

## New Jersey STEM Pathways Network Supplementary Survey Brief

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### Overview

To supplement data presented in the STEM Data Dashboard with data that is not currently collected in the state and/or not publicly, the John J. Heldrich Center for Workforce Development at Rutgers University, State University of New Jersey, fielded an online survey to all New Jersey school districts. The Heldrich Center developed the survey protocol through feedback from NJSPN leadership and from a feedback survey of NJSPN membership. The feedback survey solicited input on what additional data could be collected through a supplementary survey. The most frequent metrics that were suggested included the following:

1. Existence and details of extracurricular STEM programs and activities
2. Existence and details of internship programs and connection to local businesses
3. Existence and details of STEM professional development
4. Existence and information on integration of disciplines

### Methods

The Heldrich Center developed a survey protocol and uploaded the final survey questions to Qualtrics. Researchers collected contact information from the publicly available contact list of New Jersey school districts. The contact list contains information on 693 total school districts but nine school districts are missing contact information due to non-operational status or missing data. The survey was sent to 684 school districts and 129 fully or partially completed the survey resulting in a response rate of 18.9 percent. Due to incorrect or out of date email addresses, 23 emails bounced and researchers were able to update contact information for seven school districts and resend the survey. To increase the response rate researchers randomly selected and called 55 school districts that had not completed the survey to encourage their response and to confirm the contact information was correct.

## Results

The survey was completed fully or partially by 129 respondents. Survey respondents were asked if their school district includes 9<sup>th</sup> - 12<sup>th</sup> grades. 57 percent indicated that their school district included 9<sup>th</sup> - 12<sup>th</sup> grades. See Figure 1.

Figure 1: Does your school district include grades 9-12? (n=129)

|              | Count | Percent |
|--------------|-------|---------|
| <b>Yes</b>   | 73    | 57%     |
| <b>No</b>    | 56    | 43%     |
| <b>Total</b> | 129   |         |

### STEM Work-Based Learning Experiences

This section of the survey focused on the school district's relationship with STEM work-based learning experiences. These questions were only asked of school districts that indicated that their school district includes 9<sup>th</sup> - 12<sup>th</sup> grades. Most (52%) school districts that include grades 9<sup>th</sup> - 12<sup>th</sup> have relationships with local employers for connecting students to STEM work-based learning and experiences. See Figure 2.

Figure 2: Does your school district have relationships with local employers for connecting students to STEM work-based learning and experiences (e.g. internships, job shadowing)? (n=73)

|              | Count | Percent |
|--------------|-------|---------|
| <b>Yes</b>   | 38    | 52%     |
| <b>No</b>    | 35    | 48%     |
| <b>Total</b> | 73    |         |

There is not a strong majority of survey respondents who agreed that their school district is doing a good job of connecting students to STEM work-based experiences. 56% strongly disagree (7%), somewhat disagree (20%), or neither agree nor disagree (29%) that their school district is doing a good job of connecting students to STEM work-based experiences. 45% strongly agree (18%) or somewhat agree (27%) that they are doing a good job of connecting students to STEM work-based experiences. See Figure 3.

Figure 3: Please respond to the following statement with the degree to which you agree. My school district is doing a good job connecting students to STEM work-based experiences. (n=73)

|                                   | Count | Percent |
|-----------------------------------|-------|---------|
| <b>Strongly agree</b>             | 13    | 18%     |
| <b>Somewhat agree</b>             | 20    | 27%     |
| <b>Neither agree nor disagree</b> | 21    | 29%     |
| <b>Somewhat disagree</b>          | 14    | 20%     |
| <b>Strongly disagree</b>          | 5     | 7%      |
| <b>Total</b>                      | 73    |         |

### Computer Science Classes

At the beginning of 2018, the New Jersey legislature passed a law that requires school districts to offer a course in computer science in grades 9-12. The Murphy Administration also implemented a "Computer Science for All" Initiative in Fall of 2018, which includes \$2 million in grants for public high schools to support computer science courses and teacher professional development. This section of the survey asked survey respondents how their school district is responding to the new law. These questions were asked only to school districts that indicated their district includes 9<sup>th</sup> - 12<sup>th</sup> grades. A majority (72%) of survey respondents indicated that they currently have computer science classes. See Figure 4.

