NGSS DISTRICT IMPLEMENTATION INDICATORS

Introduction

The Next Generation Science Standards (NGSS) offer and describe a new vision for science education to better prepare all students for postsecondary success. For most teachers, schools, and districts, these standards represent a major change from current practice. This guide is designed to help school and district leaders manage that transition to new standards.

What is this document?

Standards interact with many other aspects of the educational system—including curricula, assessments, human capital, and district and school organization—and for the implementation of these standards to be successful, changes in many other aspects of the school and district will be needed. Merely swapping out one set of standards for another is insufficient. The steps for a successful transition to the new science standards at a district level will depend on local context, existing resources, and current and potential capacity.

This document outlines thirteen important indicators of successful NGSS implementation at the district level, illustrating what transition to the Next Generation Science Standards looks like in three broad areas.[1] Each indicator is written as a declarative statement that describes a concrete, high-level outcome from one area of science standards implementation. If the work underway is building towards making that statement a reality, the district is likely on track. If the work in this area isn't happening, or is not leading towards that outcome or not getting results, then something likely needs to be adjusted.

However, transitioning to new standards is rarely a linear process. For this reason, the indicators are designed to be interconnected. They are not intended to be viewed as discrete steps or a sequential process, but rather should be considered a starting point and a reference to evaluate the district's science improvement strategy.

The thirteen indicators are divided into three broad categories. The first category describes foundational strategies to think about before beginning the transition to the standards, such as making sure all students have access to robust science instruction and ensuring the management infrastructure—people, budgets, policies, authorities—is in place to drive the change. The second category, made up of eight indicators, describes areas of strategic importance to successful NGSS implementation: instructional materials, assessments, collaboration, professional learning, communications, and school structures. The document ends with a third category focused on what this all

[1] While SRI Education's *Measuring the Monitoring Progress K—12 STEM Education Indicators: A Road Map* report discusses an indicator system for policymakers and practitioners to improve STEM education, this document's target audience is specific to school district leadership and focuses specifically on measuring progress in the implementation of science standards.

is really about: student outcomes. Outside these three broad categories, the indicators are numbered, but this is for ease of reference only and does not imply an order or hierarchy.

For each of these thirteen indicators, this document highlights examples of actions districts can take to define goals and make progress. It is important to note that the examples of actions are not inclusive of all the actions a district can take, and that some actions may not apply to all districts depending on their specific needs and the amount of local control they possess. Districts can use the example actions in this document or create their own to help monitor progress toward each implementation indicator.

How was this developed?

The indicators and measurable actions in this document are based on the recommendations from two sources.

First, the *Guide to Implementing the Next Generation Science Standards*, a 2015 document written by the National Research Council and the Board on Science Education that identifies overarching principles to help guide those charged with developing a plan to implement the NGSS.

Second, extensive feedback from the teachers and district leaders who are members of the California K-8 Early Implementation Initiative, a group of ten districts selected to be the first in the state to begin implementing California's new science standards, the Next Generation Science Standards for California Public Schools K-12 (CA NGSS), as well as WestEd's K–12 Alliance. The draft went through several additional reviews by NGSS experts at Achieve and educators, school administrators, and those working at the district level to implement the NGSS around the country (see the *Acknowledgments Page* at the end of this document).

How can a district monitor progress in NGSS implementation?

It is often said that change is a process that must be managed—it does not occur instantly or without great, sustained, and intentional effort. Making the change to the Next Generation Science Standards in your district will involve a great amount of management, and monitoring progress is an essential component of that work. Monitoring progress allows a district to reflect on current implementation steps, learn about what is working and what is not, identify gaps within the process, and generate evidence of the district's implementation efforts. Tracking district progress provides opportunities for leaders to identify challenges, develop solutions, and create mechanisms for feedback from the participants in the implementation system. These opportunities for feedback allow for the timely and thoughtful refinement of processes and will ultimately increase chances for a successful implementation of the NGSS.

