The University of Texas at Austin
Charles A. Dana Center

Integrated Statistics and Quantitative Reasoning Course Framework

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About the Dana Center

The Charles A. Dana Center develops and scales mathematics and science education innovations to support educators, administrators, and policymakers in creating seamless transitions throughout the K–16 system for all students, especially those who have historically been underserved. We focus in particular on strategies for improving student engagement, motivation, persistence, and achievement.

The Center was founded in 1991 at The University of Texas at Austin. Our staff members have expertise in leadership, literacy, research, program evaluation, mathematics and science education, policy and systemic reform, and services to high-need populations.

About K–12 Math Pathways

All students, whether they are college bound or choose to enter the workforce upon graduation, should be able to critically interpret and engage with data, understand data ethics, appreciate the power and limitations of mathematics and statistics, and use available technology to carry out investigations in authentic and meaningful contexts. However, many high schools continue to guide students to an algebra-heavy curriculum, even though the labor market increasingly requires skills such as statistics, data science, and quantitative reasoning. The goal of K–12 Math Pathways is to develop relevant, engaging, and intellectually challenging pathways for grades 11 and 12 that will enable students to achieve their postsecondary aspirations and lead informed and productive lives. Developed in collaboration with experts in K–12 and higher education, the framework contained in this document describes a course that would be appropriate for all students in support of this goal.

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Introduction

This integrated statistics and quantitative reasoning (ISQR) course framework describes a course that integrates quantitative, algebraic, statistical, geometric, and data literacy concepts and strategies to empower students to live skillfully and productively in our data-driven society. Integrating these disciplines gives students a more realistic picture of how these concepts and strategies are used to approach problems. This approach pulls together all of the available tools and resources to tackle different parts of the task to reach a more comprehensive solution.

This framework, which includes design principles and learning outcomes, is intended to guide the design of high-quality instructional materials that will further cultivate students' quantitative and statistical habits of mind, provide students with the opportunity to demonstrate proficiency in applying mathematical and statistical reasoning, and help them gain the skills needed for their success in postsecondary education and future careers.

As students engage with course content and identify issues in their worlds to explore, they will approach solutions from multiple perspectives. Students will compare and contrast mathematical and statistical approaches to problem solving, which will enable them to develop a deeper understanding of the benefits and challenges of each approach. Through an ISQR course modeled on this framework, students will have multiple opportunities to develop a level of statistical thinking that is not a part of a traditional quantitative reasoning course. Students will also be exposed to mathematics concepts essential for civic and financial literacy that are covered in a quantitative reasoning course but not typically covered in a statistics course.

The modern practice of mathematics and statistics necessitates the use of computing and software. It is not reasonable to rely entirely on a graphing calculator or Excel, as this ISQR course focuses on learning from real data and authentic contexts, exploring multivariable relationships, and communicating results through a variety of data visualizations. The design of this course should incorporate the use of a statistics software or readily accessible statistics applications.

All students who have successfully completed Algebra 1 and Geometry, or Integrated Math 1 and 2, are prepared to enroll in an integrated statistics and quantitative reasoning course. Successful completion of ISQR signals readiness for continued study in any secondary or postsecondary mathematics pathway (algebraic, statistics, quantitative reasoning, or data science).

Relevant and Representative Opportunities for Success

A holistic approach to ensuring that all students have access to and success in mathematics education requires establishing a curriculum that reflects the diversity of students' voices and perspectives while providing a multifaceted learning experience. Such a curriculum incorporates familiar concepts alongside new perspectives, ensuring representation, inclusivity, and relevance. Students should be encouraged to critically analyze mathematical tools and models in context, promoting an understanding of the limitations and ethical considerations of technological advancements.

This critical lens extends to nurturing a discerning approach to statistical and/or computational analyses and interpretation, evaluating datasets, challenging assumptions, and recognizing biases. Pedagogical approaches intended to reach all students foster belonging, center sense making, and address power dynamics. They require creating an inclusive learning environment where students feel empowered to engage deeply with material, connect concepts and data to their lived experiences, question established norms, and leverage their diverse cultural backgrounds as valuable resources.

Ongoing support and resources via accessible and relevant professional learning are necessary, with an emphasis on awareness among educators and supporting programs that cultivate the development and support of teachers from all backgrounds. Likewise, assessment designs should prioritize student agency and multiple demonstrations of reasoning, accommodating diverse learning styles and contexts. Assessment data should also prompt reflection from school administrators and instructors to address disparities in student outcomes. Finally, technological tools used in mathematics education must prioritize accessibility, affordability, and inclusivity.

Course Design Principles

The design principles for this ISQR course describe how curricular materials should be structured and implemented to support a coherent and engaging student experience, with an intentional balance of conceptual understanding and procedural fluency. Curricular materials should emphasize the value and importance of actively engaging students in constructing knowledge. Students—especially those who feel disconnected from mathematics and disaffected by the learning process—should be given the opportunity to develop their mathematical and statistical reasoning abilities while engaged in meaningful, authentic work.

Designers should use these principles to create curricular materials and professional learning for teachers that reflect all aspects of the design principles. Teachers should be empowered to investigate and implement other pedagogical strategies that are supported by research and to customize the curricular materials to best serve their unique student population and context.

Through this course, we hope that students develop greater confidence in their ability to demonstrate their understanding of mathematics, statistics, and data and to think critically about how content is contextualized and delivered. We hope that teachers come to class each day knowing that their time will be purposeful and impactful. They should feel empowered to adapt materials in a way that is responsive to their students' identities, lived experiences, and aspirations. Teachers should prepare students to navigate evolving tools, norms, and problems, setting them up for success in dynamic work environments. Ultimately, teachers should find joy and passion in their work as students engage more deeply with content that matters to them; they should feel confident in their ability to recognize and facilitate students' understanding of mathematics, statistics, and data.

We are aware that many students and teachers already engage in these behaviors so these principles can be viewed as reinforcing and supportive. The spirit of this framework recognizes that we are all learners and are growing in our understanding of mathematics, one another, and the world around us.

Note: The order of the design principles does not indicate the level of importance.

