

talkSTEM Resources

For all Educators, Students, and Families

GRADES: PREK-12

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talkSTEM Resources

GRADES: PREK-12

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I. WHAT IS talkSTEM AND walkSTEM?

What is talkSTEM?

talkSTEM is a 501(c)3 non-profit organization, founded in 2015 by Dr. Koshi Dhingra, who has an extensive background in science teaching, teacher education, and research in formal and informal learning and teaching environments. Dr. Dhingra founded talkSTEM to serve as an ecosystem of science and math learning opportunities both inside and outside of the traditional school setting, with the goal of engaging students in STEM experiences “beyond the textbook”. talkSTEM offers a variety of programs, teaching tools, and platforms including the walkSTEM initiative. We invite you to join our community. Please visit talkSTEM.org and we encourage you to subscribe so you can receive newsletters with new posts on our digital forum, on an occasional basis. We invite you also to share your ideas and experiences on our digital forum, inspire others and be inspired by them, with the common goal of fostering student engagement and development of students’ STEM identity.

“The engagement of the full range of stakeholders and community members in improving STEM education in particular contexts can help mitigate the behavioral, structural, and organizational factors that affect STEM teaching and learning practices that play a role in engaging or turning certain groups of learners away from STEM pathways.” - STEM 2026, *A Report by US Department of Education, Office of Innovation and Improvement (2016)*

What is walkSTEM?

The walkSTEM initiative aims to increase mathematical and scientific literacy among all people. Its mission is to create transformative experiences that connect STEM to the everyday world. walkSTEM is a place-based STEM inquiry methodology that foregrounds mathematics but includes STEAM disciplines as it relates to exploration of the space in the real world. walkSTEM was developed in partnership with National Museum of Mathematics’ Founder Dr. Glen Whitney and was launched in the Dallas Arts District on Pi Day, 2017 in conjunction with talkSTEM’s first Pi Day Math Festival. The Pi Day Math Festival is now an annual event held in partnership with AT&T Performing Arts Center and involving two dozen organizations.

NOTE: We believe that STEM is connected to a wide range of human activities including art, architecture, the humanities, and design thinking. When we refer to STEM, we are referring to a real-world, interdisciplinary exploration of the world around us, with the goal of breaking down artificial barriers between disciplines. Our vision is a world where every person is a STEM person and every space is a STEM space.

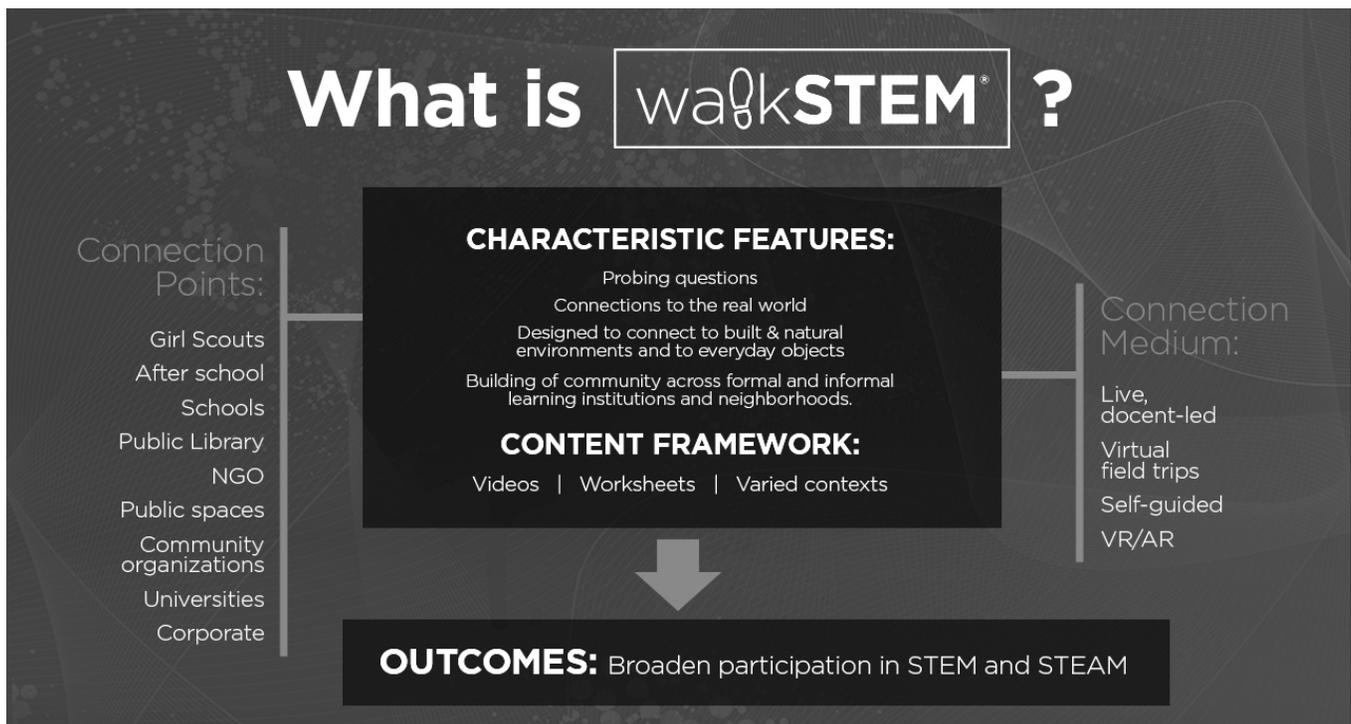


FIGURE 1: WHAT IS WALKSTEM?

Where can I experience walkSTEM?

All over DFW! And, in many cases, you can also go on a virtual walkSTEM tour via our walkSTEM Academy platform. Details below.

