Southington Board of Education Meeting

Thursday, January 27, 2022 6:30 PM
John Weichsel Municipal Center Public Assembly Room, 200 North Main Street, Southington, CT 06489
200 North Main Street
Southington, CT 06489

COMMITTEE OF THE WHOLE - INSTRUCTION

1. CALL TO ORDER
2. Executive Session - 6:30 p.m.
   a. Negotiations Update - UPSEU
   b. Negotiations Update - NIPSEU
   c. Student Matters
   d. Unaffiliated Compensation - Substitute Teacher Pay
3. Reconvene Meeting - Regular Session - 7:00 p.m.
4. Pledge of Allegiance
5. Approval of Minutes - January 13, 2022
6. Public Communications
   a. Communications from Student Board Representatives
   b. Communications from Public
   c. Communications from Board of Education
   d. Communications from Administration
7. Committee Reports
   a. Curriculum & Instruction Committee Meeting - January 14, 2022
8. Old Business
   a. Town Communications
   b. Capital Improvement Plan 2022-2023 to 2026-2027 - Revision
   c. SHS - GPA and Weighting Proposal - Second Reading
   d. SHS World Language New Course Proposal - Classical Mythology ECE - Second Reading
   e. SHS English Course Proposal - English IV - Second Reading
   f. Science Grade 3 Unit - Migrating Monarchs - Second Reading
   g. Science Grade 4 Unit - Mimicking the Natural World - Second Reading
   h. SHS Textbook Proposal - AP Biology - Second Reading
   i. Policy 4118.8 Alcohol and Drug Use - Policy Revision - Second Reading
   j. Policy 5131.6 Drugs, Alcohol, Tobacco - Policy Revision - Second Reading
   k. Policy 6146.1 Grade Reporting - Policy Revision - Second Reading
   l. Policy 9321 Time, Place, Notification of Meetings - Policy Revision - Second Reading
9. New Business
   a. Approval of Out of State/Overnight Field Trips

b. Science - Kindergarten Units - First Reading
c. Ratification of Nutmeg Independent Public Safety Employees Union (NIPSEU) Southington Secretarial and Food Service Workers Contract
d. Review/Adoption of 2022-2023 Board of Education Operating Budget
e. Retired Teacher Compensation Daily Rate for Substituting
f. Student Expulsion 2021-2022-08
g. Student Expulsion 2021-2022-10
h. Resolution to the State

10. Adjournment

The minutes presented within this document provide a summary of the discussion that took place at the Board of Education meeting. For the complete discussion of the agenda items, please view the video of the Board meeting on our website at www.southingtonschools.org. These minutes are considered a draft until approved at the following regular Board of Education meeting.

SOUTHINGTON BOARD OF EDUCATION

SOUTHINGTON, CONNECTICUT

REGULAR MEETING

JANUARY 13, 2022

The regular meeting of the Southington Board of Education (Committee of the Whole - Operations) was held on Thursday, January 13, 2022, at 7:00 p.m. as a public meeting in the John Weichsel Municipal Center Public Assembly Room, 200 North Main Street, Southington, Connecticut with an Executive Session preceding at 6:30 p.m.

1. CALL TO ORDER

Mrs. Colleen Clark, Chairperson, called the meeting to order at 6:29 p.m.

Board members present were Mrs. Dawn Anastasio, Mr. Joseph Baczewski, Mrs. Terri Carmody, Mr. Sean Carson, Mr. James Chrzanowski, Mrs. Colleen Clark, Mr. David Derynoski, Mr. Zaya Oshana, and Mr. Jasper Williams.

Cabinet administrators present were Mr. Steven Madancy, Superintendent of Schools, and Mr. Frank Pepe, Assistant Superintendent.

2. EXECUTIVE SESSION – NIPSEU NEGOTIATION UPDATE AND STUDENT MATTERS

MOTION: by Mr. Derynoski, second by Mr. Baczewski:

"Move to go into Executive Session, excluding the public and the press, for the purpose of discussing NIPSEU Negotiation Update and Student Matters, and upon conclusion reconvene to public session."

Motion carried unanimously by voice vote.

Mrs. Carmody ended Executive Session at 6:55 p.m.

The Regular Board Meeting was reconvened at 7:03 p.m.

3. RECONVENE MEETING – REGULAR SESSION

Board members present were Mrs. Dawn Anastasio, Mr. Joseph Baczewski, Mrs. Terri Carmody, Mr. Sean Carson, Mr. James Chrzanowski, Mrs. Colleen Clark, Mr. David Derynoski, Mr. Zaya Oshana, and Mr. Jasper Williams.

Cabinet administrators present were Mr. Steven Madancy, Superintendent of Schools; Mr. Frank Pepe, Assistant Superintendent; and Mrs. Jennifer Mellitt, Director of Business & Finance.

Student Representatives present were Ethan Solury and Angelina Micacci.

4. PLEDGE OF ALLEGIANCE – MOMENT OF SILENCE

The student representatives led in reciting of the Pledge of Allegiance.

Mrs. Clark called for a moment of silence in memory of Regina "Reggie" Wolak who passed away on December 27, 2021. She worked as a paraprofessional at Thalberg Elementary School for 36 years from 1976 through 2012 when she retired.

Board Recognition – Mr. Bob Brown:

The Board recognized Mr. Bob Brown, former Board of Education member, who taught in the school district for 41 years starting at Kennedy Middle School and ending at the high school and served as a Board of Education member for six years. Mr. Brown continues to serve on the statewide taskforce on how to reduce the impact of poverty on students. Mr. Oshana noted that for Mr. Brown teaching and serving on the Board of Education was not a job, it was a passion, and that he served as the conscience of the Board and made a difference in the lives of students and the community. Mr. Brown had prepared a public statement *(Attachment #1)* that he planned to read during Public Communications to share information from a CACTPS meeting that is a state standards board for teachers to which he was appointed. Mr. Brown addressed social, emotional, and mental health of students, and the struggles and stress of the education staff, in addition to the administrators receiving the brunt of finger pointing, blame, and insults over the last two years since the pandemic began. He asked the Board members and administration to tell the public how the public could help them in these unprecedented times. Mrs. Clark presented a Certificate of Excellence to Mr. Brown for his unyielding service and dedication to students and the entire community as a devoted member of the Board of Education from 2015 to 2021.

MOTION: by Mr. Oshana, seconded by Mr. Derynoski

"Move to add Item 10.k 'Student Expulsion 2021-2022-06' to the agenda."

Motion carried unanimously by voice vote.

5. APPROVAL OF MINUTES – DECEMBER 9, 2021

MOTION: by Mr. Williams, seconded by Mr. Baczewski:

"Move to approve the Regular Board of Education minutes of December 9, 2021, as submitted."

Motion carried by voice vote with Mr. Oshana abstaining.

6. PUBLIC COMMUNICATIONS

a. Communications from Student Board Representatives

Ethan Solury reported on the following:

- SHS Robotics Team "CyberKnights" started their 25th season on Saturday in the SHS auditorium. They hope to have an in-person season for the first time in two years and to travel to the World Championships in Houston, Texas in late April.
- Students experienced a smooth transition back to SHS after winter break.
- He reported on the SHS Boys and Girls Basketball teams seasons, and the Wrestling team to date.
- Athletic team home sporting events will be livestreamed on the SHS YouTube channel by the SHS Broadcasting Club this winter.

Angelina Micacci reported on the following:

- A virtual Course Fair would be held this year and would be posted to the SHS YouTube channel by January 28, 2022. Students in Grades 8-12 will have the opportunity to learn about the courses and electives offered at the high school.
- January 26 is the end of quarter two and semester one at SHS.
- She reported on the Boys Swimming & Diving Team, Girls and Boys Indoor Track team, and the middle school basketball teams seasons.

b. Communications from Public

There were a number of residents *(Attachment #2)* who came to the podium to voice their comments, recommendations, requests, and concerns regarding the following: Thanking administration for starting the process of uploading curriculum online, Connecticut Association of Boards of Education (CABE) being part of the National Schools Boards Association that sent a letter to the Attorney General asking that people who speak at Board meetings across the country be pursued by federal agents as domestic terrorists, asking the Board members to reach out to CABE Executive Board members on what their position was on that letter, requesting how much Southington pays in dues to be a member of CABE, Board members responding to emails from public, ventilation and indoor air quality in classrooms, parent donating simple and quiet DIY air filtration units to their son's classroom at Flanders that he and his young son built at a cost of less than $100 per classroom, sending formal letter to Governor Lamont, Department of Public Health (DPH) and State Department of Education requesting that Governor Lamont's Executive Powers lapse and to restore the authority to individual municipalities and school boards, asking BOE members to attend DPH and State BOE virtual Health & Safety meetings representing parent concerns regarding local control, mental health of children, school district should not be advertising a vaccination clinic for children which should be the responsibility of the health department, safety of staff and students and formulating a strong sense of community in schools, adding to the budget a Crisis Response Team, COVID vaccine should be pro-choice between individuals and their doctor, the treatment of unvaccinated individuals and students.

Please see the YouTube video link of the meeting and public communication below that also can be found on both the Town of Southington and Southington Board of Education websites: https://www.youtube.com/channel/

c. Communications from Board Members

Mr. Baczewski noted that he personally had an issue with his Southington Public Schools email address, which has since been rectified, and was not able to respond to emails from the public. Mr. Baczewski liked the idea of the DIY air filtration units presented Todd and Kristen

Ritchie; however, it needed further analysis such as energy efficiency, monitoring of filters, how many would be needed, fire safety compliant, and other factors to consider. He planned to continue discussion on these ventilation units.

Mrs. Clark explained that several years ago Board members adopted a school in the district and would attend PTO meetings so parents would have access to Board members. She planned to reinstitute the Adopt -A- School Program. She asked the Board members to inform her of what school that they wanted to adopt. She was adopting South End School.

d. Communications from Administration

Administration reported on the following:

1. UConn ECE Top 10: Mr. Madancy announced that he received news from UConn that the high school was ranked as a Top 10 high school in the state for the amount of students and courses enrolled in UConn ECE (Early College Experience) Programs, which is an opportunity for students to earn college credit. There are 169 districts that have high schools.
2. STEPS – Survey: Mr. Madancy explained that every other year the district provides the STEPS Survey (Southington Town-wide Effort to Promote Success) to students in Grades 7, 9 and 11, which is a requirement of the federal grant funds that Southington receives. STEPS was recently informed that they will be receiving an additional $125,000 a year for the next four years from the federal government to continue with their initiatives.
3. Business Department – Chamber Meeting: Mr. Madancy attended a Chamber of Commerce meeting in December to partner with agencies, businesses, and organizations in the community. His goal is to build pathways for students to enter into internships for authentic experiences. He noted that Lillian Schena, SHS Business Department Chair, also attended to discuss the Business Advisory Council.

7. COMMITTEE REPORTS

a. Curriculum & Instruction Committee Meeting – December 9, 2021

Mr. Baczewski reported that the committee discussed ongoing teacher professional development for the middle school World Language Department for alignment of Grade 7 curriculum and a proposed new high school course titled Classical Mythology ECE to provide Humanities credit. The committee also discussed a proposed English IV course to replace the current required courses of British Literature and Grammar and Composition. English IV focuses on the Common Core State Standards and the 4 C's (Critical thinking, collaboration, creativity, and communication).

Mrs. Carmody thought it was very important that students were exposed to Shakespeare, Chaucer, and British Classic Literature and would like to see the classics remain in the curriculum. Mr. Pepe explained that English IV broadens what is currently taught now and that the students would still be exposed to British Literature, it would not be eliminated. The proposal is from teachers who teach British Lit. Mr. Derynoski questioned if this modification to the curriculum would affect college requirements. This was on the agenda as a first read.

Mr. Baczewski continued that the committee reviewed a plan that vertically aligns K-5 science instruction with comprehensive coverage of Next Generation State Standards (NGSS) while supporting the Vision of a Graduate. The committee received a presentation on a new textbook for AP Biology because every 10 years the College Board requires a new text. Also

discussed was the ongoing partnership between STEPS and the Southington Police Department developing curriculum to replace the DARE Program in the schools. The new program focuses on prevention and is held over the course of six weeks with 8-10 police officers to be trained by the end of January. Mrs. Megan Albanese, STEPS Director, will communicate with Grade 5 families prior to the start of the lessons.

Mr. Oshana was concerned with English IV replacing Composition and Grammar and thought that it was important and should be looked at closer as far as taking it away. Mr. Pepe stated that English IV is a comprehensive course addressing reading, writing, speaking, and listening skills using a wide range of diverse text and not solely the British Literature text.

b. Policy & Personnel Committee Meeting – January 5, 2022

Mr. Williams, Policy & Personnel Committee Chair, reported that the committee received a presentation from Ms. Discenza, Director of School Counseling, on Policy 6146.1, Grade Reporting, which would be a four year phase-in plan starting with freshmen. The committee discussed Regulation 6146.1(3) and the considerable number of students who qualify for Honors or High Honors. Proposed revisions for Policy 4118.8, Alcohol and Drug use, Policy 5131.6, Drugs, Alcohol, Tobacco, and Policy 9321, Time, Place, Notification of Meetings, were also discussed. Policy 4215 – Evaluation and Supervision for Classified Personnel was reviewed for information regarding revising the regulation for evaluating Technology Analysts and Assistants. The policies are on the agenda as a first read.

8. SUPERINTENDENT'S REPORT

a. Personnel Report

MOTION: by Mrs. Carmody, seconded by Mr. Derynoski:

"Move to approve the Personnel Report, as presented."

Motion carried unanimously by voice vote.

9. OLD BUSINESS

a. Town Government Communications

Mrs. Clark reported that she would be meeting with Town Council Chairwoman, Rev. Vicky Triano, next week to discuss sending a letter to the state regarding issues with Town Regulations versus State Regulations. The Committee of the Chairs will be meeting on Tuesday, January 18 at 4:00 p.m. in Town Hall, which will be open to the public. Mrs. Carmody questioned what State Regulations would be addressed. Mrs. Clark stated they would be addressing Governor Lamont's continued mandates and the plans moving forward.

b. Elementary Facilities Project Update

Mr. Madancy stated that he and Mr. Mark Sciota, Town Manager, have been attending each other's meetings as a partnership between the Town and Board of Education to exchange information. Unfortunately, a lot of misinformation is being posted on social media. They gave a lengthy update on the pre-referendum work for the Elementary Facilities Project explaining the

problems and big shake-up at the state level that had delayed the Elementary Facilities Projects resulting in Southington losing three months of planning time that now would be rushed in order to meet deadlines to bring the project to referendum. They and other officials met with the state office of School Construction Grants (SCG) on Monday, January 20, 2022 and discussed new state requirements and other options moving forward.

Mr. Sciota welcomed the new Board of Education members and told them that their Town lapel pins would be delivered to them shortly. Mr. Sciota explained that he, Mrs. Clark, Mr. Madancy, Mr. Peter Romano, Director of Operations, and representatives from Collier, and the State Office of School Construction Grants discussed moving forward with the Elementary Facilities Projects and based on what was necessary to get to the state by a certain time would not be feasible. They then talked about the Capital Plan and two major issues that were on the Capital Plan such as roofs and improving the athletic facilities at the high school. Discussed were referendums and moving forward November 2022 with roofs at SHS and Hatton and full-blown improvements of the athletic fields at the high school instead of the Elementary Facilities Project at this time. Mr. Madancy explained in detail the two Capital Improvement Plan major projects that included the high school athletic facilities and tennis courts and roofs at SHS and Hatton. Mr. Madancy explained what still needed to be completed for the Elementary Facilities Projects pre-referendum work for the community to be fully informed before bringing it to referendum in 2023. Mr. Madancy stated that the Board would need to take a consensus at their next meeting on January 27 because they adopted a Capital Improvement Plan that had those projects in different years, and it would need to be amended to be swapped around.