As the district determines the most effective actions to take in order to further NGSS implementation, it is prudent to keep in mind that these actions should be measurable and yield data. Collecting and analyzing this data can help describe the progress the district is making in its journey to NGSS implementation. It can also help the district make adjustments to its implementation plan, leading to a more efficient and thoughtful transition. The data collected can be either quantitative or qualitative, should inform the intended goal, and should be information that can be collected at regular intervals, analyzed in a timely manner, and communicated to key stakeholders. If a district claims to make progress for any measurable action, it should be able to produce the data to back the claim. If the

evidence shows no progress as a result of an action it took to further standards implementation, then a district should reevaluate its strategy or actions taken in that step of implementation.

Measuring progress can be as simple as a yes/no question. For instance, with the example action, "developing partnerships with professional learning networks, researchers, and postsecondary institutions to support professional learning opportunities," the district could simply monitor whether partnerships with these entities exist, or track the number and depth of partnerships. The depth at which a district chooses to monitor progress may depend on capacity and available information. Measuring more detail, however, gives district leadership more information, enabling better decision-making and richer external collaboration efforts.

Finally, there are many ways to measure progress, and districts may find it useful to develop a rubric for each indicator that details how far along the district should be for each measurable action at various stages of implementation. (*This document does not include rubrics and is not intended to provide a continuum of implementation stages, but it can be used as a starting point in the development of rubrics by illustrating the areas in which a district should measure progress as well as possible measurable actions to advance implementation.*)

How might district leaders use this tool?

We envision several ways that educators might use this tool.

- **Crafting strategies**. Districts that are just beginning their implementation of the Next Generation Science Standards might use this document to help craft strategies and determine priorities for the work over the next few years. By addressing each of the indicators, and by applying some of the example actions, districts will be well on the way to crafting a comprehensive standards implementation strategy.
- **Recalibrating existing strategies**. For districts that have already started implementation of the Next Generation Science Standards, the indicators in this document can be a useful and important mechanism to check on status. Is there progress alongside each of the thirteen indicators? Which efforts underway are contributing most to that progress? What areas remain underdeveloped or are struggling? Can some of the example actions be applied to accelerate the pace of improvement?
- **Prioritizing science education**. For many districts, improving science outcomes for students is one of many goals the district faces, and science education leaders are constantly fighting for resources and attention from others within and outside of the system. This guide can be used to argue for support for science education, and to push for the often difficult conversations needed to drive change in school districts.
- **Understanding system issues associated with improving science outcomes**. For state-level leaders, this document can help illuminate some of the challenges districts are facing when crafting and implementing science improvement strategies. For classroom teachers and school-level leaders, this document provides a window to the issues that district-level leaders wrestle with.

NGSS District Implementation Indicators

Foundational Strategies	**Indicator #1: Equity and Access** All K–12 students have adequate opportunities to learn science.
	Indicator #2: Management The district carefully and intentionally manages implementation efforts.
Essential Strategies	**Indicator #3: Professional Learning for Teachers** High-quality professional learning opportunities for educators that lead to strong implementation of the NGSS in classrooms are readily available, and educators are consistently participating in these opportunities.
	Indicator #4: Professional Learning for School Leaders A high-quality professional learning system is created specifically for K–12 school leaders, and school leaders are consistently participating in these opportunities.
	Indicator #5: Instructional Materials Educators use high-quality instructional materials designed for NGSS learning and meet diverse student needs.
	Indicator #6: Assessments Assessments are designed and used to monitor student progress toward proficiency in the NGSS and schools are held accountable for science performance.
	Indicator #7: School Structures The district develops course scopes and sequences for implementation of NGSS courses.
	Indicator #8: Internal Communication Educators in the district have a common understanding of NGSS implementation.
	Indicator #9: Community Communication The community understands the shared goal of improving science and the transitions associated with implementation of new science standards.
	Indicator #10: Leadership Collaboration with Other Districts The district implementation leadership team collaborates with other districts to support NGSS implementation and shares solutions to common problems.
	Indicator #11: Educator Collaboration Within and Across Districts Educators collaborate with other educators within and across districts.
	Indicator #12: Partnerships with External Organizations The district partners with external organizations for implementation support.
Results	**Indicator #13: Student Outcomes** Student outcomes show evidence of three-dimensional science proficiency and engagement in science.

