North Carolina Department of Public Instruction STEM Education Schools and Programs

NC STEM Attribute Implementation Rubric
ELEMENTARY SCHOOL

PURPOSE:

The NC STEM School/Program Implementation Rubric is built around the North Carolina Department of Public Instruction's (NC DPI) "STEM Attributes," which describe characteristics of a high quality STEM school. Ten Attributes apply to elementary and middle schools; the 11th Attribute applies to high schools only. Attributes are outlined on the following page.

The rubric articulates a common language for STEM program implementation strategies and to establish a continuum describing good-to-great STEM Schools/Programs. The elementary school rubric can serve as a guide for elementary schools or other organizations in the design and/or implementation of STEM leading and learning efforts. The rubric may be used to reflect on characteristics of a School/Program and to plan action steps for the future.

Additionally, NC DPI is using this rubric as the framework for the "NC STEM Recognition" Application. For more information on the NC STEM Recognition Application, visit: http://www.ncpublicschools.org/stem/

DESIGN:

The Elementary School Implementation Rubric **contains ten (10) STEM Attributes**. Each Attribute is described individually on separate pages. Each Attribute page lists two - five "Key Elements," or key components of the Attributes (these are indicated in the rows). A four-point "Implementation Continuum" across the top of the page, ranges from "Early" to "Developing" to "Prepared" to "Model," and represents varying depths of implementation for each Key Element (these are the columns). Finally, the "Quality Indicators" describe the critical nature of a School/Program's implementation of a particular Key Element at a particular point along the implementation continuum (these are the cells).

ACKNOWLEDGEMENTS:

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For more information about the rubric, please visit: The Friday Institute Evaluation Team http://eval.fi.ncsu.edu/

Public Schools of North Carolina
State Board of Education | Department of Public Instruction

STEM Attribute Implementation Rubric
ELEMENTARY SCHOOL

North Carolina Department of Public Instruction's **NC STEM Attributes**	**Early** →	**Developing** →	**Prepared** ●	**Model** ●
Integrated Science, Technology, Engineering and Mathematics (STEM) curriculum, aligned with state, national, international and industry standards				
1) Project-based learning with integrated content across STEM subjects				
2) Connections to effective in- and out-of-school STEM programs				
3) Integration of technology and virtual learning				
4) Authentic assessment and exhibition of STEM skills				
5) Professional development on integrated STEM curriculum, community/industry partnerships and postsecondary education connections				
6) Outreach, support and focus on underserved, especially females, minorities, and economically disadvantaged				
On-going community and industry engagement				
7) A communicated STEM plan is adopted across education, communities and businesses				
8) STEM work-based learning experiences, to increase interest and abilities in fields requiring STEM skills, for each student and teacher				
9) Business and community partnerships for mentorship, internship and other STEM opportunities that extend the classroom walls				
Connections with postsecondary education				
10) Alignment of student's career pathway with postsecondary STEM program(s)				
11) Credit completion at community colleges, colleges and/or universities*				

* Applies only to high schools.

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NC STEM LEARNING NETWORK

(1) *Curriculum:* Project-based learning (PBL) with integrated content across STEM subjects				
KEY ELEMENT	**Early** ➡	**Developing** ➡	**Prepared** ●	**Model** ●
1.1 **Frequency of PBL**	Project-based learning[1] is used rarely in all STEM content areas	Project-based learning[1] is used monthly in all STEM content areas	Project-based learning[1] is used monthly throughout all subject areas, which includes all STEM content areas as well as additional subjects	Project-based learning[1] is regularly used throughout all subject areas, which includes all STEM content areas as well as additional subjects
1.2 **Frequency of STEM Integration**	Up to 25% of STEM core and elective teachers regularly make explicit efforts to integrate science, technology, engineering and math, requiring students to organize knowledge across disciplines	25-50% of STEM core and elective teachers regularly make explicit efforts to integrate science, technology, engineering and math, requiring students to organize knowledge across disciplines	50-75% of STEM core and elective teachers regularly make explicit efforts to integrate science, technology, engineering and math, requiring students to organize knowledge across disciplines	Over 75% of STEM core and elective teachers regularly make explicit efforts to integrate science, technology, engineering and math, requiring students to organize knowledge across disciplines
1.3 **Collaborative PLCs**	Semiannually, STEM teachers share STEM activities or ideas and plan learning outcomes through professional learning community meetings and common planning time	Quarterly, STEM teachers share STEM activities or ideas and plan learning outcomes through professional learning community meetings and common planning time	Monthly, STEM teachers share STEM activities or ideas and plan learning outcomes through professional learning community meetings and common planning time	Weekly, STEM teachers share or co-create STEM activities or ideas and plan learning outcomes through professional learning community meetings and common planning time
1.4 **Physical Space**	On special occasions computer labs or classrooms are transformed into collaborative spaces and project work areas for face-to-face and/or virtual collaboration among students and teachers, or to be used as exhibition spaces	Occasionally computer labs or classrooms are transformed into collaborative spaces and project work areas for face-to-face and/or virtual collaboration among students and teachers, or to be used as exhibition spaces	Frequently computer labs or classrooms are transformed into collaborative spaces and project work areas for face-to-face and/or virtual collaboration among students and teachers, or to be used as exhibition spaces; may include a STEM lab	One or more facilities or spaces are available specifically for students to collaborate and do project work; the spaces can be used for face-to-face and/or virtual collaboration among students and teachers; they can also be used as exhibition spaces; may include a STEM lab

