

BACKGROUND OF PROGRAMMING IN BHM SCHOOLS

The science standards revision at the state level brought a significant change in the scope and sequence for science programming. Grade 6 has now shifted to Earth Science, Grade 7 has continued in Life Science, and Grade 8 has now shifted to Physical Science. Beginning in 2024-2025, the required Science 9 course will be Earth Science.

Three credits of science are required for graduation. The revised standards require the following: one credit must satisfy all the earth and space science standards for grades 9 through 12, one credit must satisfy all the life science standards for grades 9 through 12, and one credit must satisfy all the chemistry or physics standards for grades 9 through 12.

The shift in content, standards, and instructional approach requires an update in instructional materials in addition to those that were adopted in the 2023-2024 school year.

PROGRAM STANDARDS

From [MDE Science Standards](#):

“The 2019 Minnesota K-12 Academic Standards in Science (Standards) set the expectations for achievement in science for grades K-12 students in Minnesota. The Standards are grounded in the belief that all students can and should be scientifically literate. Scientific literacy enables people to use scientific principles and processes to make personal decisions and to participate in discussions of scientific issues that affect society (NRC, 1996). Graduates should be prepared for career and college opportunities.

The Standards describe a connected body of science and engineering knowledge acquired through active participation in science experiences. These experiences include hands-on laboratory activities rooted in science and engineering practices. The Standards are based on current science education found in A Framework for K-12 Science Education (Framework) (NRC, 2012), which emphasize the inclusion within science standards, curriculum, and instruction of three dimensions: Scientific and Engineering Practices, Crosscutting Concepts, and Disciplinary Core Ideas. The Framework is available as a free download at www.nap.edu.”

SUMMARY OF PROCESS FOR REVIEW OF INSTRUCTIONAL RESOURCES

The district’s Continuous Improvement Process (CIP) requires a comprehensive review of needs,

educational research, and potential materials prior to making a recommendation in the Curriculum Adoption Proposal. An extended exploration, implementation, and analysis of current practices and curriculum revealed that the comprehensive curriculum used until now, while striving to make a positive impact, was not making the intended impact on student scores and engagement.

As part of the ongoing improvement process, the secondary science department has researched, reviewed, and piloted a variety of resources, strategies, and practices that are intended to improve learning, increase engagement, and lead to success in college and careers. This process has included:

- Forming and participating in professional learning communities to analyze data, discuss current practices, and make improvements to move all students forward.
- Designing learning experiences and assessments that emphasize critical thinking, inquiry, creative problem solving, and communication.
- Visiting and discussing with other schools outside of the district to observe and experience instructional strategies.
- Creating and reviewing a thorough inventory of current materials and the way that they are used.
- Piloting the use of multiple new materials and strategies with success.

Pilot resources were examined and researched. Based on research and their vision statement, along with the district core adoption checklist, teachers utilized their PLC's, data collection, and department conversations to make their final recommendation.

8th Grade Physical Science

The eighth grade science team reviewed and completed a pilot on two different instructional resources. These included both StemScopes and CK12: Custom Textbook. Presently, the team is working with numerous resources to support the standards change in the transition to Physical Science at grade 8.

StemScopes is a curricular resource that utilizes digital, print, and hands-on activities that support the new science standards. While standards aligned and provided different opportunities and resources, the team determined that the scope of the resource was not as customized as what was needed.

[CK-12 Custom Book](#) is a free curricular resource that is customizable. The team has worked to match the scope and sequence of the textbook to match instruction and align with MN state standards. The text itself is also aligned to state standards along with the NGSS standards. The rationale of using this text is the ability to adapt and adjust it quickly for students. It also has integrated adaptive practice to help tailor further to student needs. Finally, being a digital text, it can be easily translated into other languages to better serve English Language Learners. The team has customized the textbook to match scope and sequence of teaching and the new Minnesota State Standards.

To support the foundational resource, student workbooks will also be utilized. The content has been designed as an 8th grade science professional learning community – to align with the new standards being taught. These workbooks support the standards.

Materials to update and support resources are needed to enhance instruction. The team has tailored and

revised the list of materials to bolster teaching and learning. To support hands-on learning, these materials are essential to the growth of the students. The cost of materials stems from needing a great deal of new lab materials and the significant change to standards.

Due to standards changing 3 standards remain the same, shifting from high school level to grade 8 + updates to materials needed

Earth Science

The Earth Science team reviewed and completed a limited pilot on text resources and lab activities created by Pearson/Savvas, McGraw Hill, and Houghton Mifflin Harcourt. The Pearson/Savvas text is currently used at Buffalo High School. The McGraw Hill textbook was used in a pilot setting over the last two years with high school students.

Initial review of each resource began with the textbook, online, and teacher resources. All textbooks meet the current Minnesota State Standards, although supplementation will need to be used with the Pearson Textbook. Complete alignment for all courses will require instructors to select teaching order of units and some modification of content. Reading levels are appropriate for the high school level, with each text offering suggestions and guidance for modifications for lower level readers and English Language Learner (ELL) students. ELL support for all texts do include a Spanish Language textbook option. Non-spanish speaking ELL supports are limited.

The initial review of the text resources had the HMH text and McGraw Hill being preferred to the Pearson/Savvas text. The Pearson/Savvas text is not aligned to the NGSS standards and lacks built-in WICOR tools. Both HMH and McGraw Hill have strong alignment to the NGSS standards, which the Minnesota State Standards are based on and emulate. Pearson has strong teacher support and online resources, but would require the most modification of resources to reach alignment.

