



2023 CURRICULUM ADOPTION PROPOSAL

BACKGROUND OF PROGRAMMING IN BHM SCHOOLS

The science standards revision at the state level brought a significant change in the benchmarks at the high school level. In addition to the content changing, the new standards suggest a 3-Dimensional approach to science. The three dimensions that are integrated throughout the standards and benchmarks are Science & Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts.

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 and approach requires an update in instructional materials.

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.

Biology

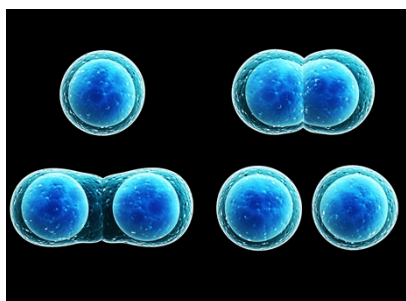
Biology looked at multiple textbooks along with two paths of NGSS curriculum adoption. Both paths focused on the use of the [NGSS \(Next Generation Science Standards\)](#) that science teachers from across the country have been collaborating to create and beginning to implement in science classrooms. A diverse group of educators have compiled their knowledge to create a rich student-driven biology curriculum. The goal of NGSS is that it is a curriculum for all to use and enables students to grow and become self-directed learners. The NGSS curriculum provides learners with real-world problem solving, instead of simply facts and memorization. This shift in teaching will make all students better learners now and in their future careers.

In addition, NGSS is a phenomenon-driven curriculum that helps students make sense of the natural world while integrating different science concepts and problem-solving skills. This type of learning allows for deeper understanding and higher level thinking.

With the information gathered from NGSS as well as the implementation of the new Minnesota Science Standards, it was decided that we would move our teaching approach from a vocabulary, unit specific approach to a broader understanding of science and how it related to our everyday lives and

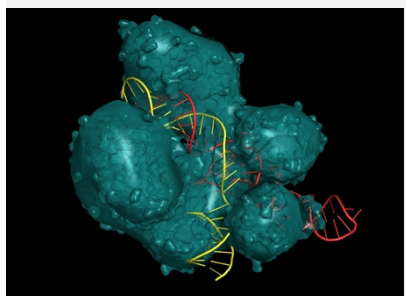
circumstances. We investigated two types of storyline based curriculums. The first, storyline approach had value in regards to real-world problems and phenomenon, however it lacked flow of information and delivery. In addition, we felt that students would get lost in the scattered nature of the information and not fully grasp the concepts at hand. This curriculum also seemed to lack some of the hands-on lab pieces we were looking for and did not seem to include all of the Science State Standards. [Here](#) is one example of a teacher's curriculum using the first storyline approach.

The second storyline curriculum investigated was [iHub - NGSS Biology Storylines](#). ([iHub Biology Curriculum](#)). Below is a summary of the iHub curriculum taken from their website.



The inquiryHub (iHub) biology curriculum is a full-year high school biology course anchored in phenomena and aligned to the Next Generation Science Standards.

Denver Public Schools teachers, working with a team of researchers from the University of Colorado Boulder and Northwestern University, designed three units, which address all of the performance expectations in the NGSS for high school biology. Scientists are part of the team and have reviewed all content for accuracy. Achieve, Inc., which reviews science units, has reviewed the first unit in the curriculum and rated it as High Quality NGSS Design if Improved.



The units are organized around coherent storylines, in which students ask and investigate questions related to an anchoring phenomenon or design challenge. Students use science and engineering practices to figure out Disciplinary Core Ideas (DCI) and crosscutting concepts needed to make sense of and explain the phenomena or solve the problem presented in the challenge.

The phenomena that students work together to explain in biology are antibiotic resistance and a bird population that evolved to become bold (Evolution), Duchenne Muscular dystrophy and gene editing (Genetics), how trees can mitigate climate change and population changes among large animals on the Serengeti (Ecosystems). Each has been chosen with input from Denver students as to what would be interesting and engaging to students like them.

Students engage with all eight science and engineering practices, becoming more proficient in learning when and how to use the practices. Lessons engage students in practices where they investigate, make sense of phenomena and problems, construct and critique models, and develop explanations and arguments. The units are designed to support students in becoming more sophisticated in their use of practices over the school year. Design challenges help students integrate knowledge across units; over time, students are expected to take more and more responsibility in problem solving within them. At the end of the genetics unit, students organize a World Cafe where they design questions for and facilitate a dialogue with peers, parents, and community members about the ethics of genetic engineering.

There are multiple assessments embedded in the materials that can be used for formative and summative purposes. These include exit tickets with multiple-choice questions that assess both student experience and understanding, student models of phenomena, and 3D transfer tasks in which students apply what they have learned to a new phenomenon. The modeling tasks are accompanied by SLO rubrics that can be used to build a portfolio of evidence of student progress.