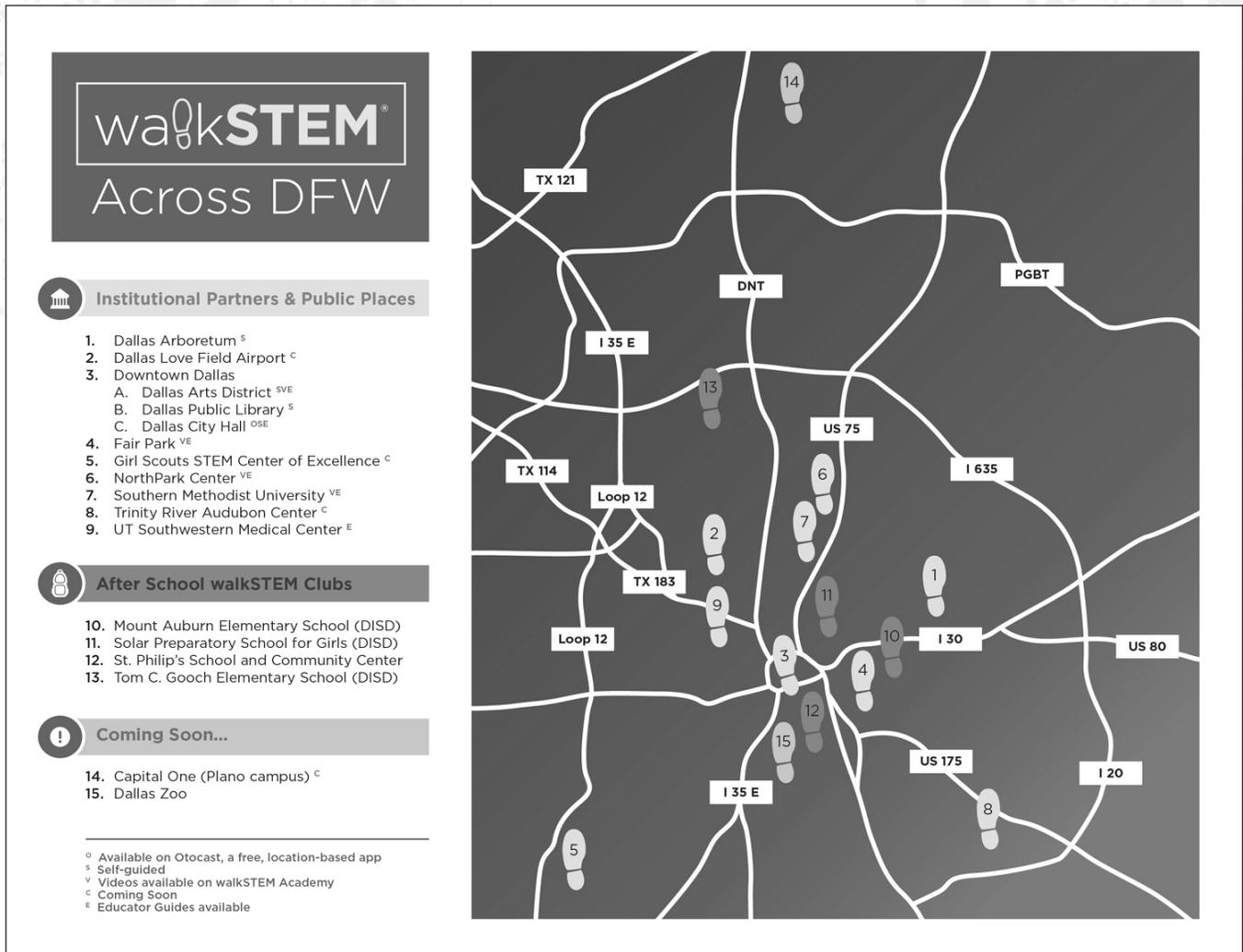


FIGURE 2: MAP SHOWING WALKSTEM SITES ACROSS DFW

Interested in learning more?

- Search “talkSTEM Pi Day Math Festival” on Youtube to view short video about the event.
- Search “talkSTEM DMA Coffee and Conversation” on Youtube to see Oswaldo Alvarenga’s discussion of walkSTEM.

II. WHAT RESOURCES ARE AVAILABLE TO ME AS AN EDUCATOR?

All talkSTEM educational resources are freely available. Our goal is to create a networked community of practice using walkSTEM and other methodologies that continue to evolve. This community includes prek-12 schools, community colleges, universities, corporate settings, informal learning spaces, and neighborhoods.

walkSTEM Resources

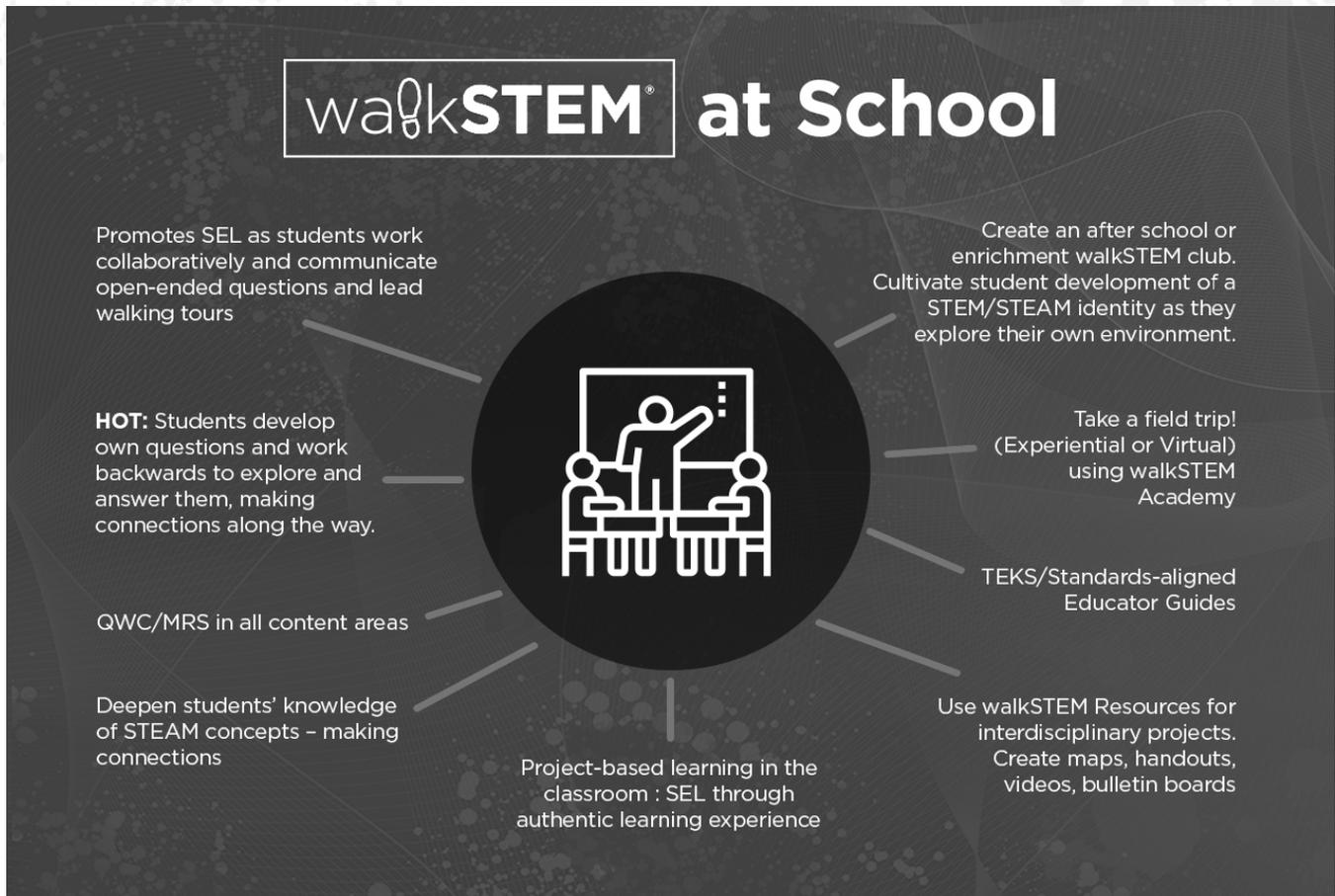


FIGURE 3: AN OVERVIEW OF THE VARIOUS WAYS WALKSTEM RESOURCES CAN BE USED IN THE CLASSROOM, AS AN ENRICHMENT ACTIVITY OR IN YOUR OUT-OF-SCHOOL PROGRAM. SEE SECTION IV FOR MORE DETAILED INFORMATION AND EXAMPLES.