Mr. Carson questioned the lifespan on the roofs and athletic facilities when they were installed and if replacement was included in long-range planning. Mr. Sciota explained that the Board of Education and the Town have Five-Year Capital Plans that are merged together. Municipalities are not always able to address replacement until years after their life expectancy. Mr. Romano took the podium and stated that there was a chart for when every roof needs to be replaced and a Roof Maintenance Program was watched closely. If the roofs are maintained properly, then the lifespan can be extended. Mr. Sciota added that Capital Plans are complicated because it is handled differently if it is under $1million. If it is over $1million, it must be put in the queue for referendum. It is a living document.

Mr. Derynoski explained that when the Turf Field was put in at the high school nine years ago, a Turf Field Committee was formed along with a Turf Fund put into operation for the future replacement. The Turf Fund is funded by a line item in the budget of $25,000 including football ticket sales and registration fees for town sports events using the fields.

c. Proposed 2022-2023 School Calendar – Second Reading

MOTION: by Mrs. Carmody, seconded by Mr. Derynoski:

"Move to approve the 2022-2023 School Calendar, as presented by the administration.

Motion carried unanimously by voice vote.

d. Policy 9325 – Methods of Operation – Meeting Conduct – Second Reading

MOTION: by Mr. Williams, seconded by Mr. Derynoski:

"Move to approve Policy 9325 - Methods of Operation – Meeting Conduct, as presented."

Motion carried unanimously by voice vote.

e. SHS – GPA and Weighting Proposal – Second Reading

Mrs. Clark noted that this agenda item was also under New Business as Agenda Item 10.i.

f. Appointment of UPSEU Negotiating Committee

Mrs. Clark appointed Board members Mr. Oshana, Mrs. Anastasio, Mr. Williams, and herself to serve on the UPSEU Negotiating Committee for Paraprofessional / ABA Therapists. The first meeting will be on February 8, 2022 at 3:30 p.m. with the location to be determined.

10. NEW BUSINESS

a. 2022-2023 Proposed Operating Budget Presentation

Mr. Madancy gave a PowerPoint presentation on the 2022-2023 proposed Superintendent's Operating Budget *(Attachment #3)*. He started by explaining the budget process to the public and noted that this was the first budget that he and Mrs. Jennifer Mellitt had put together and he thanked the entire administrative team and others for their help. Two budget workshops are scheduled for Tuesday, January 18 and Thursday, January 20. On January 27, the Board of Education adopts the 2022-2023 budget then it is presented to the Town Board of Finance and Town Council for approval.

The Superintendent's proposed 2022-2023 budget request is for $104,734,675, which is an increase of 4.12% over the current spending levels without adding any new staff. The projected increase would be $4,142,049 over the current budget. Mr. Madancy broke down and highlighted the areas of the increase in the budget versus the current budget and discussed in detail the following areas:

- Regular Education and Special Education salaries (63.46%) and benefits (18.56%), which are contractual obligations.
- Regular Education is 72.75% of the budget and Special Education is 27.25%.
- Purchased Services – Transportation, energy costs, maintenance, etc., are 14%.
- Major Projects and Special Projects are not in the budget (0%).

Mr. Madancy discussed the following: Use of Non-Lapsing Account funds for projects and equipment, use of ARP (American Rescue Plan) ESSER (Elementary School & Secondary School Emergency Relief) funds for staff, potential for savings in various areas including transportation and the Elementary School Projects, future considerations, Summer School Credit Recovery possible funding, no new personnel, use of ESSER funds to address learning loss, reduced class sizes in grades 2 and 3 due to student/teacher ratio, Special Education savings and efficiencies through a no cost audit, Summer School Program, Special Education in-district programs, reductions in Special Education budget, four-year history of funding the operating budget and an updated projected enrollment will be available in February.

Mr. Carson questioned the sustainability of reduced class sizes in grades 2 and 3. Mr. Madancy stated that it could not be sustained permanently and that they are only able to do it for 2022-2023 because of the infusion of ARP ESSER funds.

Mr. Madancy stated that if the Board members had any questions prior to Workshop #1 on Tuesday to email either him or Mrs. Mellitt for answers. A document of questions and answers would be generated after the workshops and shared with the Board of Education members, Town Board of Finance, and Town Council.

Mrs. Clark pointed out that Budget Workshop #1 on Tuesday would be held at Hatton Elementary School and Budget Workshop #2 on Thursday would be held in the Municipal Center Public Assembly Room and would be livestreamed. Mr. Oshana requested that Workshop #1 be videorecorded and put on the website.

b. SHS World Language New Course Proposal – Classical Mythology ECE – First Reading
c. SHS English Course Proposal – English IV – First Reading
d. Science Grade 3 Unit - Migrating Monarchs – First Reading
e. Science Grade 4 Unit – Mimicking the Natural World – First Reading
f. SHS Textbook Proposal – AP Biology – First Reading
g. Policy 4118.8 Alcohol and Drug Use – Policy Revision – First Reading
h. Policy 5131.6 Drugs, Alcohol, Tobacco – Policy Revision – First Reading
i. Policy 6146.1 Grade Reporting – Policy Revision – First Reading
j. Policy 9321 Time, Place Notification of Meetings – Policy Revision – First Reading

All the above are first reads and will come before the Board at their next regular meeting for action.

k. Student Expulsion – 2021-2022-06

MOTION: by Mr. Oshana, seconded by Mr. Baczewski:

"Move to expel Student 2021-2022-06 as stipulated by the Superintendent."

Motion carried unanimously by voice vote.

11. ADJOURNMENT

MOTION: by Mr. Derynoski, seconded by Mr. Baczewski:

"Move to adjourn."

Motion carried unanimously by voice vote.

The meeting adjourned at 9:16 p.m.

Respectfully submitted,
Linda Blanchard
Recording Secretary

ATTACHMENT #1 – PUBLIC COMMUNICATIONS

Bob Brown public statement to BOE, January 13, 2022

My name is Bob Brown, 587 Burritt St in Plantsville. Taught 41 years in this wonderful town and served 6 years on this Board of Ed. My—our—two kids also benefitted from a Southington public school education and are now very successful. Much of the information I am sharing is from a CACTPS meeting two weeks ago, the state standards board for teachers that I have been appointed to.

It is important to analyze where our students are and then move forward from there, placing a high priority on social, emotional and mental health. I hope that parents will support this as well. Now is NOT the time to be comparing standardized tests scores to scores 3 years ago. With substance abuse, suicides and other mental health issues on the sharp rise, we need to listen to students and collaborate on ways to help all students, with compassion. Now is also NOT the time to be cutting our budgets and cutting vital support staff. I hope other elected officials hear that as well.

Our education staff has been struggling with trauma and stress now for over almost two years. We are on the brink of a disaster as people leave the profession. I would like to share some suggestions for how to support educators.

While better pay is always valuable, and is important now more than ever, low pay is not the only reason people are leaving this profession. Being respected and valued carry equal weight. Instead of blaming and harassing educators, especially over factors they have no choice in, we should try to support them, validate them, listen to them, and find ways to relieve some of their daily stress. Reducing the number of new initiatives helps. Finding ways to give them more time for preparation, for their mental health, and for individualizing instruction help. Thanking them and supporting them with positive messages helps. Coming up with positive suggestions instead of just pointing fingers and complaining helps. Valuing their suggestions is so important—now we need a new model of decision-making that more than ever listens and collaborates. I hope parents will embrace these suggestions as well.

We have incredible education staff—all of them-- in Southington. These people have worked way beyond anything that could be expected of them. They have cared and nurtured our students. Administrators deserve some special mention—these people often receive the brunt of finger pointing, blame and insults. But the time and extra stress they have endured the last 18 months deserves special mention. Thank you to our building administrators and central office administrators and staff. I hear stories about principals, superintendent and assistant superintendent working Sundays, Saturday nights, evenings after whole days at work. We need to find ways to help and support them, to get them time to care for themselves and their own families, and to thank them.

In closing I would ask members of the public to help support our educators, thank them, understand them, listen to them, and find ways to help them. None of us are perfect, and nobody has handled our present situation perfectly. There have been mistakes made by everyone, but this town has done an extraordinary job of keeping our schools open, well-functioning and safe. Thank you, and please tell us how WE can help YOU!.

ATTACHMENT #2 – PUBLIC COMMUNICATIONS - SPEAKERS

Southington Board of Education

PUBLIC COMMUNICATION

January 13, 2022

	NAME	ADDRESS	TOPIC
1	Steven Balshiski	191 queen street #A #2	CARE
2	Todd Richoe	270 Chesterwood Terr	Ventilation
3	Kristin Ritchie	✓	"
4	Meghan Kelly	Hunt Stone Rd	Safety
5	Mickael Kryeziu	27 Hitching Post Dr.	Safety
6	Susan Zabatonski	98 Werking ST	
7	Patricia Tavalozzi	99 westbrook Rd.	
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			

ATTACHMENT #3 – POWERPOINT PRESENTATION

SUPERINTENDENTS 2022-2023 PROPOSED OPERATING BUDGET

https://www.southingtonschools.org/uploaded/Purchasing_Department/Superintendent_Budget_PP_2022-23_FINAL.pdf

Board of Education

Administrative Report

January 27, 2022

1. 2021 Ap Computer Science Female Diversity Award
2. Seal of Bi Literacy, 1 of only 58 districts in the state participating.
3. Year 1 of digital SAT
4. Narcan donation for SHS, KSA, JAD, JFK
5. DECA Recognition

STEVEN G. MADANCY
SUPERINTENDENT OF SCHOOLS

FRANK M. PEPE
ASSISTANT SUPERINTENDENT OF SCHOOLS

200 NORTH MAIN ST.
SOUTHINGTON, CT 06489

WWW.SOUTHINGTONSCHOOLS.ORG

OFFICE TELEPHONE
(860) 628-3202

FAX
(860) 628-3205

SOUTHINGTON PUBLIC SCHOOLS

Board of Education
Southington, Connecticut
Curriculum & Instruction Committee Meeting Minutes
Friday, January 14, 2022 - 10:00 a.m.
Technology Training Lab, Municipal Center

Members Present: Committee Chair Joseph Baczewski, Dawn Anastasio, Terri Carmody, Jasper Williams **Administration Present**: Assistant Superintendent - Frank Pepe, District Math and Science Coordinator - Amy Zappone, Director of Counseling - Jennifer Discenza
School Staff Present: K-5 Science Leader - Melissa O'Neil

1. Meeting called to order at 10:00 am by Chair Joseph Baczewski.
2. Senior Capstone Experience - Mr. Pepe offered context for the first presentation. The Capstone experience spans Freshman through Junior year and culminates during the first half of a student's senior year. Therefore, seniors need separate discussion points during the monthly allotted Capstone time. This need created another opportunity for STEPS and SHS to collaborate.

   Ms. Discenza provided an overview of the Senior Capstone Experience which includes five modules as part of *What's Next* , a program of the Jordan Porco Foundation. Students will understand what distress looks like for them and develop or strengthen an internal locus of control. Self-advocacy, resilience, coping, help-seeking, and time management are core concepts. STEPS will use a grant to purchase the program. Upon approval, Mrs. Albanese will send an introductory letter to senior class families.

3. Kindergarten Science Units - Mrs. Zappone and Ms. O'Neil returned to present the three Kindergarten units that will encompass the curriculum going forward. Each unit contains a driving question. Unit 1 is Waiting for Weather; Unit 2 is Mystery Class Pet and Unit 3 is Push, Pull, Play. The units include resources from CREC (videos, google slides etc.) are interdisciplinary, and are very "teacher friendly".

Committee members agreed numbers two and three above should advance to the full BOE.

4. Review of Implicit Bias Videos – Mr. Pepe presented the implicit bias videos referenced during public comment during the November Board of Education meeting. Conversation between members ensued around if there is a more effective manner to teach implicit bias. Committee members requested enrollment data, the course description and the follow up talking points suggested in the curriculum. The potential to invite a teacher to a future meeting was considered.
5. Mr. Pepe shared a list of proposed dates for future meetings and the following were tentatively agreed upon with a 9:00 am start.
   a. February 11
   b. March 11
   c. April 15
   d. May 20
6. Meeting was adjourned at 10:59 AM.

Respectfully Submitted,

Frank Pepe

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ Board Meeting Date January 27, 2022
Decision Requested X Agenda Code 8b

AGENDA REPORTING FORM

Agenda Topic: **Capital Improvement Plan 2022-23 to 2026-27 Revision**

Summary of Issue: The proposed Capital Improvement Plan calls for $24,534,937 in 2022-23 and $ 135,397,781 over the next four years for a total of $159,932,718.

Background: The Board prepares an updated five-year Capital Improvement Plan each year. Our requests are then combined with the town into a long-term Capital Improvement Plan presentation.

Alternative Strategies: Modify plan as proposed.

Cost (if applicable): _____ **Funding Source:** Capital Budget

Beginning Date of Program or Project: July 1, 2022

Ending Date of Program or Project: June 30, 2027

Recommendation or Comment: Move to approve the Capital Improvement Plan 2022-23 to 2026-27 as presented by administration.

Signature of Staff Member Submitting Report

Signature of Superintendent of Schools

Titles of Attachments:
1. Proposed Five Year Capital Plan
2. Map of Athletic Fields

SOUTHINGTON PUBLIC SCHOOLS

Capital Improvement Plan
Five-Year Projection
2022/23 to 2026/27

Southington Board of Education
Proposed Capital Improvement Projects
Five Year Plan - By Project
2022/23 THROUGH 2026/27

Site	Project Type / Description	Year of Request	2022/23	2023/24	2024/25	2025/26	2026/27	Total Request - Five Years
Air Conditioning - Elementary		Pending	**TBD**					**TBD**
Boiler Project								
SES	Replace Boiler	2020/21	148,000					148,000
SHS	Replace Boiler	2022/23			110,000			110,000
	Subtotal		**148,000**	**-**	**110,000**	**-**		**258,000**
Paving Projects								
SHS	Rear Parking Lots and Driveways Excluding Ag Sci Area, Revised 21-22	2017/18		166,000				166,000
HES	Reconstruct Paved Playground for Parking	2008/09					134,375	134,375
	Subtotal		**-**	**166,000**	**-**	**-**	**134,375**	**300,375**
Roofing Projects								
SHS	Replace 1995 Built-Up Roofing, 120,857 SF	2017/18	6,760,626					6,760,626
HES	Replace 1996 Roofing, 27,000 SF; 2003 Roofing, 45,000SF	2017/18		2,330,101				2,330,101
SES	Replace 1993 Roofing, 26,500 SF; 2003 Roofing, 28,870SF	2021/22		1,960,098				1,960,098
TES	Replace 2002 Roofing, 62,068 SF	2021/22		2,197,207				2,197,207
	Subtotal		**6,760,626**	**6,487,406**	**-**	**-**	**-**	**13,248,032**
School Safety Improvement Projects								
SYS	Elementary Security Camera System Upgrades	2018/19	**TBD**					**TBD**
SYS	Redesign Elementary and High School Entryways	2018/19	**TBD**					**TBD**
	Subtotal		**-**	**-**	**-**	**-**		**-**
Southington High School -Other Athletic Facility Projects								
SHS	Various Althletic Field Projects	2021/22	13,424,678					13,424,678
	Alternate Add-ons	2021/22	3,998,846					3,998,846
	Subtotal		**17,423,525**	**-**	**-**	**-**	**-**	**17,423,525**
Underground Oil Tank Removals & Replacements								
HES/SES	Remove and Replace Underground Oil Tanks at two Schools	2019/20	202,786					202,786
	Subtotal		**202,786**	**-**	**-**	**-**	**-**	**202,786**
Subtotal Board of Education Capital Improvement Plan			**24,534,937**	**6,653,406**	**110,000**	**-**	**134,375**	**31,432,718**
School Construction Projects								
SYS	Phase III Elementary Projects	2018/19		113,000,000				113,000,000
KSA	Karen Smith Academy	2021/22		15,500,000				15,500,000
	Subtotal		**-**	**128,500,000**		**-**	**-**	**128,500,000**
Grand Total Board of Education Capital Improvement Plan			**24,534,937**	**135,153,406**	**110,000**	**-**	**134,375**	**159,932,718**

EXISTING CONDITIONS:

- OVERALL SITE IS 50 ACRES WITH APPROXIMATELY 29 ACRES DEDICATED TO THE SPORTS COMPLEX.

