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To cite this article:

Villa, C. & Marzan, R. (2025). BioMath: Bridging the gap between math and science education. *International Journal of Education in Mathematics, Science, and Technology (IJEMST)*, 13(6), 1368-1383. <https://doi.org/10.46328/ijemst.5214>

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Article Info

Article History

Received:

2 May 2025

Accepted:

21 September 2025

Keywords

Interdisciplinary teaching

Math & science integration

Collaboration

Education

STEM

Abstract

To address the disconnect and bridge the gap between mathematics and science education, we developed interdisciplinary lessons and real-world applications by integrating Algebra 1 and Biology in a collaborative cohort model. We aim to improve student engagement, knowledge transfer, and performance on assessments in both disciplines. The traditional separation of mathematics and science in education often prevents meaningful integration of the subjects, despite the natural interconnectedness between them. In mathematics classrooms, the focus is predominantly on abstract mathematical concepts, while in science classrooms, the emphasis is placed on scientific content, leaving little room for interdisciplinary collaboration. Although STEM majors need to take both math and science courses, teachers often do not have time to discuss concepts and skills that can be integrated within the courses. With interdisciplinary teaching and intentional collaboration, we promoted an interactive learning environment, facilitated networking opportunities for students and teachers, strengthened student relationships, and enhanced the student learning experience.

Introduction

Mathematics and science have historically been separated as distinct disciplines. From the State to the Federal level, there has been the development of not only subject specific curriculum but also subject specific assessments. They have separate state and national standards. This separation is evident in frameworks such as the Common Core State Standards for Mathematics (CCSSM) (NGA & CCSSO, 2010) and the Next Generation Science Standards (NGSS) (NGSS Lead States, 2013), each designed independently with minimal overlap. But when looking at both NGSS Biology and Algebra 1 standards, we can find many commonalities, just not taught in the same order. For example, logistic and exponential growth are an early standard in NGSS biology courses, while at the end of algebra 1 courses (if classes finish the curriculum). This can limit a student's ability to synthesize knowledge as students may struggle to find the connection. Additionally, as secondary teachers have specialized education pathways, they may struggle to support and explain concepts from other disciplines to students. Terms in one class may mean something different in another, or both disciplines may use different terminology to describe the same thing. For example, the term “slope” is used in math, while in science “the rate of change” is often used (Lemke, 1990).

Integration across STEM disciplines reflects real-world problem solving and supports student learning. NGSS has incorporated crosscutting concepts (systems, patterns) and scientific practices (using mathematics and computational thinking) that explicitly call for integration with mathematics. These connections are often underutilized as teachers lack training and support in them and focus on the overarching standards. CCSMM also includes standards for modeling and data analysis that align with scientific inquiry. Teachers need time to not only look at the standards for their subject, but to sit with teachers of other disciplines to find connections.

Bridging the divide between the subjects by rethinking and realigning standards to support multiple disciplines as opposed to looking at them as distinct curriculum, teachers can design instruction and assessments that are interdisciplinary and provide authentic instruction. Real world applications help students to see the purpose and value of what they are learning. Statistics are used to analyze population data. Mathematical models help us understand how diseases spread or how allele frequencies change. Using culturally relevant pedagogy in STEM such as exploring local environmental issues can empower students to make changes in their community as it fosters not only learning, but also civic engagement. As we prepare students to enter the workforce, these real-world scenarios give them interdisciplinary problem solving skills with the ability to apply knowledge in different contexts.

Literature Review and Theoretical Framework

Not all our students are comfortable encountering math in the science classroom and vice versa. Biology relies on the analysis of models, graphs, and the use of mathematical reasoning and yet the standard biology curriculum includes very little mathematics (Heller, & Ziegler, 1996). This separation creates challenges where mathematical skills such as data analysis, graph interpretation, and model building are essential. Students miss the mathematics background that is beneficial to biology as well as a way for students to see mathematics in real world scenarios (National Science Foundation, 2011). Science teachers rely on students to have the necessary mathematics background in order to look at the quantitative content in their classes. Additionally, the language and sample problems used in mathematics classes often do not translate into the science classes, resulting in a disconnect between what the mathematics students learn and the scientific applications they encounter.

However, movements have arisen to offer solutions to this problem, basing their approaches, in large part, on the principles set forth by the National Council of Teachers of Mathematics (NCTM, 2000). In their document, *Principles and Standards for School Mathematics*, the NCTM calls for a reform to mathematics education, encouraging change that would allow students to discover their knowledge based on conceptual thinking and the exploration of mathematics in real world contexts (NCTM, 2000). Constructivism is based on the concept that individuals actively construct or create their own knowledge and that their learning experiences determine the nature of reality. Learners use their prior knowledge as a foundation and build upon it as they acquire new information...In a constructivist classroom, learning is viewed as constructed, active, reflective, collaborative, inquiry-based, and evolving (Chand, 2024). Students will use prior knowledge to build new understandings of materials, which they will then modify with new learning experiences. In the classroom, teachers will assess what students know to best meet them where they are at. But when assessed, we find that students have varying levels

of prior knowledge. This can create challenges when building on the foundational knowledge as teachers create learning experiences to meet the needs of all students,

Additionally, Dangel, Guyton, and McIntyre (2004), argue that the provided curriculum should encourage children to see connections in learning, encourage them to spend more time doing activities and problem-solving, and provide them with a variety of tasks. In the classroom, we often try to find those real-world connections as well as cross curricular connections. Too often though, there is little time for teachers to develop cross curricular plans as teachers are inundated with professional developments that do not meet the teacher's needs. Creating engaging lessons, understanding student needs, and finding connections is paramount for students to connect to the learning and develop necessary problem-solving skills (Bransford, Brown, & Cocking, 2000).