Figure 4: Please describe how your school district is responding to the new law and increased emphasis on computer science. (Open Ended; n=62)

|   | Count | Percent |
|---|-------|---------|
| <b>Currently Offer Computer Science (including AP Courses)</b>                              | 45    | 72%     |
| <b>Increasing access to computer science for middle school</b>                              | 11    | 18%     |
| <b>Proactively working to add additional Computer Science related courses and electives</b> | 9     | 15%     |
| <b>Offer Computer Science related course at the elementary level</b>                        | 5     | 8%      |
| <b>Offer Robotics Classes or Clubs</b>  | 4     | 7%      |
| <b>Will offer Computer Science because of new law</b>                                       | 4     | 7%      |
| <b>Will offer Computer Science Electives because of the new law</b>                         | 4     | 7%      |
| <b>Will offer Computer Science classes at middle school level because of new law</b>        | 3     | 5%      |
| <b>Integrating Computer Science Into Other Courses</b>                                      | 3     | 5%      |
| <b>Partnering with other organizations to offer computer science courses</b>                | 3     | 5%      |

Almost 50 percent strongly agree (21%) or somewhat agree (27%) that their district faces challenges in implementing the new requirements. However, a majority of respondents indicated that they strongly disagree (19%) or somewhat disagree (18%) or did not agree or disagree (15%) with this statement.

Figure 5: Please respond to the following statement with the degree to which you agree. Our school district faces challenges in implementing these new requirements. (n=67)

|                                   | Count | Percent |
|-----------------------------------|-------|---------|
| <b>Strongly agree</b>             | 14    | 21%     |
| <b>Somewhat agree</b>             | 18    | 27%     |
| <b>Neither agree nor disagree</b> | 10    | 15%     |
| <b>Somewhat disagree</b>          | 12    | 18%     |
| <b>Strongly disagree</b>          | 13    | 19%     |
| <b>Total</b>                      | 67    |         |

Many (75%) survey respondents indicated that their school district needed funding to make the computer science requirements easier to implement. Other specific supports included additional teachers (25%), facilities (22%), and professional development (20%). See Figure 6.

Figure 6: Please describe any specific supports (e.g. technical assistance, funding) that would make implementation easier. (Open Ended; n=51)

|   | Count | Percent |
|---|-------|---------|
| <b>Funding</b>  | 38    | 75%     |
| <b>More Teachers (who are trained in this area)</b>   | 13    | 25%     |
| <b>Facilities (space, hardware, technology, course materials)</b>   | 11    | 22%     |
| <b>Professional Development (varied for experience levels, free training from business)</b>               | 10    | 20%     |
| <b>Certification Process (relax requirements, develop online cert program)</b>                            | 5     | 10%     |
| <b>Access to curriculum (model curriculum, what works for students with special needs)</b>                | 4     | 8%      |
| <b>Communication of requirements (more clarity from state and more time to implement)</b>                 | 3     | 6%      |
| <b>Technical assistance</b>   | 2     | 4%      |
| <b>Funding to offset costs of current strategies (online platform for teachers, project lead the way)</b> | 2     | 4%      |

### STEM Outside the Classroom

The next section asked survey respondents about STEM outside of the classroom and focused on questions about STEM extracurricular opportunities, clubs, and activities. These questions were asked to all school districts. Many school districts (87%) reported that their school districts currently offer STEM extracurricular programs and clubs. See Figure 7. This is similar when the result is broken down by type of school; almost all districts that include 9<sup>th</sup> - 12 grades (93%) reported that their school district offers STEM extracurricular programs or clubs and a majority (80%) of districts that do not include grades 9 - 12 reported that their school district offers STEM extracurricular programs or clubs.