CURRENT USES OF FIELDS:

- FIELD 1 - VARSITY SOFTBALL
- FIELD 2 - FIELD HOCKEY/BOY'S LACROSSE
- FIELD 3 - TRACK & MULTI-SPORT FIELD
- FIELD 4 - VARSITY BASEBALL
- FIELD 5 - VARSITY SOCCER/GIRL'S LACROSSE
- FIELD 6 - JV BASEBALL/BAND PRACTICE FIELD
- FIELD 7 - FRESHMAN FOOTBALL FIELD/BAND PRACTICE
- FIELD 8 - JV SOCCER/GIRL'S LACROSSE
- FIELD 9 - JV SOFTBALL
- FIELD 10 - UNUSED
- FIELD 11 - TENNIS

- EXISTING GRADES RANGE FROM 200' TO 240'

20015.00

KAESTLE BOOS associates, inc

NOVEMBER 30, 2020

SOUTHINGTON HIGH SCHOOL ATHLETIC FACILITIES STUDY
OVERALL EXISTING CONDITIONS PLAN
SOUTHINGTON, CT

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ Board Meeting Date **January 27, 2022**

Decision Requested X Agenda Code **8 c.**

AGENDA REPORTING FORM

Agenda Topic: SHS GPA and Weighting Proposal – Second Reading

Summary of Issue: The Board of Education Curriculum & Instruction Committee reviewed the SHS GPA and Weighting Proposal and is bringing the presentation to the full Board

Background: _____

Alternative Strategies: _____

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: The Board of Education Curriculum & Instruction Committee is bringing the SHS GPA and Weighting Proposal to the full Board for a second reading.

Titles of Attachments:
1. GPA and Academic Levels Presentation

Frank Ryan
Signature of Staff Member Submitting Report

Stan Madansky
Signature of Superintendent of Schools

GPA and Academic Levels

Southington High School
Student Support Center

SHS Current GPA System

After the NEASC visit in 2010- SHS collapsed down from four levels to three. The three levels:

I. **College and Career Preparatory- CP, weighted at 1.0**

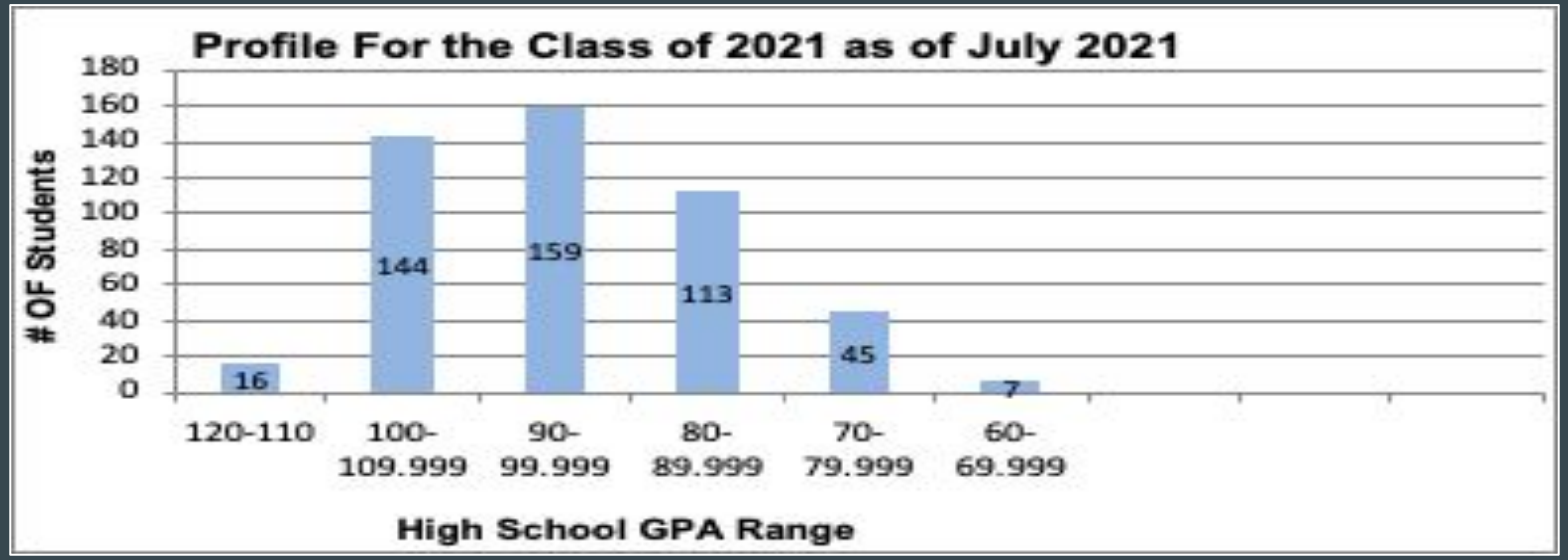
II. **Competitive College Preparatory - CCP, weighted at 1.10**

III. **Honors and Advanced Placement, both weighted at 1.20**

NEASC recommendations from 2020- Research, review, and revise the leveling practices to ensure that all students have access to challenging academic experience and that courses throughout the curriculum are populated with learners reflecting the diversity of the study body. As leveling practices are being analyzed we need to concurrently look at the GPA weight system.

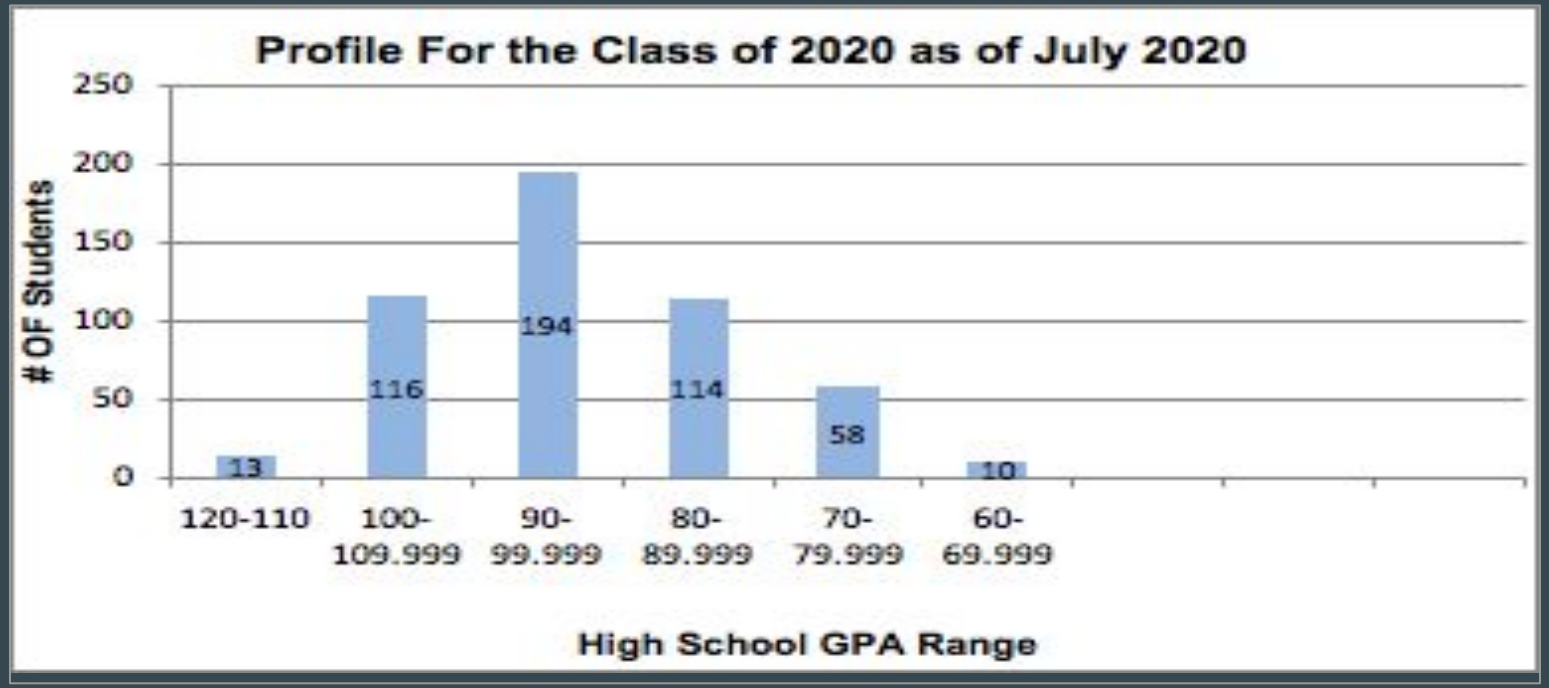
Class of 2021 GPA Range

- 89% of SHS students have a GPA of a “B” or above.
- This can lead at times to students not understanding that their GPA after recalculation by the college may be quite lower than what is on their transcript, especially for students who take primarily CCP courses.



Class of 2020 GPA Range

- 87% of SHS students have a GPA of a “B” or above.



The Challenges Of The Current GPA System

* High School weighted GPAs are almost always recalculated by colleges and universities in an attempt to fairly compare students from different high school and grading systems.

1. There is a significant disparity between the reported SHS weighted GPA and the newly recalculated GPA determined by each college.
2. The new GPA system would benefit our students during the college search process.
3. College representatives have asked us to change our current system because there is a large disparity and it doesn’t accurately reflect SHS students abilities.

Post-Secondary Data- 2020 Student Top Choice Schools

School	GPA	Comments
CCSU	4.0	Recalculates core academics and world language (including gr.12.) Weighs H/AP more heavily.
ECSU	4.0	They plan to recalculate soon if we don't change things. They will take 97% of our current GPA.
UCONN	4.0	Recalculates core academics and gives weighting to CCP, Honors and AP on a three-tiered weighting system.
URI	4.0	Uses only core academic courses 9-11 and provides additional weight to honors and AP courses.
UMASS	4.0	Removes all weights, allows one eletitive per year in GPA. Adds weight back for Honors (.5) and AP/ECE (1.0.)
University of Vermont	4.0	Uses only core academics.

Secondary School data

Secondary school data

Recommendations

*Revise the GPA system for 22-23

*Rename all the levels for 22-23

*Phased collapse of levels until 23-24

Academic Level	Actual grade
Accelerated Level	Add .50 to GPA conversion
College Level/Credit Courses	Add 1.0 to GPA conversion

- ➔ The new scale is in line with many college and university recalculation guidelines.
- ➔ SHS has already begun collapsing CP and CCP courses in science and social studies.
- ➔ Phased collapse. In 22-23 Biology and World History will be collapsed to the newly named Academic Level.

	Academic Level	Honors	AP/ECE
A+ (97-100)	4.33	4.83	5.33
A (93-96)	4.0	4.5	5.0
A- (90-92)	3.67	4.17	4.67
B+ (87-89)	3.33	3.83	4.33
B (83-86)	3.0	3.5	4.0
B- (80-82)	2.67	3.17	3.67
C+ (77-79)	2.33	2.83	3.33
C (73-76)	2.0	2.5	3.0
C- (70-72)	1.67	2.17	2.67
D+ (67-69)	1.33	1.83	2.33
D (63-66)	1.0	1.5	2.0
D- (60-62)	.67	1.17	1.67
F (Less than 60)	0	0	0

What would this look like within the range of student GPAs?

Top 15	Old GPA: Internal Rank	New GPA: Internal Rank
A	115.300: 1	4.71: 1
B	114.500: 2	4.62: 2
C	114.100: 3	4.62: 2
D	113.483: 4	4.57: 4
E	113.314: 5	4.51: 5
F	112.662: 6	4.42: 7
G	112.300: 7	4.39: 10
H	112.242: 8	4.44: 6
I	112.042: 9	4.42: 7
J	111.542: 10	4.39: 10
K	110.908: 11	4.42: 7
L	110.468: 12	4.27: 13
M	110.354: 13	4.27: 13
N	110.229: 14	4.27: 13
O	110.167: 15	4.35: 12

Middle Students	Old GPA	New GPA
240	94.271	3.17
241	94.250	3.16
242	94.242	3.16
243	94.221	3.34
244	94.208	3.06

Bottom 1/3	Old GPA	New GPA
340	86.980	2.83
341	86.943	2.6
342	86.883	2.46
343	86.833	2.61

Bottom 10%	Old GPA	New GPA
471	70.100	1.43
472	70.083	1.17

Questions

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ **Board Meeting Date** **January 27, 2022**

Decision Requested X **Agenda Code** **8 d.**

AGENDA REPORTING FORM

Agenda Topic: SHS World Language New Course Proposal - Classical Mythology – ECE – Second Reading

Summary of Issue: The Curriculum & Instruction Committee has reviewed SHS World Language New Course Proposal – Classical Mythology

Background:

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: The Board of Education Curriculum & Instruction Committee is bringing the SHS World Language New Course Proposal – Classical Mythology - ECE to the full Board for a Second Reading.

Titles of Attachments:

1. New Course Proposal

Signature of Staff Member Submitting Report

Signature of Superintendent of Schools

PROPOSED COURSE/PROGRAM CHANGE FORM

Southington Public Schools
Southington, Connecticut

School: **Southington High School**

Department: **Humanities**

Please check appropriate item:

New Course: ☒

Revised Course: ☐

Course Title: **Classical Mythology ECE**

1. **Proposed Change – Please give a brief description of proposed new course or revision to existing course.**

Classical Mythology (CAMS 1103 - UConn ECE) looks at the origin, nature, and function of myth in the literature and art of Greece and Rome and explores the re-interpretation of classical myth in modern art forms.

2. **Rationale – What is the purpose of the proposed new course or course change? To what extent will it benefit the students?**

Classical Mythology ECE will provide students with an opportunity to receive a Humanities credit while exploring the mythology of the ancient Greek and Roman world. The course examines some of the greatest stories ever told in ancient Greece and Rome and asks students to track their continued influence in today's world. The course highlights the importance of mythic "truth values" and how those values influence, shape, and define a culture - whether ancient or modern. Additionally students will benefit from the college credits they can earn from this ECE course.

3. **Target Population – Which group of students will be directly affected (grade level, academic level)?**

Any junior or senior student who is interested in this course and has successfully completed sophomore year English. (The course is reading & writing heavy.)

PROPOSED COURSE/PROGRAM CHANGE FORM

4. **Evaluation – How do you plan to assess the implementation of the proposed new course or the course change?**

This course will have a course evaluation and will monitor students' engagement with and interpretation of classical myths and their use in both ancient and modern contexts.

Additionally the syllabus and overall course design require approval from Professor Roger Travis at UConn.

5. **Cost – What are the anticipated costs for staff, textbooks, materials, other?**

There is no cost to this additional class. All required readings are open-source and will be made available by the teacher. Our current staff is sufficient to accommodate this new course offering.

	YEAR		
	I	II	III
Staff	$	$	$
Textbooks	$	$	$
Materials	$	$	$
Other	$	$	$
TOTAL	**$**	**$**	**$**

Comments: _____

Principal: Approved ☑ Denied ☐

Signature MH EC

mp\Curriculum\Proposed Course Change Form, 2010.doc

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ **Board Meeting Date** **January 27, 2022**

Decision Requested **X** **Agenda Code** **8 e.**

AGENDA REPORTING FORM

Agenda Topic: SHS English Course Proposal – English IV - Second Reading

Summary of Issue: The Curriculum & Instruction Committee has reviewed SHS English Course Proposal – English IV

Background:

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: The Board of Education Curriculum & Instruction Committee is bringing the SHS English Course Proposal – English IV to the full Board for a Second Reading.