Interdisciplinary Education in Secondary Schools

There are several types of interdisciplinary approaches to education. Multidisciplinary instruction involves bringing together multiple subjects but with no intentional collaboration amongst teachers (Beane, 1997). For example, a science teacher using data to make graphs and a math teacher teaching graphing. In contrast, in interdisciplinary teaching, two or more disciplines are intentionally integrated to explore connections and create new understandings. For example, creating codesigned lessons in biology and human geography to understand population dynamics. Cross disciplines borrow tools or perspectives from another discipline like using mathematical models to interpret science data. Transdisciplinary is a holistic approach with the goal of creating project-based learning units to address real world problems integrating multiple subjects (Klein, 1990).

Interdisciplinary teaching mirrors real-world scenarios, enhancing students' abilities to tackle complex challenges. By integrating subjects, we empower students to solve problems as professionals would in the real world (Jacobs, 1989). For example, a cross curricular project where students tackle an environmental issue like invasive species, requiring them to apply their understanding of ecosystems (science), analyze data trends (mathematics), utilize technology to monitor or design mitigation tools (technology), and craft persuasive public awareness campaigns (language arts). This mimics professionals coming together to solve a problem, where each discipline contributes its own piece.

Mathematics and Science Integration

While integration of subjects like math and science is advocated in education professional developments, there is little research on its effectiveness. There are several challenges in interdisciplinary teaching in STEM. School schedules are often rigid, where teachers have little to no collaborative planning time or difficulty in scheduling classes to create cohorts (Johnston & Berglund, 2018). Additionally, in secondary schools, teachers are specialized in single subject pedagogy and may feel uncomfortable teaching material outside their discipline. Teachers need professional development with a focus on creating interdisciplinary lessons that are not superficial. There is also difficulty aligning lessons when standards have not been aligned. Looking through the standards of multiple subjects, developing lessons, and creating assessments is time-intensive and needs institutional support/

collaborative planning time.

Academic Performance and Assessment Outcomes

With a focus on interdisciplinary and ultimately transdisciplinary lessons, students develop critical thinking and promote cognitive flexibility. As student assessments become performance based (through experimental design, data analysis, or modeling), we can gain clearer insights into student understanding of material while assessing content knowledge and application skills. Transferable skills like problem solving and critical thinking are tested on standardized exams in multiple subjects.

Standardized testing traditionally measures content knowledge, but the current CAST and CAASPP exams also include a performance-based assessment where students need to apply problem solving and data analysis. Additionally, the AP exam for science has a multiple choice and free response questions based on graphing and analysis. Students concurrently enrolled in both AP Bio and AP Statistics, as well as AP Human Geography and 9th grade biology at our school reported that they felt more confident in their responses when they were able to make connections between the curricula.

While designing interdisciplinary formative assessments can be complex and time consuming, they can not only deepen student understanding of material but also provide valuable feedback to teachers. Because formative assessments are adaptable, they reflect what is happening in the classroom (Black & William, 1998). Assessments such as project-based learning and performance tasks can evaluate deeper learning and process skills across multiple domains. They can also align with real world tasks, increasing engagement (Darling-Hammond et al., 2020).

Method

Research Design and Data Collection

We developed a plan to address students' learning experience through their understanding in reading, interpretation, and analysis of: data, graphs, and models. The research is quantitative. Students took 2 pre-assessment at the beginning of the year to determine a baseline score. We wanted to investigate how addressing students' reading, interpretation, and analysis abilities would translate to high stake assessments. Research has shown that there is a correlation between higher reading/comprehension abilities and student achievement in math and science assessments (Grimm, 2008; O'Reilly & McNamara, 2007).

The study required the creation of a cohort of 9th grade Algebra 1 and Biology students where they shared the same Algebra 1 teacher and Biology teacher. This approach allowed the teachers to help promote an interactive learning environment, facilitate networking opportunities for students and teachers, strengthen student relationships, and enhance the student learning experience by seeing the integration of math and science. Students were provided with tasks such as warmups where they were asked to analyze and interpret data. After attempting to answer on their own, students then collaborated in their responses using think-pair-share. We alternated the

sections of the tasks with analyzing and interpreting data to bridge the gap between the two subjects. The tasks were done on a weekly basis with each teacher allocating class time. Students were asked to complete lessons designed and co-taught by the researchers as well as performance tasks designed around information they studied that week in both their biology class as well as concepts learned in their Algebra 1 class (like what they would experience on the CAST and CAASPP exams). With support for cross curricular planning time, teachers were able to pinpoint academic language that applied in both subjects as well as align standards to support lessons.