Equitable Pedagogy

Equitable pedagogy solicits the thinking of all students and provides for those contributions to occur in a variety of ways. Such participation is created by fostering a sense of belonging and strong relationships among students. Central to this is the idea of sense-making, where students actively construct understanding rather than passively receive information. Educators should address issues of power and authority in the classroom, cultivating students' critical awareness of agency and positionality in the classroom and beyond.

Leveraging students' funds of knowledge (Rodriguez, 2013), which include their cultural backgrounds and experiences, enriches the learning process and may connect to students' career or postsecondary aspirations. Teaching must recognize and incorporate the cultural assets that students bring, even if they do not align with the dominant mathematical or technical language. Instruction should draw on the multidimensional nature of mathematics, integrating concepts, skills, reasoning, and communication. Incorporating equity-focused frameworks, such as Universal Design for Learning (UDL) (Rogers-Shaw et al., 2018) and mathematics language routines (Zwiers et al., 2017), ensures that all students have access to and can benefit from the course material.

Designers will develop lesson activities, assessments, and teacher support materials that...

- Engage all students in a relevant and intellectually challenging curriculum.
- Support engagement in culturally sustaining pedagogical practices, drawing connections between mathematics content and various lived experiences.
- Employ diverse active instructional methods (such as hands-on and technology-based activities, small group collaborative work, facilitated student discourse, and interactive lectures).
- Promote active and social learning through facilitated interactions among peers, teachers, students, and community members, fostering opportunities for respectful discussions.
- Provide students with opportunities to engage in critical thinking and to explain their reasoning and justify conclusions.
- Provide students with opportunities to engage in the four-step data investigation cycle, including formulating questions that can be answered with data, collecting or assembling data that can answer these questions, analyzing the data, and interpreting and summarizing conclusions from the data.
- Use technology to explore and investigate in order to develop conceptual understanding.
- Allow flexibility in choosing research-based, pedagogical approaches.
- Support questioning that encourages thinking, metacognition and self-help behaviors.
- Incorporate strategies that position mistakes and failed strategies as opportunities to learn, and encourage self-monitoring and help-seeking behaviors.
- Consider the principles of Universal Design for Learning.
- Use asset-based approaches that cultivate resilience while centering identity, interest, and agency through data.

Equitable Pedagogy (cont.)

Using curriculum that incorporates equitable pedagogy, teachers can...

- Use evidence-based, inclusive instructional methods that cater to the diverse needs of students with varying backgrounds, cultural experiences, and strengths, fostering an accessible and supportive learning environment.
- Foster a culture of both joy and intellectual challenge in their classrooms, centering on rich conversations about data and concepts.
- Support active discussion and engagement, using a variety of active learning instructional methods such as inquiry, small group collaborative work, and hands-on and technology-based activities.
- When appropriate, provide diverse active learning activities and physical simulations prior to turning to software and applications so that students understand what the technology is doing.
- Provide activities and tasks with multiple, accessible entry points that offer meaningful opportunities for student exploration and co-creation of understanding.
- Anticipate where students might struggle and support them productively through the struggle, providing instruction and information about the role of productive struggle in learning.
- Discuss and refer to the purpose and goals of the lesson so that students understand how the current work contributes to their learning.
- Make connections with students' previous knowledge, cultural background, experience, and future postsecondary and career aspirations.
- Provide students with regular, scaffolded opportunities to self-monitor, evaluate, and reflect on their learning, both individually and with their peers.
- Provide multiple means of engagement, representation, and expression. Regularly provide opportunities for both individual and collaborative work, promoting a balanced approach to skill development and fostering teamwork.
- Monitor student progress and make needed accommodations, offering remediation and enrichment and differentiating instruction, when appropriate.
- Facilitate explicit connections between student approaches, reasoning, and, as appropriate, more efficient methods.
- Foster respectful peer discussions so students feel they belong and are welcomed to engage in the material.
- Advance student understanding by asking questions that build on, but do not limit, student thinking and that go beyond gathering information to probing thinking and requiring explanation and justification.

As a result of teacher behaviors that implement equitable pedagogy, students can...

- Develop a sense of belonging and self-empowerment in mathematics, cultivating a positive self-identity and recognizing the potential for personal agency in the field.
- Make sense of new concepts and tasks, including making connections to their prior understanding and work from previous courses, and by applying and building on previously learned problem-solving strategies.

As a result of teacher behaviors that implement equitable pedagogy, students can...

- Develop their ability to work productively individually and in teams, including helping one another by sharing strategies and solution methods and by developing strategies collaboratively.
- Examine societal implications and human impacts of statistics by considering contextual nuances, power dynamics, and ethical considerations inherent in statistics.
- Persevere in exploring difficult concepts and challenging tasks.
- Use mathematical, statistical, and technological tools and representations to support their thinking and problem solving and to develop conceptual understanding.
- Be willing to make and learn from mistakes.
- Use "look back" and alternative solution methods to support or reconsider solutions.
- Assess and monitor their own understanding and progress, with a focus on course learning goals.
- Draw on multiple sources of knowledge, including mathematics, statistics, culture, language, and family.

Equitable Learning Environment

An equitable learning environment is inclusive and supports students with disabilities and students from diverse cultural, economic, and linguistic communities. Valuing and respecting students' identities—leveraging their assets and lived experiences—fosters a positive and empowering learning atmosphere. Encouraging discourse, agency, and positive perceptions of students as learners is vital for their success.

Designers will develop lesson activities, assessments, and teacher support materials that...

- Cultivate caring, respectful, and asset-based relationships with and among students.
- Value student input and promotes curiosity that encourages exploration.
- Create safe spaces that normalize struggle such that students (and teachers) are able to make mistakes and learn from them through dialogue with one another.
- Create opportunities for independent and collaborative student work, while positioning the teacher as a facilitator and student discourse as the primary discourse in the classroom.
- Create opportunities for students to learn from mistakes and engage in productive struggle.
- Demonstrate what students are learning is valuable outside of the classroom, highlighting mathematics and statistics as necessary tools to model (using a variety of representations) and solve problems that arise in the real world.
- Provide resources, such as videos in which professionals discuss and demonstrate how they use mathematics and statistics in their work.
- Incorporate opportunities for students to develop and apply metacognitive strategies (planning, monitoring, evaluating, and reflecting on their learning) to set and monitor goals.
- Facilitate teacher reflexivity in how their power and authority influence the learning environment and impact students.