Titles of Attachments:

1. Course Proposal

Frank Ryan
Signature of Staff Member Submitting Report

Peter Madaras
Signature of Superintendent of Schools

PROPOSED COURSE/PROGRAM CHANGE FORM

Southington Public Schools
Southington, Connecticut

School: **Southington High School**

Department: **English**

Please check appropriate item:

New Course: ☒

Revised Course: ☐

Course Title: **English IV**

1. **Proposed Change – Please give a brief description of proposed new course or revision to existing course.**

The Southington English Department will create an English IV course to replace the current required courses-British Literature and Grammar and Composition.

2. **Rationale – What is the purpose of the proposed new course or course change? To what extent will it benefit the students?**

Having two distinct courses with different focuses for grade 12 is not in line with the construction of the English courses in Grades 9, 10 and 11. Grade 12 students in the CCP and CP levels have disparate experiences when the experience should be much more aligned as it is in the prior grades. As the final required English course, English IV should focus on the skills that reflect mastery of both the Common Core State Standards and the 4 Cs. Moreover, English IV will incorporate more diverse content, reflective of the needs of our current students. Instead of focusing solely on early British literature or solely on writing skills, English IV will be a comprehensive English course that addresses reading, writing, speaking, and listening skills using a range of diverse texts. Incorporating both fiction and nonfiction texts from a range of writers from diverse backgrounds and cultures will provide students with a richer understanding of others and themselves. It will provide an opportunity for students both to see themselves in the texts they read and to develop their awareness of people different from them, leading to a greater understanding of humanity and empathy.

3. **Target Population – Which group of students will be directly affected (grade level, academic level)?**

PROPOSED COURSE/PROGRAM CHANGE FORM

Grade 12 students in the CCP and CP levels

4. Evaluation – **How do you plan to assess the implementation of the proposed new course or the course change?**

Teachers will create common assessments and calibrate scoring to ensure that students are mastering the CCSS skills. They will also seek feedback from the students through course reflections.

5. Cost – **What are the anticipated costs for staff, textbooks, materials, other?**

200 copies - A Woman is No Man - $3300
200 copies - Aristotle and Dante Discover the Secrets of the Universe - $2400

	YEAR I	II	III
Staff	$ N/A	$ N/A	$ N/A
Textbooks	$ 5700	$ N/A	$ N/A
Materials	$ N/A	$ N/A	$ N/A
Other	$ N/A	$ N/A	$ N/A
TOTAL	$ 5700	$	$

Comments: _____

Principal: Approved ☑ Denied ☐

PROPOSED COURSE/PROGRAM CHANGE FORM

Frank Pepe, Original Signature on File
Signature

mp\Curriculum\Proposed Course Change Form, 2010.doc

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ **Board Meeting Date** **January 27, 2022**

Decision Requested **X** **Agenda Code** **8 f.**

AGENDA REPORTING FORM

Agenda Topic: Science Grade 3 Unit – Migrating Monarchs– Second Reading

Summary of Issue: The Curriculum & Instruction Committee has reviewed Science Grade 3 Unit – Migrating Monarchs

Background:

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: The Board of Education Curriculum & Instruction Committee is bringing the Science Grade 3 Unit – Migrating Monarchs to the full Board for a Second Reading.

Titles of Attachments:

1. Science Grade 3 Unit

Frank Ryan
Signature of Staff Member Submitting Report

Peter Madaras
Signature of Superintendent of Schools

Unit 3 - Case of the Missing Monarchs
Students explore the causes and effects behind the declining monarch butterfly population. The monarch butterfly has an immense habitat range. Unlike most species, the habitat range of the monarch changes significantly with the seasons. As the climate changes, the cues for triggering monarch's migration are off. Monarchs use both temperature and precipitation cues to determine when migration begins. As the students analyze weather and climate data, they begin to realize that the cues are occurring too early in the spring and too late in the fall putting the monarch at risk. Through data analysis students come to realize that the climate in North America is shifting and changing. Students observe characteristic variations and predict reasons for these differences found between males and females of the same species and note patterns seen across multiple species. Students learn that the majority of these differences help the organism to survive, find a mate, or reproduce. They then identify the importance of characteristic variations for the male and female monarch butterflies. The final sequence helps students to understand that survival is not only related to the characteristic variations and adaptations but also behavior. Group behaviors help species survive in a difficult situation. Monarch butterflies roost at night to help maintain body temperature and to achieve safety in numbers. *Optional:* Consider growing and releasing monarchs in conjunction with this unit (this would then build upon 3-LS1-1 from Unit 2) or planning and developing a butterfly garden to provide additional hands-on learning opportunities. To view the flowchart for this unit, click here.
Suggested Pacing: 14 - 16 hrs
Anchoring Phenomenon/Design Problem: Monarch butterfly disappearance
Unit Driving Question(s): ● Why are the monarch butterflies disappearing? ● What are the monarch butterflies' survival secrets?
Culminating Performance Task: Students develop a model to explain the reasons for which the monarch butterfly population and behaviors in North America are changing. The model will also represent the ways the monarch is able to overcome some of these challenges.

Back to Top of Page

NGSS Performance Expectation(s): (Hyperlinks will bring reader to NGSS Evidence Statements)

- 3-LS2-1 Construct an argument that some animals form groups that help members survive.
- 3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
  - [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]
- 3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
  - [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]
- 3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.
  - [Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.]
  - [Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.]

Three Dimensions that form the Foundation for these NGSS Performance Expectations:

Science & Engineering Practices:

Engaging in Argument from Evidence

- Construct an argument with evidence, data, and/or a model.(3-LS2-1)
- Construct an argument with evidence. (3-LS4-3)

Constructing Explanations and Designing Solutions

- Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)

Analyzing and Interpreting Data

- Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (3-ESS2-1)

Disciplinary Core Ideas:

LS4.B: Natural Selection

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)

LS2.D: Social Interactions and Group Behavior

- Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size (Note: Moved from K–2). (3-LS2-1)

LS4.C: Adaptation

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)

ESS2.D: Weather and Climate

- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)

Crosscutting Concepts:

Patterns

- Patterns of change can be used to make predictions. (3-ESS2-1)

Cause and Effect

- Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1, 3-LS4-2, 3-LS4-3)

Back to Top of Page

Possible Common Core State Standards Connections:

ELA-

- RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4) (3-LS2-1)
- RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4) (3-LS2-1)
- RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.(3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)
- RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (3-LS1-1)
- W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.(3-LS4-1), (3-LS4-3), (3-LS4-4) (3-LS2-1)
- W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.(3-LS4-1), (3-LS4-2), (3-LS4-3), (3-LS4-4)
- SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS4-2), (3-LS4-3), (3-LS4-4)
- SL.3.5 Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. (3-LS1-1)

Mathematics —

- MP.2 Reason abstractly and quantitatively. (3-ESS2-1), (3-LS4-3)
- MP.4 Model with mathematics. (3-ESS2-1), (3-LS4-3), (3-LS4-4), (3-LS2-1)
- MP.5 Use appropriate tools strategically. (3-ESS2-1) (3-LS4-3)
- 3.NBT Number and Operations in Base Ten. (3-LS2-1)
- 3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3-ESS2-1)
- 3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in bar graphs. (3-ESS2-1) (3-LS4-3)

PROGRESSION OF LEARNING

Learning Sequence 1

- **Learning Sequence Driving Questions**
  - How has the monarch population changed?
  - What factors influence this change?
  - What features do the monarch's have to promote survival?
- Learning Sequence 1
- **Relationship to Anchoring Phenomena/Design Problem**
  - This sequence introduces the case of the missing monarchs to the students.
- **Student Expected Outcome**
  - Students will generate, categorize, and prioritize questions about the decline in population and survival needs of the monarch butterfly.

Learning Sequence 2

- **Learning Sequence Driving Question**
  - Why does the monarch butterfly migrate? Is migration necessary for survival?
- Learning Sequence 2

Back to Top of Page

- Relationship to Anchoring Phenomena/Design Problem
  - The monarch butterfly has an immense habitat range. Students investigate the importance of the migration and the necessary habitat components that foster survival.
- Student Expected Outcomes
  - Students will analyze data representing monarch butterfly migration.
  - Students will use data to explain what environmental features support the monarch's ability to survive, and what environmental features interfere with the monarch's survival.

Learning Sequence 3

- Learning Sequence Driving Question
  - What are the seasonal climate patterns in the different regions of North America?
  - If the climate patterns change, how will the monarch butterflies be affected?
- Learning Sequence 3
- Relationship to Anchoring Phenomena/Design Problem
  - As the climate changes, the cues for triggering monarch migrations are off. Monarchs use both temperature and precipitation cues to determine when to begin their migration. Through data analysis students come to realize that the climate in North America is shifting and changing, and this puts the monarchs at risk.
- Student Expected Outcomes
  - Students will analyze the weather data collected throughout the year, recognizing the variations and ranges of weather over time.
  - Students will represent data in tables and various graphical displays in order to draw conclusions, identify patterns and make predictions about the weather.

Learning Sequence 4

- Learning Sequence Driving Questions
  - How do characteristic variations help an organism survive, find a mate and/or reproduce?
  - Does this connect to the monarch butterfly population decline?
- Learning Sequence 4
- Relationship to Anchoring Phenomena/Design Problem
  - Characteristic variations help an organism survive, find a mate, or reproduce.
- Student Expected Outcomes
  - Students will use evidence to explain why some organisms have specific characteristics and behaviors that give them advantages to survive.
  - Students will construct an argument with evidence about the significance of the characteristic variations seen in monarch butterflies.

Learning Sequence 5

- Learning Sequence Driving Question
  - Why do some animals live in groups?
- Learning Sequence 5
- Relationship to Anchoring Phenomena/Design Problem
  - Monarch butterflies roost at night to help maintain body temperature and to achieve safety in numbers.
- Student Expected Outcomes
  - Students will design an investigation to collect data about huddle dynamics.
  - Students will construct an argument with evidence that being part of a group helps monarchs survive.

Assessments:

- Culminating Performance Task
  - Students use their Evidence Logs to develop a model that explains the reasons for which the monarch butterfly population in North America is changing.

Back to Top of Page

- The model should also include ways the monarch butterfly is able to overcome some of these challenges.
- Once complete, students should share their products with the class through a gallery walk.

- Elementary Assessment Resources
- Grade 3 Performance Expectation Rubrics
- Grade 3 Assessment Tasks and Rubrics
- 2019-2020 - G3-G8 Interim Assessment Blocks (IABS) by CREC Bundle

Additional Resources:

- G3 Unit Materials List
  - Click on specific tab for unit-specific materials
- EPIC! Digital Library - G3 U3 List
  - Includes ebooks and videos
  - Must have an educator user account for free access

Back to Top of Page

Learning Sequence 1

Brief Description:
This sequence introduces the case of the missing monarchs to the students. The students preview texts and the Monarch Butterfly Population Data to generate questions about the monarch's survival needs and recent population decline.

Suggested Pacing:
0.5 - 1 hr

Lesson-Level Phenomenon/Design Problem:
Monarch butterfly population decline

Relationship to Anchoring Phenomena/Design Problem:
This sequence introduces the case of the missing monarchs to the students.

Learning Sequence Driving Question:
How has the monarch population changed? What factors influence this change? What features do the monarch's have to promote survival?

Student Expected Outcome:
- Students will generate, categorize, and prioritize questions about the decline in population and survival needs of the monarch butterfly.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Analyzing and Interpreting Data ● Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. 3-ESS2-1	**LS4.C: Adaptation** ● For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. 3-LS4-3	Patterns ● Patterns of change can be used to make predictions. 3-LS1-1, 3-ESS2-1

Related Performance Expectation(s) in this Unit:
- 3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
  - [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]

Possible Common Core State Standards Connections:
ELA-
- RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)(3-LS2-1)
- RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)(3-LS2-1)
- RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)
- W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.(3-LS4-1),(3-LS4-3),(3-LS4-4)(3-LS2-1)
- W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)
- SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and

Back to Top of Page

relevant, descriptive details, speaking clearly at an understandable pace. (3-LS4-2),(3-LS4-3),(3-LS4-4)

Mathematics —

- MP.2 Reason abstractly and quantitatively. (3-ESS2-1),(3-LS4-3),(3-LS4-4)
- MP.4 Model with mathematics. (3-ESS2-1),(3-LS4-3),(3-LS4-4),(3-LS2-1),(3-LS1-1)
- MP.5 Use appropriate tools strategically. (3-ESS2-1)(3-LS4-3),(3-LS4-4)
- 3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in bar graphs. (3-ESS2-1)(3-LS4-3),(3-LS4-4)

Prior Student Knowledge:

- 3-LS4-3: (K.ESS3.A) ;(2.LS2.A) ; (2.LS4.D)

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Students watch the video on Slide #1 of the *Monarch Butterfly Slideshow* about the decline of the butterfly population.
- Tell the students, as secret agents, their new case is to investigate the case of the missing monarch butterflies.

Resources:

- Monarch Butterfly Slideshow

Suggested Instructional Strategies:

- Initial Scientific Model
  - Small Group Models
- I Notice, I Wonder
- Talk Activities

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

- Show students Slide #2 of the *Monarch Butterfly Slideshow.*
  - Students should notice the overall declining trend as well as predict what will happen in 2020.
  - Teacher Note: Slide #6 has the data source (at the time of publishing, the 2020 data is not available). You can check here for the 2020 data after November 2020.
- Read *Traveling Butterflies* by Susumu Shingu (linked from epic! Books on Slide #3)
  - Optional: Read the text: *Monarch Butterfly of Aster Way* by Elizabeth Ring
- In small cooperative groups, prompt the students to generate questions using the *Question Formulation Technique* (Slide #4).
  - Let students know that the questions generated should be about the monarch butterfly and its change in population.
  - Students need to develop questions that they can investigate to solve the case of the monarch's decline and to understand the survival needs of the species.
  - Once the questions have been formulated, have the students share their most pressing

Back to Top of Page

questions.
    - Create a Driving Question Board (Slide #5) from these questions on a classroom wall, anchor chart, www.padlet.com, or Google Slides.
    - Once all of the questions are visible, help the students to sort the questions into themes. The themes should align to the sequences in the unit.

Resources:
- Monarch Butterfly Slideshow
- *Traveling Butterflies* by Susumu Shingu on epic! books
- Optional:
    - *Mr. McGinty's Monarchs* by Linda Vander Heyden on epic! Books
    - *Monarch Butterfly of Aster Way* by Elizabeth Ring
- Question Formulation Technique
    - Sample padlet

Suggested Instructional Strategies:
- Talk Activities

Teacher Action(s):
- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):
- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❑ **SEP:** *Analyzing and Interpreting Data*
- ❑ **DCI:** *LS4.C: Adaptation*
- ❑ **CCC:** *Patterns*

Summative Assessment Description(s):
- As the students work through each learning sequence, have them track learned concepts and ideas on their *Evidence Logs*. These evidence logs will help students build a final explanatory piece that represents their complete understanding of the monarch butterfly, its survival adaptations and its recent decrease in population.

Resources:
- Evidence Logs

Suggested Instructional Strategies:
- Driving Question Board (for first learning sequence only)
- Question Formulation Technique (QFT)
- Talk Activities

Additional Resources:
- G3 Unit Materials List

Back to Top of Page

- Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 2

Brief Description:
Students learn that the monarch butterfly has an immense habitat range. Through their interaction with maps and texts, students understand the importance of the migration and the necessary habitat components that foster survival. Students make a final claim linking climate and migrations to the survival of the species.

Suggested Pacing:
2.75 - 3.25 hrs

Lesson-Level Phenomenon/Design Problem:
Monarch butterfly migration map

Relationship to Anchoring Phenomena/Design Problem:
The monarch butterfly has an immense habitat range. Students investigate the importance of the migration and the necessary habitat components that foster survival.

Learning Sequence Driving Question:
Why does the monarch butterfly migrate? Is migration necessary for survival?