Participants

The participants were recruited from a freshman cohort of 27 students that were randomly placed in classes by the counselor (union contract dictates that core classes have a maximum of 27 students). Our school is approximately 60% female / 40% male and 54% Latino, 45% Black, and 1% other. Our classes and study reflect the school demographics. The age range of the subjects is 13-15 years old. 20 students consented to be part of the study. We had 11 male (4 Black males and 7 Latinos) and 9 females (6 Black and 3 Latinas). These students were enrolled in Algebra 1 and Biology and moved between courses together.

Setting

The study took place over the 2023-24 academic school year, in the classroom during school hours. Students were given a series of warm-ups throughout the semester on Fridays in both biology and math where students analyzed graphs and did data analysis. Co-created and co-taught lessons looking at data were developed for multiple units for students to complete as well. Students who did not agree to be part of the study still completed the warm-ups, but their data will not be included in this study.

Assessments

Students took two pre-assessments (iReady and CSU/UC Mathematics Diagnostic Testing Project (MDTP)) at the beginning of the year to determine a baseline score for each student and a class average. Every student in grade 9, at our school, takes the iReady in reading and math at the beginning (BOY), middle (MOY), and end of the year (EOY). The iReady assessment is a computer adaptive test that assesses students' skills in K-8th. The data from the iReady provided us with a grade level in math for each student. Our student BOY grade level average was 5th grade. The data, however, did not provide a full picture of their algebra readiness, therefore we had students take the MDTP assessment which specifically targets students' readiness for success in Algebra 1 (Algebra 1/Integrated Math 1 Readiness Test AMR45A19). With these two assessments, we were able to get a better picture of our students' needs and how to address the challenges they would face; by not having the prerequisite skills required for algebra 1 and biology courses. We then implemented strategies and monitored student growth with data collected from various assessments aligned with the learning targets of each course that included:

- Curricular Guides: Aligned activities based on the NCTM Principles and Standards for School Mathematics (2000) and state biology standards.

- Warm-up Activities
- Assessment Tools: Pre- and post-tests designed to measure student understanding in both Algebra 1 and Biology. iReady data and UC/CSU MDTP data
- Interactive Learning Tools: Digital platforms and resources for collaborative projects and simulations that integrate mathematical concepts into biological contexts.
- Grading Rubrics.

Results

Data was collected from iReady, MDTP, and our Cross Curricular Warm-Ups to answer the following research questions:

1. Will students be able to transfer knowledge between disciplines and increase scores on district/ state standardized tests that integrate content on performance tasks and common formative assessments?
2. Is there a correlation between students communicating their reasoning and their ability to analyze data and draw conclusions?

iReady

Our BioMath cohort students took the iReady Exam at the beginning, middle, and end of the year. For our research we focused on comparing the data from the beginning and end of the year. The average for the BOY was 475 and the average for the EOY is 500. Our iReady average for the beginning of the year assessment (BOY) compared to the end of the year assessment (EOY) showed an average growth of 26 points (see Figure 1).

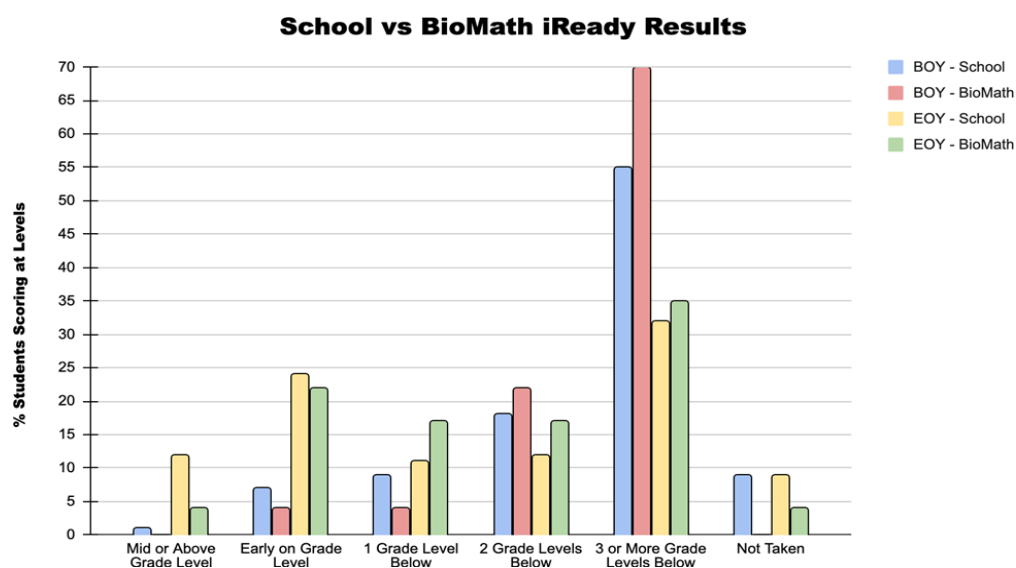


Figure 1. iReady Math Results for School vs Cohort

A 26-point growth indicates that students are making strides in their progress towards meeting proficiency and moving in the positive direction towards early on grade level/grade level proficiency. In addition to the iReady assessment. Our BOY data shows that 70% of our students started the school year 3 or more grade levels below.