Here are five sets of walkSTEM Resources Available to all Educators:

1. ARTIST-CREATED REPRESENTATION OF WALKSTEM TOUR AS A MODEL FOR CLASSROOM OR AFTER SCHOOL CLUB ACTIVITIES. (FIGURE 4)

This map is available as a download on talkSTEM.org (click Educator Resources tab and then Parent/Educator Guides). We worked with Canadian artist, Julie McLaughlin and in collaboration with several of the Arts District organizations to create this unique map as a Mathematical Representation of the Arts District. It is a model of what students can also do in STEAM classrooms or through interdisciplinary projects.

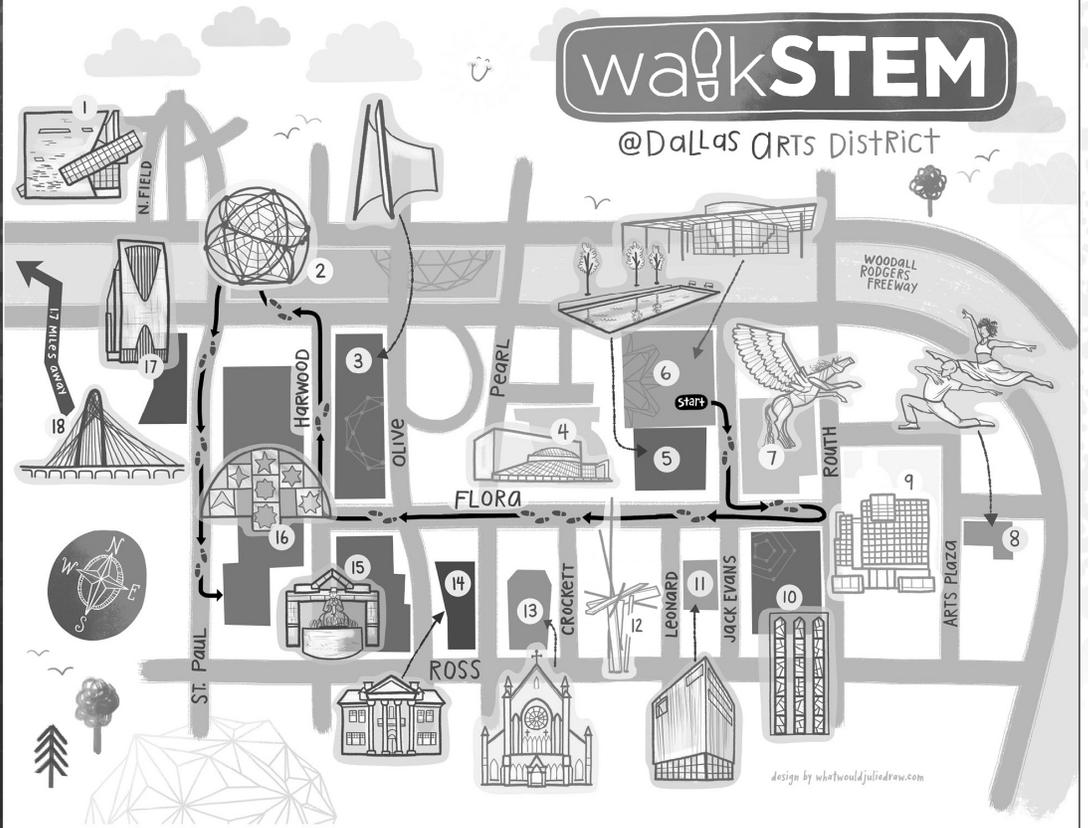
WALK ON!

Map Legend

1. Perot Museum of Nature and Science
2. Klyde Warren Park
3. Nasher Sculpture Center
4. Morton H. Meyerson Symphony Center
5. Elaine D. and Charles A. Sammons Park
6. Margot and Bill Winspear Opera House
7. Booker T. Washington High School for the Performing and Visual Arts
8. Dallas Black Dance Theatre
9. One Arts Plaza
10. Dallas City Performance Hall
11. Dee and Charles Wylie Theatre
12. Hall Arts
13. Cathedral Shrine of the Virgin of Guadalupe
14. Belo Mansion
15. Crow Collection of Asian Art
16. Dallas Museum of Art
17. Hunt Consolidated Headquarters
18. Margaret Hunt Hill Bridge

Note:

All information about these sites is courtesy of the institutions in the Dallas Arts District and their staff. We appreciate their collaboration! Vancouver artist, Julie McLaughlin, created our map. We hope it helps you appreciate the beauty, form and function of our Arts District — and perhaps even see it in a new light.



design by whatwouldjuliedraw.com

DID YOU KNOW?

The Dallas Arts District viewed through a mathematical lens

1 PEROT MUSEUM OF NATURE AND SCIENCE:

The building's outer skin is made up of 656 textured precast concrete panels, totaling 4 million pounds — the equivalent of 12 blue whales or 30 sauropods (the biggest dinosaurs to walk the earth). What's the average weight of each concrete panel?

2 KLYDE WARREN PARK:

Performance stages and trees are heavy, and when your park is suspended above a busy freeway, minimizing weight is key! But the engineers had a secret weapon to minimize weight — using geo-foam in places where planting soil wasn't necessary. At half the weight of soil, geo-foam helped the engineers lose a lot of weight. How did they go about calculating the weight of plants that had not even grown yet?

3 NASHER SCULPTURE CENTER:

Walk under the Richard Serra Sculpture in the garden, *My Curves Are Not Mad*. The sculpture consists of 2 Cor-Ten steel plates that are 44 feet long, 14 feet tall and 2 inches thick. Each weighs about 50,000 lbs. The massive Cor-Ten steel plate is actually very fragile because it has an incredibly long-term material memory. So if you make any mark on the surface, it stays for a long, long time. When the Nasher team had to transport this sculpture from the DMA just two blocks away, this was a nerve-racking task! Read more about this on our blog when we spoke to Chief Curator, Jed Morse.