Figure 7: Does your school district currently offer STEM extracurricular programs or clubs? (n=122)

|              | Count | Percent |
|--------------|-------|---------|
| <b>Yes</b>   | 106   | 87%     |
| <b>No</b>    | 16    | 13%     |
| <b>Total</b> | 122   |         |

In addition, most school districts (74%) indicated that that their school district hosted or supported STEM related events, activities or competitions in the past two years. See Figure 8. This is similar when the result is broken down by type of school; a majority of districts that include 9<sup>th</sup> - 12 grades (82%) reported that their school district sponsored STEM events or competitions and a majority (64%) of districts that do not include grades 9 - 12 reported that their school district sponsored STEM events or competitions.

Figure 8: Has your school district hosted or supported STEM related events, activities, or competitions in the last two years? (n=122)

|              | Count | Percent |
|--------------|-------|---------|
| <b>Yes</b>   | 90    | 74%     |
| <b>No</b>    | 32    | 26%     |
| <b>Total</b> | 122   |         |

Survey respondents were asked to select all STEM extracurricular related programs, clubs, or events currently offered. A majority of respondents indicated that they offer Robotics (62%), STEM clubs (58%), Science Clubs (55%), and Math Clubs (53%). See Figure 9. School districts that include grades 9 - 12 were more likely to report that their school district offers specific programs, clubs, or events; however, there are some exceptions such as more school districts that do not include grades 9 - 12 reported their district offers STEM clubs (64%) compared to school districts that do have grades 9 -12 (58%) and more school districts that do not include grades 9 - 12 reported their district offers coding clubs (44%) compared to school districts that do have grades 9 -12 (38%). See Figure 9.

Figure 9: Please select from the following list STEM extracurricular programs, clubs, or events currently offered in your district. (n=110)

|                          | Overall Count | Overall Percent | Includes Grades 9 - 12 | Does not Include Grades 9 - 12 |
|--------------------------|---------------|-----------------|------------------------|--------------------------------|
| <b>STEM Clubs</b>        | 64            | 58%             | 58%                    | 64%                            |
| <b>Math Clubs</b>        | 58            | 53%             | 63%                    | 41%                            |
| <b>Science Clubs</b>     | 60            | 55%             | 70%                    | 35%                            |
| <b>Engineering Clubs</b> | 33            | 30%             | 39%                    | 17%                            |
| <b>Technology Clubs</b>  | 42            | 38%             | 45%                    | 30%                            |
| <b>Robotic Clubs</b>     | 68            | 62%             | 80%                    | 41%                            |
| <b>Coding Clubs</b>      | 43            | 39%             | 38%                    | 44%                            |
| <b>Hackathons</b>        | 7             | 6%              | 11%                    | 0%                             |
| <b>STEM Competitions</b> | 42            | 38%             | 48%                    | 26%                            |

Other response (Open Ended)

|  |
|--|
| Biology Code of Life   |
| Green Fair   |
| Game Club  |
| Some students in Tech club have attended Hackathons  |
| SHPE- society Professional Hispanic Engineers JR Chapter   |
| Medical Explorers Club   |
| Invention Convention   |
| Evening Math Family Events   |
| students have steam class once a week  |
| Science Fairs  |
| Science Olympiad   |
| Saturday Programs thru Fairleigh Dickinson University  |
| Science Research Club/Wacksman Student Scholars Program  |
| Art Clubs/ Painted Words-Literary Magazine   |
| Evening Science Family Events  |
| TSA  |
| Saturday Programs at Rutgers SMART   |
| Hour of Code (District Wide)   |
| Engineering Design Challenges  |
| Math nights  |
| Title 1 Art Integration / STEM events  |
| First Lego League Robotics, Weather Club, Solar Cars, 3-D Printing, CAD, Website Design, Video Game Programming, Hour of Code, Bridge Building |
| Family Stem Night  |
| STEAM Carnival   |