Equitable Learning Environment (cont.)

Using curriculum that incorporates an equitable learning environment, teachers can...

- Establish a learning environment that provides multiple means of engagement, representation, action, and expression.
- Create a harmonious classroom learning culture where students actively engage in the learning process by teaching, providing feedback to peers, and taking ownership of their individual learning journeys.
- Model thoughtfulness and respect when discussing social issues and other topics that may be personal or sensitive to students, creating a classroom culture that values diverse perspectives and experiences.
- Create a safe, student-centered learning environment in which all students feel a sense of belonging to the class and mathematics and are not afraid to take risks or make mistakes.
- Offer low-stakes and/or no-stakes formative assessment and help students realize that confusion and errors are a natural part of learning by facilitating discussions on mistakes, misconceptions, and struggles.
- Position students as self-sufficient learners while focusing on facilitation, monitoring thinking, and pushing students to higher level skills.
- Value reasoning and problem solving shared by students, and wait for students to clarify others' thinking.
- Motivate students' learning of concepts through opportunities for exploring and solving problems that build on and extend their current understanding.
- Allocate substantial instructional time for students to decide which representation(s) to use, and to discuss and make connections among representations.
- Illustrate the relevance of the content through data and quantitative information from compelling contexts.

As a result of teacher behaviors that implement an equitable learning environment, students can...

- Take responsibility for making sense of tasks by drawing on and making connections with their prior understanding and ideas.
- Work effectively to monitor their own progress and test their own assumptions in their analyses.
- Engage in a supportive learning environment where comfort and encouragement prevail, allowing students to try new things, ask questions, and view mistakes as opportunities for growth.
- Learn to work collaboratively with peers, actively supporting others in their learning process and contributing to a cooperative and enriching classroom environment.
- See how potential future careers connect to what they are learning.
- Accept and expect that their peers will use a variety of solution approaches and that they will discuss and justify their strategies with one another.
- Help to shape others' thinking in supportive and collegial ways, and accept the same support from others.
- Persevere in solving problems and realize that it is acceptable to say, "I don't know how to proceed here," and then seek help from appropriate sources, including their peers.
- Be comfortable reflecting on mistakes and misconceptions, approaching them as learning opportunities to improve their mathematical understanding.
- Feel they belong and are a valued member of the classroom.

Equitable Communication

Equitable communication is essential in high school mathematics, particularly quantitative reasoning and statistics courses. Activities should prioritize diverse modalities to accommodate various student needs, accessibility for students with disabilities, and multilingual learners. These activities should promote written, visual, and oral communication.

Integrating cultural knowledge and interdisciplinary connections fosters inclusivity, preparing students for future careers or postsecondary educational opportunities, while appropriate use of multiple communication modalities promotes clarity and literacy for various stakeholder groups.

Designers will develop lesson activities, assessments, and teacher support materials that...

- Provide students with opportunities to develop their ability to read and communicate about and with mathematics, statistics, and data in authentic contexts, using written, symbolic, visual, and oral formats.
- Support accessibility in communication for students with disabilities and multilingual students.
- Allow students to demonstrate understanding, using various forms of communication.
- Provide guidance on supporting students in moving from self-created to standard terms and definitions.
- Provide students with opportunities to make their thinking visible as they communicate results and justify conclusions.
- Provide models of complete and effective communication of results and justifications.
- Provide students with opportunities to analyze and critique presentations of quantitative information.
- Provide different modalities to accommodate various student needs.
- Foster communication, dialogue, and constructive feedback among students as a method for refining or revising views when evidence warrants.

Using curriculum that incorporates equitable communication, teachers can...

- Develop greater confidence in their own understanding of students' quantitative and statistical skills, and use information gathered from student communication to make just-in-time adjustments to instruction.
- Scaffold instruction to support students in developing necessary skills in reading, writing, and oral communication.
- Provide students with feedback and opportunities for revision of writing assignments and presentations to enhance communication and presentation skills.
- Support student growth in discipline-specific use of mathematical and statistical terminology and notation.
- Prepare students for potential terminology and notation used in specific career fields.
- Support students in developing active listening skills and in asking clarifying questions to their peers that deepen understanding.
- Provide students with regular opportunities to write about and discuss mathematics and statistics within authentic, relevant, and contextualized tasks.

Equitable Communication (cont.)

Using curriculum that incorporates equitable communication, teachers can...

- Allow students to choose how they would like to communicate their learning and understanding.
- Facilitate discourse among students by positioning them as authors of ideas who explain and defend their approaches, using varied representations.
- Incorporate pauses to allow time for students to formulate responses to teacher questions and peer comments.
- Foster effective whole class discussion by selecting and sequencing student approaches and solution strategies.
- Facilitate discussions that make explicit connections between student approaches, reasoning, and, as appropriate, more efficient procedures.

As a result of teacher behaviors that implement equitable communication, students can...

- Feel prepared for future careers by emphasizing the development of "whole human skills" that go beyond automated tools, focusing on interpreting, communicating, evaluating, and debating rapidly evolving data science models for industry or academia.
- Leverage their own cultural knowledge and practices from their communities, fostering inclusivity and cultural relevance in the learning process.
- Develop greater confidence in their active listening and communication skills.
- Effectively communicate ideas, assumptions, reasoning, representations, and conclusions to one another in pair, small group, and whole class discourse and, when appropriate, to external audiences.
- Expect to be asked to explain, clarify, and elaborate on their thinking, using written, visual, and oral formats.
- Accept and act on appropriate constructive feedback, and suggest refinements to instruction when appropriate.
- Experience growth in moving from self-created language to clarity and precision with discipline-specific terminology.
- Seek to understand the approaches used by peers by asking clarifying questions, trying out others' strategies, and describing the approaches used by others.
- Identify similarities and differences to support or refute arguments.
- Analyze and critique presentations of quantitative information.

Equity in Tools and Technology

Equity in tools and technology requires that all materials and tools are available and accessible to all students, comply with Americans with Disabilities Act (ADA) standards, and feature support for multilingual learners. Ideally, these technologies should be low cost or free to ensure accessibility.

Technologies should be compatible across multiple platforms and devices, and capable of handling large data sets efficiently. Addressing digital divides and generational differences in perceptions of emerging technology is essential to ensure equitable access and engagement with the course content.