4 MORTON H. MEYERSON SYMPHONY CENTER:

The Lay Family organ is made up of 4,535 pipes of varying length and diameter. How does this create and affect the music that's produced?

FIGURE 4: WALKSTEM @ DALLAS ARTS DISTRICT MAP AND LEGEND

5 THE DONOR REFLECTING POOL AT SAMMONS PARK:
The water depth is 1/16"-1/8" deep. The area of the pool is 3,972 sq. ft. How many gallons of water is that? From the Taj Mahal to the Lincoln Memorial Reflecting Pool in the National Mall in DC, reflecting pools have been built because they are beautiful. If you were designing such a pool, think about which materials to use, color, size, volume of water? Why does water reflect light? How do you maximize the amount of reflection?

6 MARGOT AND BILL WINSPEAR OPERA HOUSE:
The main stage of the Winspear Opera House is so big you could park a Boeing 737 on it! The "falling stars" chandelier is the centerpiece of the Winspear Opera House. Light radiates from suspended, internally lit acrylic rods - over 300 of them forming a constellation above the audience. With a diameter of 40 feet and a height of the same, the randomly spaced rods do look like falling stars.

7 BOOKER T. WASHINGTON HIGH SCHOOL FOR THE VISUAL ARTS:
This was the first institution in the Dallas Arts District and the only school. As noted on the school's website: "Mathematics has spread its influence far beyond the realm of numbers. ... Views about human nature, religion, truth, space and time, and much more have been shaped and honed by the ideas and practices of this vital scientific field." How has your life been influenced by math?

8 DALLAS BLACK DANCE THEATRE:
How are math and dance related? From tango to tap, ballet to breakdancing, dance draws heavily on concepts of symmetry, geometry (think shapes, lines, angles, arcs), patterns, and proportion - not to mention speed and patterns of music and movement. Here's another interesting fact: Dallas Black Dance Theatre has performed across the globe in 31 states, 14 countries and 5 continents!

9 ONE ARTS PLAZA:
The main facade of this building is a square made up of continuous 10' x 10' ribbon windows! If there are 17 windows across and 17 windows down, can you do the math on how many windows are in the front face of this building?

10 DALLAS CITY PERFORMANCE HALL:
The large LED curtain on stage provides endless possibilities for set design. The curtain is 60' wide and 32' tall. What math concepts did the designers of this LED curtain need to consider? Here are some: screen area, aspect ratio, luminous flux density, fraction of light lost...what do these terms mean and how do they relate to the screens you use? Speaking of light, when you walk by the DCPH, take a look at the three fused glass windows by artist Octavio Medelín and consider, how did the artists create those colors? What are the slopes of the different lines you see? What other questions come to mind?

11 HALL ARTS:
John Henry's iconic yellow sculpture, *Tartin's Sentinel*, stands at 101 feet tall! How does knowledge about material science, engineering, geometry and physics help you see this sculpture in different ways? Go for a stroll down the Texas Sculpture Walk, and use your mathematical lens. What math do you see?

12 DEE AND CHARLES WYLY THEATRE:
Totally tubular. The exterior of the Wyly is composed of 466 aluminium tubes with widths ranging from 3" to 10". The tubes are only attached at the top. Why is this?

13 BELO MANSION:
Beló Mansion is the former home of Colonel H.A. Beló, founder of *The Dallas Morning News*. Built in 1890 in the neo-classical revival style, the mansion shows features of classical symmetry. What can you point out that is symmetrical in the front of the mansion?

14 CROW COLLECTION OF ASIAN ART:
The Eastern architecture of Hinduism and Buddhism considered the circle, the square, and the triangle to be the most perfect of building forms. Do you notice one of these shapes featured prominently on the outside of this building?

15 MARGARET HUNT HILL BRIDGE:
This is not the Arts District but it is a very mathematical structure not too far away! The dramatic 400-foot parabola supports 58 cables, which are intertwined on either side of the central arc. What's a parabola and how do you draw one? If all of these cables were laid end to end, how many miles would they stretch for?

16 CATHEDRAL SHRINE OF THE VIRGIN OF GUADALUPE:
This is the oldest Catholic parish in Dallas, and the second busiest Catholic cathedral in the nation! Over 15,000 people file through the cathedral during the weekend. How many people would that be, on average, per hour?

17 DALLAS MUSEUM OF ART:
Check out Sol Lewitt's *Wall Art #398* (Contemporary Art - Barrel Vault, Level 1). In math, a sequence is an ordered list of objects. If we think of this work as a sequence, what would the next shape look like?

18 HUNT CONSOLIDATED HEADQUARTERS:
Admire the majestic glass sail and ellipse facade fronting the north end of the building. The glass of the sail is curved top to bottom. Can you name other ellipses in the natural and built world? How can you draw an ellipse accurately? Walk into the lobby and take a look at the Foucault Pendulum. What does the motion of the pendulum prove? How would it move differently at the equator? South Pole?

FIGURE 4: WALKSTEM @ DALLAS ARTS DISTRICT MAP AND LEGEND

2. VIDEO LECTURE BY DR GLEN WHITNEY, WALKSTEM ADVISER, ON HOW TO DESIGN A WALKSTEM TOUR.

To view a 20 min talk given by Dr Whitney on How to Talk the Talk and Walk the Walk, visit “walkSTEM Academy” on Youtube, select Teacher Development playlist. This is also a great video for older students to watch if they are starting a walkSTEM club or if they are working on creating their own walkSTEM tour on campus as a project (more on these possibilities on p. 9)

3. WALKSTEM NETWORK

The growing walkSTEM Network consists of students, varied walkSTEM partner organizations, supporting institutions, educators, after school clubs, and other interested individuals. walkSTEM network members receive special invitations to walkSTEM events, share best practices related to the program and its lessons, connect with others with similar interests, and help increase integration of a STEM community in North Texas. We are proud to include the Dallas ISD STEM Department as a valued member of our network. You can view a list of current Network partners in Figure 1 walkSTEM across DFW.

4. WALKSTEM ACADEMY

walkSTEM Academy is our growing platform on YouTube, consisting of short videos showing place-based STEM inquiry in action. The goal is to make our content as accessible as possible to all.

- We currently have videos of each walkSTEM stop in our Dallas Arts District, North Park Center, and Fair Park walkSTEM experiences
- Great for field trips - real and virtual. The playlists, currently found on YouTube, is open to all Dallas ISD educators as an approved site.
- Coming soon! Videos of tours at the Girl Scouts STEM Center of Excellence; Love Field Airport; Capital One HQ (both an AR app and videos), SMU Campus, Dallas Zoo
- Also coming soon: short videos submitted by teachers/students. We will expand walkSTEM Academy to include videos created by schools so they can showcase their walkSTEM designs. Join our community by subscribing on talkSTEM.org so we can let you know once this feature of the Academy is launched later this fall.