[1] Project-based learning (PBL) activities have students working in small, collaborative groups; the groups go through a process of inquiry and eventually produce high-quality products/presentations; projects can mirror the real work of professionals and move beyond classroom in purpose or audience

(2) *Curriculum:* Connections to effective in- and out-of-school programs				
KEY ELEMENT	**Early** ➡	**Developing** ➡	**Prepared** ●	**Model** ●
2.1 **STEM Network**	School/program is seeking to establish partnerships with other schools, communities, postsecondary institutions, and businesses to identify solutions for building a quality STEM school/program	School/program engages with other schools, communities, postsecondary institutions, and businesses to identify solutions for executing a quality STEM school/program	School/program has documented partnerships with other schools, communities, postsecondary institutions, and businesses to identify solutions for executing a quality STEM school/program	School/program has partnerships with other schools, communities, postsecondary institutions, and businesses to identify solutions for executing a quality STEM school/ program; partnerships are purposeful, mutually beneficial, monitored, and evaluated
2.2 **Students and STEM Professionals**	Leaders are creating plans to provide opportunities for students to meet STEM professionals and/or to experience professional STEM work environments during and/or outside school[2]	Direct experiences with STEM professionals, professional STEM work environments, and/or practical applications of STEM content during and/or outside school[2] are available to students at least 2 times throughout the year	Direct experiences with STEM professionals, professional STEM work environments, and/or practical applications of STEM content during and/or outside school[2] are available to students at least 4 times throughout the year	Direct experiences with STEM professionals, professional STEM work environments, and/or practical applications of STEM content during and/or outside school[2] are available to students approximately monthly
2.3 **Research & Development**	On an annual basis school/program leaders and other STEM teachers share with each other research and information on best practices related to their STEM program goals	On a semiannual basis school/program leaders and other STEM teachers share with each other research and information on best practices related to their STEM program goals	On a quarterly basis school/program leaders and other STEM teachers share with each other research and best practices related to their STEM program goals	On a monthly basis school/program leaders and other STEM teachers share with each other research and best practices related to their STEM program goals

[2] For example, presentations or workshops, field trips, clubs, competitions, study trips, and summer/afterschool/weekend programs taught by STEM teachers and/or industry professionals