|  |
|--|
| STEM Enrichment Classes After School   |
| Young Innovators Club  |
| STEM instruction   |
| Science Symposium  |
| Educational Technology Community Night   |
| STEAM Course   |
| Video Editing  |
| Raider Academics-Science Club/Bio- Waxman Program  |
| Skills USA   |
| Environmental Clubs  |
| Makerspace   |
| Evening STEAM Family Events  |
| Robotics for GT students   |
| Agriculture  |
| Makerspace   |
| solar cars   |
| PI Day   |
| Cybersecurity  |
| Environmental Club   |
| Women in STEM summit   |
| Enrichment class 3x per week   |
| Although we do not formally offer Tech or Coding clubs we do offer opportunities for students during the school day. |
| 3D Printing Club   |

In addition, a majority (71%) of survey respondents strongly agree (31%) or somewhat agree (40%) that their school district is doing a good job of offering and supporting STEM extracurricular activities and events. See Figure 10. This remains similar when broken down by school district type.

Figure 10: *Please respond to the following statement with the degree to which you agree. Our school district is doing a good job of offering and supporting STEM extracurricular activities and events. (n=119)*

|                                   | Count | Percent |
|-----------------------------------|-------|---------|
| <b>Strongly agree</b>             | 37    | 31%     |
| <b>Somewhat agree</b>             | 48    | 40%     |
| <b>Neither agree nor disagree</b> | 16    | 14%     |
| <b>Somewhat disagree</b>          | 12    | 10%     |
| <b>Strongly disagree</b>          | 6     | 5%      |
| <b>Total</b>                      | 119   |         |

### STEM Professional Development Opportunities

The next section asked survey respondents about STEM professional development opportunities, information on courses offered, and encouragement of STEM specific professional development. These questions were asked of all school districts. A majority of survey respondents reported that their school district offered STEM-related teacher professional development in the past two years (75%). See Figure 11. This remains similar when broken down by school district type.

Figure 11: Has your school district offered STEM-related teacher professional development in the past two years? (n=119)

|              | Count | Percent |
|--------------|-------|---------|
| <b>Yes</b>   | 89    | 75%     |
| <b>No</b>    | 30    | 25%     |
| <b>Total</b> | 119   |         |

The most common professional development courses included course related to integrating disciplines and STEAM (32%) and Coding related courses (25%). See Figure 12 for full list of professional development courses mentioned.

Figure 12: Most Common Professional Development Courses Mentioned (Open Ended; n=75)

|  | Count | Percent |
|--|-------|---------|
| <b>Professional Development Courses Related to Integrating Disciplines and STEAM</b> | 24    | 32%     |
| <b>Coding Professional Development</b>   | 19    | 25%     |
| <b>Next Generation Science Standards Professional Development</b>                    | 12    | 16%     |
| <b>Maker Space Professional Development</b>  | 11    | 15%     |
| <b>Robotics Professional Development</b>   | 9     | 12%     |
| <b>Project Lead the Way Professional Development</b>                                 | 8     | 11%     |
| <b>Google Professional Development</b>   | 8     | 11%     |
| <b>Principles of Engineering Professional Development</b>                            | 6     | 8%      |
| <b>3D Printing Professional Development</b>  | 6     | 8%      |
| <b>Project Based Learning</b>  | 4     | 5%      |
| <b>Math Professional Development</b>   | 3     | 4%      |
| <b>Lego EV3 Mindstorm</b>  | 3     | 4%      |
| <b>Biomedical Science Professional Development</b>                                   | 3     | 4%      |
| <b>Liberty Science Center Opportunities in Professional Development</b>              | 3     | 4%      |
| <b>Virtual Reality Professional Development</b>                                      | 3     | 4%      |

Almost all (96%) survey respondents indicated that their school district encourages teachers to participate in STEM professional development. See Figure 13. This remains similar when broken down by school district type.