5. PARENT/EDUCATOR GUIDES AND STUDENT ACTIVITY SHEETS AVAILABLE

Parent/Educator Guides and Student Activity Sheets are freely available on talkSTEM.org (click on Educator Resources) for locations including:

- walkSTEM tours at Dallas Arts District, NorthPark Center, Fair Park, Dallas Public Library
- Easily searchable on www.talkSTEM.org under Educator Resources tab. You can search by grade, TEKS, and more.
- Coming soon! Look out for new interactive guides for Girl Scouts STEM Center, Love Field, Dallas Zoo, Capital One HQ, Texas Discovery Gardens

NOTE: For the educator guides at Dallas Arts District and NorthPark Center, detailed math and science TEKS-aligned guides and activity sheets for each stop are available (thanks to support from City of Dallas Office of Cultural Affairs). Each stop has easily downloadable and engaging student activity sheets geared toward different grade bands (K-2, 3-5, 6-7, and up). Each of these activity sheets in turn has pre-, during-, and post-viewing sections that can be utilized in order to ensure that students are actively processing material and making connections. Use with videos and/or to augment real field trips. walkSTEM tours and related activities are very appropriate for all sorts of interdisciplinary work including ELA, Arts, Engineering, Architecture, Urban Design, Environmental Studies, and more. Please share your experiences using these resources by submitting a blog post for our Digital Forum (more information on p. 8). You can also share on our social media. Use #talkSTEM and #walkSTEM.

More talkSTEM Resources

GROWING LAB GIRLS TOOLKIT

- Authentic activities aligned to Science, Engineering, Mathematics and ELA standards (grades 7-12). Download an electronic copy at www.talkstem.org!
- Inspired by Lab Girl by Dr. Hope Jahren and developed by talkSTEM in collaboration with partners UT Southwestern Medical Center, SMU, Dallas Arboretum, and Design, Connect, Create nonprofit organization.

- Includes exciting Writing and Photography contests for your students! (next round deadline in Dec. 2018; judged by science journalist at Dallas Morning News and Scientific American)

TALKSTEM DIGITAL FORUM

- This engaging forum available to anyone includes blog posts and video by a wide variety of people engaged in STEM and STEAM ecosystem. Visit www.talkSTEM.org and click on Forum.
- We invite Dallas ISD professionals to contribute to the forum! High school students wishing to share about unique STE(A)M experiences are also welcome.

TEACHER DEVELOPMENT VIDEO RESOURCES

- How to Talk the Talk and Walk the Walk: This engaging lecture by Dr. Glen Whitney describes the walkSTEM methodology and inspires educators to “think outside the box” when it comes to designing learning experiences for their students
- Designing Math Trails: Be sure to also check out this fascinating lecture by Prof Ron Lancaster on a different version of walkSTEM methodology

21 DAY SUMMER AND FALL STEAM ONLINE CHALLENGES FOR FAMILIES, TEACHERS, AND STUDENTS (K-8)

- Sign up for these FREE challenges on talkSTEM.org, and receive a daily email including ideas for low or no-cost STEAM activities

WALKSTEM MATH TRAIL AT DALLAS CITY HALL PLAZA DEVELOPED BY DR RON LANCASTER

- Free download under talkSTEM.org (Educator Resources)
- Suitable for high school

III. HOW CAN I GET INVOLVED?

We have a number of Dallas ISD teachers, administrators, and high school students who volunteer with us. To learn more, visit www.talkSTEM.org, click on walkSTEM, and Get Involved.

We’d love you to get a walkSTEM hub started at your campus (preK-12). There’s a good deal of flexibility to do this because we don’t believe that one size fits all.

IV. walkSTEM IN SCHOOL

HERE ARE SOME WAYS YOU CAN UTILIZE WALKSTEM RESOURCES IN SCHOOL SETTINGS:

- Having students design walkSTEM tours (on a small scale or a larger scale as a long-term project) is a flexible, creative, inquiry-based pathway.
- walkSTEM can be the basis for homework, a project, or after school club at any grade level (see sections 4 and 5 for more information).
- Great potential for interdisciplinary STEAM activity - designing maps, bulletin boards, asking questions about artwork, etc.
- Be sure to check out our guides on the variety of ways you can implement the walkSTEM initiative on campus with any grade level.
- Read through our step-by-step guide for starting a club for any age group as a school enrichment or out of school activity (more information on p. 13)
- Spring 2018 Dallas ISD school clubs include Solar Preparatory School for Girls, Mount Auburn STEAM Academy and Tom C. Gooch Elementary. We would love to add your campus to our growing list of schools.
- We hope that each and every school will join the walkSTEM movement in their own way soon! Let’s get our students and teachers to see that they are members in the global STE(A)M ecosystem and it starts with where they are right now. Reach out to koshi@talkSTEM.org with any questions.
- Learn more: Search “walkSTEM Academy” on Youtube and go to “walkSTEM in and out of School” playlist to view short videos with more information.

More Details on implementing walkSTEM in School settings

There are a variety of ways to implement the walkSTEM initiative at school. Our free walkSTEM resources allow for creative and flexible applications.

Suggestions for using walkSTEM Academy videos in the Classroom

NOTE: walkSTEM Academy is a collection of short, standards-aligned videos that uses the language of mathematics and science to explore STEM concepts. We use observation-based mathematics to ask and answer some of our inquiry questions as we go on our walks in all kinds of different settings, but these videos could be used in any class or content area! We view math as the language that facilitates our learning and innovation as we ask questions about our lived environments. We also consider historical, artistic, scientific and engineering ideas as we go on our walks because the real world is a fascinating and interdisciplinary space.

INTRODUCE TOPICS OR REINFORCE CONTENT

All walkSTEM videos are standards-aligned. Select videos from the library to reinforce standards you are currently teaching. You can search videos by TEKS, content, grades, and location. The educator guides can be coupled with the video to use as a station or extension activity.