(3) *Curriculum:* Integration of technology and virtual learning				
KEY ELEMENT	**Early** ➡	**Developing** ➡	**Prepared** ●	**Model** ●
3.1 **Instructional Tech for STEM**	Technology tools relevant to the STEM program have been identified[3]	Technology tools relevant to the STEM program are available to STEM teachers and students;[3] up to 50% of students and teachers are proficient in these technology tools	Technology tools relevant to the STEM program are being used by most STEM teachers and students;[3] 50-75% of students and teachers are proficient in common technology tools	Technology tools relevant to the STEM program are being used by almost all STEM teachers and students;[3] more than 75% of students and teachers are proficient in common technology tools
3.2 **Instructional Tech Resources for STEM**	STEM teachers rarely receive information regarding computer-based and/or online instructional resources for STEM aligned to the NC Essential Standards for Technology (e.g. links to instructional technology tools, articles about effective use of instructional technology, meetings with peers focused on instructional technology, etc.)	STEM teachers annually receive information regarding computer-based and/or online instructional resources for STEM aligned to the NC Essential Standards for Technology (e.g. links to instructional technology tools, articles about effective use of instructional technology, meetings with peers focused on instructional technology, etc.)	STEM teachers semiannually receive information regarding computer-based and/or online instructional resources for STEM aligned to the NC Essential Standards for Technology (e.g. links to instructional technology tools, articles about effective use of instructional technology, meetings with peers focused on instructional technology, etc.)	STEM teachers monthly receive information regarding computer-based and/or online instructional resources for STEM aligned to the NC Essential Standards for Technology (e.g. links to instructional technology tools, articles about effective use of instructional technology, meetings with peers focused on instructional technology, etc.)
3.3 **Computer & Web-based Technology**	STEM teachers occasionally use a few computer-based, online, mobile, virtual, and/or other technology tools to support instruction	STEM teachers weekly use computer-based, online, mobile, virtual, and/or other technology tools to support instruction	STEM teachers daily use computer-based, online, mobile, virtual, and/or other technology tools, as appropriate, to support instruction; the technology is often in the hands of students	STEM teachers seamlessly integrate computer-based, online, mobile, virtual, and/or other technology tools are into instruction; the technology is consistently in the hands of students
3.4 **Tech Support**	STEM teachers have limited access to maintenance support for instructional technology; IT equipment is regularly inoperable for extended periods of time	STEM teachers occasionally have access to maintenance support for instructional technology; IT equipment is occasionally inoperable for extended periods of time	STEM teachers have regular access to maintenance support for instructional technology; IT equipment is rarely inoperable for extended periods of time	STEM teachers and students have on-demand access to maintenance support instructional technology; IT equipment is rarely inoperable for extended periods of time

[3] For example, spreadsheet applications in biology, robotics in programming, design software in engineering, or calculators in math

(4) *Curriculum:* **Authentic assessments and exhibition of STEM skills**				
KEY ELEMENT	**Early** ➡	**Developing** ➡	**Prepared** ●	**Model** ●
4.1 **Authentic Assessments**	STEM core and elective teachers are encouraged and supported to use multiple indicators of student success, including knowledge- and performance-based assessments (projects, portfolios, etc.)	As many as 50% of STEM core and elective teachers use multiple indicators of student success, including knowledge- and performance-based assessments (projects, portfolios, etc.)	50-75% of STEM core and elective teachers use multiple indicators of student success, including knowledge- and performance-based assessments (projects, portfolios, etc.) multiple times during the school year	Over 75% of STEM core and elective teachers regularly use multiple indicators of success, including knowledge- and performance-based assessments (projects, portfolios, etc.)
4.2 **Teachers Collaboratively Develop Assessments**	Twice a year STEM teachers share assessment strategies	Quarterly STEM teachers share assessment strategies; they occasionally co-create measures of student success and examine and reflect on student work	STEM teachers collaborate at least monthly to reflect on student work, to discuss strategies for using the results to inform instruction, and to co-create various measures of student success	STEM teachers collaborate at least biweekly to reflect on student work, to discuss strategies for using the results to inform instruction, and to co-create various measures of student success
4.3 **Celebrate STEM Work**	Students, teachers and administrators annually celebrate high-quality student work in STEM	Students, teachers and administrators celebrate high-quality student work in STEM with semiannual on-site and online exhibits	Students, teachers and administrators celebrate high-quality student work in STEM with quarterly on-site and online exhibits	Students, teachers and administrators celebrate high-quality student work in STEM through on-going student exhibits on-site, online and/or in state and national forums
4.4 **Culture of Innovation**	Program leadership annually honors and encourages innovation in STEM among students	Program leadership semiannually honors and encourages innovation in STEM among students	Program leadership and program participants quarterly honor and encourage innovation in STEM among students	Program culture consistently honors, encourages and incentivizes innovation in STEM among students