Figure 13: Does your school district encourage teachers to participate in professional development related to STEM? (n=111)

|              | Count | Percent |
|--------------|-------|---------|
| <b>Yes</b>   | 106   | 96%     |
| <b>No</b>    | 5     | 4%      |
| <b>Total</b> | 111   |         |

A majority of school districts (60%) reported that they partner with any organizations to support STEM-related teacher professional development. See Figure 14. This remains similar when broken down by school district type.

Figure 14: Does your school district partner with any organizations to support STEM-related teacher professional development (e.g. businesses, non-profits, faith-based organizations, libraries)? (n=111)

|              | Count | Percent |
|--------------|-------|---------|
| <b>Yes</b>   | 67    | 60%     |
| <b>No</b>    | 44    | 40%     |
| <b>Total</b> | 111   |         |

Almost all (98%) survey respondents indicated that their school district supports teachers who wish to pursue STEM-related professional development courses in addition to what is required. See Figure 15. This remains similar when broken down by school district type.

Figure 15: Does your school district support teachers who wish to pursue STEM-related professional development courses in addition to what is required? (n=112)

|              | Count | Percent |
|--------------|-------|---------|
| <b>Yes</b>   | 110   | 98%     |
| <b>No</b>    | 2     | 2%      |
| <b>Total</b> | 112   |         |

A majority of school districts strongly agree (43%) or somewhat agree (45%) that their school district is currently working on increasing teacher access to quality professional development programs related to STEM. See Figure 16. This remains similar when broken down by school district type.

Figure 16: *Please respond to the following statement with the degree to which you agree. Our school district is currently working on increasing teacher access to quality professional development programs related to STEM.* (n= 112)

|                                   | Count | Percent |
|-----------------------------------|-------|---------|
| <b>Strongly agree</b>             | 48    | 43%     |
| <b>Somewhat agree</b>             | 51    | 45%     |
| <b>Neither agree nor disagree</b> | 10    | 9%      |
| <b>Somewhat disagree</b>          | 3     | 3%      |
| <b>Strongly disagree</b>          | 0     | 0%      |
| <b>Total</b>                      | 112   |         |

### Integrating Multiple Disciplines and Prioritization of STEM Learning

The next section asked school districts about integrating multiple disciplines in the classroom and how their school district prioritizes STEM learning. These questions were asked of all school districts. Almost all survey respondents (96%) reported that their school district supports teacher integrating multiple disciplines in their classes. See Figure 17. This remains similar when broken down by school district type.

Figure 17: *Research has shown that integrating multiple disciplines in the classroom results in greater student engagement, outcomes, and retention.* Does your school district support teachers integrating multiple disciplines in their classes? (n=112)

|              | Count | Percent |
|--------------|-------|---------|
| <b>Yes</b>   | 108   | 96%     |
| <b>No</b>    | 4     | 4%      |
| <b>Total</b> | 112   |         |

Survey respondents were asked to describe how their school district supports teachers in integrating multiple disciplines in their classes. Here are some key examples. (n=83)

“Arts Integration and Integrative STEM were the major Initiative in my District over past several years. Teachers are encourage to co-teach (substitutes are provided) and to integrate multidisciplinary projects. In certain cases, we required it.”

“In our STEM Academy, teachers have time built in their day, every day, to meet as part of a Professional Development Committee that is composed of various disciplines. The goal is for conversations to continue from one discipline into another.”

“Integrated lessons and projects are encouraged and built into curriculum. For example, a 6th grade science project on building a house incorporates science, engineering, math, and personal finance disciplines.”

“We have a STEAM class for Grades 5-8 that meets once a week for each grade level. The class has a Math/Science teacher, a Technology teacher, and an art or music teacher present and scheduled for to allow integration of content. Grades K-4 have a similar period called Maker Space where the

homeroom teacher, Technology/media teacher, Art teacher, and Social Studies teacher conduct and plan the lessons together.”