FOUNDATIONAL STRATEGIES

INDICATOR #1: EQUITY AND ACCESS

All K–12 students have adequate opportunities to learn science.

The Next Generation Science Standards are designed for all students, and an essential part of implementation is ensuring that all K—12 students are receiving adequate science instruction. For example, in elementary school, time for science is often lost because of emphasis placed on other content areas. Therefore, it is important for districts to allocate adequate instructional time specifically for science and highlight its importance to schools and the greater community. There are many examples of certain students being discouraged or prevented from taking higher-level courses in science despite adequate preparation, or of certain schools within a district receiving a disproportionate amount of the resources for teachers, facilities, or support. Attending to those issues are paramount if every child is to learn the science necessary for them to be successful in the future.

Examples of actions districts can take to make progress toward the indicator are:

- Allocating quality instructional time and resources for science for all K—12 students, including:
  - Ensuring appropriate science course offerings, including course prerequisites, in middle and high school so that all students have access to all standards; and
  - Appropriate science instructional time and classroom materials for all students in elementary school.
- Examining teacher needs to offer opportunities for all high school students to take courses in all of the NGSS disciplines; and
- Ensuring teachers who are working with particular groups of students—including not only students who are English Learners, have special needs, or who are not performing on grade level, but also gifted and talented students—provide those students with appropriate science instructional support.
- Using research- and practitioner-informed criteria to determine the qualities of instructional materials that can best support diverse students (e.g., the materials include authentic and meaningful learning scenarios for students from various backgrounds and experiences).
- Monitoring course enrollment patterns, grades, and assessment scores disaggregated by subgroup and adjusting strategies if gaps persist.

INDICATOR #2: MANAGEMENT

The district carefully and intentionally manages implementation efforts.

A district's transition to the NGSS is a considerable task involving years of work and the involvement of many people within and around the district. Essential to the transition is a central office leadership team coupled with site-based leadership, comprised of individuals who collectively have managerial authority to make changes such as setting budgets and hiring staff, expertise in science and science instruction, and the ability to communicate clearly with both internal and external stakeholders. Especially in a large district, establishing an inclusive, dedicated team to lead the NGSS implementation efforts and adjust them accordingly along the way can help the process be more effective in areas such as professional learning, instructional materials evaluation and selection, and communications. The leadership team should include members from both the district and school levels, education professionals who are engaged in implementation efforts, and a representative from an external partnership (*e.g.*, a science center or STEM coalition).

The team needs a clearly documented strategy that describes goals for science instruction and student learning and explains how the district will reach those goals. The strategy should ensure adequate time, funding, and resources are available for sustainable implementation. Careful monitoring of the work is equally important, as new information and progress will inevitably drive changes in strategy and plans. Districts need to collect data about ongoing implementation, and have a mechanism to analyze and learn from that data so that the strategy can be improved as implementation takes place.

Examples of actions districts can take to make progress toward the indicator are:

- Establishing a science leadership team that collectively:
  - Represents the district office, schools, educators, administrators, and multiple content areas (e.g., science certainly, but also mathematics and English language arts);
  - Has expertise in the previous science standards, the NGSS, instructional materials, assessments, communications, budget, policy, equity and access, and professional learning;
  - Can communicate effectively with stakeholders inside and outside of the district.
  - Can liaise with other districts and other education networks to share information;
  - Has authority to make district-level policy decisions about implementation; and
  - Has experience with and understanding of managing systemic change.
- Creating and publicizing science strategic plans with timelines and budgets for the enactment of the NGSS. Plans should have clear annual goals and address:
  - Educator and school leader professional learning;
  - Instructional materials selection and refurbishment;
  - Development, analysis, and implementation timeline of assessments;
  - Internal and external communications content and mechanisms;
  - Collaboration with external partners, other districts, and between schools;
  - School structures, including opportunities for all students to learn science; and
  - Time, funding and resources for sustainable implementation.
- Establishing policies, systems, and routines that can monitor progress on science strategic plans and implementation efforts and adjusting steps based on feedback and evidence.