(5) *Curriculum:* Professional development on integrated STEM curriculum, community/industry partnerships and connections with postsecondary education				
KEY ELEMENT	**Early** ➡	**Developing** ➡	**Prepared** ●	**Model** ●
5.1 **Individualized PD**	STEM teachers participate in large group professional development sessions that introduce novice STEM teaching skills	STEM teachers participate in large group professional development sessions focusing on critical STEM teaching skills – may include strategies for inquiry-based instruction, for integrating STEM, or information on cutting edge content	STEM teachers have identified unique professional development goals and tailor as much as 25% of their STEM professional development activities to meet their individual, professional needs – may include strategies for inquiry-based instruction, for integrating STEM, or information on cutting edge content	STEM teachers have identified unique professional development goals and tailor at least 50% of their STEM professional development activities to meet their individual needs – may include strategies for inquiry-based instruction, for integrating STEM, or information on cutting edge content
5.2 **Job-embedded PD**	A job-embedded or practice-based approach to professional development[4] is used twice during the school year for STEM teachers	A job-embedded or practice-based approach to professional development[4] is used quarterly during the school year for STEM teachers	A job-embedded or practice-based approach to professional development[4] is used monthly during the school year for STEM teachers	A job embedded or practice-based approach to professional development[4] is used multiple times a month for STEM teachers
5.3 **Specific to Teachers & Students**	Professional development activities for STEM teachers focus on standardized, scripted teaching strategies	On an annual basis professional development activities for STEM teachers focus on strategies for teaching specific content to specific types of learners[5]	On a quarterly basis professional development activities for STEM teachers focus on strategies for teaching specific content to specific types of learners[5]	Professional development activities for STEM teachers that focus on strategies for teaching specific content to specific types of learners[5] are frequently available
5.4 **Frequency of PD**	STEM teachers participate in 10-20 hours per year of STEM-related professional development which addresses integrated content, community/industry partnerships, connections with postsecondary education, pedagogy, and/or digital learning	STEM teachers participate in 20-25 hours per year of STEM-related professional development which addresses integrated content, community/industry partnerships, connections with postsecondary education, pedagogy, and/or digital learning	STEM teachers participate in 25-30 hours per year of STEM-related professional development which addresses integrated content, community/industry partnerships, connections with postsecondary education, pedagogy, and/or digital learning	STEM teachers participate in 30 or more hours per year of STEM-related professional development which addresses integrated content, community/industry partnerships, connections with postsecondary education, pedagogy, and/or digital learning

[4] Job-embedded professional development includes action research, peer observation, critical friends feedback, curriculum alignment, coaching, lesson study, or problem-solving
[5] Specific by content area and grade-level, and for either high-performing, low-performing, average-performing, English as Second Language, or Exceptional Children, etc.

(6) *Curriculum:* Outreach, support and focus on underserved students, especially females, minorities and economically disadvantaged students				
KEY ELEMENT	**Early** ➡	**Developing** ➡	**Prepared** ●	**Model** ●
6.1 **Culture of Inquiry**	A few school/program leaders have articulated what a culture of inquiry and creativity looks like as it relates to STEM, emphasizing the inclusion of all students in the culture	A core group of school/program participants maintain a culture of inquiry and creativity as it relates to STEM, and emphasize the inclusion of all students in the culture	A culture of inquiry and creativity exists throughout a majority of participants in the STEM school/program and emphasizes the inclusion of all students in the culture	A culture of inquiry and creativity exists between and among the STEM school/program students, teachers and administrators and emphasizes the inclusion of all students in the culture
6.2 **Recognize Under-represented Students**	No clear guidelines and/or practices explicitly focus on increasing long-term participation by students from underrepresented groups[6] in the STEM education pipeline	1 guideline and/or practice focuses on increasing long-term participation by students from underrepresented groups[6] in the STEM education pipeline	At least 2 guidelines and/or practices focus on increasing long-term participation by students from underrepresented groups[6] in the STEM education pipeline	Several guidelines and/or practices focus on increasing long-term participation by students from underrepresented groups[6] in the STEM education pipeline

[6] In North Carolina and nationally groups of students underrepresented in stages of the education and workforce pipeline include female students, students of color, and students from low socio-economic backgrounds

