

**SMSP Attributes for**

**Excellent STEM Teaching and Learning**

The following elements were determined by the experience of our regional professional educators and confirmed by research literature as critical for successful STEM learning.

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| **Are the following STEM attributes**  **clearly represented in a unit of study?** | **Present** | **Not Present** |
| Integrates Science, Technology, Engineering, and Math. |  |  |
| Develops communication and literacy skills. |  |  |
| Provides authentic, real-world experiences through contextual learning (may include active citizenship). |  |  |
| Forms partnerships with business, industry, agencies, and nonprofits (may occur outside the school). |  |  |
| Provides career awareness through postsecondary and career relevant connections. |  |  |
| Fosters problem-solving, critical thinking, and argumentation skillsthrough inquiry and design. |  |  |
| Includes effective instructional strategies that develop collaboration and teamwork. |  |  |
| Uses equitable instructional practices that are inclusive to all students regardless of gender, disability, ethnicity, race, language, socioeconomic status, gender identity and sexual orientation. |  |  |
| Usesstandards-based performance/proficiency assessments. |  |  |

**SMSP STEM Attributes Descriptions**

*Classroom characteristics generated by SMSP teachers.*

**Integrates science, technology, engineering, and math**

* Includes content/standards and practices
* All four components are embedded in instruction and real world applications
* S-T-E-M components are pointed out when they occur
* Provided in background knowledge
* Student discussions/journaling on integration of parts
* Use of tools and instruments – measuring (authentic use of math)
* Developing models that use all four components
* Included in multimedia presentations and directed to authentic audience
* Cross curricular units and activities
* Integrate the use of industry standard of technology
* Written reflection making connections to S-T-E-M

**Develops communication and literacy skills**

*Scaffold, instruct, support*

* Reading and writing skills needed for class work – connect disciplines
* Intentional practice
* Academic vocabulary
* Teach structure of scientific writing
* Reflection/journaling – document thinking
* Defend arguments – claims and evidence
* Summarize, describe, compare/contrast
* Create a model and explain how it works
* Thank you letters to partners
* Picture books – read and discuss
* Communicate findings – oral and written
* Scientific readings, articles
* Engineering notebook
* Words, images and graphs to instruct
* Talking in class – pair-share, turn and talk
* Research: text and web-based while being able to paraphrase to student language
* Formal and informal presentations – class, school, partners, public
* Multimedia – videos, brochures, posters
* E-mail – experts
* Differentiating formal and informal audience – purpose
* Connections to other schools
* Goal setting
* Writing an reference letter
* Build on other’s arguments
* Cornell notes
* Interviews

**Provides authentic, real-world experiences through contextual learning**

* Project-based learning
* Students sharing of their experiences and connections
* Student defined problems with design for solutions
* School gardens with farmer
* Role play
* Business/industry tours – observe industry applications
* Current events
* School business
* Citizen science
* Address school problems – recycle, school yard, energy us
* Project focuses on a community issue – students may identify
* Agency and nonprofit programs – ODFW, Biz Town, SOLVE
* Observe or participate in community projects
* Real world skills – positive relationships, collaboration, active listening
* Identify levels of community – class, school, neighborhood, town, state
* Home-based questions/problems
* Integrate economic components – cost effectiveness

**Forms partnership with business, industry, agencies, and nonprofits**

* Local community members
* Experts
* On-going support - volunteers
* Parents
* Field trips
* Universities
* Include in content- career opportunities
* Skype professionals
* Open house for community partners
* Mentors and Internships
* Class project identifying community partners and career choices
* Judges for competitions
* Model industry process in the classroom
* Former students present to class
* STEM nights – family, school, community
* Co-teacher or guest teacher
* Grant writing collaboration

**Provides career awareness through postsecondary and career relevant connections**

* Guest speakers - wide variety
* Career-related videos
* Field trips – universities, industry
* Literature
* Part of research project
* Connect class activities with real world applications
* Use career connections (salary) in projects
* Promote next steps in education needed for connected careers
* Website/technology exploration of careers and postsecondary education – local and global
* Use professionals in the classroom
* Posters in the classroom – universities, community partners
* Reference to careers and education part of each unit introduction
* Collaboration with counselors
* Internships and mentor programs
* Job shadow
* Connect to universities, colleges and technical schools
* Create a resume

**Fosters problem-solving, critical thinking, and argumentation skills through inquiry and design**

* Open-ended projects and activities – student generated
* Models
* Illustrating
* Communication skills – explicit instruction
* Connect to anchor texts in reading and writing
* Class/student debates (defend ideas) – supported by evidence
* Civil argumentation
* Use growth mindset
* Teamwork – discussion and defending of ideas
* Testing solutions (prototypes) - accept failure and encourage persistence
* Support analysis skills
* Class culture of constructive critiquing by students and teacher
* Evaluation of designs and time for revisions
* Reflection summary of learning activities– written or oral
* Philosophical chair/debate

**Includes effective instructional strategies that develop collaboration and teamwork**

* Active listening/participation
* Model expectations and outcomes
* Turn and talk
* Team roles, contract, rubric – assign and rotate jobs (similar to industry roles)
* Providing supportive criticism – students and teacher
* Sentence stems/frames for discussion/sharing skills
* Accountability
* Conflict resolution – social skills
* Group leader and recorder skills supported
* Debrief/reflect on group efforts – peer review
* Monitor group dynamics and effectiveness
* Use SIOP or GLAD strategies
* Show connection/examples to the real world of work

**Uses equitable instructional practices that are inclusive to all students regardless of gender, disability, ethnicity, race, language, socioeconomic status, gender identity and sexual orientation**

* Intentionality in all classes
* Positive teacher-student relationships
* View from various perspectives
* Be aware of possible hidden – not obvious- identities
* Use language supports – sentence frames
* Teach vocabulary
* Avoid home projects that require unavailable resources
* Use recycled project materials
* Build background – use representative literature
* Students share their connection to the learning
* Post clear and student-friendly objectives
* Consider problems/questions/projects connected to other parts of the world
* Assigned roles for all in collaborative groups – student reflection to check inclusiveness
* Intervene immediately when biases noticed – discuss with class as appropriate
* Build an inclusive classroom culture
* Use a wide diversity of examples and role models
* Teacher modeling
* Connect to other schools different from yours
* Recruit diverse population for elective classes

**Uses standards-based performance/proficiency assessments**

* Standards displayed in classroom and clearly articulated throughout
* Provide an exemplar
* Common formative assessments
* Self-assessments by students
* Content/skills practice (building in the need to fail and persist)
* Standards-based rubrics (students practice use beforehand)
* Revisions allowed
* Finished product (assistance by community partner)
* Student/peer reflection and assessment connected to standards and rubrics
* Authentic audience for student work (presentations, competitions)
* Targeted, timely feedback
* Proficiency-based – can retake until mastery