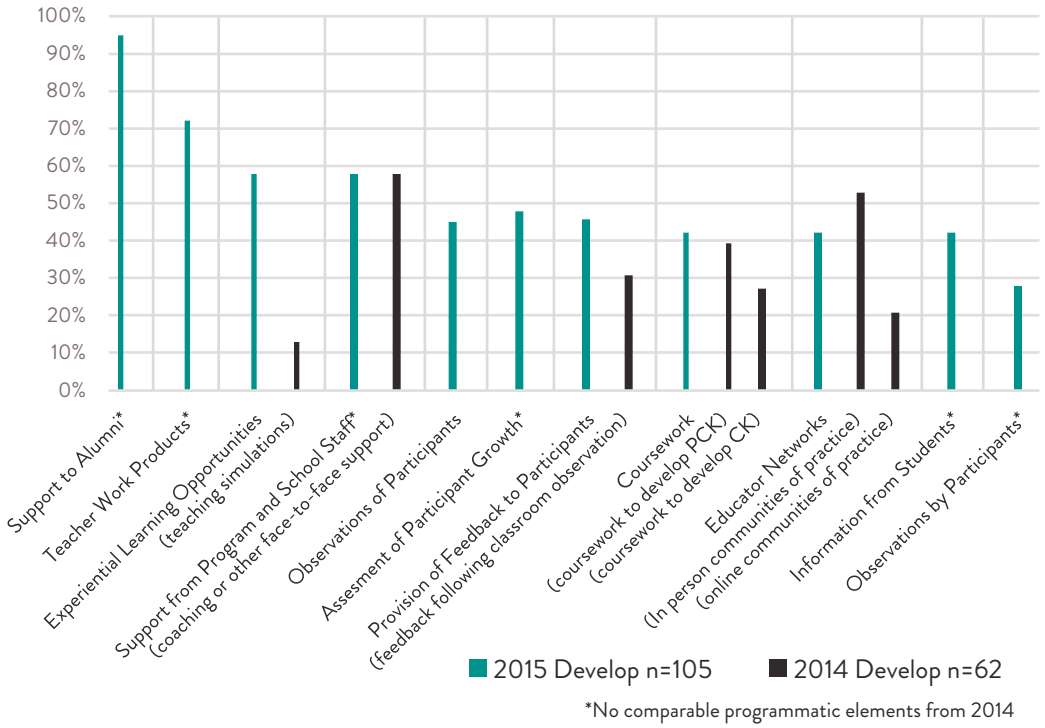
*No comparable programmatic elements from 2014

YEAR-TO-YEAR CHANGES IN PROGRAMMATIC ELEMENT COHERENCE

Comparison to last year's Development data as shown. Last year's top two are replaced by programmatic elements not asked about in 2014: support to alumni and teacher work products.

Experiential learning opportunities as a programmatic element has increased to the point where it is the third most prevalent, while coaching has fallen from first to fourth most prevalent (although the frequency of this programmatic element remains relatively unchanged).

Only Develop phase is shown; comparable data is not available to compare coherence of programmatic elements in Prepare phase.



*No comparable programmatic elements from 2014

FINDINGS BY PROGRAMMATIC ELEMENTS

Included:

- Support from Program/School Staff (Coaching)
- Educator networks

Not Included:

- Use of Student Information
- Use of Teachers' Artifacts
- Inclusion of Coursework
- Experiential Learning Opportunities
- Observations by Participants
- Observations of Participants
- Provision of Feedback
- Assessment of Participant Growth
- Support Provided to Alumni