Designers will develop lesson activities, assessments, and teacher support materials that...

- Position technology as a fundamental tool but not the focus of the learning.
- Acknowledge unequal student access to digital tools and internet connectivity.
- Consider varying levels of student technology literacy (i.e., prior exposure to technological tools).
- Ensure access to a range of tools and experiences, giving students agency in the selection of tools where appropriate.
- Use technology and statistical software and applications that are freely available, easy to use, accessible across platforms and devices, and robust to multiple contexts and data set sizes, with ongoing accessibility to students after the class ends.
- Engage students in the effective use of technology for data analysis and for doing mathematics and statistics.
- Engage students in technology that connects to their future career aspirations.
- Where appropriate, use hands-on activities and physical simulation prior to introducing computer applications so that students understand what the applications are doing.
- Include tasks that engage students in visualization and exploration to develop conceptual understanding, communicating concepts in interactive, dynamic, and responsive ways.
- Do not overload teachers and students with unnecessary technological tools.

Equity in Tools and Technology (cont.)

Using curriculum that incorporates equity in tools and technology, teachers can...

- Focus less on leading students through procedural calculations (handled by technology) and more on determining assumptions and inputs, and on interpreting outputs and results.
- Use student-centered teaching practices and technology to assist students in visualizing and understanding important mathematical concepts.
- Introduce students to various data analysis and visualization tools that students can use beyond the classroom and support them in understanding the best uses for each tool.
- Support students with varying levels of access to technology at home, ensuring an equitable learning experience for all.
- Empower students to be creative and to use technology to support their own goals, leveraging technology as a tool that can expand the scope of real-world problems and data that students can investigate.
- Be comfortable in learning alongside students since teachers are not experts in the use of every technology.
- Be willing to experiment in response to students' questions by modeling good practices for seeking answers to such questions.
- Be sensitive to each student's specific needs and make devices and internet access available equitably.

As a result of teacher behaviors that implement equity in tools and technology, students can...

- Develop technological fluency to prepare for emerging industry tools, ensuring adaptability and readiness for the dynamic field.
- Use technology to visualize and understand important concepts and to support data-based conclusions.
- Create data visualizations, analyses, and reports that clearly communicate their thinking and conclusions.
- Use modern tools that prepare them for what they may see in college or the workplace and that allow them to gain experience to learn new tools in the future.
- Use technology to carry out investigations that might otherwise be too difficult or time-consuming.
- Consider the relative usefulness of a range of tools in particular contexts and choose from a variety of tools appropriate for a given task.
- Understand that the use of technology does not replace the need to evaluate the reasonableness of conclusions or to assess whether the conclusions apply in a given context.
- Focus their cognitive load on critical interpretation rather than on procedural calculations that can be handled by technology.

Equitable Contexts

Equitable contexts are those that resonate with and reflect students' cultural backgrounds, communities, fields of study, and personal interests. This approach not only makes learning more relevant and engaging, but it also introduces them to new and significant ideas, providing both reflective and expansive learning experiences (often referred to as "windows and mirrors" in the curriculum). The curriculum should encourage students to collect data pertinent to their own lives, making their learning experience more personalized and meaningful.

Designers will develop lesson activities, assessments, and teacher support materials that engage students in meaningful work, using data and contexts that...

- Are scaffolded and accessible to learners from varied backgrounds.
- Are diverse, relevant, and authentic.
- Align with student interests.
- Reflect the experiences of diverse student populations.
- Position the work as preparation for a variety of pathways and careers.
- Address topical and socio-political issues (e.g., disparate health outcomes).

Using curriculum that incorporates equitable contexts, teachers can...

- Ensure inclusivity and accessibility for diverse learners.
- Use culturally relevant data and contexts as both windows (offering new perspectives) and mirrors (reflecting students' experiences), fostering a connection between statistics concepts and diverse cultural backgrounds to create an inclusive and responsive learning environment.
- Provide students with opportunities to share their personal backgrounds and interests, including cultural and societal values, and help make the connection between what is important in students' lives and future aspirations and what they are learning in class.
- Provide interesting and real (not contrived) data sets and tasks, both in class and on assessments, including those that are local to students.
- Facilitate exploration of problems from a variety of academic disciplines, programs of study, careers, and cultures.
- Focus less on classroom management and more on channeling the engagement that naturally comes from relevant contexts.

Equitable Contexts (cont.)

As a result of teacher behaviors that implement equitable contexts, students can...

- Engage in relevant mathematical experiences.
- Connect mathematical knowledge to innate cultural knowledge and practices within their native communities, bridging the gap between academic concepts and lived experiences.
- Genuinely engage with course content, pushing their own understanding towards a meaningful objective.
- Actively seek and describe connections between classroom experiences and the world outside of class (including their own personal experiences).
- Develop critical thinking skills in key areas of civic reasoning, financial literacy, and risk assessment.
- Learn about new pathways, careers, and opportunities they can explore in the future.
- Use statistical and mathematical modeling to carry out investigations related to their own interests or backgrounds.
- Examine the ways in which data are collected in their day-to-day lives, and consider the ethics and consequences of collecting and using data to make decisions.

Equitable Assessment

Equitable assessments fairly and accurately measure each student's mastery of course learning outcomes. Assessments should provide multiple ways for students to demonstrate their reasoning and understanding where possible, offering students choices that leverage their interests and strengths. Creating space for teachers to reflect on and address disparate student outcomes is crucial.

Designers will develop both formative and summative assessments that...