INDICATOR #3: PROFESSIONAL LEARNING FOR TEACHERS

High-quality professional learning opportunities for educators that lead to strong implementation of the Next Generation Science Standards in classrooms are readily available, and educators are consistently participating in these opportunities.

To successfully implement any new standards, teachers at all levels will need to learn a great deal. Due to the increased complexity of the standards, many teachers will need to learn more science content knowledge. Most teachers will need to learn deeply about three-dimensional learning, how to foster it within a classroom, and time to practice teaching three-dimensional activities and learn from their efforts. Indeed, a hallmark of a great teacher is constant improvement, always learning more and working to incorporate that knowledge to deliver stronger results for students.

These learning opportunities for educators should be developed in connection to the learning opportunities for school leaders, if possible.

Examples of actions districts can take to make progress toward the indicator are:

- Identifying which grades, courses, and teachers should receive formal professional development support in which years in conjunction with the district's K—12 science improvement strategy. Over the course of the NGSS implementation plan, all teachers will need considerable professional development.
- Reviewing teacher contracts, district policies, school routines, and school schedules to maximize opportunities for teacher learning in conjunction with school and district leadership, including using already available structures such as collaborative teams for professional learning.
- Developing the structure and plan for a continuous professional learning system about teaching the NGSS for all K—12 science educators with the goal of providing about 100 hours per teacher per year. Such a plan should build on what we know about quality professional learning, such as:
  - Be differentiated by content, grade-level, and experience level of the teacher;
  - Provide multiple, coherent learning opportunities for educators throughout the school year;
  - Includes educators in the planning process;
  - Builds in feedback mechanisms to allow for improvements and adjustments to the professional learning system;
  - Focuses on developing the content-knowledge of all involved;
  - Creates opportunities for within school and across school collaboration.[2]
- Monitoring how many science educators are participating in which professional learning opportunities.
- Developing or adopting criteria used to select or create appropriate professional learning opportunities.
- Creating and executing a plan to recruit and train K—12 science professional development leaders and facilitators from within the district.

[2] See Suzanne M. Wilson's 2013 Report, *Professional Development for Science Teachers,* for more information. http://science.sciencemag.org/content/340/6130/310

INDICATOR #4: PROFESSIONAL LEARNING FOR SCHOOL LEADERS

A high-quality professional learning system is created specifically for K–12 school leaders, and school leaders are consistently participating in these opportunities.

School leaders must have a comprehensive understanding of how the Next Generation Science Standards are similar and different from the district's previous science standards, and of how the various components of the district's science strategy can work to increase science learning for students. For most school leaders—deans, assistant principals, department chairpersons, principals, curriculum coordinators, instructional coaches, and the like—this will require access to continuous professional learning opportunities that allows them to understand and increase their comfort with science as a discipline, experience and engage with the instructional changes required by the new standards, and clearly understand their role in implementing the district's science strategy, including observing science classrooms, allocating resources, and working with external partners.

Examples of actions districts can take to make progress toward the indicator are:

- Developing the structure for a continuous, multi-year professional learning system for K–12 school leaders that:
  - Is accessible to the full range of school leaders in the district, including experienced leaders, newer leaders, leaders from different school levels, and leaders in different roles;
  - Provides multiple learning opportunities throughout the school year; and
  - Includes feedback mechanisms to allow for improvements and adjustments to the professional learning system, including what is working well and how to improve.
- Articulating the roles and decisions for school leaders in conjunction with the district's science strategy, including:
  - The aspects of science teaching and learning that are decided at the classroom (e.g., lesson plans), school (e.g., benchmark assessment tasks), and district level (e.g., instructional materials, course sequences);
  - The roles of external partners, so that school leaders know and understand how to work with partners collaboratively to increase science outcomes for students;
  - The school level resources that should focus on science instructional improvement; and
  - The classroom, school, and district data that should be used for structuring teacher conversations and for managing improvement.
- Ensuring school leaders understand and support instructional changes by:
  - Discussing and dissecting examples of three-dimensional learning;
  - Engaging in active reflection and analysis to understand the shifts of the Next Generation Science Standards;
  - Illustrating what the Next Generation Science Standards look like in the classroom, therefore increasing an administrator's confidence to observe science classrooms and discuss content;
  - Modeling how to structure teacher conversations and feedback around student and school-level data about science performance; and
  - Providing examples of ways school leaders can support their teachers and students (*e.g.*, providing time for collaboration, grade-level team meetings, and/or professional learning communities).
- Monitoring the participation and quality of each professional learning opportunity.

