High School STEM Full Implementation

Full Implementation
Whole school or district STEM initiatives. This is a non-traditional model of education in which the classroom resembles a work environment and students contribute to solving problems in the community. STEM careers, experiences, and skills drive the curriculum. Curriculum is integrated in authentic problem-based learning that is STEM career oriented and cross disciplinary. Students collaborate in teams to solve problems. Teachers facilitate teams of students towards solving problems and developing work force skills, commonly the skills required by STEM businesses in that area or region. Frequently, schools have partnerships with businesses to provide materials, resources, and capital.

Infrastructure

Full STEM implementation is a highly collaborative environment between teachers, students, staff, and community. Teachers have common planning times in order to collaborate. Teachers may be offered the freedom to partner with each other to create new STEM opportunity classes. Administrators and Teachers collaborate with external school partners to integrate those opportunities in the classroom. The established Leadership Team provides guidance to the school staff, parents and community.

Action Items	Metric
Develop a leadership team to provide guidance and support	• Leadership team created with a clearly outlined set of roles and responsibilities. They must meet on a regular basis to provide program guidance and support • Shared mission and vision • Collaborative decision making model with defined roles and responsibilities
Develop teacher learning communities	• List of teacher learning communities and cross curricular members
Assure adequate laboratory space, resources and supplies for collaboration and lab or project based experiences	• Create a floor plan layout and inventory of equipment appropriate to the program
Courses are strategically scheduled to provide a natural progression from subject to subject to allow for teacher collaboration and co-teaching.	• Master schedule gives evidence of strategically aligning courses/teachers. • Schedule teacher preparation period and courses together that will require co-teaching. Also begin using common planning spaces for further collaboration
Identify and adopt appropriate technologies aligned to your school's curriculum as well as the your regional workforce needs	• Perform a technology needs assessment and procure funds or partnerships to purchase or lease that technology

Established program review and evaluation	Establishment of an advisory committee for ongoing monitoring of mission, vision and scope of projects

Instruction

Students engage in project-based learning that offers real world, relevant and complex problems. This may include internships, co-ops, work studies, mentorships, and job shadowing. Classrooms are facilitated by teachers who guide students to ask questions, research, solve problems and develop new technologies. This method of learning is offered to the whole student body. Students work in teams towards goals. Students collaborate with teachers, often changing the traditional teacher-student relationship to a more collegial relationship.

Action Items	Metric
Expand career counseling and opportunities for work-based learning	• List of career exploration opportunities and resources.
Use appropriate instructional strategies for learning in an integrated educational environment such as but not limited to: Contextual learning, Problem-based learning, Project-based learning, and Inquiry-based learning	• Best/effective practice is employed for engagement, alignment and rigor for instructional improvement • Goal setting and monitoring driven by data, development of individualized learning plans that include student input
Professional development for teachers that provides cross-curricular teamwork and in project based learning (PBL).	• List of professional development activities with description of content. • Evidence of 80% teacher participation. • School provides extended professional development during summer and throughout year increasing teacher content and pedagogical knowledge as indicated by pre/post test
Develop strategies for student centered learning identifying student abilities, interests, and strengths for continued engagement.	• Pre and post student assessment surveys in interest, content and attitudes
Identify local/ regional STEM employment needs and align curriculum and instruction to the needs of industry	• Assess local workforce through a needs assessment surveying community and businesses, analyze results, and incorporate in school STEM plan
Connection with business/industry skills to classroom instruction	• On-going evaluations of authentic student learning and skill development related to industry expectations
Provide opportunities and protocols for students to research and participate in outreach/service learning projects	• Systematic collection of feedback related to outreach activities

Curriculum

Courses must be aligned to Indiana Academic Standards and Indiana's Common Core Standards. However, the school may create new courses that integrate standards from multiple courses that may span a year or more. Schools may offer licensing, certifications, and possibly associate degrees. These schools offer college-level coursework and workforce skill development. Schools are innovative with scheduling. Classes may be several hours or possibly even the whole day. Courses are strategically scheduled to provide a natural progression from subject to subject. Courses may be combined with multiple teachers spanning multiple periods.

Action Items	Metric
Develop a well-defined set of learning objectives that support teaching for deeper understanding of STEM, based on current research of how students learn.	Demonstrate learning objectives that show the research correlation.
Develop a comprehensive K-12 alignment of STEM Standards and assessments	Show standards per grade level.
Expand current course offerings to include STEM immersed curriculum and standards such as AP, IB, Dual credit, PLTW etc.	List of course opportunities, programs of study, and pathway
Adopt project based curriculum or modify existing curriculum for PBL to build curriculum around the STEM competencies emphasizing inquiry and reasoning skills	Provide course syllabi of project based curriculum with STEM competencies.