(7) *Community:* **A communicated STEM plan is adopted across education, communities and businesses**				
KEY ELEMENT	**Early** ➡	**Developing** ➡	**Prepared** ●	**Model** ●
7.1 **STEM Program Plan**	Program leaders have created a basic STEM program plan[7] in which actions toward 1-4 *STEM Attributes* are outlined	Program leaders have created a detailed STEM program plan[7] grounded in research and in which actions toward 5-10 *STEM Attributes* are outlined	At least 50% or more of a STEM Leadership Team[8] is formed and has created a STEM program plan[7] that is grounded in research, aligned with school and/or school-system strategic plans, focused on student participation in the STEM pipeline[9], and outlines action toward 11 *STEM Attributes*	A fully-formed STEM Leadership Team[8] has led stakeholders in a collaborative design process to create a STEM program plan[7] that is aligned with school and/or school-system strategic plans, focused on student participation in the STEM pipeline[9], and demonstrates evidence of 11 *STEM Attributes*
7.2 **Communicate STEM Program Plan**	Program leaders' communication of the STEM program plan garners minimal participation and buy-in from STEM teachers and key stakeholders	Program leaders' annual communication of the STEM program plan develops some participation and buy-in from STEM teachers and key stakeholders	Program leaders' semiannual communication of the STEM program plan develops participation and buy-in from STEM teachers and key stakeholders	Program leaders' quarterly communication of the STEM program plan secures participation and buy-in from STEM teachers and key stakeholders
7.3 **Program Data**	A variety of school/program-level student data on STEM performance (from test scores to work samples) is available annually to administrators and teachers and is used to inform decisions	A variety of school/program-level student data on STEM performance (from test scores to work samples) is available semiannually to administrators and teachers, and is used to inform instructional and programmatic decisions	A variety of school/program-level student data on STEM performance (from test scores to work samples) is available quarterly to administrators and teachers, and is used to inform instructional and programmatic decisions throughout the year	A variety of school/program-level student data on STEM performance (from test scores to work samples) is available monthly to administrators and teachers, and is used to inform instructional and programmatic decisions throughout the year
7.4 **Resource Allocation**	Limited discretionary funds or other resources are allocated for implementation of STEM strategies	Discretionary funds or other resources are allocated to advance implementation of some strategies outlined in the STEM Program Plan	Discretionary funds or other resources are allocated to advance implementation of most of the STEM strategies outlined in the STEM Program Plan and a sustainability plan is in place	Discretionary funds or other resources are allocated to advance implementation of all the strategies outlined in the STEM Program Plan and a sustainability plan is in place

[7] A school- or district-level STEM plan which already exists, including detailed sections in a School Improvement Plan or a 5 Year Plan, may be substituted
[8] A fully-formed STEM Leadership Team is at the school-level, and includes at least 1 or more representatives of the following groups: students, teachers, administrators, community college staff, college or university staff, business persons (at least one person for each career pathway, if pathways are a focus), community leaders, and parents
[9] This includes student participation in any identified STEM career pathways/clusters

(8) *Community:* STEM work-based learning experiences to increase interest and abilities in fields requiring STEM skills for each student and teacher				
KEY ELEMENT	**Early** ➡	**Developing** ➡	**Prepared** ●	**Model** ●
8.1 **Learning Connected to Industries**	Program leaders are researching and planning in-school learning opportunities for students on content that is directly connected to current work in STEM-related industries	1-2 in-school learning opportunities (projects, activities, etc.) for all students focus on content directly connected to current work in STEM-related industries	Several in-school learning opportunities (projects, activities, etc.) for all students focus on content directly connected to current work in STEM-related industries	In-school learning opportunities (projects, activities, etc.) for all students frequently focus on content directly connected to current work in STEM-related industries
8.2 **Students Work in Teams**	Students rarely learn in teams to frame problems and test solutions that incorporate STEM content and/or apply STEM skills	Students occasionally learn in teams, with clearly defined individual and team expectations, to frame problems and test solutions that incorporate STEM content and/or apply STEM skills	Students weekly learn in teams, with clearly defined individual and team expectations, to frame STEM-related problems and test solutions that incorporate STEM content and/or apply STEM skills	Students regularly learn in teams, with clearly defined individual and team expectations, to frame problems and test solutions that incorporate STEM content and/or apply STEM skills
8.3 **Applied Learning for STEM Teachers**	Very few STEM teachers ever participate in applied learning experiences[10] to increase their STEM content or career knowledge	At least 25-50% of STEM teachers participate every-other-year in at least 1 applied learning experience[10] to increase their STEM content or career knowledge	50-75% of STEM teachers participate every-other-year in at least one applied learning experience[10] to increase their STEM content or career knowledge	Over 75% of STEM teachers participate every-other-year in at least one applied learning experience[10] to increase their STEM content or career knowledge