INDICATOR #5: INSTRUCTIONAL MATERIALS

Educators use high-quality instructional materials designed for Next Generation Science Standards learning and meet diverse student needs.

Science educators need access to robust tools to help organize course material, plan units, and design daily lessons. With NGSS, robust instructional materials are even more important, as the changes required by three-dimensional learning are significantly different than previous instructional practice and not particularly well supported by the most common textbooks. Robust instructional materials are educative for both teachers and students—so as students learn science, teachers understand better the disciplinary core ideas, scientific practices, and cross-cutting concepts. Ultimately, for the vast majority of teachers and districts, writing your own instructional materials will not be nearly as feasible as partnering or purchasing well-designed ones.

During the transition to the NGSS, however, while there's a lack of fully aligned NGSS material, it is important to support educators who often must modify existing materials in order to support this vision that all students can succeed in science and be ready for college, careers, and citizenship upon completion of high school.

Examples of actions districts can take to make progress toward the indicator are:

- Creating an inventory of existing science instructional materials to identify which tools are currently used in which ways in which schools.
- Articulating beliefs and policies around procurement that value the purchase and usage of aligned, high-quality materials, balancing the needs for system-wide coherence with teacher and school autonomy.
- Developing transition plans to accommodate immediate needs for instructional materials while materials designed for the NGSS materials may be difficult to find or are still in the development process. This may mean focusing on particular aspects of the NGSS initially, particular pedagogies (such as writing), particular routines (*e.g.*, grade level meetings) or on particular units instead of whole courses until better-quality materials are available.
- Providing and using objective criteria to evaluate instructional materials for alignment with the NGSS, including using research- and practitioner-informed criteria to determine the qualities of instructional materials that can best support diverse students.
- Training educators involved in the instructional materials adoption process to evaluate existing and new instructional materials for alignment with the NGSS.
- Developing procurement strategies, funding plans, communications plans, and/or platforms to ensure educators have access to instructional materials designed for the NGSS.
- Adopting or recommending instructional materials that:
    - Focus student learning on explaining engaging phenomena or solving problems;
    - Explicitly include supports that can engage diverse learners and are accessible to all students; and
    - Build on existing effective classroom strategies for engaging diverse student groups.
- Evaluating and addressing the laboratory and refurbishment needs of selected materials.
- Connecting instructional material support with the district's professional learning system.
- Evaluating outcomes of students (*i.e.*, end-of-course assessments, common exams, student work) to determine whether materials are leading to effective instruction in the classroom.

INDICATOR #6: ASSESSMENTS

Assessments are designed and used to monitor student progress toward proficiency in the NGSS, and schools are held accountable for science performance.

All assessments should be used to improve outcomes for students. The NGSS require that educators and students take a different approach to learning and meet more rigorous targets than previously required by former state standards. Assessments provide critical information to stakeholders—primarily students, teachers, and parents—within a district about how implementation activities are supporting all students in meeting these new learning goals, provided that educators are able to interpret and use the feedback from assessments effectively. Procuring robust assessments is important; it is equally or more important that mechanisms and routines be established so that educators can learn from the resulting data to improve their craft. Districts should consider a using data from a wide range of assessments for their improvement and transition efforts—from teacher-created quizzes to end-of-course exams to the Federally-required grade-band science testing. Assessments should be designed for the standards that are being implemented in classrooms, and they should serve a clear and specific purpose.