“Currently, we use Pineapple Charts (where teachers volunteer what they are teaching and if another teacher is interested they can observe the class). There is also a lot district-wide initiative to increase writing in all subjects and ensuring reading and dissecting informational text occurs in all subjects instead of just ELA. Finally, a lot of in-house PD occurs using our human capital to share and highlight what other departments are doing and how it can be infused into other disciplines.”

“Our school district has implemented a science specialist program in grades k through 5 where students attend science/STEM classes twice per week. We have converted all K-5 libraries into media centers with maker spaces and coding areas. In grades 6-8 our district has implemented integrated STEM electives that feed off of core science classes and other elective areas. PBL projects are implemented throughout all grade levels. In grades 9 through 12 students integrate engineering based projects throughout all sciences and math courses. Students are also exposed to STEM elective courses that promote the cross-cutting concepts of science, math and STEM related skill sets.”

A majority (80%) of survey respondents reported that they either strongly agree (39%) or somewhat agree (41%) that their school district prioritizes STEM learning. See Figure 18. School districts that include 9 - 12 grades have a larger amount that strongly agree (40%) or somewhat agree (44%) than school districts that don't include grades 9 - 12 where 38% strongly agree and 38% somewhat agree.

Figure 18: *Please respond to the following statement with the degree to which you agree. Our school district prioritizes STEM learning.* (n=107)

|                                   | Count | Percent |
|-----------------------------------|-------|---------|
| <b>Strongly agree</b>             | 42    | 39%     |
| <b>Somewhat agree</b>             | 44    | 41%     |
| <b>Neither agree nor disagree</b> | 16    | 15%     |
| <b>Somewhat disagree</b>          | 5     | 5%      |
| <b>Strongly disagree</b>          | 0     | 0%      |
| <b>Total</b>                      | 107   |         |

Survey respondents were asked to provide any final thoughts on their district's commitment to STEM learning. Here are some key quotes. (n=55)

“We have made an effort to embed STEM throughout the day so all students have the opportunity to access it and not just those that can come before or after school. In our technology classes, we offer coding and programming even as early as kindergarten. The elementary school has a STEM related arts class that focuses on different themes related to STEM. At the middle school, students have choice and can take an entire STEM track of related arts including coding classes and engineering.”

“We hired a dynamic STEM supervisor 4 years ago who has made a tremendous difference in our K-12 science program. For us, that made the difference to have one person who can work with teachers to make STEM a priority across the K-12 landscape.”

“We are committed to improving STEM education in our district. We have many STEM-related pieces already in place, and are developing a plan to further improve K-12 STEM education in the coming years. Additional funding and professional development opportunities would be very beneficial to improving STEM education in our district.”

“Our district is committed to STEM Learning. Budgeting is an issue to obtain equipment, teacher training, and additional teachers.”

“We are so swamped with trying to raise student achievement on state exams (literacy and math) that STEM does not always take a front seat. We also lack the funding to do big initiatives.”

“We are a tiny district and would love to do more STEM related things. We lack space and funding at the time to do more of these things. We also have other very important areas that we need to improve as well in the district.”

“Our district has been very supportive of STEM initiatives, but those initiatives have been spearheaded primarily by three staff members. We sorely need more STEM staff members. We would be able to populate additional teacher rosters quickly and give more students the opportunity to take a STEM class.”

“Our developing strategic plan is focusing on student agency and choice, with more inquiry and student-centered learning. We are also looking to increase the integration of technology at high levels of the SAMR model. In all of this, we see STEM as important to our efforts, but we are resistant to making STEM the sole focus of our efforts. [redacted] County has a thriving tradition of arts and humanities education. As we move forward, we are hopeful for intersections with STEM and with design theory, but we are more focused on ensuring that all students have opportunities to find themselves and their passions at our school, both inside and outside of STEM.”

“I like the idea of providing guidelines or guidance for how districts can improve STEM offerings for their students. We say this all the time, but it's true. Districts, even buildings within a district, are siloed to the point where the seeds of innovation can't flourish simply because we're too afraid to share, brag, whatever. I can't wait to see what comes of this survey data!”