The 475 average BOY score indicates that on average students were at a 5th grade math level. The EOY data shows the percentage of students with 3 or more grade levels decreased to 35%.

Mathematics Diagnostic Testing Project

The results of our BOY Algebra 1 readiness Test for our cohort were an average of 14%. The scores for our EOY Algebra 1 Readiness Test were 34%. The data showed an increase of 20% in students Algebra 1 readiness (see Figure 2). The areas assessed included:

- Data Analysis & Probability & Statistics (DAPS)
- Decimals, including applications; Percents; Absolute Value (DECM)
- Exponents & Square Roots; Scientific Notation (EXPS)
- Functions & their Representations (FNCT)
- Fractions, including Applications (FRAC)
- Geometry (GEOM)
- Integers (INTG)
- Linear Equations & Inequalities (LINR)

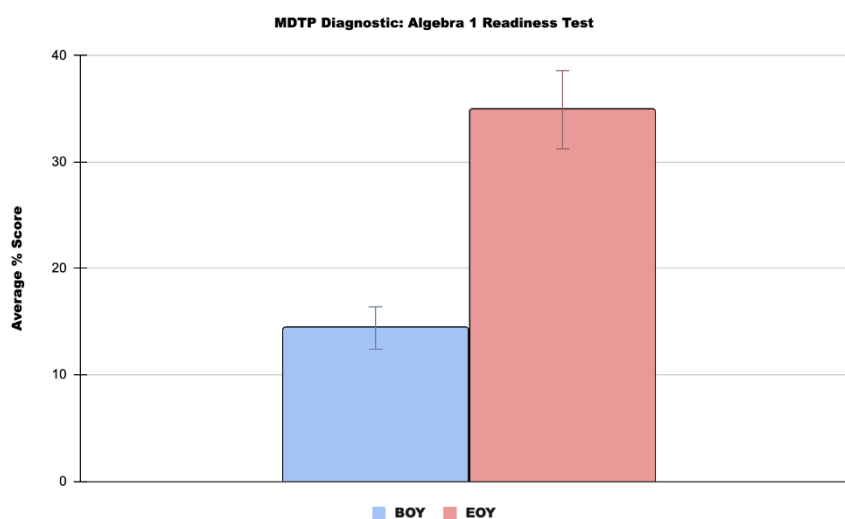


Figure 2. BOY vs EOY of MDTP Diagnostic

There was an emphasis in analyzing skills from the assessment that would evaluate students' ability to transfer knowledge and communicate reasoning between Algebra 1 and Biology. For example, many of the areas assessed required students to not only show computational skills but rather include interpreting graphical representations, analyzing data, and applying the mathematics to context.

Cross Curricular Warm-Ups

For cross curricular warm-ups, we focused on Analyzing and Interpreting Data. Students completed warm-ups throughout the school year in both Algebra 1 and Biology classes. We collected a total of 6 warm-ups at random

from our sample set representing the beginning, middle, and end of the year to assess student growth. We focused on specific subsections of Analyzing and Interpreting Data to monitor student progress and mastery. To ensure that the warm-ups selected for analysis were representative of the full range of student ability and growth across the year, we created tasks that were intentional and fit the subsections of analyzing and interpreting data.

Insightfulness of Interpretation

Our data showed that on average students started at a 1.4 mastery which meant that students' conclusions were weak and lacked implications and insights (see Figure 3). By the end of our study students were at an average of 3.1 which meant that students had grown to draw relevant conclusions with insight and were moving in the direction of drawing strong grasps of implications (see Table 1).

Table 1. Rubric used for Assessing Insightfulness of Interpretation

Criteria	Excellent 4	Proficient 3	Developing 2	Needs Improvement 1
Insightfulness of Interpretation	Provides deep insights and draws meaningful conclusions that show a strong grasp of implications	Draws relevant and mostly accurate conclusions with some insight	Conclusions are basic or lack depth; misses some implications	Conclusions are weak, unsupported, or show a lack of insight