EXAMPLE 1: *Your elementary school students are learning about different strategies for solving equations. Set up a station activity with the walkSTEM Academy videos *What's the Really Big Number Here?* or *How Many Different Ways Can You Count?* (both on the Dallas Arts District playlist). Students can work in groups of 2-4 to watch the videos and then complete the corresponding educator guide activity pages (see Fig 4 and Fig 5 or check out the links available on our video page). You can also come up with your own questions about the videos! As an extension activity, students may collaborate to create their own counting stop in a space in the classroom or around campus, then present them to their peers. Note: This type of authentic learning activity helps students see how STEM is inherent to their environment, and gives them an opportunity to strengthen their social-emotional skills through cooperative design.*

The image shows two side-by-side pages from the walkSTEM Academy resources. Both pages have a dark header with the 'walkSTEM' logo. The left page is an Educator Guide for the video 'A Really Big Number'. It includes sections for 'Teacher's Guide', 'Grade Levels: 3-5', 'Before Your Walk', 'Big Idea: Estimation is a highly valuable mathematical skill and can be used to determine an accurate count or number.', 'Calculating Area', 'How can estimation be used in the process of finding the area of an object or figure?', 'Recommended Materials: construction paper, pencils, rulers, scissors', and a paragraph describing a hands-on lesson and an interactive online activity. The right page is a Student Activity Sheet for the same video. It includes sections for 'Student Version', 'Grade Levels: 3-5', 'During Your Walk', 'walkSTEM Activities (3-5)', a question: 'Which number is the best estimate of the number of square-shaped stones in this picture?' with options '100', '1,000', '10,000', and '100,000', and a photo of a sidewalk made of square stones. Below the photo are two questions: 'How do you know?' and 'Estimate the total number of square stones on the sidewalk where you are standing. About how many square stones do you think there are from one corner to the next?'. At the bottom of the right page, there are two more questions: 'How could you use what you know about area to find the total number of square stones on the sidewalk?' and 'Describe the strategy you would use to find the total number of square stones from one corner to the next.' Both pages have a footer with the text 'talkSTEM.org | #IWalkSTEM'.

FIGURE 5: SAMPLE EDUCATOR GUIDES AND STUDENT ACTIVITY SHEET, AVAILABLE AS A FREE DOWNLOAD ON TALKSTEM.ORG (CLICK ON EDUCATOR RESOURCES)

EXAMPLE 2: You want your middle school social studies students to have a deeper understanding of the history of their city. Choose one video from each playlist on walkSTEM Academy (Dallas Arts District, Fair Park or NorthPark Center), and create 4-5 stations based on these stops. Students can work in groups of 2-4 students to watch the videos and then write a one paragraph reflection about what they learned, as well as any questions. Alternatively, you may create research teams of 2-4 students, and assign a playlist to each group. After watching the videos and taking notes, students can present their findings to the whole class before working in teams to create their own “Historical STEM Tour” of the campus, including a descriptive map to leave in the main office for visitors interested in taking the tour.

EXAMPLE 3: Facilitate a walkSTEM experience in your Pre-K classroom. Create walkSTEM stations or stops for your students based on concepts you are teaching in class to support their understanding in the context of their environment. You may even consider having walkSTEM “STEM jackets” for your students (Fig 6 and 7) while rotating through the stations to promote creative play and development of their STEM identity.



FIGURE 6: PREK WALKSTEM GEAR STATION



FIGURE 7: PREK STUDENTS EXPERIENCING WALKSTEM AT DALLAS ISD

Make STEM Engaging!

Put away the worksheets and textbooks! Our free resources are a great way for students to strengthen their STEM identities by seeing how STEM concepts are inherent to the real world and their everyday environments.

EXAMPLE: Plan a PBL! Students internalize concepts when they have a personal or emotional connection to what they are learning. Use the videos as a model for students to create their own walkSTEM experience around your home, campus, or at another based on what they are learning, using the Project-Based Learning methodology. Students will strengthen their growth mindset and ability to collaborate by working in teams, having the creative agency to develop their own walkSTEM tour, and providing feedback to one another.

For example, have your high school art students design their own theme park as a STEM project. Take them on a virtual field trip for inspiration to Fair Park in Dallas for inspiration. Show them the How Fast can You Go: Texas Star video to learn about speed, and Similar Triangles or Not? Esplanade to consider how common walking areas at parks are structured. Don't forget to follow us! Please feel free to share your students' work using walkSTEM Academy using #walkSTEM and #talkSTEM. Be sure to also check out our digital forum at talkstem.org which consists of a series of video and text-based blogs for you to discover best practices and be inspired by a wide range of other STEM formal and informal educators and professionals. You can also submit your own content. If students choose to create short videos of their walkSTEM Experience, we also invite you to submit it for review to be added to the walkSTEM Academy collection!

Videos submitted for review should highlight student work, include open-ended questions that foreground STEM concepts in a real-world location and have clear audio. For more information or questions about submitting your work, contact koshi@talkstem.org.

V. OTHER talkSTEM RESOURCES AS ENRICHMENT

walkSTEM Academy and other talkSTEM Resources can be used in a wide variety of ways to support enrichment activities or out-of-school programming.

Take it Outside the Classroom (Field Trips – Real and Virtual)

EXAMPLE 1: *Take a field trip! The benefits of place-based and experiential learning are undisputed. Choose a walkSTEM experience location from the walkSTEM Academy library, such as NorthPark Center or Fair Park. Take your students through the tour using our educator guides (see attached example on page ___ of this packet) to help engage students at a deeper level as they explore STEM concepts in the everyday world. You can visit all the stops, or choose just a few! Depending on the age of students, you can even assign each small group a specific stop to watch on walkSTEM Academy. They can then be responsible for leading the whole group through the stop when you are there. If you are already planning to visit one of the many fabulous museums in the Dallas Arts District or Fair Park, this is a great way to augment your field trip. If you are planning a field trip to Dallas Arboretum, Trinity River Audubon Center, Dallas Zoo, or other walkSTEM Network members, be sure to ask about taking a walkSTEM tour onsite. Having students recognize that they are members in a growing community of STEM explorers is a powerful message! Be sure to check our website so you know who our newest walkSTEM partners are.*

Planning field trips can be logistically challenging. If you can't make it out, try a virtual field trip instead! Watch several videos in one session, or take students to a new stop each day!

After your field trip (in-person or virtual), you could...

Facilitate a whole group or table-group discussion about what students learned. Use questions or activities from the educator guides, and give students an opportunity to write down or share their own questions based on what they observed.

Use the field trip to inspire a project (PBL). For example, perhaps you want your group of high school art or architecture students to design their own park. Take them on the walking or virtual tour of Fair Park as an example of how theme park rides or large public spaces are created.