Student Expected Outcomes:
- Students will analyze data representing monarch butterfly migration.
- Students will use data to explain what environmental features support the monarch's ability to survive, and what environmental features interfere with the monarch's survival.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Analyzing and Interpreting Data ● Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. 3-ESS2-1 **Engaging in Argument from Evidence** ● Construct an argument with evidence.	**LS4.C: Adaptation** ● For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. 3-LS4-3 **ESS2.D: Weather and Climate** ● Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.3-ESS2-1	**Patterns** ● Patterns of change can be used to make predictions. 3-LS1-1, 3-ESS2-1 **Cause and Effect** ● Cause and effect relationships are routinely identified and used to explain change. 3-LS2-1, 3-LS4-2, 3-LS4-3

Related Performance Expectation(s) in this Unit:
- 3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
  - [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.]

Possible Common Core State Standards Connections:
ELA/Literacy —
- RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS4-3)

Back to Top of Page

- RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS4-3)
- RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS4-3)
- W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS4-3)
- W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS4-3)
- SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS4-3)

Mathematics —

- MP.2 Reason abstractly and quantitatively. (3-LS4-3)
- 3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. (3-LS4-3)

Prior Student Knowledge:

K.ESS3.A ; 2.LS2.A ; 2.LS4.D

Possible Misconceptions:

- All living things can survive in the same environment.
- Weather and climate mean the same thing.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Show students the *Journey North Adult Monarch First Sightings 2019*.
  - The 2019 animation of migration nicely shows the population migration by month.
  - You can view a full season of monarch migration (northward). It is recommended to spend time with the maps prior to showing students.

Resources:

- Journey North Adult Monarch First Sightings 2019 **(Click "play" to see the map populate.)**
- Journey North Monarch Maps (main site with additional animal tracking)

Suggested Instructional Strategies:

- I Notice, I Wonder
- Talk Activities

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

- Allow students to engage with the Journey North Migration Maps.
  - If student groups have devices accessible, have students engage with the 2019 animated map after explaining how to use the site.

Back to Top of Page

        - Monarch type (egg, larva, adult, etc.) can be changed by the toggle on the right side of the map as well as the year.
    - As the students explore the animation, ask the students to complete an *I Notice, I Wonder* sheet as they interact with the map.
    - If devices are not available to student groups, provide a forum in which the teachers showcase the movement of the monarch species on the smart board/screen.
    - Students use the Stability and Change, Cause and Effect, and Patterns *CCC Discussion Cards* to help expand their observations through multiple perspectives.
    - Students share their observations and questions with the class.
        - Teacher Note: You can project the appropriate *CCC Discussion Cards* on the Smart Board to help the students deepen their questions.

Resources:

- Journey North Adult Monarch First Sightings 2019
- I Notice, I Wonder sheet
- CCC Discussion Cards

Suggested Instructional Strategies:

- Question Formulation Technique (QFT)

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

- Ask students to share their predictions about why the monarch butterfly migrates.
    - As you prompt students you may need to link the idea of migration to geese, a migratory species well-known to the region.
        - Why do geese fly south in the winter?
        - Why do they come back in the spring?
- After eliciting initial ideas, read *National Geographic Readers: Great Migrations Butterflies* By Laura Marsh on epic! Books or *Monarch and Milkweed* by Helen Frost.
    - As the teacher reads the text, the students complete a *Give Me Five Template* with their ideas for why the monarch migrates.
    - Students Turn and Talk with a neighbor about their templates to get five ideas to then share with the class.
    - Generate a class anchor chart or google slide to track student ideas, a sample anchor chart is on Slide #1 of the *Explain Slideshow*.
- Ask the students to define the term Habitat. Be sure their definition includes the following:
    - A habitat is a zone in which the living thing lives and grows.
        - Not all living things can live and grow in the same habitat.
        - In the case of the monarch butterfly, the habitat range changes with the season.
- Show Slide #2 from the *Explain Slideshow* to remind them of what was seen in the book.
    - Students work individually or with a partner to complete the maps on Slides #3-6 in the *Explain Slideshow.*

Back to Top of Page

        - Students are asked to color the different climate zones found within North America and then to label the most likely location to find a monarch during certain months of its migration (spring and fall).
- Students discuss the following questions:
    - What is the habitat in the different seasons or months?
    - Why are some regions no longer a part of the range?
    - How does temperature play a role in the monarch's migration patterns?
    - How does the amount of daylight play a role in the monarch's migration patterns?
    - Teacher Notes:
        - Linking temperature, season, and amounts of daylight maps with the content developed on the slideshow may help students understand that the monarch butterfly requires specific temperatures and that the different seasons change the temperatures and amounts of daylight significantly enough that the butterfly can no longer survive or access its needs, requiring it to move to a different region by extending its habitat.
        - In order to help the students understand monarch migration and each of the climate zones according to season you may need to pull in additional texts or activities. Potential readings through epic! books include:
            - *Monarch Butterfly Migration by Rebecca Hirsh*
            - *Climate Maps by Cynthia O'Brien,*
            - *Using Climate Maps by Rebecca Hirsch*

Resources:

- Give Me Five Template
- National Geographic Readers: Great Migrations Butterflies by Laura Marsh on epic! Books
- *Monarch and Milkweed* by Helen Frost (YouTube reading)
- Explain Slideshow
- Monarch Butterfly Migration by Rebecca Hirsh on epic! Books
- Climate Maps by Cynthia O'Brien on epic! Books
- Using Climate Maps by Rebecca Hirsch on epic! Books

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: habitat, health, species, population, region, resource, behavior, growth, characteristics, mate, trait, migration, climate, latitude, longitude

ELABORATE (Applications / Extensions)

Activity Description:

Students complete a Claim, Evidence Reasoning (CER) to address: How does the monarch's migration pattern help the species survive?

Back to Top of Page

- Using the Agree-Disagree Line Instructional Strategy on Slide #1 of the *Elaborate Slideshow,* ask students to identify a claim that best represents their ideas about the monarch's migration. Post the following claims (Slides #2 and #3) on opposite sides of the room:
  - The monarch butterfly's migration pattern is necessary for the species' survival.
  - The monarch butterfly's migration pattern is NOT necessary for the species' survival.
- Students discuss with their like-minded peers why they picked the claim that they did and then each claim group shares their reasoning with the class.
  - Allow students to move about the room if they hear other ideas that may provide better evidence for a claim.
- After completing the Agree-Disagree line, ask students to generate a *CER (Claim, Evidence, Reasoning)*. You can keep the claims from the previous activity posted.
  - Students can use those claims or modify the posted claim to suit their ideas.
  - Students will complete the CER Template on Slide #4 in the *Elaborate Slideshow*.
- Class discusses the question on Slide #6

Resources:
- Elaborate Slideshow

Suggested Instructional Strategies:
- Talk Activities
- CCC Discussion Cards
- CER Organizing Template
  - STEM Teaching Tool #17: Beyond the written CER
  - CER Rubric Example

Teacher Action(s):
- Expects the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):
- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❑ **SEP:** *Analyzing and Interpreting Data; Engaging in Argument from Evidence*
- ❑ **DCI:** *LS4.C: Adaptation; ESS2.D: Weather and Climate*
- ❑ **CCC:** *Patterns; Cause and Effect*

Summative Assessment Description(s):
- Student responses from the Elaborate CER template.
- As the students work through each learning sequence, have them track learned concepts and ideas on their *Evidence Logs*. These evidence logs will help students build a final explanatory piece that represents their complete understanding of the monarch butterfly, its survival adaptations and its changes in population.

Resources:
- Evidence Logs

Back to Top of Page

Elaborate Further / Reflect / Enrichment

Activity Description:

- Class goes outside to participate in the *Monarch Migration Game.*
    - Teacher Note: Do not have students drinking from cups of juice with straws. Instead use cups of water and a finger to pretend to have a proboscis.

Resources:

- Monarch Migration Game

Additional Resources:

- G3 Unit Materials List
    - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 3

Brief Description:
As the climate changes, the cues for triggering monarch butterfly migrations are off. Monarchs use both temperature and precipitation cues to determine when migration begins. As the students engage with weather and climate data, they will realize that the cues are occurring too early in the spring and too late in the fall to trigger successful migration timing which puts the monarch at risk. If it leaves the Northern region too late, their survival may be impacted by a lack of food or low temperatures. If the temperatures in Mexico get too warm too quickly in the spring, the monarchs may leave the region only to move to a region with no food supply and temperatures that are too cold. Through data analysis students come to realize that the climate in North America is shifting and changing.

Suggested Pacing:
2.5 - 3 hrs

Lesson-Level Phenomenon/Design Problem:
Newsela Headline: Missing monarchs in Mexico-Late start might make flight south tricky

Relationship to Anchoring Phenomena/Design Problem:
As the climate changes, the cues for triggering monarch migrations are off. Monarchs use both temperature and precipitation cues to determine when to begin their migration. Through data analysis students come to realize that the climate in North America is shifting and changing, and this puts the monarchs at risk.

Learning Sequence Driving Question:
What are the seasonal climate patterns in the different regions of North America? If the climate patterns change, how will the monarch butterflies be affected?

Student Expected Outcomes

- Students will analyze the weather data collected throughout the year, recognizing the variations and ranges of weather over time.
- Students will represent data in tables and various graphical displays in order to draw conclusions, identify patterns and make predictions about the weather.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Analyzing and Interpreting Data • Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (3-ESS2-1) **Constructing Explanations and Designing Solutions** • Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)	**LS4.C: Adaptation** • For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3) **ESS2.D: Weather and Climate** • Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)	**Cause and Effect** • Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1, 3-LS4-2, 3-LS4-3)

Related Performance Expectation(s) in this Unit:

- 3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

Back to Top of Page

- [Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.]
- [Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.]

Possible Common Core State Standards Connections:

Mathematics —

- MP.2 Reason abstractly and quantitatively. (3-ESS2-1),(3-LS4-3),(3-LS4-4)
- MP.4 Model with mathematics. (3-ESS2-1),(3-LS4-3),(3-LS4-4),(3-LS2-1),(3-LS1-1)
- MP.5 Use appropriate tools strategically. (3-ESS2-1)(3-LS4-3),(3-LS4-4)
- 3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3-ESS2-1)
- 3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in bar graphs. (3-ESS2-1)(3-LS4-3),(3-LS4-4)

Prior Student Knowledge:

K.ESS2.D

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Show students Slide #1from the *Learning Sequence #3 Slideshow* and tell them the news article was recently published with the title: Missing Monarchs in Mexico: Late Start Might Make Flight South Tricky.
- Students view Slide #2 and brainstorm why the monarch butterfly did not not leave the northern region on time.
  - Teacher Note: Monarchs typically start their migration in August, but this particular butterfly did not start migrating until October.
- Break students into Precipitation (Slides #7 and #8) and Temperature (Slides #4 and #5) groups.
  - Students should review the tables and make a prediction as to whether or not temperature and/or precipitation conditions could help explain why the butterfly started its migration so late.
  - Students share their ideas/rationales related to their data with the class.

Resources:

- Learning Sequence #3 Slideshow

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

- Students read the Newsela article about monarch butterflies and their late start in 2017. As students read they should identify predictions/reasons for the monarch's late start in October of 2017 and record these ideas on post-it notes.

Back to Top of Page

- Students share and discuss their findings.
- Students discuss their ideas about the difference between weather and climate (Slide #9).
    - Students may not understand the differences between weather and climate, but will learn about it in Explain. This is a formative assessment geared toward gauging their initial understanding of the two concepts.
- Students participate in the Card Sort Activity on Slides #10-13.
    - Each card is a statement taken from the Newsela article.
    - Students sort each statement card by using their best guess to decide if Weather or Climate would be responsible for each statement and placing the card under the correct heading.
        - Students will have the opportunity to revise their sort table in Explain.
            - Teacher Note: In the text the term "global warming" appears. Please do not use this term with students...it should be climate change. This is because some regions have had a cooling effect whereas others a warming effect. It is important not to give students this misconception that the whole world is warming.

Resources:

- Newsela article
- Learning Sequence #3 Slideshow

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity #1: Weather vs Climate

- Students watch Crash Course video on *Weather vs. Climate*.
- Students identify the differences between climate and weather and make a class anchor chart.
    - Teacher Information:
        - If more resources are needed, epic! Books has a variety of texts about both weather and climate listed in Resources.
        - These resources can be used to help students identify that climate looks at weather patterns over time and that weather is on the short-term. Climate can be used to help people make predictions about weather in a region.
        - The "Weather and Climate through Infographics" used in conjunction with "Climate Maps" shows how weather conditions relate to the climate maps.
        - Students should be able to identify that climate maps are best used for generating general predictions about a region's seasonal conditions.

Resources Activity #1:

- Weather vs. Climate Crash Course video
- Learning Sequence #3 Slideshow
- Books on epic! Books:
    - *Climate Maps* by Cynthia O'Brien
    - *Weather and Climate through Infographics* by Rebecca Rowell (pages 6 & 7)
    - *Using Climate Maps* by Rebecca Hirsch (chapter 1)

Back to Top of Page

Activity #2: Does climate change?
Climate represents an average of conditions over time.

- Students are asked:
  - In general, what is the climate in Connecticut in March? In September?
  - In general, what is the climate in Texas in March? In September?
    - Compare and contrast the two states' climates.
  - Can climate change over time?
  - If we mapped average weather conditions for a region, would they be exactly the same every year?
  - Would they be close?
- Students analyze temperature graphs (Slides #1-6) of the *Climate Data Slideshow* over time for March (a colder month) and September (a warmer month) and identify the ways in which climate has changed in Connecticut and Texas.
  - Teacher Note:
    - Use the purple trend lines to help with this.
    - If you want to change the state or data series, use NOAA Climate at a glance app.
- Discuss if the graphs provide evidence of climate change.
  - Ask students:
    - What patterns do you notice in the data?
    - Does that pattern show evidence of climate change?
    - How is the climate changing?
- Students work in four groups and are given one of the Slides #8-11 to predict future temperatures.
  - Give each group a ruler and one slide to graph their prediction of the temperature trend for the next 40 years. They should use the trend line already provided.
- Each group shares their predictions and reasoning with the class.

Resources:

- Climate Data Slideshow
- NOAA Climate at a glance app
- Additional information if students are curious about the "why" behind climate change
  - NASA page
  - Birds and Climate Change - NASA

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: weather, pattern, climate, temperature, precipitation, climate zone, Celsius, Fahrenheit, season, average

ELABORATE (Applications / Extensions)

Activity Description: How does climate change impact monarchs?

- Show the student the *Elaborate Slideshow* Slide #2.

Back to Top of Page

- Prompt student thinking: Are monarchs affected by climate change? Provide time for the students to turn and talk. Collect student ideas before progressing.
- Go through the remaining slides regarding the ways monarchs are affected by climate change.
    - With each slide elicit student ideas and provide time for them to talk about the details on the slide prior to progressing.
    - Students complete the *Cause and Effect Organizer* (Slide #11).
        - Alternative option to Slide #11 and #12: Students use the new information and data to construct a causal explanation (Slide # 14) for the Monarch's late timing in 2017.
    - Students turn and talk about the question on Slide #12 and support their answer with evidence.
        - They may be able to expand these ideas with information from the monarch research they have done throughout the Unit.
    - Groups share their ideas with the class.
    - Teacher Note: More detailed teacher information can be found on the *WWF Climate Change Series*.

Resources:

- Elaborate Slideshow
- WWF Climate Change Series

Suggested Instructional Strategies:

- Talk Activities
- CCC Discussion Cards

Teacher Action(s):

- Expects the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?"

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Constructing Explanations and Designing Solutions; Analyzing and Interpreting Data*
- ❏ **DCI:** *LS4.C: Adaptation; ESS2.D: Weather and Climate*
- ❏ **CCC:** *Cause and Effect*

Summative Assessment Description(s):

- Students' cause and effect explanations for the delayed monarch migration from Elaborate.
- As the students work through each learning sequence, have them track learned concepts and ideas on their *Evidence Logs*. These evidence logs will help students build a final explanatory piece that represents their complete understanding of the monarch butterfly, its survival adaptations and its changes in population.