[10] For example, study trips, fellowships, externships, etc.; durations of experiences could vary from 1 day to 1 year

(9) *Community:* **Business and community partnerships for mentorships, internships and other opportunities extend the classroom walls**				
KEY ELEMENT	**Early** ➡	**Developing** ➡	**Prepared** ●	**Model** ●
9.1 **Collaboration in Network of Schools**	School/program leadership rarely participate in a network of schools or school leaders which addresses STEM education issues	School/program leadership participates semiannually in an active, online network of schools or school leaders which addresses STEM education issues	School/program leadership participates annually in a face-to-face or at least quarterly in an active, online network of schools or school leaders which addresses STEM education issues	School/program leadership participates annually in a face-to-face and at least quarterly in an active, online network of schools or school leaders which addresses STEM education issues
9.2 **Communication Tools**	One-way communication tools, such as websites and newsletters, and/or two-way tools, like social media platforms, webinars, and meetings, are used annually to communicate internally and externally about STEM program activities	One-way communication tools, such as websites and newsletters, and/or two-way tools, like social media platforms, webinars, and meetings, are used semiannually to communicate internally and externally about STEM program activities	One-way communication tools, such as websites and newsletters, and/or two-way tools, like social media platforms, webinars, and meetings, are used quarterly to communicate internally and externally about STEM program activities	One-way communication tools, such as websites and newsletters, and/or two-way tools, like social media platforms, webinars, and meetings, are used monthly to communicate internally and externally about STEM program activities
9.3 **Stakeholders & Funding**	A team of community stakeholders has assembled to discuss STEM education solutions or to create funding streams	A team of community stakeholders assembles at least every 2 years to discuss STEM education solutions, including long-term funding; these individuals include the STEM Leadership Team, local business partners, and other STEM industry professionals	A team of community stakeholders assembles annually to continue building a STEM program and long-term funding streams; these individuals include the STEM Leadership Team, local business partners, and other STEM industry professionals	A team of community stakeholders assembles semiannually to maintain a STEM program and long-term funding streams; these individuals include the STEM Leadership Team, local business partners, and other STEM industry professionals

(10) *Connections:* Alignment with students' career pathways to postsecondary programs				
KEY ELEMENTS	Early ➡	Developing ➡	Prepared ●	Model ●
10.1 **Vertical Planning**	STEM teachers vertically plan within their school and across school-levels (elementary, middle and high) every 2 years	Once a year STEM teachers vertically plan within their school and across school-levels (elementary, middle and high)	At least twice a year STEM teachers vertically plan within their school; once a year STEM teachers plan across school-levels (elementary, middle and/or high)	At least twice a year STEM teachers vertically plan within schools; twice a year STEM teachers plan across school-levels (elementary, middle, and/or high)
10.2 **Information Sharing**	Information about middle school, secondary, and/or postsecondary STEM programs and/or STEM career topics is shared annually among counselors (elementary schools may not have counselors) and some teachers	Information about middle school, secondary, and/or postsecondary STEM programs and/or STEM career topics is shared semiannually among counselors (elementary schools may not have counselors) and some teachers	Information about middle school, secondary, and/or postsecondary STEM programs and/or STEM career topics is shared quarterly among counselors (elementary schools may not have counselors) and some teachers	Information about middle school, secondary, and/or postsecondary STEM programs and/or STEM career topics is shared quarterly among counselors (elementary schools may not have counselors) and all teachers
10.3 **Career Exploration for Students**	Once a year students participate in career exploration activities which include opportunities to explore STEM careers and professional activities and skills (e.g. online activities, guidance from teachers, guidance from business partners, etc.)	Twice a year students participate in career exploration activities which include opportunities to explore STEM careers and professional activities and skills (e.g. online activities, guidance from teachers, guidance from business partners, etc.)	Quarterly students participate in career exploration activities which include opportunities to explore STEM careers, professional activities, and skills (e.g. online activities, guidance from teachers, guidance from business partners, etc.)	Monthly students explore careers, including STEM careers, professional activities, and skills, as a part of their coursework (e.g. online activities, guidance from teachers, guidance from business partners, etc.)

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