EXAMPLE 2: *Teach your middle or high school students about the importance of diversity and inclusivity in STEM fields using our free, downloadable Growing Lab Girls Toolkit with a lunch bunch or enrichment group. Each day, students may complete a toolkit challenge, work on a research task or read about and discuss the work of a scientist.*

EXAMPLE 3: *Homework time! Assign a walkSTEM Academy video and activity sheet as homework to help reinforce content. Identify the standard being taught, and find a corresponding video from the walkSTEM library.*

EXAMPLE 4: *Sign up for the free 21 Day Fall STEAM Challenge on www.talkstem.org. Each day, check your inbox for a new activity. Use these activities as class warm-ups in any class or during morning meeting as a way to promote SEL development and build community. Facilitate a 5-10 minute whole group popcorn reflection as closure. Encourage students to both share and pose open-ended questions about what they learned.*

EXAMPLE 5: *Start a walkSTEM Club! walkSTEM clubs are an easy format for bringing the walkSTEM experience to your community, as a part of the growing walkSTEM network. Using the lived world available on school campuses or neighborhoods, students and teachers develop a walking tour of their own to promote seeing their world through the lens of Science, Technology, Engineering, Arts, and Mathematics (we definitely see Art, Architecture & Humanities as tightly connected to STEM). walkSTEM clubs are part of the walkSTEM network and will enjoy membership benefits such as being featured on talkSTEM's social media platform.*

Forming a club is a great way to encourage students to see themselves as a part of the broader STEM community while supporting an authentic learning opportunity (Figs 8, 9 and 10). For more information about starting a walkSTEM Club, see Section VI.



FIGURE 8: 3RD AND 4TH GRADE WALKSTEM CLUB MEMBERS PRACTICE LEADING A CAMPUS TOUR AT MOUNT AUBURN STEAM ACADEMY (DALLAS ISD)

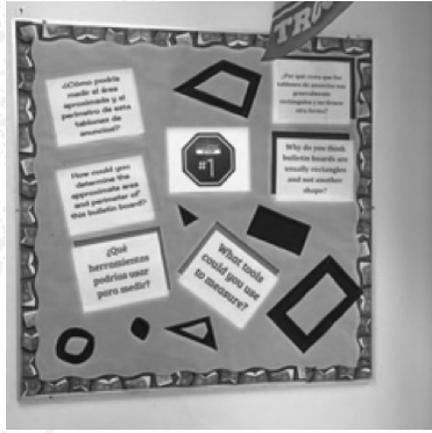


FIGURE 9: WALKSTEM CLUB BULLETIN BOARD AT MOUNT AUBURN STEAM ACADEMY (DALLAS ISD)



FIGURE 10: WALKSTEM CLUB NOTEBOOKS MAINTAINED BY YOUNG SOLAR PREP STUDENTS

VI. walkSTEM® CLUBS

What is a walkSTEM® club?

walkSTEM clubs are an easy format for bringing the walkSTEM experience to your community, as a part of the growing walkSTEM network. Using the lived world available on school campuses or neighborhoods, students and teachers develop a walking tour of their own to promote seeing their world through the lens of Science, Technology, Engineering, Arts, and Mathematics (we definitely see Art, Architecture & Humanities as tightly connected to STEM). walkSTEM clubs are part of the walkSTEM network and will enjoy membership benefits such as being featured on talkSTEM's social media platform.

Forming a club is a great way to encourage students to see themselves as a part of the broader STEM community while supporting an authentic learning opportunity.

Who can participate?

walkSTEM Clubs can start at any grade level and are made up of different group sizes. The clubs may function as a school enrichment, homeschool or out of school program. Club members participate in the walkSTEM movement by collaborating to create a unique walkSTEM experience in a location of their choice, such as a neighborhood, park or school campus!

Follow these 5 easy steps to starting a walkSTEM club at your school or site:

STEP 1: LEARN!

Visit walkSTEM Academy by clicking the link on walkstem.org. Watch our 20-minute video, How to Talk the Talk and Walk the Walk, of Dr. Glen Whitney, walkSTEM Adviser and Founder, National Museum of Mathematics, on designing walkSTEM tours.

Next, watch What's the Really Big Number Here?, Spinning Speedy Star and Mathematics of Turtles for more examples. We also encourage you to check out the other videos in our growing collection for inspiration!

STEP 2: RECRUIT!

The number of suggested club members depends on the age of students and availability of volunteer club leaders. For example, if you have a group of eight 5th Grade students, you may only need 1 volunteer leader, but you may want two leaders for the same number of Pre-K students. (Asking for parent volunteers is also a helpful strategy)

After setting the number of participants you feel you can successfully manage, send home a flyer and permission form to parents. You may have to operate on a first- come, first- served basis if you generate a lot of interest! Be sure to promote diversity and inclusion within your club.

Also recruit parent volunteers to help out!

STEP 2: HOST AN INTRODUCTORY MEETING!

After setting a weekly meeting time (plan on at least 6-8 meetings total - whether you meet once a week or multiple times is up to you!), host your first meeting. Share the purpose of a walkSTEM Club with your group, using videos from walkSTEM Academy such as Starting a walkSTEM Club, Welcome to walkSTEM and What is the Really Big Number Here? for demonstration purposes.

Define the term “docent” for club members, and have them come up with examples of docents they may have encountered in other settings (like a field trip to an art museum!). Explain they will be creating their own walkSTEM tour as a team and then will lead others on the walking tour that they design. We call this being a walkSTEM docent because we see the Real World as a fascinating, living “museum”. walkSTEM docents share the curated experiences developed by the club in live events and/or you are very welcome to submit short videos like the ones you see on walkSTEM Academy to us. We plan on adding short videos submitted by walkSTEM clubs to our platform, walkSTEM Academy.

You may plan a culminating event when you invite others (parents, other students, teachers) so the kids have the opportunity to lead small groups through their walkSTEM tour.

STEP 3: BRAINSTORM!

Next, give club members an opportunity to begin brainstorming open-ended questions about the space around them. No question is off-limits and there are no criticisms. Be open-minded! Avoid evaluating questions on any basis. The kids need to feel free while at the same time see you consider each question seriously. This will prepare them to begin asking STEM-related driving questions that will ultimately become “stops” on their walk.

STEP 4: Collaborate to design a series of walkSTEM tour stops!

The minimum number of stops is 3. These stops can be stationary, compiled as a video collection or explored through a culminating event/tour led by club docents depending on what works best for your group or space!

Give club members the opportunity to brainstorm open-ended questions, foregrounding math, about the space (both indoors and out!) around them. For example, students may ask, “How might you determine the number of tiles needed to cover this space?” or “How can we determine the age of this tree?” Eventually, these questions will lead to additional STEM-related questions about the space, and club members should come up with a variety of possible responses for each.

STEP 5: SCRIBE YOUR STOPS WITH APPROPRIATE TOOLS!

Make sure club members have chosen relevant stops in the real world. No need for a special demonstration or construction created to illustrate a concept.

Collaborate with club members to choose a minimum of 3 stops for the final product and work with them to write a script in outline-format. Identify and collect tools that may support the walkSTEM experience such as a tape measure, calculator or piece of string.

If you decide to create stationary stops, use the walkSTEM signage to mark them, and post questions or have club members create a map and/or guide including questions for tour participants.