Extended Learning

Learning does not stop at the end of the school day. This type of school offers opportunities outside of the classroom and school through afterschool programs, volunteering, work studies, etc. Often the school staff participates in or even runs the programs for extended learning.

Action Items	Metric
Alignment of the school day schedule to accommodate extended school learning	Evidence of flexibility in offering opportunities
Bridges and connects in-school and out-of-school learning opportunities	Show the alignment of standards used in both

High School STEM Partial Immersion

<u>Partial Implementation</u>
This is a non-traditional school experience. STEM experiences and related skills are integrated into the curriculum. The STEM program may be school wide, with teachers collaborating across disciplines for long term projects or a school-within-a-school scenario. These projects may be in addition to the normal curriculum or used to enhance the educational process. This may also include a school in which only a portion of the student body participates in these long term projects, interdisciplinary learning, or STEM career-based courses in CTE. Frequently the schools maintain business partnerships for materials, resources, and capital. The established Leadership Team provides guidance to the school staff, parents and community.

Infrastructure
Partial STEM immersion has highly collaborative environment between teachers, students, staff, and community. Teachers involved in the STEM Immersion may have common planning times in order to collaborate. Teachers may be offered the freedom to partner with each other to create new STEM opportunity classes. The leadership team will provide guidance and support to faculty, as well as, provide communication to students, the community and businesses.

Action Items	Metric
Develop a leadership team to provide guidance and support	Leadership team created with a clearly outlined set of roles and responsibilities. They must meet on a regular basis to provide program guidance and support Shared mission and vision Collaborative decision making model with defined roles and responsibilities
Develop teacher learning communities	List of teacher learning communities and cross curricular members
Identify and adopt appropriate technologies aligned to your school's curriculum as well as the your regional workforce needs	Perform a technology needs assessment and develop a plan to begin to add necessary technology to support STEM
Established program review and evaluation	Establishment of an advisory committee for ongoing monitoring of mission, vision and scope of projects
Identify courses and curriculum that allow for integration of multiple STEM disciplines	Provide collaboration time for STEM teachers involved in integrated courses

Instruction

While partial STEM implementation schools provide traditional schools experiences, they also provide non-traditional STEM experiences either to part of the student body or in specific tracks. Classes may still be the typical length but are highly project or inquiry based and allows students to solve real world problems that are relevant to them. Many offer co-op, internship, or work study programs in addition to the school's normal course offerings. Partial STEM implementation schools are highly collaborative. Teachers have common planning times in order
to collaborate. Teachers may be offered the freedom to partner with each other to create new STEM opportunity classes. Teachers collaborate with school partners to integrate those opportunities in the classroom. Students work in teams towards goals. Often the school

Action Items	Metric
Expand career counseling and opportunities for work-based learning	List of career exploration opportunities and resources
Use appropriate instructional strategies for learning in an integrated educational environment	Best/effective practice is employed for engagement, alignment and rigor for instructional improvement
Professional development of teachers that provides cross-curricular teamwork	List of professional development opportunities that demonstrate a cross-curricular emphasis
Identify local/ regional STEM employment needs and align curriculum and instruction to the needs of industry	Assess local workforce through a needs assessment surveying community and businesses, analyze results, and incorporate in school STEM plan

Curriculum

Courses must be aligned to Indiana Academic Standards and Indiana's Common Core Standards. However, the school may create new courses that integrate standards from multiple courses that may span a year or more. Schools may offer licensing, certifications, and possibly associate degrees. These schools offer college-level coursework and workforce skill development. Schools are innovative with scheduling. Classes may be several hours or possibly even the whole day. Courses are strategically scheduled to provide a natural progression from subject to subject. Courses may be combined with multiple teachers spanning multiple periods.

Action Items	Metric
Build curriculum around the STEM competencies emphasizing inquiry and reasoning skills	• Provide course syllabi of project based curriculum with STEM competencies
Develop a well-defined set of learning objectives that support teaching for deeper understanding of STEM based on current research on how students learn.	• School based learning objectives • Student Learning Objectives for STEM education
Research based authentic and integrated assessments are utilized to capture student learning and growth	• Pre/post tests • Innovative or non-traditional assessments
Offer a variety of AP, PTLW, and IB in the STEM disciplines	• List of course opportunities, programs of study, and pathway
Adopt inquiry and/or project- based curriculum or modify existing curriculum	• Consistently utilize Inquiry and PBL
Curriculum is connected to real-world contexts and careers in STEM fields, aligned to local or regional needs	• Curriculum provides instruction on STEM workforce skills
Opportunities exist for guest speakers, field work, and application of concepts	• Calendar of in-school and out-of-school opportunities for students • Partnerships with business and community

Extended Learning

Learning does not stop at the end of the school day. This type of school offers opportunities outside of the classroom and school through afterschool programs, volunteering, work studies, etc. Often the school staff participates in or even runs the programs for extended learning.