Resources:

- Evidence Logs

Back to Top of Page

Suggested Instructional Strategies: ● 60 Formative Assessment Ideas
Additional Resources: ● G3 Unit Materials List ○ Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 4

Brief Description:
In this sequence, the students observe characteristic variations and predict reasons for these differences found between males and females of the same species. Students learn that the majority of these differences help the organism to survive, find a mate, and/or reproduce. By the end of the sequence, the students analyze the differences between the male and female monarch butterfly and rationalize a purpose for the difference(s). Students then construct an argument using evidence to explain if the identified characteristic variation helps the monarch to survive, find a mate, or reproduce.

Suggested Pacing:
3 - 3.5 hrs

Lesson-Level Phenomenon/Design Problem:
Male and female characteristic variations

Relationship to Anchoring Phenomena/Design Problem:
Characteristic variations help an organism survive, find a mate, or reproduce.

Learning Sequence Driving Question:
How do characteristic variations help an organism survive, find a mate and/or reproduce? Does this connect to the monarch butterfly population decline?

Student Expected Outcomes:
- Students will use evidence to explain why some organisms have specific characteristics and behaviors that give them advantages to survive.
- Students will construct an argument with evidence about the significance of the characteristic variations seen in monarch butterflies.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Engaging in Argument from Evidence ● Construct an argument with evidence, data, and/or a model. (3-LS2-1) **Constructing Explanations and Designing Solutions** ● Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2) ● Construct an argument with evidence. (3-LS4-3)	**LS4.B: Natural Selection** ● Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)	**Cause and Effect** ● Cause and effect relationships are routinely identified and used to explain change. (3-LS2-1, 3-LS4-2, 3-LS4-3) Patterns ● Patterns of change can be used to make predictions. (3-ESS2-1)

Related Performance Expectation(s) in this Unit:
- 3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.
  - [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.]

Back to Top of Page

Possible Common Core State Standards Connections:

ELA-

- RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)(3-LS2-1)
- RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)(3-LS2-1)
- RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)
- W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.(3-LS4-1),(3-LS4-3),(3-LS4-4)(3-LS2-1)
- W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)
- SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS4-2),(3-LS4-3),(3-LS4-4)

Prior Student Knowledge:

3-LS4-2

Possible Misconceptions:

- Organisms' physical features are not linked to function or meeting a survival need.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description: Why do these two cardinals look so different?

- Show the students the images of the male and female cardinal on Slide #1 of the *Learning Sequence #4 Slideshow.*
- Tell the students that these two animals are of the same species.
    - Teacher Notes:
        - You may have to define species to help students understand the concept. A species represents animals of the same type that are able to mate and reproduce. Dogs are a species because two dogs can have puppies. Cats and Dogs are not the same species because they can not have baby cat-dogs!
        - If organisms cannot produce offspring (living offspring with reproductive capability) then the animals are not of the same species. This is not important for third graders to know at this point.
- Ask the students to identify the differences between the two cardinals.
- Turn and Talk: Ask the students to discuss their ideas about why the two organisms from the same species might look so different. You can share with the students that these animals are cardinals. The red cardinal is the male/boy, and the green cardinal is the female/girl. After students turn and talk, allow them to share the key concepts they discussed with the whole group.
- Record student thinking on an anchor chart.

Resources:

- Learning Sequence #4 Slideshow

Suggested Instructional Strategies:

- Initial Scientific Model
    - Small Group Models
- Talk Activities

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions

Back to Top of Page

- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description: Characteristic Variations in the Animal World

- Students work in pairs or small groups to complete the observation and prediction sheets on Slide #3-4 in the *Learning Sequence #4 Slideshow.*
- Students view Slide #5-11.
    - These slides can be posted for the whole class to see at once, or you can print out color cards for each student group.
    - Ask students to predict and record their ideas as to why each difference occurs in animals of the same species.
- As a class, students share their ideas about how these differences help the animal.
    - As students share, record their thinking on the board.
        - Students may come up with ideas like survival, finding a mate, reproduction, safety, camouflage, protecting young, etc.
        - Teacher Notes:
            - Actual reasons for characteristic variations are listed under each of the animal slides in the speaker note section of the slideshow.
            - Do not share any information about the monarch butterflies at this time.
    - Students identify patterns that are the same for multiple species (i.e., Males are brightly colored to attract a female; females are more camouflaged to protect the young, males are often bigger, etc)

Resources:

- Learning Sequence #4 Slideshow

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description: Animal Characteristic Variations

- Provide time for students to research other concepts/adaptations such as: (1) antlers, (2) camouflage, (3) colorful male birds (article linked below), (4) color warning (poison).
    - Students work in groups to explore one of these characteristic variations using text and online resources such as the *San Diego Zoo Student Resource Page* or epic! Books.

Back to Top of Page

        - There are VERY few age appropriate resources that identify the characteristic variations between males and females of the same species.
    - Potential prompts for kids as you engage in research or discussion:
        - Why is the male so colorful? Why aren't the females?
        - Do the females/male take care of the offspring?
        - Does the female/male have special structures to defend itself from predators?
- After student groups share out their research, have the students apply some of these concepts to the different species represented in the Explore section of the *Learning Sequence #4 Slideshow*.
    - Help students to understand that there are three potential reasons for variation between males and females: (1) finding a mate, (2) survival, (3) reproducing. Ask students to connect their initial ideas from the engage and explore activities to these themes.
    - Do not share any information about the monarch butterflies at this time.

Resources:

- San Diego Zoo Student Resource Page
- Possible epic! Books:
    - Horns and Antlers by Yanitzia Canetti (more in this series as well)
    - Hide-And-Seek Science: Animal Camouflage by Emma Stevenson
    - Animal Colors by: J. Clark Sawyer
    - other books on animal adaptation
- SciShow Kids: Camouflage: Animal Hide & Seek video
- Learning Sequence #4 Slideshow

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: individual differences, characteristics, variation, traits, population, inherit, predator, prey, reproduce, advantage, camouflage, plumage

ELABORATE (Applications / Extensions)

Activity Description: Monarch Characteristic Variations

- Students look at Slide #13 in the *Learning Sequence #4 Slideshow to* identify the differences between the male and female monarch.
- Using Slide #13, students select a characteristic variation and identify a potential purpose for that variation.
    - The differences between a male and female monarch are subtle (1) Males have a black dot on each of the hind wings. (2) Females have thicker veins. There is further information in the Speaker Notes on Slide #15.
    - Ask the students to identify one of the differences and to construct a hypothesis as to why this difference helps the monarch:
        - mating
        - reproduction

Back to Top of Page

        - survival
    - Students must provide scientific reasoning to back up their ideas. Reasoning should include application of ideas learned in the explain section.
        - Teacher Notes:
            - The occurrence of these differences are not entirely understood by scientists. Scientists have used their understanding of other characteristic differences in other species to apply those ideas to the monarch butterfly.
            - Current scientists hypothesize that the black dot may emit pheromones to attract a female and the wider banding on the female helps the butterflies distinguish one another from afar. Butterflies use both pheromones and eyesight to communicate and understand their surroundings.
- Student groups construct an argument with evidence about the significance of the characteristic variations seen in monarch butterflies and present their arguments to the class.
- Class discusses: Does this connect to the monarch butterfly population decline?

Resources:

- Learning Sequence #4 Slideshow

Suggested Instructional Strategies:

- Talk Activities
- CCC Discussion Cards
- CER Organizing Template
    - STEM Teaching Tool #17: Beyond the written CER
    - CER Rubric Example

Teacher Action(s):

- Expects the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Engaging in Argument from Evidence; Constructing Explanations and Designing Solutions*
- ❏ **DCI:** *LS4.B: Natural Selection*
- ❏ **CCC:** *Patterns; Cause and Effect*

Summative Assessment Description(s):

- Monarch characteristic variation responses from Elaborate.
- As the students work through each learning sequence, have them track learned concepts and ideas on their *Evidence Logs*. These evidence logs will help students build a final explanatory piece that represents their complete understanding of the monarch butterfly, its survival adaptations and its changes in population.

Resources:

- Evidence Logs

Back to Top of Page

Suggested Instructional Strategies: ● 60 Formative Assessment Ideas
Additional Resources: ● G3 Unit Materials List ○ Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 5

Brief Description:
The final sequence helps students to understand that survival is not only related to the characteristic variations and adaptations but also behavior. Group behaviors help species survive in difficult situations. Monarch butterflies roost at night to help maintain body temperature and to achieve safety in numbers.

Suggested Pacing:
2.5 - 3 hrs for the 5Es
1.75 - 2.25 hrs for the Culminating Performance Task

Lesson-Level Phenomenon/Design Problem:
Penguin huddle

Relationship to Anchoring Phenomena/Design Problem:
Monarch butterflies roost at night to help maintain body temperature and to achieve safety in numbers.

Learning Sequence Driving Question:
Why do some animals live in groups?

Student Expected Outcomes:
- Students will design an investigation to collect data about huddle dynamics.
- Students will construct an argument with evidence that being part of a group helps monarchs survive.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:

Engaging in Argument from Evidence
- Construct an argument with evidence, data, and/or a model. 3-LS2-1

Constructing Explanations and Designing Solutions
- Use evidence (e.g., observations, patterns) to construct an explanation. 3-LS4-2

Disciplinary Core Ideas:

LS2.D: Social Interactions and Group Behavior
- Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size (Note: Moved from K–2). 3-LS2-1

Crosscutting Concepts:

Patterns
- Patterns of change can be used to make predictions. 3-LS1-1, 3-ESS2-1

Cause and Effect
- Cause and effect relationships are routinely identified and used to explain change. 3-LS2-1, 3-LS4-2, 3-LS4-3

Related Performance Expectation(s) in this Unit:
- 3-LS2-1 Construct an argument that some animals form groups that help members survive.

Possible Common Core State Standards Connections:

ELA-
- RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)(3-LS2-1)
- RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)(3-LS2-1)
- W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.(3-LS4-1),(3-LS4-3),(3-LS4-4)(3-LS2-1)

Mathematics —
- MP.4 Model with mathematics. (3-ESS2-1),(3-LS4-3),(3-LS4-4),(3-LS2-1),(3-LS1-1)
- MP.5 Use appropriate tools strategically. (3-ESS2-1)(3-LS4-3),(3-LS4-4)

Back to Top of Page

- 3.NBT Number and Operations in Base Ten. (3-LS2-1)(3-LS1-1)

Prior Student Knowledge:
3-LS2-1: 1.LS1.B

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Show students Slide #1 from the *Learning Sequence #5 Slideshow.*
- Students complete the Share-Trade activity on Slide #2.

Resources:

- Learning Sequence #5 Slideshow
  - Slide #1 adapted from: Science Kids Fun Facts About the Antarctic

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

- Students share their final responses from the Engage Share-Trade activity.
  - If not included in their shared Engage responses, ask students to consider how animals might have to work together to survive in this harsh environment.
  - Students explore the *Antarctic Animals List* and fill in Slide #3 of the *Learning Sequence #5 Slideshow* as they share their ideas with one another.
    - They can initially discuss their ideas in a Turn and Talk, and then share their big ideas with the whole class.
- Record their big ideas on an anchor chart or smart notebook.
- After the students share their ideas, go back to the facts on Slide #1 and make connections between the animals' characteristics and the environmental conditions of Antarctica, paying attention to the special adaptations they notice.

Resources:

- Learning Sequence #5 Slideshow
- Antarctic Animals List

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses

Back to Top of Page

- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

- Students view the BBC Article and Video.
    - The article is not Grade 3 friendly, you may have to read aloud and preview the video clip together.
    - After seeing the video, help students to understand that group dynamics are essential to the survival of the penguins.
        - Adaptations can be special body parts and they also can be behaviors.
        - The grouping behaviors of penguins are also considered special adaptations that help the species survive the extreme cold temperatures.
- Ask the students to design an investigation to measure how huddling helps the penguins in Antarctica to survive and stay warm.
    - Students look at Slide #4 of the *Learning Sequence #5 Slideshow.*
    - Ask the students to collaborate to come up with ways they can collect data using the tools supplied.
        - Students determine their huddle formation. They can research how penguins huddle and move to keep warm. This should help them design their class huddle and non-huddle formations.
        - Students determine how long they will need to stay in huddle formation to collect good data and at what intervals students will record temperatures.
    - Teacher Notes:
        - Do not set up the investigation for the students. They must design their own investigations to collect independent data.
        - Remind the students that there has to be specific constants in order for their data to be reliable.
        - Students should collect temperatures from non-huddle situations, as well as huddled situations and compare the results.
        - The room's temperature should be the same during each of the data collection periods.
        - You can scaffold the discussion to get the kids to an investigation such as this-each student can have a thermometer taped to their clothing and enter the huddle, at different time intervals/locations in the huddle they should record the temperature on their thermometers, repeat the same data collection practices when students are not in a huddle formation.
- Students share their data, using the class data to find averages or make graphs to show differences.
    - Once the data has been collected compare the results for the differing locations in the huddle.
    - Where were the highest temperatures? Where were the lowest temperatures?
    - In what formation did the temperatures change the most?
- Students watch the *How Does Huddling Help Penguins Stay Warm?* video and discuss as a class.

Resources:

- BBC Article and Video
- Learning Sequence #5 Slideshow
- How Does Huddling Help Penguins Stay Warm? | BBC Earth
    - Optional video: Emperor Penguins Huddle for Warmth Video

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels

Back to Top of Page

- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):
- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: behavior, adaptation, survival, group behavior, species, cooperative, trait, environment, parent, relationship

ELABORATE (Applications / Extensions)

Activity Description:
- Students are shown Slide #9 of the *Learning Sequence #5 Slideshow.*
- Students complete the WIS/WIM portion of Slide #10.
    - Teacher note: The butterfly is NOT known to be in groups during the day. However the Monarchs will often group up at night (roost) as they rest and prepare for their journey the following day. Once in Mexico the monarch roost for the winter in forests near Mexico city (see image). Scientists have noticed that monarchs during their migration roost at night in groups, when cold the monarchs roost closer to one another.
- Class reads and discusses *Why do monarchs form roosts during fall migration?* article.
- Students complete the question in the last section of Slide #10.
- Teacher facilitates a simple argumentation forum based on the students' answer to the last question (roosting is OR is not necessary for survival).
    - Students work with like minded peers to debate with opposing students. Each group supports their arguments with evidence.

Resources:
- Learning Sequence #5 Slideshow
- Why do monarchs form roosts during fall migration? from Journey North (text only)
- Why do monarchs form roosts during fall migration? from Journey North (with pictures)

Suggested Instructional Strategies:
- CCC Discussion Cards
- STEM Teaching Tool #17: Beyond the written CER

Teacher Action(s):
- Expects the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):
- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

Back to Top of Page

- ❏ **SEP:** *Engaging in Argument from Evidence; Constructing Explanations and Designing Solutions*
- ❏ **DCI:** *LS2.D: Social Interactions and Group Behavior*
- ❏ **CCC:** *Patterns; Cause and Effect*

Summative Assessment Description(s)

- WIS/WIM from Elaborate Slide #10 from the *Learning Sequence #5 Slideshow*.
- As the students work through each learning sequence, have them track learned concepts and ideas on their *Evidence Logs*. These evidence logs will help students build a final explanatory piece that represents their complete understanding of the monarch butterfly, its survival adaptations and its changes in population.

Resources:

- Learning Sequence #5 Slideshow
- Evidence Logs

Suggested Instructional Strategies:

- 60 Formative Assessment Ideas

Culminating Performance Task

- Students use their Evidence Logs to develop a model that explains the reasons for which the monarch butterfly population in North America is changing.
  - The model should also include ways the monarch butterfly is able to overcome some of these challenges.
- Once complete, students should share their products with the class through a gallery walk.

Additional Resources:

- G3 Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ **Board Meeting Date** **January 27, 2022**

Decision Requested **X** **Agenda Code** **8 g.**

AGENDA REPORTING FORM

Agenda Topic: Science Grade 4 Unit – Mimicking the Natural World– Second Reading

Summary of Issue: The Curriculum & Instruction Committee has reviewed Science Grade 4 Unit – Mimicking the Natural World

Background:

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: The Board of Education Curriculum & Instruction Committee is bringing the Science Grade 4 Unit – Mimicking the Natural World to the full Board for a Second Reading.