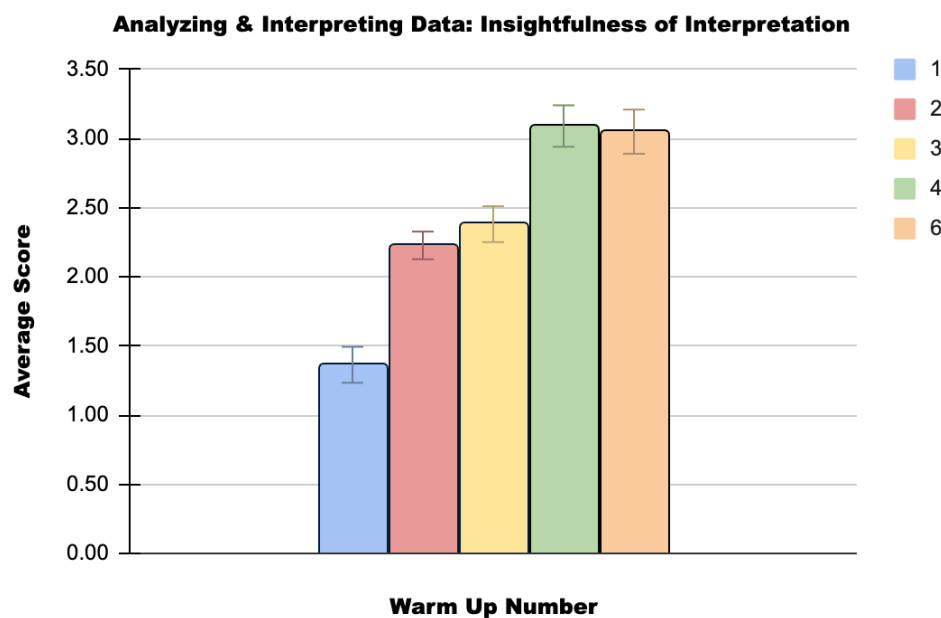


Figure 3. Insightfulness of Interpretation

Communication and Clarity

Our data showed that on average our students started the school year needing improvement and were developing in the area of communicating their reasoning (see Figure 4). By the end of the school year students had an average score of 3.3 which meant that they were proficient in being able to communicate well with minor clarity issues (see Table 2).

Table 2. Rubric used for Assessing Communication and Clarity

Criteria	Excellent 4	Proficient 3	Developing 2	Needs Improvement 1
Communication and Clarity	Findings are communicated clearly and logically, with precise language and structure	Findings are communicated well, with only minor clarity issues	Findings are somewhat clear but lack coherence or contain vague language	Findings are poorly communicated, unclear, or lack logical structure

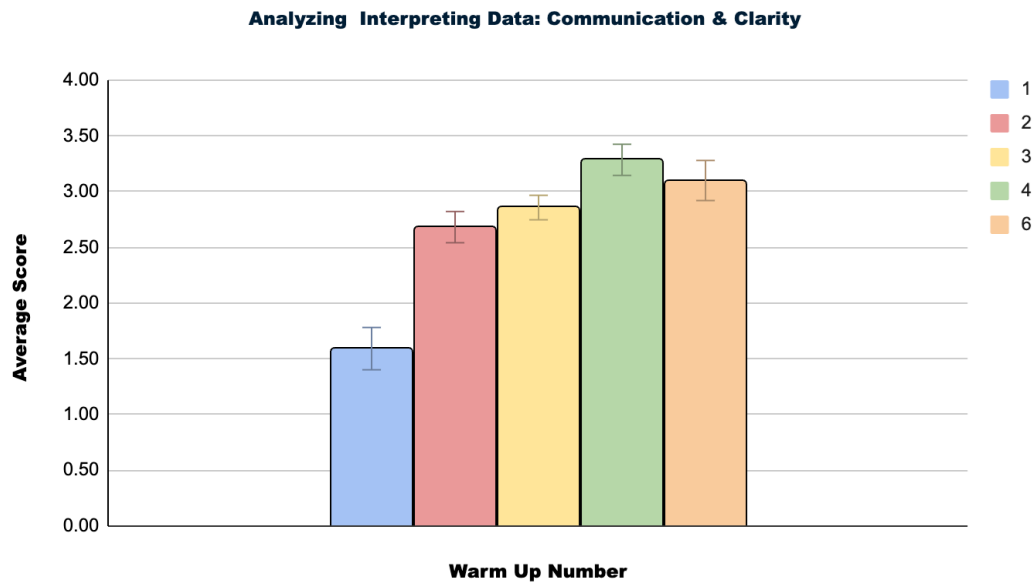


Figure 4. Communication and Clarity of Responses

Understanding of Patterns

The average students score 1.4, between needs improvement and developing. By the end of the study, students were averaging 3.1, putting them in the proficient range (see Table 3).