- Capture disaggregated student performance data in a way that facilitates examination for improving equitable student outcomes. Align with course learning outcomes, including knowledge, practices, skills, and dispositions.
- Align with course learning outcomes and course design by valuing conceptual understanding and student growth, and by prioritizing open-middle and open-ended items with diverse and relevant contexts.
- Allow for multiple ways of demonstrating understanding and reasoning by employing a variety of assessment methods (e.g., projects, portfolios, presentations) that summarize thinking processes and results from the application of the data investigative process.
- Are consistent with equitable grading practices, such as no-stakes assessments and allowing students to revise and resubmit work.
- Provide students with opportunities to demonstrate their reasoning in multiple ways (i.e., different modalities).
- Encourage holistic ways of measuring learning (such as reporting "approximations of knowledge") rather than correctness, recognizing that there are multiple ways of knowing, each with pros and cons, that often vary across cultures.
- Have diversity in the context and data sets used.
- Are designed to give students choice on the tasks and contexts they engage in.
- Allow for flexibility in assessment item contexts so that teachers can use assessment items that are relevant to their students.
- Are designed to go beyond focusing solely on correctness by considering new ways to measure approximations of knowledge, such as considering the strength of student arguments.
- Where appropriate, include robust feedback loops so that students have the opportunity to revise their work (without penalty to a grade) based on teacher/peer feedback.
- Include task-specific rubrics where appropriate.
- Are embedded with daily formative measures in appropriate places to yield actionable data to lead to improved learning.
- Identify the intended informational purpose of each item (e.g., whether it measures conceptual understanding, procedural fluency, selecting appropriate strategy).
- Create structures for teachers to periodically analyze student performance data.
- Are adaptable to allow students to demonstrate understanding, using various forms of expression.

Equitable Assessment (cont.)

Using curriculum that incorporates equitable assessment, teachers can...

- Design authentic, problem-based assessments directly tied to real-world outcomes, incorporating evaluations by industry mentors and community members to ensure relevance and practical application.
- Value assessment primarily as an opportunity to learn about student understanding and to adapt and improve instruction.
- Monitor students' progress to make immediate and longer term instructional modifications
- Embed assessments in daily routines and activities, and use ongoing formative assessments that value the journey. Reward and encourage growth.
- Use multiple forms of assessment that capture both conceptual understanding and procedural fluency.
- Provide students with opportunities to think about and refine their thinking based on feedback from peers and teachers.
- Develop rubrics that are flexible enough to align with each classroom's individual culture and needs, ensuring adaptability to diverse learning environments.
- Provide a variety of formative and summative assessments, emphasizing ample low-stakes formative assessments before high-stakes assessments to support ongoing learning and skill development.
- Use task-specific rubrics for clarity.
- Think critically about their own perceptions of student strengths and weaknesses to provide appropriate targeted instruction.
- Use assessment outcomes to improve teaching and student learning, employing a reflective approach to refine instructional strategies and enhance the learning experience.
- Design assessments that prepare students for future real-world learning contexts and careers by aligning assessments with practical applications, industry relevance, and using real-world data and applications, reinforcing the connection between classroom assessments and real-world skills.

As a result of teacher behaviors that implement equitable assessment, students can...

- Gain a greater sense of belonging in science, technology, engineering, and mathematics fields, and recognize the diverse paths to success by understanding that success in the industry includes not only mathematically fluent professionals but also those who excel in communication, civic engagement, and collaboration.
- See assessments as part of the learning process and an opportunity to reflect on learning and to continue growing, emphasizing the ongoing nature of learning.
- Approach assessments with a growth mindset, viewing them as a demonstration of understanding at that point in time rather than a definitive marker of innate ability in mathematics, fostering resilience and continuous improvement.
- Use evidence of their understanding to advance their own learning and to prepare for summative assessments.
- Think about and refine their thinking based on feedback from peers and teachers.
- Demonstrate their thinking in multiple modalities, including ones that align with their strengths and ones that push them to grow in areas where they can improve.
- Have voice and agency in how they demonstrate growth and proficiency.
- Show evidence of growth and mastery through portfolios that highlight process, product, and reflection.

Equity in Professional Learning

Equity in professional learning refers both to creating an equitable and inclusive environment for teacher participants and to supporting teachers in developing an equity mindset. Educators need ample time and support for their professional learning, including regular feedback and reflection loops to evaluate and improve their practice.

Professional learning experiences should mirror those of students in mathematics classrooms, emphasizing sense making, belonging, and the development of a critical lens. Meeting teachers where they are in their professional journeys ensures that they receive the appropriate support and resources. An equity mindset is crucial for teachers to effectively address and understand the diverse needs of their students.

Designers will develop comprehensive professional learning that...

- Builds an equity mindset in teachers via ongoing professional learning so that teachers recognize the need for mathematics pathways.
- Creates cultures and climates that support belonging, equity, and inclusion, and discusses content and pedagogy through an equity lens.
- Is based on research-supported teaching practices.
- Is asset-based.
- Models effective teaching practices.
- Involves active participation in a supportive and collaborative environment.
- Emphasizes the importance of formative assessment.
- Stresses the value of integrating statistical thinking and quantitative reasoning, and emphasizes how they are integrated in the curriculum.
- Provides teachers with opportunities to learn to work with authentic, real-world data sets in the context of applying the data investigative process.
- Provides teachers with regular opportunities to reflect on their learning and teaching practices and on how classroom practices are viewed by and impact all students.
- Introduces culturally responsive and sustaining pedagogical theory and strategies so that teachers can understand how different cultures can be supported in, and can contribute to, the classroom environment.
- Supports teachers in reflecting on their classroom practices (e.g., cultural relevance, collaborative team exercises) and how they are viewed by and impact all students.
- Integrates technology appropriately, providing instruction as needed.
- Includes cycles of classroom implementation where teachers apply their learning, reflect, and adjust.
- Emphasizes the importance of formative assessment and is time- and cost-effective.
- Is distributed over time.
- Is adaptable in terms of delivery methods.
- Leverages the expertise of district leaders, school leaders, and teachers.
- Meets the unique needs of the districts, schools, and teachers.

Equity in Professional Learning (cont.)

Using curriculum that incorporates equity in professional learning, teachers can...

- Feel more confident in areas that are not traditionally emphasized in their own professional training, such as data analysis and data technology.
- Combine knowledge of students (e.g., challenges and misconceptions, interests, and motivations) and knowledge of teaching (e.g., design of instruction, sequencing of content, choice of examples, representations) with knowledge of content to support student learning and growth.
- Understand the value of technology and other active learning practices in developing conceptual understanding.
- Adopt evidence-based instructional practices and strategies that align with the diverse needs of the students.
- Regularly reflect on current classroom practices, specifically with a lens towards facilitating a supportive learning environment that is equitable and inclusive, promoting continuous improvement in teaching strategies.
- Support students in understanding the value of and the differences between mathematical and statistical approaches.
- Demonstrate the value of and the differences between different tools and technologies, and support student growth in selecting an appropriate tool for a given task.
- Gain skills and practices to enhance facilitation and responsiveness to students and to eliminate barriers to learning, sharing responsibility for improving learning for each and every student.
- Develop and leverage a growth mindset about each and every student's ability to engage with statistical concepts deeply through the understanding and implementation of appropriate pedagogical content knowledge.
- Embrace inclusive practices that build on what students bring to the classroom in terms of experiences, talents, and interests rather than seeing differences as weaknesses.
- Engage in a cycle of ongoing professional learning, including opportunities to regularly engage with other educators who teach the course, either in person or virtually in communities of practice.