Titles of Attachments:

1. Science Grade 4 Unit

Signature of Staff Member Submitting Report

Signature of Superintendent of Schools

Unit 2 - Mimicking the Natural World

Biomimicry is how humans mimic the natural world in their innovations and designs. This bundle will compare and contrast energy transfer in the natural and designed worlds focusing on how electric currents, light and sound are received and perceived by both. As a result of observing those interactions in nature, much of human innovation and design can be directly attributed to how organisms survive all manner of energy inputs.

To access the flowchart for this unit, click here.

Suggested Pacing:
19 - 23 hrs

Anchoring Phenomenon/Design Problem:
How does nature inspire human innovation?

Unit Driving Question:
What is biomimicry and how have human innovations been inspired by observing the natural world?

Culminating Performance Task:
How Does A Device Mimic The Natural World?

NGSS Performance Expectation(s): (Hyperlinks will bring reader to NGSS Evidence Statements)

- 4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
  - [Assessment Boundary: Assessment does not include quantitative measurements of energy.]
- 4-PS4-2. Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
  - [Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.]
- 4-PS4-3. Generate and compare multiple solutions that use patterns to transfer information.*
  - [Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]
- 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
  - [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.]
  - [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]
- 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
  - [Clarification Statement: Emphasis is on systems of information transfer.]
  - [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]
- 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Three Dimensions that form the Foundation for these NGSS Performance Expectations:

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
	PS3.A: Definitions of Energy	Energy and Matter

Back to Top of Page

Planning and Carrying Out Investigations

- Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.
- Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

Developing and Using Models

- Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.
- Develop a model to describe phenomena.
- Use a model to test interactions concerning the functioning of a natural system.

Constructing Explanations and Designing Solutions

- Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems.
- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

- Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

PS3.B: Conservation of Energy and Energy Transfer

- Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.
- Light also transfers energy from place to place.
- Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy.

PS4.B: Electromagnetic Radiation

- An object can be seen when light reflected from its surface enters the eyes.

PS4.C: Information Technologies and Instrumentation

- Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa.

ETS1.C: Optimizing The Design Solution

- Different solutions need to be tested in order to
- Energy can be transferred in various ways and between objects.

Cause and Effect

- Cause and effect relationships are routinely identified.

Patterns

- Similarities and differences in patterns can be used to sort and classify designed products.

Systems and System Models

- A system can be described in terms of its components and their interactions.

Back to Top of Page

Engaging in Argument from Evidence • Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). • Construct an argument with evidence, data, and/or a model.	determine which of them best solves the problem, given the criteria and the constraints. (secondary) **LS1.A: Structure and Function** • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. **LS1.D: Information Processing** • Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. **ETS1.B: Developing Possible Solutions** • Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. • At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.	

Possible Common Core State Standards Connections:

ELA/Literacy -

- RI.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information.*(4-PS4-3)*
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS4-3)
- W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2),
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-2)
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-2)*(4-LS1-2)*

Mathematics -

- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-2)

Back to Top of Page

- 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)
- 3-5.OA Operations and Algebraic Thinking (3-ETS1-2)
- MP.2 Reason abstractly and quantitatively. (3-5-ETS1-2)
- MP.4 Model with mathematics .(3-5-ETS1-2)(4-PS4-2)
- MP.5 Use appropriate tools strategically. (3-5-ETS1-2)

Possible Preconceptions/Misconceptions:

Students may believe that:

- energy can be made, used or lost.
- only living things have energy.
- bats are blind and can only hear well.
- Snakes can "hear"
- the result of light shining on something and brightening that item.
- plants do not respond to outside stimuli - they just grow straight up.
- plants obtain their energy directly from the sun.
- plants breath like humans
- plants leaves main job is to collect water
- things "use up" energy
- energy is lost
- electronic devices only use electricity to send and receive data.

PROGRESSION OF LEARNING

Learning Sequence 1

- **Learning Sequence Driving Question**
  - What is biomimicry and how have humans learned from observing nature?
- Learning Sequence 1
- **Relationship to Anchoring Phenomena/Design Problem**
  - This is the introduction to the anchoring phenomenon. Students are introduced to the idea that humans mimic nature in their designs. This is called biomimicry.
- **Student Expected Outcomes:**
  - Students will make observations about similarities and differences in the natural and designed world.
  - Students will generate questions about how humans mimic nature.

Learning Sequence 2

- **Learning Sequence Driving Questions**
  - What is energy?
  - What are sense receptors?
  - How do organisms receive and perceive energy stimuli for survival?
- Learning Sequence 2
- **Relationship to Anchoring Phenomena/Design Problem**
  - Students explore how animals receive and perceive energy through their sense receptors. This helps them to continue connecting how biomimicry often drives human innovation.
- **Student Expected Outcomes:**
  - Students will describe the cause effect relationships between sight, sound, touch and reaction by making and recording observations.
  - Students will investigate sense receptors to determine cause and effect relationships in relation to the phenomena.
  - Students will make observations about how animals use sense receptors and how they use that information.

Back to Top of Page

Learning Sequence 3

- Learning Sequence Driving Question
  - How do animals send and receive sound, and how have humans used this information in the design world?
- Learning Sequence 3
- Relationship to Anchoring Phenomena/Design Problem
  - Humans study how animals receive, perceive and respond to sound and base designs off of that information. Some examples of human design mimicking sound in nature can include whales/submarines, bats/lane changing or back up sensors and GPS.
- Student Expected Outcomes:
  - Students will use a model to identify similarities between animal sense receptors and human design.
  - Students will collect evidence to identify and describe how energy is transferred and sound is produced.

Learning Sequence 4

- Learning Sequence Driving Question
  - How is light received and perceived in the natural world?
- Learning Sequence 4
- Relationship to Anchoring Phenomena/Design Problem
  - Humans study how animals receive, perceive and respond to light and base designs off of that information.
- Student Expected Outcomes:
  - Students will develop a model to describe how light enters the eye and processes information.
  - Students will construct an argument to determine how the external structures in animals help serve various functions.

Learning Sequence 5

- Learning Sequence Driving Question
  - What sense receptors do plants have that help them survive?
- Learning Sequence 5
- Relationship to Anchoring Phenomena/Design Problem
  - Humans study plant structure and function and base designs off of that information. Some examples of human design mimicking plants are solar panels and velcro.
- Student Expected Outcome:
  - Students will use a model to describe the components of a plant and how its structures help them survive.

Learning Sequence 6

- Learning Sequence Driving Question
  - How do animals use electricity?
- Learning Sequence 6
- Relationship to Anchoring Phenomena/Design Problem
  - Students learn about electricity and energy transfer. Then apply that information to animals that generate electricity, as well as how humans use electricity for similar and different reasons.
- Student Expected Outcomes:
  - Students will collect evidence to identify and describe how electrical energy is transferred and produced.

Back to Top of Page

- Students will describe observations from an investigation to determine how electrical energy is transferred from place to place and can change into other forms of energy (sound and light).
- Students will investigate how animals use electricity to survive.

Assessments:

- Culminating Performance Task
  - Students compare the characteristics of an existing device to the natural world.

- Grade 4 Assessment Tasks and Rubrics
- 2019-2020 - G3-G8 Interim Assessment Blocks (IABS) by CREC Bundle

Additional Resources:

- G4 Unit Materials List
  - Click on specific tab for unit-specific materials
- EPIC! Digital Library - G4 U2A List
  - Includes ebooks and videos
  - Must have an educator user account for free access

Back to Top of Page

Learning Sequence 1

Brief Description:
This sequence introduces students to the phenomenon through side by side comparisons of the natural world and the design world. Students make observations, ask questions, and compare images to develop ideas. This lesson only has the engage and explore sections of the 5-E model. These concepts will be built upon in future lessons.

Suggested Pacing:
0.75 - 1.25 hrs

Lesson-Level Phenomenon/Design Problem:
What is biomimicry and how have humans learned from observing nature?

Relationship to Anchoring Phenomena/Design Problem:
This is the introduction to the anchoring phenomenon. Students are introduced to the idea that humans mimic nature in their designs. This is called biomimicry.

Learning Sequence Driving Question:

- What is biomimicry and how have humans learned from observing nature?

Student Expected Outcomes:

- Students will make observations and ask questions about biomimicry.
- Students will compare and contrast the natural world to the design world.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
• n/a	**LS1.A: Structure and Function** • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. *This content is not achieved in this learning sequence. Students are introduced to the idea as they think about biomimicry.*	**Cause and Effect** • Cause and effect relationships are routinely identified. **Patterns** • Similarities and differences in patterns can be used to sort and classify designed products.

Related Performance Expectation(s) in this Unit:
n/a

Possible Common Core State Standards Connections:
n/a

Prior Student Knowledge:
n/a

Possible Preconceptions/Misconceptions:
Students may focus on "How" humans learn. Redirect to "What" humans learned.

LESSON PLAN – 5-E Model

Back to Top of Page

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Students watch a Biomimicry slideshow that compares the natural world to the design world.
- Students complete an I Notice, I Wonder organizer to engage prior knowledge and generate interest.

Resources:

- Biomimicry Slideshow
- I Notice, I Wonder

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

- Students work in groups and create a Venn diagram to focus on one slide that compares the natural world and design world.
- Students discuss and complete their Venn diagrams.
- Students complete a gallery walk to view classmates' ideas.
- Students provide feedback using post-it notes on their classmates' venn diagrams then revise their own venn diagrams from the feedback they receive.

Resources:

- Biomimicry Slideshow (Venn Diagram is Slide #10)

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to work together without direct instruction
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems.
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Tests predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others

Back to Top of Page

- Records observations and ideas
- Suspends judgement

Additional Resources:

- G4 Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 2

Brief Description:
This sequence introduces the concept of energy and how it is perceived by sense receptors. Students explore and build an understanding of how animals receive and perceive information through their senses and explore how different senses acquire information about different energy sources.

Suggested Pacing:
3.5 - 3.75 hrs

Lesson-Level Phenomenon/Design Problem:
How do sense receptors receive and perceive energy?

Relationship to Anchoring Phenomena/Design Problem:
Students explore how plants and animals receive and perceive energy through their sense receptors. This helps them to continue connecting how biomimicry often drives human innovation.

Learning Sequence Driving Question:

- What is energy? What are sense receptors? How do organisms receive and perceive energy stimuli for survival?

Student Expected Outcomes:

- Students will describe the cause and effect relationships between sight, sound, touch, and reaction by making and recording observations.
- Students will investigate sense receptors to determine cause and effect relationships in connection to the phenomena.
- Students will make observations about how animals use sense receptors and how they process the perceived information.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Developing and Using Models ● Develop a model to describe phenomena. **Engaging in Argument from Evidence** ● Construct an argument with evidence, data, and/or a model.	**PS3.A: Definitions of Energy** ● Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **PS3.B: Conservation of Energy and Energy Transfer** ● Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the	**Cause and Effect** ● Cause and effect relationships are routinely identified. **Systems and System Models** ● A system can be described in terms of its components and their interactions.

Back to Top of Page

	surrounding air; as a result, the air gets heated and sound is produced. ● Light also transfers energy from place to place. ● Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. **LS1.D: Information Processing** ● Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions	

Related Performance Expectation(s) in this Unit:

- 4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
  - [Assessment Boundary: Assessment does not include quantitative measurements of energy.]
- 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
  - [Clarification Statement: Emphasis is on systems of information transfer.]
  - [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

Possible Common Core State Standards Connections:

ELA/Literacy

- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2)
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-2)
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)

Prior Student Knowledge:

n/a

Possible Preconceptions/Misconceptions:

Students may believe that:

- energy can be made, used or lost.
- energy is only in living things.

Back to Top of Page

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Students watch a short Energy Transfers video that shows various forms of energy once to observe a variety of motion.
- Students watch the video a second time and pick six types of motion and fill out the Engage Observation Chart while watching the slide show.
- Students share their ideas with their table and find at least one more idea to add to their paper.
- Create a Driving Question Board based around the central questions "What is energy and how do the senses receive/perceive it?"
- Keep the Driving Question Board handy for the duration of this learning sequence and remove questions as the students find answers for them.

Teacher Notes:
Possible types of motion from video: walking, breaking the eggs, kicking a ball, flames, flag waving, marshmallow toasting, heating a test tube, cooking and flipping pancakes, jumping into the water, smashing a watermelon, fireworks, flower blooming, canoeing, foosball, excavator.

Resources:

- Energy Transfers Video
- Engage Observation Chart

Suggested Instructional Strategies:

- Driving Question Board
- I Notice, I Wonder
- Talk Activities

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as"Why did this happen?," "What do I already know about this?" and "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Question)

Activity Description:
Activity #1: What is energy?

- Students observe the presence of energy through teacher led demonstrations
- Teacher demonstrates and prompts students to take note of the energy and the sense they use to identify the energy.
    - Breaking a glow stick
    - Moving a slinky
    - Strumming a ukulele
    - Lighting a match, etc..
- Students turn and talk after each demonstration and determine what type of energy is present and what sense they used to identify the event.

Activity #2: Your senses make sense of energy

Back to Top of Page

- Students go to 3 centers that explore touch, sight, and sound in terms of energy while completing their Recording Sheet. They will explore their senses as well as the energy that activates them:
    - Station #1 - Touch Without Seeing - Place hand in a mystery box with a hand warmer inside (heat energy)
    - Station #2 - Sight Without Sound - Wear sound-blocking headphones and shine a flashing light on and off (light energy)
    - Station #3 - Sound Without Sight - Be blindfolded and hear an alarm from a phone or some other adjustable-volume source (sound energy)
- Once students have gone through all 3 stations: Students briefly discuss their Recording Sheet
- Students expand on the activity by further discussing possible reactions to additional forms of energy gathered through sense receptors (ex, Being caught in a thunderstorm (lightning/thunder), touching a hot stove, taking a cold shower, etc…).
- The teacher asks how they think animals might react to the similar types of stimuli? Would it be the same or different than how humans react?

Resources:
- Recording Sheet

Suggested Instructional Strategies:
- Question Formulation Technique (QFT)
- Talk Activities

Teacher Notes:
- A sense receptor is a nerve ending that reacts to a physical stimulus - hearing, sight, touch, taste or smell. Different sense receptors gather different kinds of sensory information about the world. That information is in the form of different kinds of energy.

Teacher Action(s):
- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):
- Thinks freely, within the limits of the activity
- Tests predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

Why is it that we have many senses instead of just one? Take a stance on which sense is the most important.

- Students participate in an activity where they pick the sense they believe is the most important:
    - Students are asked: "If an animal had only one sense, which one do you think they'd need most?" (sight, sound, touch, smell, or taste).
    - Signs are placed around the room for each sense. Students move to the sign that they feel is the most important sense and discuss with their like-minded peers why they have taken that stance.
    - Students share their group's ideas with the whole class.

Back to Top of Page

    - After the class shares, students may move if their stance changes. (*Provide multiple animals to see if their stance changes.)
- Use epic! books' *Animal Senses* or another book about animal senses as a read aloud. Use the driving question board from the Engage section and see if any of their questions can now be answered.
- Students discuss how animals' senses compared to humans.
- The class discusses sense receptors and how different receptors receive/perceive particular kinds of energy
- Students discuss how humans have mimicked animal and plant senses in their designs.
    - Some examples:
    - Bats & Whale Sonar - Humans designed marine sonar technology
    - Animals heightened sensitivity to sound - Humans designed dog whistles and other sound devices
    - Snakes ability to sense infrared radiation from prey - Humans designed infrared technology
    - How plants response to light - Humans designed grow lights and solar panels that follow maximum light
    - Spider's ability to squeeze through tight spaces and turn quickly - Humans are working on a Prototype Rescue Robot that can work in areas too dangerous for humans.
    - Tentacle Inspired Prosthetic.
    - Humpback whale's shape - Humans designed wind turbine blades
    - Bird's wing & body shape - Humans designed airplanes
    - Leaves reaction to sunlight - Humans designed solar cells

Resources:
- epic! books: Animal Senses
- How Biomimicry is Inspiring Human Innovation
- The Best Of Biomimicry: Here's 7 Brilliant Examples of Nature-Inspired Design
- Prototype Rescue Robot
- Tentacle Inspired Prosthetic

Additional Teacher Information:
- Energy Background Information for Teacher PDF

Suggested Instructional Strategies:
- Talk Activities

Teacher Action(s):
- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):
- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: movement, detect, response, receive, perceive, response, stimuli

Back to Top of Page

ELABORATE (Applications / Extensions)

Activity Description: What kind of information do animals get from their sense receptors? How do they use that information?