If you want to host a culminating event, have club members practice leading the entire tour in advance, using their script as a guide. You may even choose to create matching attire for club members, such as t-shirts, for the event!

Final Product or Culminating Event Examples!

As noted above, there are a wide variety of ways to have club members present or share their work. Examples include, but are certainly not limited to:

HOST A CULMINATING EVENT!

At several elementary schools, club members have led guests on their walkSTEM experience tours as a part of a community or parent event, such as STEAM Night or Back to School Night. Students can work in groups to lead the tours, or you may opt to have 1-2 student experts for each stop, with a tour “lead” walking the group to each location. We also encourage students who speak multiple languages to translate the tours to make them even more accessible!

CLUB MEMBERS AS STUDENT AMBASSADORS!

If you have regularly scheduled school tour days or events, walkSTEM Club members may lead mini-tours of their walkSTEM experience as a part of the visit.

CREATE AN INTERACTIVE MAP!

After designing their experience, club members can collaborate to create an interactive map of the stops on their tour. The map may include questions for each stop, important background information or built-in tools, such as a ruler. Interested participants can pick up a copy of the map in the main office and take a self-guided tour! Use the walkSTEM signs to mark different stops, or create colorful bulletin boards with posted questions and information!

FILM THE EXPERIENCE!

Have club members create a video of their experience to be shared with other classes, parents or to submit to be uploaded to walkSTEM Academy once approved!

What if I need some help?

Contact our Director at koshi@talkstem.org or Program Manager at jonathan@talkstem.org.

VII. TEKS ALIGNMENT FOR WALKSTEM STOPS IN THE DALLAS ARTS DISTRICT AND NORTHPARK CENTER

walkSTEM TEKS Alignment Grade Band K-2

TEKS	Magnolia Trees and Fractals	Ad Astra Sculpture	Booker T. Washington Pegasus	Calculating Dimension	Colors and Math	Favorite Ratios	Multiple Methods of Counting	Playing with Numbers	The Sun, Angles, And Design	What's the Most Symmetrical Solid?
Proc.*	A, E, F, G	A, B, C, D, E, F, G	A, D, F	A, B, C, D	A, E, G	A, B, C, D, E, F, G	A, B, C, D, E, F, G	A, B, C, D	A, B, E	A, B, C, D, E, F, G
K.2					G			A, B, C, D		X
K.3								C		
K.6	A, F	A, B, C, D, F	A, B, D	A, D, F				A, D, F		A, B, C, D, F
K.7		A		A		A		A, B		B
1.2					G		B			
1.3						D, E		D, F		
1.5							B	G		

walkSTEM TEKS Alignment Grade Band K-2

TEKS	Magnolia Trees and Fractals	Ad Astra Sculpture	Booker T. Washington Pegasus	Calculating Dimension	Colors and Math	Favorite Ratios	Multiple Methods of Counting	Playing with Numbers	The Sun, Angles, And Design	What' s the Most Symmetrical Solid?
1.6	A, D	B, D, E, F	A, D, E	C, D				C, D		A, C, D, E, F
1.7		A, B, D		A		A, B		A		
2.2					D		A			
2.6						A				
2.8	A, D, E	A, D	B, C	A			E			A, D
2.9		A, D, E		D		A, D				

*Mathematical Process TEKS are the same across all grade levels

walkSTEM TEKS Alignment Grade Band 3-5

TEKS	A Really Big Number	Playing with Numbers	Ad Astra Sculpture	Booker T. Washington Pegasus	Calculating Dimension	Colors and Math	Favorite Ratios	Magnolia Trees and Fractals	Multiple Methods of Counting	The Sun, Angles, And Design	What' s the Most Symmetrical Solid?
Proc.*	A, B, C	A, B, C, D, E, F, G	A, B, C, D, E, F, G	A, D, F	A, B, C, D	A, E, G	A, B, C, D, E, F, G	A, E, F, G	A, B, C, D, E, F, G	A, B, F, G	A, B, C, D, E, F, G
3.2	A								A		
3.3						A					
3.4	G										
3.5		A, B					C, E	C			
3.6	C	B	D, E	A, B	B			A	D		A
3.7			B								
4.4	C, D								D, E		
4.5		A							B		
4.6		A	A	A, C, D	A			A, D		A	
4.7			A, B, C, E	D							B
4.8	B, C						C				
5.3	A	A			A	D, F, H, I			A		
5.4		B, E, F							F		
5.5				X							
5.7	X		X				X				

*Mathematical Process TEKS are the same across all grade levels

walkSTEM TEKS Alignment Grade Band 6-8

TEKS	A Really Big Number	Ad Astra Sculpture	Calculating Dimension	Colors and Math	Magnolia Trees and Fractals	Multiple Methods of Counting
Proc.*	A, B, C	A, B, C, D, E, F, G	A, B, C, D	A, E, G	A, B, C, D, E, F, G	A, B, C, D, E, F, G
6.3						D, E
6.4	H	B, H		E, G	A, B	
6.5		A			A	
6.6					A, B, C	
6.7						
6.8	C, D	A			A	D
6.10						A
6.11						
7.3			A, B			B
7.4	E	D, E			A	
7.5		C	C			
7.6					H	
7.7					X	
7.9	C					C
7.11		C			C	
8.2						
8.3						
8.5					A, B, E, H, I	
8.6		C				
8.8		D			D	
8.10	D					

*Mathematical Process TEKS are the same across all grade levels

walkSTEM TEKS Alignment Grade Band 6-12

TEKS	Playing with Numbers	Booker T. Washington Pegasus	Favorite Ratios	The Sun, Angles, and Design	Thermal Expansion	What's the Most Symmetrical Solid?
Proc.*	A, B, C, D, E, F, G	A, D, F	A, B, C, D, E, F, G	A, B, F, G	A, B, C, D, E, F, G	A, B, C, D, E, F, G
6.3					D, E	
6.4						
6.5						
6.6	C					
6.7	A, C, D					
6.8						
6.10						
6.11		X				
7.3	A, B				A, B	
7.4			D			C
7.5	C				A	
7.6						
7.7	X				X	
7.9						
7.11						
8.2					C	
8.3			A, C			
8.5	I					E
8.6						
8.8						
8.10		A, C				B
A.2			D		D	D
A.3					B	
A.5			A			
A.12			E		E	
G.7						
G.9				A		
A2.5						
P.2				X		
P.4				E, F		

*Mathematical Process TEKS are the same across all grade levels

walkSTEM TEKS Alignment Grade Band 9-12

TEKS	MAGNOLIA TREES AND FRACTALS
Proc.*	A, B, C, D, E, F, G
A.12	C
G.7	A
A2.5	B
P.5	B
AQR.2	H

*Mathematical Process TEKS are the same across all grade levels

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