The HMH Text and the McGraw Hill are similar; both provide teacher frameworks to show and explain alignment of the NGSS standards to the content. Both texts have clear guiding questions identified for each section and text aligns well with those questions. The majority of guiding questions will also align with the MN State Standards. Both texts also include visual clues for students to process information into a science textbook.

The McGraw Hill stands above the HMH text with its built in structures for students to develop thoughts using a CER model (Claim, Evidence, Reasoning). This model is used throughout BHS for students to process complex ideas. McGraw Hill also includes online resources that support video, interactive graphics, additional visual resources, supplementary text supports. There are also many WICOR strategies embedded, supporting the Portrait of a Graduate and BHM as an AVID District. Labs provided by both textbooks target getting students a deeper understanding of concepts. The labs generally lack in quality analysis and so instructors will need to modify them to improve this.

With a shift in standards, there will also be an increased cost for equipment needed in these courses. There will be 3 sections of a class during a single instructional hour. The goal of the Earth Science team is to provide students the opportunity to complete scientific inquiry during the course. This requires specific

equipment and material resources.

Physics

Physics at BHS is undergoing a major change. For the past years, BHS has offered a Physics course that met the graduation requirements of the state as well as opening the option for students to take either the AP Physics: Mechanics C or AP Physics 1 exams. There has not been evidence of a large investment by the students in taking the AP exams however, students are in need of the option of physics for their possible career paths. This has allowed an exploration of options for a College in the Schools course. In researching the different programs through both SCSU and UMN, a decision was made to pursue Introductory College Physics (Phys 1101W) from UMN. This course is an algebra based, writing intensive physics class that will allow students to earn 4 credits upon completion. The credit that students will receive is good for more than just general science at colleges. This is a recommended course for all students interested in pursuing a career path in science or engineering.

Beyond the original physics course, BHS also was also offering a Topics in Physics course. This class was designed to help struggling students achieve the credit requirement for graduation. The content was paired down to reduce the math burden and build in a more hands on, everyday life approach. Students were not allowed to choose this course--they were placed based on their individual needs. Moving forward, this course will no longer be offered at BHS.

The new general physics course will now adopt some similar approaches to what was seen in Topics in Physics to help balance the credit requirement as well as offset the CIS Physics course. Minnesota has adopted new science standards and this course will meet the physics standards.

Physics will need to be updated in several areas. A primary core resource has not been adopted in more than 20 years. Due to this, much of what was being used as a resource was an online site; [The Physics Classroom](#). This site started as a free resource years ago but has drifted into a pay site in some respects. Although it meets the needs, the uncertainty of cost is not feasible to continue. The last physical textbook that was purchased was Conceptual Physics by Paul Hewitt. This resource is well written for the non-science student as well as science motivated students. In reviewing the latest edition of this text, it was found to be a resource that supports updated standards and needs.

Lab experiences are also an important part of physics and this is the other area that needs to be updated. Several years ago, the software support for the interfaces and sensors used in class was lost. The COVID-19 pandemic allowed a bridge by having more limited lab groups. Upon return, however, there are urgent needs for more sets of equipment. The software will move to a subscription contract and it should be more open to use on a wider array of devices.

With the new changes students at BHS will be well served by this updated physics course and the addition of the CIS Physics. Both will provide a pathway towards graduation, state standards and college/career options.

CIS Physics

The high school is making some adjustments to the offerings in physics by adding [CIS Physics](#) through

the University of Minnesota. After receiving confirmation of the university accepting BHS, the ability to make selections for a textbook was given. The adoption will include the recommended resource.

The addition of this course will benefit students at BHS by allowing them to end their learning with a lab science credit that is more than just general science credit. This course will not only prepare students that are looking to enter a science or engineering related field, but it is also a writing intensive course and each student will earn 4 credits.

RECOMMENDATIONS

The team recommends the following:

8th Grade Life Science -

Utilizing CK-12 and worksheets, the team recommends updating classroom materials to support and implement new standards in Science. With the finalization of the new standards and shift in course progression, the materials requested will be essential in implementing and teaching the course. The materials needed are listed in the Science CAP Resource Spreadsheet.

Earth Science - [Inspire Earth Science](#) -- McGraw Hill

The textbook is aligned to NGSS standards which makes the text easy to align with the MN State Standards. The incorporates WICOR strategies through CER, science notebook integration, mini investigations, connections to STEM fields, uses of graphic organizers. The guiding questions are open ended and provide students the opportunity to develop several unique responses.

McGraw-Hill has a robust online platform to support the text which includes the ability to adapt lessons for learners. Supports include full curriculum sports for ELL students (Spanish).

Physics - [Conceptual Physics](#)

This is the recommended primary resource for the new physics course that is offered at the high school. We would like to have a classroom set of textbooks for students to use with an option of a digital copy students could access through Google Classroom from home.

CIS Physics - [College Physics: A Strategic Approach](#)

This is the recommended textbook resource from the University of Minnesota.

FINANCIAL IMPLICATIONS

Grade 8 Physical Science	\$32,642
Earth Science	\$45,921
Physics	\$19,477

\$98,040

Detailed information on the financial impact is here: [Science CAP Resource Spreadsheet 2023 + 2024](#)

NEXT STEPS

Once approved, the resources will be purchased and teachers will begin preparing for implementation. Planning and preparation will take place in August and the implementation of resources will be supported through the district's Continuous Improvement Process.

- Timeline for purchase
 - After July 1, 2024.

- Professional Development needs or Preparation for Use
 - Summer Curriculum Writing Planning Time
 - Spring / Fall Professional Development
 - Implementation CIP days