Assessments designed for three-dimensional standards are themselves a work in progress, and it is unlikely that high-quality, fully aligned science assessments will be readily and commercially available in the very near future. Districts will need to decide how best to contend with this reality, including using varied assessments together to provide feedback on implementation progress; building continuous improvement plans into all assessment development efforts; and exploring additional mechanisms to signal the importance of science learning for all students, such as the inclusion of science as part of the district's accountability system (in test-based or non-test-based ways).

Examples of actions districts can take to make progress toward the indicator are:

- Aspire and work towards the use of an assessment and monitoring system designed to measure student proficiency in NGSS performance expectations that:
  - Is comprised of assessments that reflect the major shifts and innovations of the NGSS (*e.g.,* phenomenon/problem-driven, three-dimensional learning, inclusion of engineering) and are intentionally designed for a variety of different purposes;
  - Includes a variety of opportunities for students to demonstrate their competencies, including formative and summative classroom-embedded performance tasks (*e.g.,* written, oral, interactive) as well as larger-scale assessment opportunities;
  - Uses student work (including from classroom tasks) to guide the development, evaluation, and interpretation of high-quality and aligned assessment tasks at all levels of the assessment system within the district;
  - Includes time and mechanisms so teachers and school leaders can regularly analyze and learn from the assessment data and student work to improve their craft and improve implementation efforts (*e.g.,* instructional materials adoption);
  - Is appropriately coherent so that meaningful comparisons can be made across classes, courses, and schools; and
  - Produces sufficient information that can be used together to provide stakeholders with a complete and actionable view of student, classroom, and school progress toward the NGSS for all students.

- Making science part of the district accountability framework to reinforce the need for high-quality, three-dimensional science instruction in every grade.
- Intentionally articulating to all stakeholders the particular purpose and intended use of each assessment related to monitoring and reporting student and program progress toward the NGSS, paying particular attention to ensure that students and educators are not overburdened.
- Supporting educators with professional learning opportunities to ensure educators:
    - Can develop formative and summative assessments as necessary and integrate them into instruction; and
    - Know how to use assessment data to monitor and inform instructional activities intended to help all students meet learning goals, including students with diverse backgrounds and needs.
- Reviewing school and district performance on common assessments and using the results to make decisions and improvements in resource allocation and/or policies, paying particular attention to disaggregated data by sub-group in order to address equity concerns.
- Consistently integrating the analysis of student work samples into assessment data evaluation systems.
- Facilitating partnerships with other schools or districts for technical and strategic support and to share assessment resources (*e.g.*, item task bank, common tasks, shared professional development opportunities).
- Developing and implementing district assessment systems that value and intentionally support continuous improvement, including the improvement over time of assessments themselves.

INDICATOR #7: SCHOOL STRUCTURES

The district develops course scopes and sequences for implementation of Next Generation Science Standards courses.

The middle and high school standards in the Next Generation Science Standards are grade-banded, and while some states may have adopted or recommended specific course models, districts need to decide how to organize the standards into courses. The courses need to be designed at levels of complexity that are developmentally appropriate for students to build knowledge both within a course and over the sequence of courses.

For all courses, it should be clear which students have access to those courses at what times, and how prerequisite knowledge and skills will be determined. When creating such pathways, districts need to remember the equity concerns of Indicator #1.

Examples of actions districts can take to make progress toward the indicator are:

- Making decisions about the scope and sequence of science courses in middle and high school that may involve:
  - Developing middle or high school course pathways that align with the Next Generation Science Standards and are designed with coherent progressions of student knowledge (*e.g.*, integrated NGSS course pathways that are not discipline specific);
  - Aligning secondary course offerings with district and state graduation requirements and postsecondary opportunities at two- and four-year institutions;
  - Coordinating the placement of standards into courses with mathematics and English/language arts;
  - Examining teacher needs to offer opportunities for all high school students to take courses in all of the NGSS disciplines; and
  - Providing a larger scope of science learning opportunities through elective science, technology, engineering, and mathematics (STEM) or Career Technical Education (CTE) courses, such as Health Sciences or Manufacturing Systems.
- Creating a plan for the transition to a new course scope and sequence.
- Tracking course enrollment, grade, and completion outcomes by subgroup to evaluate district and student needs.