As a result of teacher behaviors that implement equity in professional learning, students can...

- Learn from teachers who are confident in their subject matter and facilitation strategies.
- Become agents of their own learning, interrogating data and processes, and redirecting.
- Develop positive identities built on self-efficacy, self-evaluation, and reflection.
- Gain a sense of confidence and community by learning alongside their teachers, reducing the pressure to know the right answer ahead of time and fostering a supportive and collaborative learning environment.
- Benefit from and experience better learning outcomes from teachers' cycles of learning, classroom implementation, and reflection, ensuring a dynamic and continually improving learning experience.

Student Learning Outcomes

Because the ISQR course is designed to be fully integrated and not implemented as a semester of quantitative reasoning and a semester of statistics, the table below is organized in two columns. The first column categorizes learning outcomes in terms of where the content might be found in a traditional quantitative reasoning or statistics course. The second column of the table highlights opportunities for and benefits of the integration of content.

Modernized pathways in mathematics, statistics, and data science provide new opportunities to increase the number of students who extend their exploration of mathematics. Traditional mathematics and statistics lessons that teach concepts as a set of procedures and with an exclusive focus on procedural fluency result in widespread disengagement as students see no relevance to their lives. The inability to see relevance in the content disproportionately impacts some student groups, who may also receive additional harmful messages that mathematics is not for them.

This integrated course offers different ways to increase diversity, empower students as learners, and encourage them to continue their study of mathematics and related fields. In addition, educators can offer social and emotional support to students through engaging lessons that allow students to connect with the ideas being taught. Content must be introduced, explored, mastered, and communicated in context. To that end, the second column of the table also includes suggestions for relevant applications.

Learning Outcomes for Integrated Statistics and Quantitative Reasoning		
Overarching Themes	**Opportunities for Integration**	**Potential Applications**
Overarching Global Learning Outcomes		
Students will be able to: • Develop mathematical habits of mind, such as engaging in sense making; communicating effectively verbally, in writing, and using graphical displays; justifying conclusions; and critiquing their own work and the work of their peers. • Approach solutions to authentic tasks from multiple perspectives (e.g., conceptual, numerical, algebraic, statistical, graphical, geometric) to refine thinking and produce a more robust solution. • Select and use available technology as appropriate for the situation.	An integrated statistics and quantitative reasoning course allows for approaching problems from multiple perspectives rather than from only a mathematical or only a statistical approach.	• Authentic and relevant applications, including financial, media, health, and civic literacy should be integrated throughout the course. Examples of other potential applications: ◦ student-researched examples that illustrate their personal interests (e.g., sports, music, gaming) ◦ local community issues that can be investigated using data analysis

Learning Outcomes for Integrated Statistics and Quantitative Reasoning		
Overarching Themes	**Opportunities for Integration**	**Potential Applications**
• Employ systematic problem-solving processes, including the statistical problem-solving process (formulating questions that can be answered by data, collecting or considering data, analyzing data, and interpreting results).[1]		◦ unintended consequences of policies and law that can be investigated using data analysis ◦ historical data that can be analyzed to understand trends
Numerical and Distributional Thinking[2]		
From a Quantitative Reasoning perspective Students will be able to: • Reason, model, and communicate with and about quantities, ratios, rates, proportions, and percentages using equivalent forms, when appropriate, to investigate and describe relationships and to solve problems. • Calculate absolute and relative change from data and explain which is a more appropriate measure in a given context. • Apply estimation skills and know why, how, and when to estimate results. Assess and justify the reasonableness of estimations using the context and comparisons to other known values. • Interpret and compare measures of center and measures of variability, and evaluate claims based on such summaries. • Distinguish between proportional and nonproportional situations, and, when appropriate, apply proportional reasoning.	Expanding previous quantitative skills to develop dexterity in comparing messy and very large and very small numbers allows for analysis of authentic situations. Ordering small numbers (numbers less than 1) supports the interpretation of probabilities, P-values, and comparing P-values to significance levels. Distributional thinking is an important component of statistical thinking, preparing all students for future work.	• Interpret and make decisions related to authentic and relevant uses of quantities, including very large and very small quantities. For example: ◦ incidence of medication side effects ◦ student/local/state/federal budgets ◦ interest rates related to investments, loans, and credit cards, including compound interest ◦ environment, land management, and agriculture ◦ weighted averages, indices, coding, and ranking and voting methods ◦ growth and decline represented as fractions rather than percentages

1 Bargagliotti et al., 2020.

2 Distributional thinking involves viewing data as a distribution, as opposed to a collection of individual values, and considering variability in the distribution.

Learning Outcomes for Integrated Statistics and Quantitative Reasoning		
Overarching Themes	**Opportunities for Integration**	**Potential Applications**
From a Statistics perspective Students will be able to: • Calculate (using technology) and use appropriate measures of center and variability to summarize data and to compare data distributions. • Use appropriate measures to compare groups of unequal size. • Use authentic data to investigate real-world problems. • Demonstrate distributional thinking by recognizing the distinction between individual values of a variable and the distribution of the values of a variable.		◦ other applications related to media, financial, health, and social literacy from the perspective of analyzing, communicating, understanding, and revealing inaccuracies/ deceptions • Summarize large numerical data sets to learn about a population or the behavior of a random variable. For example: ◦ polls and surveys ◦ social media use ◦ distribution of food and technology deserts ◦ access to clean water
Graphical Reasoning		
From both Quantitative Reasoning and Statistics perspectives Students will be able to: • Analyze published graphical representations of data from a variety of sources. • Compare data distributions using appropriate graphical displays. • Construct and interpret univariate and multivariable data visualizations, including but not limited to histograms and scatterplots. • Identify misleading or incorrect aspects of graphical displays.	An integrated approach has the potential to better develop the ability to analyze and detect inaccuracies in media infographics, which often include both numerical and statistical information. It also develops the ability to present both numerical and statistical information to others (e.g., peers, employers) in a variety of forms.	• Examples from simple to complex multiple variables that address: ◦ media, financial, health, civic, and social literacy ◦ comparing groups to identify systemic inequalities ◦ student-researched examples that illustrate their personal interests (e.g., sports, music, gaming) ◦ analyzing graphs from the "What's going on in this graph?" collection[1]