Chemistry

Chemistry looked at multiple primary sources to support the curriculum with the new adoption of state

science standards.

Experience Chemistry is a resource from Savvas and the content is presented in a manner that doesn't support our belief of a high school chemistry curriculum. The text is presented in a workbook style where students would be writing in the text, thus texts would need to be purchased yearly. The text provided numerous visuals, but lacked the math application that is necessary to ensure students have the foundational understanding of chemistry to take college level chemistry, if they so choose.

An Introduction to Chemistry, a resource from Chiral Publishing Company, is a more typical high school chemistry textbook. The content is written at a level that supports the multiple reading levels of students in Chemistry. This resource also has a pdf version of the text, digital resources, and appendixes of additional content to support students outside of the classroom. The digital appendixes of content are not included in the print version and portions of the new standards are only addressed in these appendixes. The text also lacks updated particle diagrams of visuals that would benefit students in their building of foundational understanding. Chem X would not be supported through the use of this resource.

Basic Chemistry, 6th Edition, is a resource from Pearson. This text provides more updated visuals throughout the text for students. The text is written at a level that supports multiple reading levels of students in Chemistry. Units were presented in a manner that could lead some students to form misconceptions regarding fundamental concepts of chemistry. We also didn't feel the problem solving methodology would benefit all students in their learning. Some units were missing the depth of content to meet standards for both Chemistry and Chem X.

Chemistry - Introductory Chemistry 7th Edition, is a resource from Pearson. The textbook that can be adopted in both the general chemistry class and the Chem X class. The resource follows and supports the high school chemistry curriculum through use of step-by-step examples, practice problems, and real life applications of the content that are inclusive to students' lived experiences. The textbook comes with the Mastering Chemistry program. Mastering Chemistry includes a full e-text, which comes with videos and interactive self-assessments and study guides. The online self-assessments and homework program will allow students to get immediate feedback on the problems, such as wrong answer feedback, individualized help, and hints or simpler sub-problems to get students on the right track, and the questions can be tailored to specific instructional goals for our curriculum. The textbook and Mastering chemistry program also comes with teaching resources that can be embedded into presentations and lessons and a test question bank with customizable questions.

College in the Schools (CIS) Chemistry

The goal of this curriculum cycle for CIS chemistry is to update the current text and homework platform to more closely align with what is being used on campus.

Chemistry, The Central Science, 15th Edition, a resource from Savvas. This is the AP Version of the text. College in the Schools Chemistry uses the text recommended by the college. The text being used at

Buffalo High School is currently the 10th edition, copyright 2006, compared to the 15th edition, copyright 2018/2023 being used on campus at Southwest Minnesota State University and in many of the partner high schools. The digital homework/mastery platform is not available to us due to the outdated version of the textbook we are using. Upgrading to the 15th edition would include at least 6 years of Mastering Chemistry, the digital homework platform. This would allow the use of problem sets that mirror the college's requirements more closely than the current homework and classwork assignments that are in place.

RECOMMENDATIONS

The team recommends the following:

Biology - [iHub - NGSS Biology Storylines](#)

This curriculum encompasses NGSS Standards, MN State Standards as well as phenomenon research-based strategies. This curriculum provides learners opportunities to collaborate and investigate real-world scenarios. This curriculum is engaging, informative and designed with life-long learning in mind. We found value in the lesson plans, teacher guides, assessment options, Spanish translations and materials guide. This curriculum is user friendly for both educators and students.

Chemistry - [Introductory Chemistry 7th Edition](#)

The Introductory Chemistry textbook from Pearson uses the Mastering chemistry program allowing students full digital access to an online text and self assessment tools. The program is easy to use and understand for both students and instructors. The resource can be used for both the general chemistry class and the chem x class. The subscription to the Mastering Chemistry program is included in the adoption to last 9 years.

CIS Chemistry- [Chemistry: The Central Science, AP Edition, 15th Edition](#)

This resource will allow students taking the college chemistry course an updated version of the textbook to more closely mirror the experience of those on the SMSU campus as well as in other CIS classrooms across the state. The subscription to Mastering Chemistry is included in the adoption for at least six years. The digital platform available is very user friendly for students, as well as for educators to build problem sets for student use.

FINANCIAL IMPLICATIONS

The total budget request is still being determined as price quotes with vendors are being gathered. Details about the purchases can be found on this [spreadsheet of requests](#).

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, 2023.
- Professional Development needs or Preparation for Use
 - Summer Curriculum Writing Planning Time
 - Spring / Fall Professional Development
 - Implementation CIP days (1 per quarter / trimester during 2023-2024 school year)