INDICATOR #8: INTERNAL COMMUNICATION

Educators in the district have a common understanding of Next Generation Science Standards implementation.

Districts are organizationally situated between state departments of education and schools. Creating a common understanding of the transitions associated with implementing the Next Generation Science Standards among these three levels is essential—leaders in all organizations need to know how their work can support implementation. Districts should ensure that they are sharing timelines and transition plans with their schools and that there is a channel of communication from the schools back to the districts. During the planning and execution of the transition, districts should be regularly and routinely seeking input from school leaders and educators.

Examples of actions districts can take to make progress toward the indicator are:

- Crafting a strategic plan to improve science instruction district wide, and sharing that plan widely.
- Gathering feedback from school leaders and educators to inform:
  - The development of transition plans; and
  - The progress and effectiveness of ongoing transitions.
- Communicating transition plans with school leaders and educators, including:
  - The multi-year timeline for implementation;
  - Changes to assessment plans and structures;
  - Changes in instructional materials;
  - Changes in course scope and sequence for science courses;
  - Changes in collaboration time and school culture; and
  - Professional learning opportunities for school leaders and educators.

INDICATOR #9: COMMUNITY COMMUNICATION

The community understands the shared goal of improving science education and the transitions associated with implementation of new science standards.

Improving science learning by implementing new standards requires substantial instructional shifts, and the district should make ongoing plans to communicate those shifts and what they mean for students, teachers, and classrooms to the surrounding community (*e.g.,* families, parent groups, businesses, postsecondary institutions, or informal science educators). Schools are situated within communities, and when large changes are anticipated, it is critical to ensure stakeholders have an opportunity to be engaged and provide feedback as plans develop. When community members are included in those conversations, they can feel more involved in the science education efforts occurring and are more likely to be partners in advancing these efforts. Communication should include logistical issues like assessment timelines, but also information about what students will know and be able to do and how this improved science education will lead to better student outcomes and college- and career-readiness. Communication should be ongoing, direct, and in multiple directions—and remember that explaining without listening is a recipe for frustration.

Examples of actions districts can take to make progress toward the indicator are:

- Providing the community, including the students themselves, with regular, clear communication about the transition to the NGSS, including:
  - The multi-year timeline for implementation;
  - Changes that will happen in the school during implementation, including how science classrooms and student work might look different during transitional phases and after full implementation;
  - A description of any mistakes that have been made during implementation, with plans to rectify them; and
  - Changes to assessment plans and structures.
- Providing the community with information about the goals of the Next Generation Science Standards, including:
  - What students will know and be able to do at the end of each grade or grade band;
  - How improved science for *all* students with increased instructional support and classroom time will lead to better student outcomes for all students;
  - How students will learn science differently and how this will prepare them for their next steps;
  - How communities can support local implementation efforts (*e.g.*, coordinating field trips to local science museums or other informal education centers); and
  - The benefits to students of improved science education and the STEM opportunities available.
- Structuring community engagement to include opportunities for local stakeholders to provide feedback to inform refinement of implementation transition plans (*e.g.*, participating in a dialogue at a parent and student science night).

INDICATOR #10: LEADERSHIP COLLABORATION WITH OTHER DISTRICTS

The district implementation leadership team collaborates with other districts to support NGSS implementation and shares solutions to common problems.

While districts may implement the NGSS under different conditions and contexts, opportunities to share expertise, strategies, materials developed, and results achieved with other districts can be incredibly valuable and can enhance the capacity of a district. Joining or establishing a network of districts or schools facing similar challenges can provide leadership teams with opportunities to discuss solutions and strategies.

Examples of actions districts can take to make progress toward the indicator are:

- Forming collaborations with other districts to enhance district capacity by sharing resources for implementation (*e.g.*, communications materials, professional development workshops).
- Creating opportunities throughout the year that allow for district-level education professionals to collaborate with other district professionals to support NGSS implementation (e.g., working together to evaluate instructional materials, visiting classrooms, analyzing assessment data).
- Leveraging joint funds to secure better pricing on teacher tools, classroom equipment, or technical assistance.