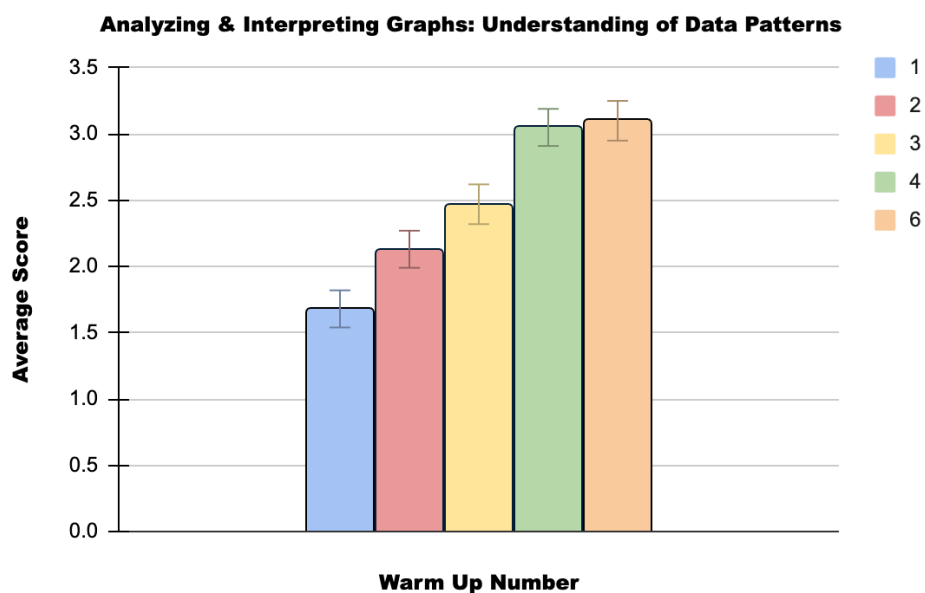


Figure 5. Understanding of Data Patterns

Students were able to recognize data patterns and trends and explain them. We saw a big jump by the second sample; students were able to identify some patterns and begin to explain them (see Figure 5). By the third sample students were then able to adequately explain the observed patterns.

Use of Evidence

On average students started at 1.2 (see Figure 6), which meant that students lacked evidence to support their claims (see Table 4). By the end of the study students were in the 3.4 range and were using evidence from data to support most of their interpretations and claims.

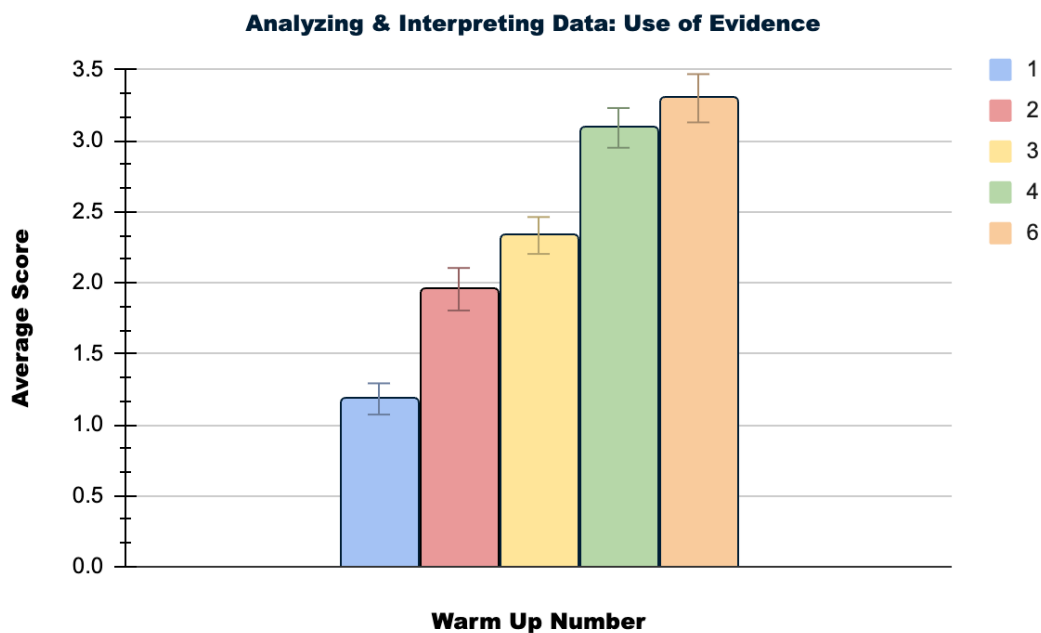


Figure 6. Use of Evidence in Responses

Table 4. Rubric used to assess Use of Evidence

Criteria	Excellent 4	Proficient 3	Developing 2	Needs Improvement 1
Use of Evidence	Supports interpretations with strong, relevant evidence from data; all points are well-supported	Uses evidence from data to support most interpretations effectively	Uses minimal or vague evidence from data; support for interpretations is weak	Lacks evidence to support interpretations; conclusions are unsupported

Discussion

What Did We Do? Building the Bridge

We began our work by asking our school administration and the counseling team to identify a cohort of 9th graders to take Algebra 1 and Biology. Together, we then aligned our units of study and identified points of connection between the two curricula. We started by creating a reference guide outlining the units covered in each course and arranged them in an order that would allow the concepts to flow both within the class and across the disciplines (see Table 5).