1 The Learning Network, 2024.

Learning Outcomes for Integrated Statistics and Quantitative Reasoning		
Overarching Themes	**Opportunities for Integration**	**Potential Applications**
Reasoning About Relationships Between Variables		
From a Quantitative Reasoning perspective Students will be able to: • Select and use mathematical functions, including linear, exponential, and inversely proportional to describe relationships. • Reason informally about piecewise and cyclical relationships. • Justify the choice of one function type versus another to describe a relationship. • Interpret parts of expressions, such as terms, factors, and coefficients. • Predict and then confirm the effect that changes in coefficient values have in an algebraic relationship. ***From a Statistics perspective*** Students will be able to: • Identify and describe statistical relationships (ones that take variability into account) between two numerical variables. • Explain the difference between a statistical relationship and a deterministic relationship. • Explain the difference between association and causation. • Identify potential confounding variables and describe possible effects. • Discuss whether a correlation reported in the media is real or spurious. • Identify and describe the association between two categorical variables. • Reason about relationships between more than two variables.	The treatment of deterministic relationships modeled by functions supports the conceptual development of statistical relationships that take variability into account and leads to deeper understanding of functional relationships.	• Simpson's Paradox and other examples illustrating the importance of multivariable thinking can be drawn from the following areas: ◦ media, financial, health, civic, and social literacy ◦ racial and gender disparities in health care ◦ student-researched examples that illustrate their personal interests (e.g., sports, music, gaming)

Learning Outcomes for Integrated Statistics and Quantitative Reasoning		
Overarching Themes	**Opportunities for Integration**	**Potential Applications**
Modeling		
From a Quantitative Reasoning perspective Students will be able to: • Identify an algebraic model, when appropriate, and use technology to determine model coefficients. • Assess the reasonableness of a model for given data and consider alternative models given what is known based on the context. • Use mathematical models to predict exact or estimated outputs. • Identify how changing parameters affects results. • Use linear and nonlinear mathematical models to investigate and draw conclusions in contexts that are rooted in authentic daily experiences. • Use network models (e.g., vertex-edge graphs using critical paths, Euler paths, and minimal spanning trees), when appropriate, for a given situation. • Address limitations and long-term ramifications of chosen models and recognize when a change in a model is needed. • Identify when there is insufficient information given to solve a problem and identify assumptions used to approach a problem. From a Statistics perspective. ***From a Statistics perspective*** Students will be able to: • Model relationships between numeric variables using models that acknowledge chance variability. • Use statistical models to investigate and draw conclusions in contexts that are rooted in authentic, daily experiences.	An integrated course provides exposure to both mathematical modeling and statistical modeling, rather than to just one of these approaches. Mathematical modeling involves using algebraic functions and graphical techniques to describe authentic situations. Many of the financial applications in quantitative reasoning are not seen in a typical high school statistics course. Mathematical modeling extends into advanced algebra/ precalculus models, keeping the bridge open back to STEM. Statistical modeling extends mathematical models by allowing for and describing chance variation, and by accessing the accuracy of predictions—both of which are often missing in quantitative reasoning courses.	• Model applications such as population growth/ decline, business production/income/ profit, credit card debt, installment savings, amortization schedules, and mortgages. • Model disease spread, scheduling, and routing situations. • Apply geometric concepts to model situations and solve problems such as those arising in art, architecture, and other fields. • Use data to model applications such as student debt, social media use, and access to technology.

Learning Outcomes for Integrated Statistics and Quantitative Reasoning		
Overarching Themes	**Opportunities for Integration**	**Potential Applications**
• Evaluate the usefulness of a statistical model and assess the accuracy of predictions based on the model.		
Probabilistic Reasoning		
From a Quantitative Reasoning perspective Students will be able to: • Describe situations involving uncertainty, distinguishing among rarely, unlikely, equally likely, likely, and almost always. • Calculate probabilities, including conditional probabilities, using tools such as two-way tables and tree diagrams. • Interpret statements about risk that are expressed in terms of probabilities, percentages, ratios, and odds. • Interpret probabilities in context and use probabilities to inform decision making. ***From a Statistics perspective*** Students will be able to: • Use simulation to estimate probabilities. • Reason with and about conditional probabilities. • Make connections between probability and sampling models. • Use the information provided by a probability distribution to make statements about the long-run behavior of a variable. • Make informed decisions based on the expected value and variability of a random variable.	An integrated course allows for deeper understanding of proportional reasoning through expanded consideration of conditional probabilities. While the typical quantitative reasoning course often includes interpretation of conditional probabilities, understanding of conditional probabilities would be deepened by connecting conditional probability to the assessment of error probabilities when drawing data-based conclusions. The integration of quantitative reasoning probability topics and the probability topics usually included in a statistics course allows for a better understanding of different approaches to probability (classical probability [equally likely outcomes] versus relative frequency approach to probability).	• Assess potential for error when drawing conclusions from data. • Analyze the likelihood of false positive and false negative test results, and the consequences of making decisions based on such results. • Compare relative risk and absolute risk. • Analyze demographic disparities in areas such as health care and access to advanced courses.