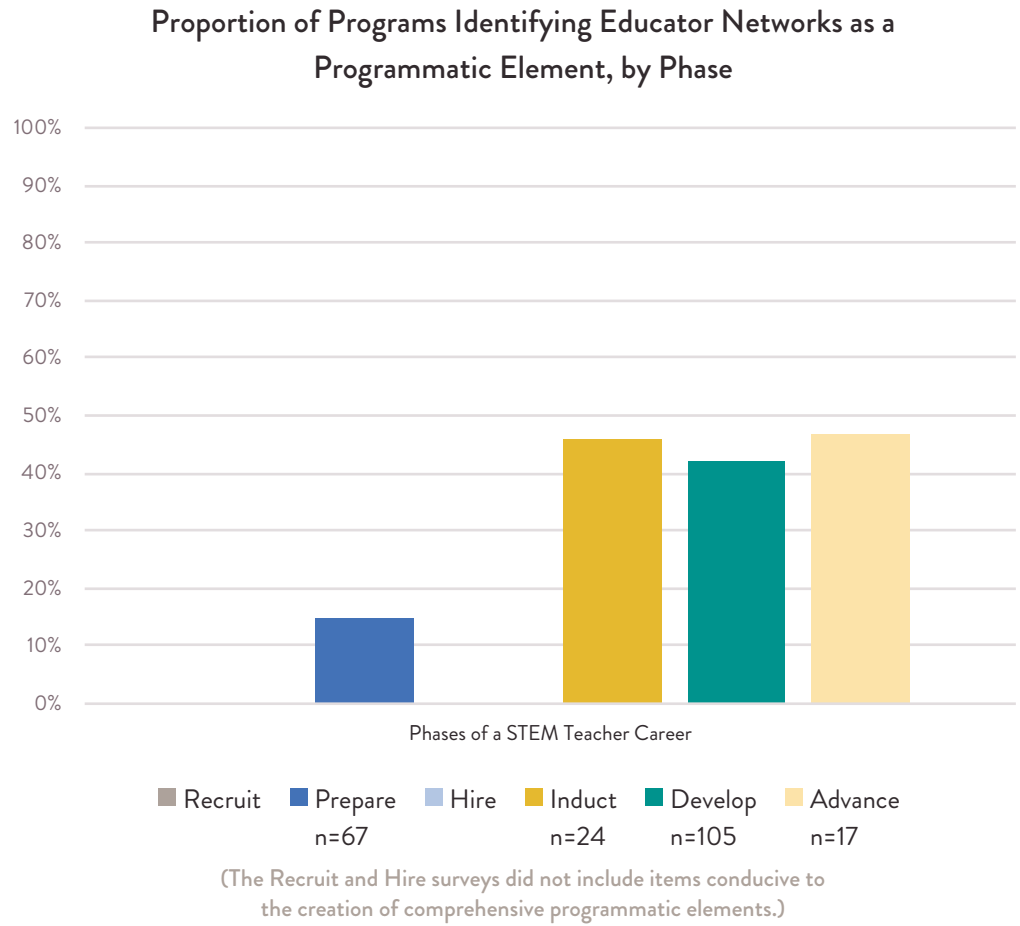
FINDING SECTION H:
PROGRAMMATIC ELEMENT: EDUCATOR NETWORKS

- Networking with fellow teachers is common in in-service programs, but doesn't guarantee success.
- Coaching as a best practice may be specific to 100kin10 partner organizations.

H1: NETWORKING WITH FELLOW TEACHERS IS COMMON IN IN-SERVICE PROGRAMS, BUT DOESN'T GUARANTEE SUCCESS

Across all programs, opportunities to network with fellow teachers are not very common in pre-service, used in only 15% of Prepare programs, although this is in general very common in in-service, used in more than 40% of all Develop programs.

Our outcomes analyses (not shown) show that programs with much better Develop outcomes (retention rates) put the same amount of emphasis on teacher networks as the average. So while educator networks are fairly common, they don't appear to guarantee success as measured by retention rates.



H1: NETWORKING WITH FELLOW TEACHERS IS COMMON IN IN-SERVICE PROGRAMS, BUT DOESN'T GUARANTEE SUCCESS

While there is no trend in our data between incorporating Educator Networks and better outcomes, the following 100Kin10 Partner organizations offer Preparation or Develop programs that do incorporate Educator Networks and are in the top 10% of reported outcomes:

Prepare:

- American Museum of Natural History
- Boston University
- Guilford County Schools
- Philadelphia Education Fund
- Project Inspire
- UCLA

Develop:

- American Modeling Teachers Association
- Amgen Biotech Experience at EDC
- TAF
- WestEd
- BSCS
- LessonSketch - University of Michigan: School of Education

H2: COACHING AS A BEST PRACTICE MAY BE SPECIFIC TO 100Kin10 PARTNER ORGANIZATIONS

There were moderate relationships with programs that train both elementary and secondary educators. This may be evidence for coaching as a best practice when preparing any level educator, but may also be an artifact specific to 100Kin10 partners.

Coaching is negatively correlated with mid-sized programs, suggesting a possible logistical constraint in the use of this Instructional Practice.

Correlation between Programmatic Element of Support from Program and School Staff and Background Characteristic	Phases of a STEM Teacher Career			
Background Characteristic	**Prepare**	**Induct**	**Develop**	**Advance**
Includes Early Childhood Educators	negligible	weak positive	negligible	moderate positive
Includes High School Educators	moderate positive	moderate positive	weak positive	substantial positive
Includes Middle School Educators	negligible	substantial positive	negligible	moderate positive
Includes Elementary Level Educators	moderate positive	negligible	negligible	negligible

END