Deliverables	Metric
Identify and partner with after school providers to continue educational opportunities in the after school setting	• Leadership team identifies approved after school programs • School provides facilities for conducting after school programs or identifies satellite locations and provides transportation for students
Parents and community members are included in extended day learning	• Newsletters, websites, and social networks are utilized to provide information to stakeholders • Parents and community members participate in the activities
All students are afforded the opportunity to participate in extended learning but school uses data to identify specific students who could benefit most and encourage participation	• Struggling students participate in extended learning opportunities • General population of students participate as desired

High School STEM Minimal Immersion

Minimal Implementation

This is a traditional school setting. STEM-related problem-based learning is supplemental to the adopted curriculum. This could include separate STEM units, often done at the end of a unit or school year. It could also include short units offered by industry or non-profits such as Project Learning Tree or National Energy Foundation. These units serve to briefly provide STEM experiences to students and develop skills required in the workforce.

Infrastructure

School support from the administrative team to STEM teachers who provide STEM curriculum during the normal school day. Teachers are provided essential materials and resources to effectively teach the STEM curriculum. Administrators encourage the collaboration of teachers and the integration of STEM in all classrooms. School-wide Professional Development on STEM integration should be provided.

Deliverables	Metric
Develop teacher learning communities Professional learning communities define roles and responsibilities that align to the mission, vision, goals, and expectations	• Professional Learning Communities are created with a clearly outlined set of roles and responsibilities.
Courses are strategically scheduled to provide a natural progression from subject to subject.	• Curriculum progressions that evidence such scheduling • Time for planning vertically with other teachers included in schedule
Identify courses and curriculum that require integration of multiple STEM disciplines and allow for co-teaching of the material	• Schedule teacher preparation period and courses together that will require co-teaching. Also begin using common planning spaces for further collaboration
Collaborative leadership team (which can include representative from school, district, school board, community, higher education, and STEM industry) develops a shared mission and vision, high expectations for students, end of program goals, and structures for collaboration time and professional learning	• Vision and mission are clearly defined and communicated to all stakeholders. • Student expectations are shared with teachers, parents, and community members. • A schedule for collaborative time and plan for professional learning is in place. • Leadership team meets on a regular basis to monitor program goals and provide guidance and support.

Instruction

Instruction occurs during the typical content area course period and is usually conducted by one teacher or a small group of teachers. Teacher collaboration is important in any school setting. The Minimum STEM immersed school may or may not collaborate for cross-disciplinary instruction. Administration provides support for STEM teachers with professional development, curriculum resources, and materials necessary to effectively instruct students.

Deliverables	Metric
Facilitate student participation in problem based learning through STEM investigations, open-ended inquiry, and authentic, real world problems during units of STEM or STEM projects	• Increased students' time on task and student engagement • Use of student self-reflection and assessment • Observation of student approaches to investigation of a problem to include collaboration, questioning, data, communication, evidence-based claims, and critical thinking
Use innovative and non-traditional instructional strategies for learning in an integrated educational environment, such as a "flipped classroom" or virtual learning days	• Curriculum leadership team identifies instructional strategies appropriate for STEM education and project based learning • Teachers are provided training for these strategies
Identify local/ regional STEM employment needs and align curriculum and instruction to the needs of industry	Assess local workforce through a needs assessment surveying community and businesses, analyze results, and incorporate in school STEM plan

Curriculum

Courses must be aligned to Indiana Academic Standards and Indiana's Common Core Standards. However, the school may create new courses that integrate standards from multiple courses that may span a year or more. Schools may offer licensing, certifications, and possibly associate degrees. These schools offer college-level coursework and workforce skill development. Schools are innovative with scheduling. Classes may be several hours or possibly even the whole day. Courses are strategically scheduled to provide a natural progression from subject to subject. Courses may be combined with multiple teachers spanning multiple periods.