INDICATOR #11: EDUCATOR COLLABORATION WITHIN AND ACROSS DISTRICTS

Educators collaborate with other educators within and across districts.

There exists incredible capacity for science teaching and learning within most districts. Unfortunately, most of this capacity resides within the practices of individual teachers who don't have the mechanisms or avenues to share this knowledge with others. By creating networks of teachers, districts can tap into this capacity and accelerate their NGSS implementation efforts.

Establishing a network for educators to collaborate can provide opportunities for educators to share ideas about classroom strategies, successes and challenges, resources, assessments, and plans. Such networks are easier to start and sustain when there are common purposes and tools involved, such as enacting the same instructional materials or using the same end-of-course exams.

Examples of actions districts can take to make progress toward the indicator are:

- Expecting or requiring that schools provide time on a continual basis throughout the school year for educators across schools to collaborate with:
  - Other science educators of the same grade level (*e.g.*, professional learning communities, grade-level teams, high school departments);
  - Science educators in different grade levels for vertical planning and coordination of instruction; and
  - Educators from other content areas and initiatives, such as mathematics and English/language arts for coordination of instruction.
- Developing a mailing list or online platform for educators to virtually collaborate.

INDICATOR #12: PARTNERSHIPS WITH EXTERNAL ORGANIZATIONS

The district partners with external organizations for implementation support.

Many external organizations can help a district's science improvement efforts. Establishing a network with external partners can secure community support, expertise, and financial assistance for ongoing education needs. University departments generally have extensive scientific expertise, and often have outreach resources that can help educate students, parents, and teachers. Businesses often have a vested interest in advancing scientific understanding—their products come from the discoveries of scientists—and can be allies in outreach and development. Local museums and after school programs provide content support, engaging activities for students and families, and might be able to help with professional development. External partners can also help develop common language and understanding of the NGSS in the community and expose students to potential careers.

It is important to ensure that the purpose of any partnership furthers the goals of the district rather than adjusting the goals of the district to fit the mission of partner organization(s). Since the district has primary responsibility for educating students in science, the network should be configured to push for coherence and alignment of efforts with the district leading the work.

Examples of actions districts can take to make progress toward the indicator are:

- Creating opportunities to form partnerships that support the district's goals by collaborating with non-governmental organizations such as science centers, museums, or local businesses for community science-related events and resource sharing.
- Developing partnerships with researchers, and postsecondary institutions to support professional learning opportunities.
- Developing a mailing list or online platform to collaborate and/or creating a meeting structure for educators to physically meet with external partners.

RESULTS

INDICATOR #13: STUDENT OUTCOMES

Student outcomes show evidence of three-dimensional science proficiency and engagement in science.

While the previous indicators address a variety of district-level inputs, a district should also look at student outputs to measure long-term success within programs. From the beginning of the implementation process, it is important to monitor a variety of student outputs to use as baselines for comparisons against later years. In particular, districts should use disaggregated data by subgroup when monitoring student proficiency and engagement in science in order to ensure all students are successfully receiving science instruction, especially those subgroups who have been traditionally underserved in science classrooms. The following metrics of student performance and engagement could help illustrate successful implementation of the NGSS several years into the process.

Examples of student metrics districts can measure to help monitor this indicator are:

- District assessment scores disaggregated by subgroup, allowing the district to monitor access and equity of science instruction in each grade band.
- Enrollment of students in advanced level science courses (e.g., Chemistry 2, Physics 2), Advanced Placement (AP) or International Baccalaureate (IB) science courses, and dual enrollment in postsecondary institutions in STEM courses.
- End-of-quarter or semester exam scores.
- Increase in numbers of science capstone or research projects.
- Survey responses from students about science courses, addressing topics such as:
  - Whether the student finds science courses interesting and engaging;
  - Whether the student might pursue a STEM career; and
  - Whether the student participates in extracurricular STEM activities (e.g., clubs, internships, work-based learning).
- Students taking more than the minimum number of science courses required for high school graduation, including STEM and CTE courses, which could be measured by:
  - Student course completion;
  - Students gaining certificates or licenses; and
  - Grades in STEM courses disaggregated by subgroup.

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