Learning Outcomes for Integrated Statistics and Quantitative Reasoning		
Overarching Themes	**Opportunities for Integration**	**Potential Applications**
Data Collection, Data Ethics, and Data Privacy		
From a Statistics perspective Students will be able to: • Collect data in appropriate ways. • Critically evaluate data collection methods used in surveys and research studies. • Discuss the ethical issues around the collection and management of data, data privacy, and informed consent, and identify potential ethical issues in specific contextual situations. • Identify types of bias and potential sources of bias in data collection. • Describe the role of random selection and random assignment in the design of statistical studies. • Describe how the types of conclusions that can be drawn and the way in which conclusions can be generalized depend on the way in which the data were collected.	Quantitative reasoning courses typically only have a surface treatment of data collection and would benefit from the treatment that is typical in statistics and data science.	• Exploring ethical and privacy issues related to: ◦ data collection, including privacy and informed consent, such as data collected by Facebook and in the Tuskegee experiments ◦ students' own data on their health, financial, and personal identification information
Analyzing and Communicating Mathematical and Statistical Findings		
From a Quantitative Reasoning perspective Students will be able to: • Interpret numerical summaries and information in graphical displays and use that information to draw conclusions. • Evaluate and communicate about incomplete, incorrect, or deceptive reports. • Compile numerical information and summaries from a variety of sources, and analyze the information holistically to make and justify decisions.	An integrated course supports development of both statistical and mathematical thinking. Rather than a focus on decontextualized skills practice, the focus is on practical applications of these types of thinking to draw conclusions and make decisions.	• Analyze data and numerical summaries from examples that address: ◦ media, financial, health, civic, and social literacy ◦ environment, land management, and agriculture ◦ student-researched examples that illustrate their personal interests (e.g., sports, music, gaming)

Learning Outcomes for Integrated Statistics and Quantitative Reasoning		
Overarching Themes	**Opportunities for Integration**	**Potential Applications**
• Describe potential risks when generalizing to a new situation. • Communicate the strengths and deficiencies of models and provide cautions in interpretations. Communicate assumptions made and anticipated or possible impact of future events. ***From a Statistics perspective*** Students will be able to: • Recognize and describe sampling variability and the role it plays in drawing conclusions from data. • Use sample data to compare groups. • Evaluate whether conclusions based on sample data are reasonable given the way in which the data were collected. • Use sample data to estimate population characteristics and interpret margin of error. • Use sample data to draw conclusions about a population and assess risk of error. • Use informal hypothesis testing with simulated p-values to test conjectures and draw conclusions. • Understand the meaning of "statistical significance" and "significantly different." • Explain in context the difference between statistical significance and practical significance. • Use graphs and numerical summaries to communicate the results of a statistical analysis.	Quantitative reasoning looks at drawing conclusions from data, and statistics takes this a step further by also assessing risks associated with using sample data to draw conclusions. That is, statistics considers sampling variability in a more explicit way. Statistical significance and the difference between statistical significance and practical significance are important concepts for civic and media literacy that are not typically addressed in a quantitative reasoning course. An integrated course provides exposure to these concepts.	• Analyze and provide feedback on numerical/quantitative and statistical arguments made: ◦ in the media ◦ in workplace examples ◦ by classroom peers in projects and presentations

Bibliography

Ball, D., Thames, M., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education, 59*(5). https://doi.org/10.1177/0022487108324554

Bargagliotti, A., Franklin, C., Pip, A., Gould, R., Johnson, S., Perez, L., & Spangler, D. A. (2020). *Pre-K–12 guidelines for assessment and instruction in statistics education II (GAISE II)*. American Statistical Association. https://www.amstat.org/docs/default-source/amstat-documents/gaiseiiprek-12_full.pdf

Blanke, B. (n.d.). *Three reads using a problem stem: Focusing on The 8 Standards for Mathematical Practice.* https://www.mathlearningcenter.org/sites/default/files/documents/Three%20Reads%20iTunes%20Using%20a%20Problem%20Stem.pdf

Conference Board of the Mathematical Sciences. (2012). *The mathematical education of teachers II.* American Mathematical Society and Mathematical Association of America.

Feldman, J. (2023). *Grading for equity: What it is, why it matters, and how it can transform schools and classrooms*. Corwin Press.

Franklin, C. A., Bargagliotti, A. E., Case C. A., Kader, G. D., Scheaffer, R. L., & Spangler, D. A. (n.d.). *Statistical education of teachers.* https://www.amstat.org/asa/files/pdfs/EDU-SET.pdf

Franklin, C., Kader, G., Mewborn, D., Moreno, J., & Peck, R. (2007). *Guidelines for Assessment and Instruction in Statistics Education (GAISE) report: A pre-K–12 curriculum framework.* https://www.amstat.org/docs/default-source/amstat-documents/gaiseprek-12_full.pdf

Hill, H., Ball, D., & Schilling, S. (2008). Unpacking pedagogical content knowledge: Conceptualizing and measuring teachers' topic-specific knowledge of students. *Journal for Research in Mathematics Education, 39*(4), 372–400.

Ladson-Billings, G. (2023). "Yes, but how do we do it?": Practicing culturally relevant pedagogy. In *White teachers/diverse classrooms* (pp. 33–46). Routledge.

Learning Forward: The Professional Learning Association. (n.d.). https://standards.learningforward.org

Los Angeles Unified School District. (n.d.). *Three reads: Applying constructive conversation skills.* https://www.lausd.org/cms/lib/CA01000043/Centricity/domain/335/lessons/integrated%20math/cards/ThreeReadsCard-low.pdf

National Council of Teachers of Mathematics. (2014). *Access and equity in mathematics education: A position of the National Council of Teachers of Mathematics.* https://www.nctm.org/Standards-and-Positions/Position-Statements/Access-and-Equity-in-Mathematics-Education/

National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all.* National Council of Teachers of Mathematics.

National Council of Teachers of Mathematics. (2018). *5 practices for orchestrating productive mathematics discussions* (2nd ed.). National Council of Teachers of Mathematics.

National Council of Teachers of Mathematics. (2024). *The intersection of culture and mathematics: A position of the National Council of Teachers of Mathematics.* https://www.nctm.org/Standards-and-Positions/Position-Statements/The-Intersection-of-Culture-and-Mathematics/

Peck, R., & Short, T. (2018). How to read a statistics problem. In *Statistics companion: Support for Introductory Statistics.* Cengage.

Style, E. (1996). Curriculum as window and mirror. *Social Science Record, 33*(2), 21–28.

The Learning Network. (2024, May 9). *What's going on in this graph?: Hotter summers.* The New York Times. https://www.nytimes.com/2024/05/02/learning/whats-going-on-in-this-graph-may-8-2024.html

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