Deliverables	Metric
Develop a well-defined set of learning objectives that support teaching for deeper understanding of STEM based on current research on how students learn	• School based learning objectives • Student Learning Objectives for STEM education
Curriculum is connected to real-world contexts and careers in STEM fields, aligned to local or regional needs during units of STEM or STEM projects	• Curriculum maps reflect this connection • Curriculum provides instruction on STEM workforce skills
Opportunities exist for guest speakers, field work, and application of concepts	• Calendar of in-school and out-of-school opportunities for students • Partnerships with business and community

Extended Learning

Learning does not stop at the end of the school day. This type of school offers opportunities outside of the classroom and school through afterschool programs, volunteering, work studies, etc. Often the school staff participates in or even runs the programs for extended learning.

Action Items	Metric
Identify and partner with after school providers to continue educational opportunities in the after school setting	• Leadership team identifies approved after school programs • School provides facilities for conducting after school programs or identifies satellite locations and provides transportation for students
Bridge and connect in-school and out-of-school learning opportunities	• Extended Learning curriculum maps • Opportunities for after school staff to work with teaching staff
Extended day curriculum is research-based and offered to all students	• After school program adopts inquiry or project based learning
Parents and community members are included in extended day learning	• Newsletters, websites, and social networks are utilized to provide information to stakeholders • Parents and community members participate in the activities

High School STEM Supplemental

Supplemental Implementation

Schools may offer STEM experiences that are not a part of the regular school day. This may include but is not limited to afterschool programs, summer programs, school clubs, and academic competitions and fairs.

Extended Learning

Learning does not stop at the end of the school day. This type of school offers opportunities outside of the classroom and school through afterschool programs, volunteering, work studies, etc. Often the school staff participates in or even runs the programs for extended learning.

Action Items	Metric
Identify and partner with after school providers to continue educational opportunities in the after school setting	• Leadership team identifies approved after school programs • School provides facilities for conducting after school programs or identifies satellite locations and provides transportation for students
Alignment of the school curriculum and schedule to allow for extended learning activities to continue the work of the school day	• Transportation opportunities exist for all students • Curriculum extension documents connecting in-school curriculum to extended day learning
Bridge and connect in-school and out-of-school learning opportunities	• Extended Learning curriculum maps • Opportunities for after school staff to work with teaching staff
Extended day curriculum is research-based and offered to all students	• After school program adopts inquiry or project based learning
Parents and community members are included in extended day learning	• Newsletters, websites, and social networks are utilized to provide information to stakeholders • Parents and community members participate in the activities

STEM Collaborative Partnerships

Higher education

Higher education plays a particularly important role in STEM education for two parallel reasons: preparing a cadre of STEM teachers and preparing students for STEM careers. It is important to recognize that for higher education to successfully prepare STEM teachers for the classroom and students for the STEM workforce, they may have to change their own instructional practices, recruiting procedures, staffing, and departmental structure.

Action Items	Metric
Increased pre-service teacher preparation for STEM subject matter	• All newly licensed teachers are required to receive STEM preparation
Provide professional development services to the school and school district pertaining to STEM instruction	• Professional development is aligned to research based best practices in Science, Math, Engineering, and Technology instruction • Professional development is regularly scheduled and ongoing through school year and summer
Higher education staff works with individual teachers on lesson plans, instructional practice, and classroom management	• Assign school staff to mentor/master educators from the higher education level
Create internship or apprenticeship opportunities for pre-service and new teachers	• Assign pre-service or new teachers to qualified STEM educators • Use teacher evaluation to assess apprentices teacher ability

Business and Industry

Businesses are becoming increasingly aware of how they can respond to their own needs as well as those of society by engaging in the community and schools. Indiana's business community has a vested interest in the success of STEM education because they require a well-educated pipeline of employees to fill positions now and in the future. Working together, schools and business can create a relationship, benefiting both parties. Schools are constantly looking for resources and this is a wide range from human capital to money to materials. Business and industry can supply resources in the form of supplies and materials. This could be from the basic office supplies all students and teachers need as well lab ware, technology and software, machines, etc. Teachers need a variety of supplies and materials in order to achieve a project or inquiry based classroom. In addition, schools can help the business by allowing appropriate advertising and marketing or logos on newsletters and school equipment. Business and industry can also supply human capital. The experts of a particular field are currently working in that field. Schools need to bring those experts into the classroom to help the teacher with projects and to work with students. This will develop student and teacher interest in the subject.

Action Items	Metric
Provide internships for teachers and students	
Participate in professionally developing teachers and school staff	
Work with teachers to create work based projects and real world problem based units and curriculum and provide classroom support	
Lobby school boards for increased STEM education in the classroom	
Provide resources and materials for the classroom	
Promote the STEM and school based achievements within the community	
Participate with after school programs based at the school to improve STEM based activities in the out of school setting	