Table 5. Units to COVER in Biology and Algebra 1 CLASSES

Units to cover	
Biology	Algebra 1
Ecosystem Interactions & Energy	Equations and Inequalities
History of Earth's Atmosphere: Photosynthesis & Respiration	Functions
Evidence of Common Ancestry & Diversity	Extension of Linear Complex
Inheritance of Traits	Exponents, Radicals, and Polynomials
Structure, Function & Growth (from cells to organisms)	Quadratic Functions
Ecosystem Stability & the Response to Climate Change	Probability & Statistics (order can change)

Jacob (1989) discusses the importance of an intentional interdisciplinary approach and how this can aid students with higher order thinking and problem solving. We wanted our students to see a relevance in what they were learning and explore the interconnectedness of the two subjects. We began by discussing anecdotal challenges that students face in both Biology and in Algebra 1. In Biology, students often struggle with graphing, interpreting data, and using concrete evidence to support their reasoning and justify their claims (Clary & Wandersee, 2014). In Algebra 1, many students often lack the prerequisite skills required to tackle the Algebra 1 content. Additionally, students struggle with motivation and seeing how what they are learning applies in a real-world context.

Next, we examined our school-wide data and observed that one of the weaker areas on SBAC scores in both ELA and Mathematics was *Analyzing and Interpreting Data*. With this information, we designed a series of interdisciplinary warm-ups to help students build these skills. These activities reinforced prerequisite knowledge, challenged students to apply that knowledge in unfamiliar contexts, and helped students see a connection between math, science, and real-world applications. In addition to content, we also worked to align our instructional practices. Klein (1990), defines true interdisciplinary education as being deliberate and purposeful of content, methods, and perspectives across subjects, rather than a superficial pairing of units.

To address student motivation, we designed an engaging experience for our cohort scholars offering them a dual enrollment opportunity and STEM challenges. Our goal was to provide them with opportunities outside of the classroom that would spark their curiosity, introduce them to careers in STEM fields, and make learning fun (Valtorta & Berland, 2015; Yoon & Lee, 2014; Darling-Hammond et al., 2020). This led to a collaboration with California State University, Dominguez Hills (CSUDH), where we were able to provide students with opportunities to engage with scientists, researchers, and community experts. One opportunity was the Apple App Challenge, where students identified a need in their community regarding mental or physical health and designed an app to address that need. A benefit of this experience was that once a month, students were able to have college experiences as we visited the campus to work on their designs in the Center for Innovation in STEM Education

(CISE). Additionally, through our partnership with CSUDH, we were able to offer students the opportunity to take their first college class through a dual enrollment program. All cohort students were enrolled in a computer programming class that earned them college credit and helped them develop skills in a growing STEM field.

How Did It Impact Our Results?

Our results showed a significant improvement in students' iReady scores. When requesting the cohort of students for the study, we wanted to avoid the honors group. Our goal was to study how our efforts could positively impact the general student population. In the beginning of our study, diagnostics showed that on average, 70% of our students were three or more grade levels behind in math, with most lacking the prerequisites and foundational knowledge to tackle Algebra 1 content. This can make it difficult for students to access grade-level content, which can unfortunately lead to more gaps in students learning (Grimm, 2008). By the end of our study, we had reduced the percentage of students who were three or more grade levels below from 70% to 35%. While the data does not show the growth of students who were far below grade level, many students in this group made significant progress. These students improved but still fell within the three or more grade levels below band.

We began our instruction with open-ended warm-up questions that allowed students to feel success in the classroom. We incorporated Kagan Collaborative Strategies to help build relationships and establish structures that could help students with sharing their ideas. These strategies helped students build connections with their peers and teachers. The familiarity and consistency in the structures was helpful in student interaction and engagement. Students were more willing to share ideas and build confidence (Black & Wiliam, 1998).

Students knew that their teachers were regularly sharing ideas with one another and collaborating. This cross-classroom approach created continuity with students often starting an activity in one class and then continuing in the other. This integration was impactful as students in Algebra 1 were able to elaborate and expand on the mathematical concepts that were introduced in Biology. For example, students collected data in Biology lessons and then used that data in Algebra 1 to practice plotting points on the x- and y- axis. This is a foundational skill that a lot of our students lacked.

As students advanced with these prerequisite skills, they were able to move on to draw line graphs and later applied that prior knowledge to more complex functions such as exponential and quadratics. This cross-class interdisciplinary approach to addressing foundational skills is a shift from traditional approaches. It also led to a change in student attitude as students stopped asking "why do I need to learn this?" and "when am I ever going to need this?" Students developed deeper understandings of both biological and mathematical concepts. For example, slope was not just "rise over run", but a real-world example such as the rate of growth in a plant in biology (Bakke et al. 2013).

A key takeaway from our collaboration was the importance of bridging the vocabulary gap between content areas. Our math instructor had to learn some biology content and our biology instructor had to review some math concepts. To collaborate effectively, we needed to understand parts of each other's content. Lemke (1990)

discusses the importance of scientific language and literacy and its effect on understanding science; we would argue that by making the connection between the scientific language and mathematics this could lead to a broader understanding of both. We discovered that there were many vocabulary terms that we shared and with slight adjustments in definitions and framing, students were able to create more connections. For example, one student said, “So domain and range is like carrying capacity in bio?” This connection helped students with interpreting the limits and behavior of biological systems such as population growth.

When we analyzed the assessment data, we found that for all students initially scored a “1- Needing Improvement” in the category of *Analyzing and Interpreting Data*. With this information, we provided students with time in class to work on their interpretations. We reviewed the rubrics as a class and asked students to reflect on what could be added to their responses to improve their responses. Some of the students' responses included, “Maybe we should include numbers from the tables,” and “We should provide examples”. We also provided students with sample responses to review.

An interdisciplinary strategy that we used in class to support students with their writing was evidence-based writing using Claim, Evidence, and Reasoning (CER). We introduced CER by first modeling responses and providing sentence starters. In addition, students analyzed samples and conducted “error analysis” to identify ways to strengthen and clarify evidence and responses. As students practiced CER in both biology and math, their writing became less opinion based and more evidence based. O'Reilly & McNamara (2007) research suggests that CER strengthens students' ability to interpret data. We were able to see this in our data. Our students moved into the Proficiency category in all areas of *Analyzing and Interpreting Data*. By the end of the study, students were able to more clearly communicate their ideas / reasoning while supporting them with evidence.

Motivation

Our cohort students were given the opportunity to experience college culture by being able to visit CSUDH to participate in the Apple App Challenge, where they competed against other schools in designing an APP that could improve their neighborhood. In addition, our students got an opportunity to take their first college class as part of a dual enrollment class through our partnership with CSUDH where they were exposed to careers in STEM and learned Introductory Coding. Through these experiences, we observed an increase in student motivation as well as willingness to persevere in challenging problem solving. Students were able to make connections to what they were learning in the classroom by engaging in these experiences and learning from experts in the field.

Conclusion

Our research focused on the impact of the interdisciplinary instruction on student proficiency levels as measured by the Mathematics Diagnostic Testing Project (MDTP) and iReady assessments. We also explored whether there is a correlation between students' ability to communicate their reasoning and their aptitude to analyze data and draw meaningful conclusions. The collaboration between our Algebra 1 and Biology classes was effective in improving students' scores on both state assessments and formative assessments. In addition, we observed

significant growth in students' ability to analyze and interpret data as well as engagement in class. Students were able to transfer knowledge between subjects, reinforcing concepts learned in one class in the other. By the end of the year, the cohorted students demonstrated improvement which was reflected in higher MDTP math readiness scores as well as iReady assessment score. This will help them be more successful in future math classes.

Our main finding was that an improvement in students' ability to analyze and interpret data through cross-curricular warm-ups, translated to improved performance on students' overall assessments. The emphasis on critical thinking, making connections, identifying patterns, and supporting their arguments / claims with evidence, as well as demonstrating their reasoning was a factor in our success. Establishing classroom structure using Kagan strategies promoted academic discussions and student collaboration. Our research demonstrates the power of bridging the gap between Math and Science - two disciplines that can naturally align but that are often taught in isolation from one another. Science provides a place where math can be applied to real life problem solving. It answers the question, "When am I going to need this?"

The support of our school and the administrative team were invaluable in this collaboration. A cohort of Algebra 1 and Biology was created for this interdisciplinary study and written into the school's master schedule, with scheduling coordinated by the school administration and counseling team. We worked closely with the grade level counselor to ensure that students were in good standing for participating in field trips, which was one of their motivating factors. Additionally, our school provided us with paid planning time which made our collaboration achievable. We were also provided with the opportunity to share our research and findings with the faculty during professional development.

Recommendations

While our sample size was limited, the results were promising. We saw students progress in significantly improving their performance not only on assessments, but an increased proficiency in interpreting and communicating data-based findings. This growth demonstrates the impact of interdisciplinary collaboration, as students were able to make meaningful connections between mathematical concepts and their biology course. Based on these promising results, we recommend allocating structured professional development time for the math and science departments to collaborate at all grade levels. This dedicated time will allow departments to align teaching units / standards, develop cross curricular lessons, as well as develop vertical assessments to continue to build skills. This will ensure that skills are reinforced at each grade level. Expanding this approach to cross curricular planning has the potential to further gains in student achievement, increase engagement, as well as provide a more authentic learning experience. Cross-disciplinary thinking not only deepens content understanding, but encourages critical thinking, problem-solving, and communication skills - all vital for college and career readiness.

Acknowledgements

We gratefully acknowledge funding for this project from the National Science Foundation Robert Noyce Master

Teacher Fellowship (MTF) Track (1949973). The project received IRB approval from California State University, Dominguez Hills (IRB-FY2024-55). Further, we would like to express our deepest gratitude to all those who supported and contributed to the successful completion of this research. First and foremost, Dr. Kamal Hamdan, Dr. Cecelia Duenas, Dr. Kristen Stagg, Dr. Kathryn Theiss, Wendy Monroy, Dr. Austin Hendy, and Ayham Dahi for their invaluable guidance, insightful feedback, and unwavering support throughout the research process. Finally, we extend our appreciation to our school and district for providing the facilities necessary to carry out the study.

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