- As a class, read the *Sharks and Their Lateral Line article*.
- Students complete a *Write and Pass* activity about a shark's lateral line and what information they think the shark receives from the lateral line.
- Students develop a model or drawing to show what a shark can sense through their lateral line and what form of energy it is receiving and perceiving.

Teacher Note: This should also include a discussion of the interactions within the lateral line system to include more details of the system's physical, chemical and biological components and how they enable a shark to receive/perceive energy and what the shark then does with that information.

Resources:

- Sharks and Their Lateral Line article
- Write and Pass

Suggested Instructional Strategies:

- Talk Activities
- CCC Discussion Cards

Teacher Action(s):

- Expects students to use formal labels, definitions, and explanations provided previously
- Encourages students to apply or extend the concepts and skills in new situations
- Reminds students of alternate explanations
- Refers students to existing data and evidence and ask "What do you already know?", Why do you think…?"

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draws reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Developing and Using Models; Engaging in Argument from Evidence*
- ❏ **DCI:** *PS3.A: Definitions of Energy; PS3.B: Conservation of Energy and Energy Transfer; LS1.D: Information Processing*
- ❏ **CCC:** *Cause and Effects; Systems and System Models*

Summative Assessment Description(s)

- May assess student Recording Sheet and shark model/drawing
- Students should fill in their Summary Table - return back to the summary table and add in notes regarding the activities, important ideas and the relationship to the anchoring phenomenon (How humans mimic nature in their designs.). (*Teacher should collect and save these after each sequence.)

Back to Top of Page

Resources:
- Recording Sheet
- Summary Table

Suggested Instructional Strategies:
- 60 Formative Assessment Ideas

Additional Resources:
- G4 Unit Materials List
    - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 3

Brief Description:
This sequence has students explain a speaker model and also looks into the similarities between animal receptors and human design as seen in hearing aids. Then they identify and describe how that transfer of energy is produced specifically through sound.

Suggested Pacing:
3.25 - 3.75 hrs

Lesson-Level Phenomenon/Design Problem:
What human innovations were inspired by mimicking the way the natural world receives and perceives sound?

Relationship to Anchoring Phenomena/Design Problem:
Humans have mimicked the natural world through their observations of how sound is received and perceived in nature. Some examples of human design mimicking can include whales/submarines, bats/lane changing or back up sensors and GPS.

Learning Sequence Driving Question:

- How do animals send and receive sound, and how have humans used this information in the design world?

Student Expected Outcomes:

- Students will use a model to identify similarities between animal sense receptors and human design
- Students will collect evidence to identify and describe how energy is transferred and sound is produced

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:

Developing and Using Models
Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model to describe phenomena.
- Use a model to test interactions concerning the functioning of a natural system.

Constructing Explanations and Designing Solutions

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

Disciplinary Core Ideas:

LS1.A: Structure and Function

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

LS1.D: Information Processing

- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.

PS3.A: Definitions of Energy

- Energy can be moved from place to place by moving objects or through sound, light, or electric currents.

Crosscutting Concepts:

Energy and Matter

- Energy can be transferred in various ways and between objects.

Cause and Effect

- Cause and effect relationships are routinely identified.

Patterns

- Similarities and differences in patterns can be used to sort and classify designed products.

Back to Top of Page

	PS3.B: Conservation of Energy and Energy Transfer ● Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. ● Light also transfers energy from place to place. ● Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. **PS4.C: Information Technologies and Instrumentation** ● Digitized information can be transmitted over long distances without significant degradation. **ETS1.C: Optimizing The Design Solution** ● Different solutions need to be tested in order to determine which of them best solves the problem.	

Related Performance Expectation(s) in this Unit:

- 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
  - [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.]
  - [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]
- 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
  - [Clarification Statement: Emphasis is on systems of information transfer.]

Back to Top of Page

- [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]
- 4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
  - [Assessment Boundary: Assessment does not include quantitative measurements of energy.]
- 4-PS4-3 Generate and compare multiple solutions that use patterns to transfer information.

Possible Common Core State Standards Connections:

ELA/Literacy -

- W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)

Mathematics -

- 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)

Prior Student Knowledge:

4-LS1-1: 1.LS1.A; 1.LS1.D; 3.LS3.B

4-PS4-3: K.ETS1.A; 1.PS4.B; 1.PS4.C; 2.ETS1.B; 2.ETS1.C; 3.PS2.A

Possible Preconceptions/Misconceptions:

Students may believe that:

- bats are blind and can only hear well.
- snakes "hear."

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Teacher shows the National Geographic *Elephant Communication Video.*
- Teacher displays the *I Notice, I Wonder Pictures* (Slides #2-5). The pictures depict the sending and receiving of various sound energies.
- Students fill in an I Notice, I Wonder Organizer (Slide #6) .
- Students engage in discussing their ideas. Discussions can be in the form of:
  - Small group or
  - Fishbowl
    - A group of students are chosen to discuss a given topic.
    - The rest of the class watches, listens, or reads the transcript of the discussion.
    - A secondary discussion occurs concerning the outcomes and process of the first.
- Once the discussions have finished, the teacher records student observations and questions from the model (use chart paper and keep for the duration of the sequence).

Resources:

- Elephant Communication Video
- I Notice, I Wonder Pictures and Organizer

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Creates interest

Back to Top of Page

- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

- Students create and experiment with a paper roll speaker system model off of the directions in Wikihow's *How to Make Paper Cup iPhone Speakers* explanation.
    - Use two paper or plastic cups and an empty paper towel or toilet paper roll
    - Place the paper towel/toilet paper roll horizontally in front of you and trace the base of a cell phone onto the center of the paper roll.
    - With adult supervision, cut the phone's rectangle shape on the top part of the paper towel roll (paper towel roll should have only one hole so that phone will not fall through the paper roll)
    - Using a paper roll, trace a circle onto the side of each cup. Position the circles closer to the base of the cup as opposed to the rim of the cup. ***Caution: Positioning the circles too close to the rim of the cups will limit how the speakers amplify.*
    - Cut out circles on cups and insert paper roll (roll should fit snugly)
    - Insert phone into paper roll
- Explore ways to make sound louder and softer using different materials (different sizes and types of cups and length of paper tube) to guide students in discussing sound waves and what changes them.
    - The phone's loudspeakers vibrate and make sound waves
    - Sound waves spread out from each cup
    - Sound waves bounce off the tube walls
- Students record the design of their favorite speaker system into their Science Journals.
- Students fill in a *Give Me Five* sheet based on what they discover.
- When done, teacher should collect these for future reference in the Elaborate section to come later in the sequence.
- *Optional:* Ask what components could they add or change to effect more changes in the sound?

Teacher Note:

- It may be easier/more time efficient if the holes in the cups are pre-cut.

Resources:

- How to Make Paper Cup iPhone Speakers
- Give Me Five

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

Back to Top of Page

- Thinks freely, within the limits of the activity
- Tests predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity #1 Description:

- Students work in pairs or small groups depending on computer access to complete the below listed 6 interactive pieces from the *DK Findout! SOUND Interactive Website*:
    - How are sounds created?
    - Making Music
    - Echoes
    - Loudness
    - Pitch
    - Using soundwaves to navigate
- Students fill in their *3-2-1 activity* sheet as they read each section
- Class reads about Morse Code and other technologies that enable digitized information to be transmitted over long distances in *Communication Technology: From Smoke Signals to Smartphones* by Tracey Kelly on epic! Books
- Class discusses the questions they still have based off of their 3-2-1 Activity sheet.

Resources:

- DK Findout! SOUND Interactive Website
- 3-2-1 Activity
- *Communication Technology: From Smoke Signals to Smartphones* by Tracey Kelly on epic! Books

Activity #2 Description:

- Students watch the following videos:
    - Anatomy Of The Ear
    - How Do Animals Hear?
    - How Do Hearing Aids Work?
- Students work in small groups (2-4 students) and fill in a Similarities and Differences Sheet.
    - Students write “Hearing Aids” in one center circle and “Animals” in the other center circle and then compare and contrast how each receives and perceives sound.
- Class discusses their findings and relates it back to their “Give Me Five” papers from the Explore portion of the sequence. After the discussion, students revise their Similarities and Differences Sheet.
- Teacher collects the revised sheets as part of their Evaluation.

Resources:

- Anatomy Of The Ear
- How Do Animals Hear?
- How Do Hearing Aids Work?
- Similarities and Differences Sheet

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students

Back to Top of Page

- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: vibrate, vibration, soundwave, transmit, wave

ELABORATE (Applications / Extensions)

Activity Description:

- Students revisit the *I Notice, I Wonder pictures* from Engage.
- Students work in 4 or 8 small groups with ONE of the four slides per group to add explanatory labels explaining how animals send and receive sound and how humans have mimicked this.

Resources:

- I Notice, I Wonder Pictures (print each slide #2-#5 on 11 x 17 paper if possible.)

Suggested Instructional Strategies:

- Talk Activities
- CCC Discussion Cards
- CER Organizing Template
  - STEM Teaching Tool #17: Beyond the written CER

Teacher Action(s):

- Expects the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", "Why do you think…?"

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draws reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Developing and Using Models; Constructing Explanations and Designing Solutions*
- ❏ **DCI:** *PS3.A: Definitions of Energy; PS3.B: Conservation of Energy and Energy Transfer; PS4.C: Information Technologies and Instrumentation; ETS1.C: Optimizing The Design Solution; LS1.A: Structure and Function; LS1.D: Information Processing*

Back to Top of Page

❏ CCC: *Energy and Matter; Cause and Effects; Patterns; Systems and System Models*

Summative Assessment Description(s)

- Revised Similarities and Differences sheet from the Explain section of the sequence.
- Students should fill in their Summary Table - return back to the summary table and add in notes regarding the activities, important ideas and the relationship to the anchoring phenomenon (How humans mimic nature in their designs.). (*Teacher should collect and save these after each sequence.)

Resources:

- Summary Table

Suggested Instructional Strategies:

- 60 Formative Assessment Ideas

Additional Resources:

- G4 Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 4		
Brief Description: In this sequence, students learn how light is received by animals and how the eye processes that information. Students will discuss various animals that have light producing capabilities and how that light serves a purpose in the animal's survival.		
Suggested Pacing: 2 - 3 hrs		
Lesson-Level Phenomenon/Design Problem: What human innovations were inspired by mimicking the way the natural world receives and perceives light?		
Relationship to Anchoring Phenomena/Design Problem: Humans have mimicked the natural world through their observations of how light is received and perceived in nature.		
Learning Sequence Driving Question: How is light received and perceived in the natural world?		
Student Expected Outcomes: ● Students will develop a model to describe how light enters the eye and processes information. ● Students will construct an argument to determine how an animal's internal and external structures help serve various functions - bioluminescence for improving survival.		
CONNECTIONS TO STANDARDS		
Three Dimensions Related to the Specific Learning Performance(s):		
Science & Engineering Practices: **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. ● Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. **Developing and Using Models** Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to	**Disciplinary Core Ideas:** **PS3.A: Definitions of Energy** ● Energy can be moved from place to place by moving objects or through sound, light, or electric currents. **PS3.B: Conservation of Energy and Energy Transfer** ● Light also transfers energy from place to place. **PS4.B: Electromagnetic Radiation** ● An object can be seen when light reflected from its surface enters the eyes. **LS1.A: Structure and Function** ● Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	**Crosscutting Concepts:** **Energy and Matter** ● Energy can be transferred in various ways and between objects. **Systems and System Models** ● A system can be described in terms of its components and their interactions.

Back to Top of Page

represent events and design solutions. ● Develop a model to describe phenomena. ● Use a model to test interactions concerning the functioning of a natural system.	**LS1.D: Information Processing** ● Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions.	

Related Performance Expectation(s) in this Unit:

- 4-PS4-2: Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
  - [*Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.*]
- 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
  - [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.]
  - [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]
- 4-LS1-2: Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
  - [Clarification Statement: Emphasis is on systems of information transfer.]
  - [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]

Possible Common Core State Standards Connections:

ELA/Literacy -

- RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1)
- RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4-PS3-1)
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS3-1)
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-2) (4-LS1-2)
- W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)
- W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1)
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic.(4-PS3-3)
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-1)(4-PS3-3)
- W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-PS3-1)

Mathematics -

Back to Top of Page

- MP.4 Model with mathematics (4-PS4-2)
- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-2)
- 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)

Prior Student Knowledge:

PS3.A: N/A

PS3.B: K.PS2.B ; 3.PS2.A ;

PS4.B: 1.PS4.B ; 1.PS4.C

LS1.A: 1.LS1.A ; 1.LS1.D ; 3.LS3.B

LS1.D: N/A

Possible Preconceptions/Misconceptions:

Students may think sight (seeing something) is the result of light shining on something and brightening that item.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Students view the *Eyes, Eyes Baby! slideshow* and record what they notice and wonder about the different slides. Engage #1 focuses on different types of eyes.
- Print each slide (in color) and post them on chart paper around your room. Students can walk around and record what they notice and wonder about each on an Eyes Observation Chart.
- Following the activity, teacher should lead a discussion about what the students observed and wondered.

Resources:

- Eyes, Eyes, Baby! Slideshow
- Eyes Observation Chart

Suggested Instructional Strategies:

- I Notice, I Wonder
- Talk Activities

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

Back to Top of Page

Students explore how the eye processes light through an activity where a baggie filled with water serves as a model for the lens of an eye. The following lesson has been adapted from BetterLesson.com's Understanding the Eye.

- To start the lesson take a toy ball that flashes when it hits a wall or floor and demonstrate using it.
- Instead of focusing on the question "How does it work?," asked students "How can you see this?" This question sets them up for understanding how their eyes work.
- Ask students to draw an initial model of an eyeball and how they think it works (*it lets light in*). Students can share their ideas, and then circle back together to discuss how they think an eye works.
- Students get into pairs and give each pair a baggy 80% filled with water (sealed really well) and a Snellen Eye Chart.
- Students look through the baggy at the Snellen Eye Chart from various distances. Asked them to note any observations on a Give Me Five sheet.
- If further explanation is needed, reference back to *page 2 "Investigate" from BetterLesson.com's* Understanding the Eye lab.

Resources:

- Understanding the Eye
- Snellen Eye Chart
- Give Me Five

Suggested Instructional Strategies:

- Question Formulation Technique (QFT)
- Talk Activities

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Tests predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

- Students watch one (or more if necessary) of these short videos to learn about the parts of the eye.
  - *Bill Nye The Science Guy on The Eyeball (Bill Nye)*
  - *Sense of Sight - How Human Eyes Work (Make Me A Genius)*
  - *How the Body Works - The Eye (Kids Health)*
- After watching the video of choice, students think about what part of the eye the baggy represents (*lens*), and what the baggy is doing.
- Students draw a second eye model and compare it to their original. Discuss what's changed.
- Teacher shares *Your Eyes* article.
- Students label the parts of the eye on *How The Body Works -The Eye* Handout.
- Students compare their second eye model to this new labeled eye model.
- REVISIT THE QUESTION - How does light enter the eye? How is it processed?

Back to Top of Page

- Teacher asks "What in the design world mimics how an eye works?"
- Brief Elaboration: Revisit the initial slide show. Students think about which eyes let in more light?
- Students read *From Cat Eyes to...reflectors on epic! Books* and discuss how this applies to the way light is received and perceived.

Resources:

- Bill Nye The Science Guy on The Eyeball (Bill Nye)
- Sense of Sight - How Human Eyes Work (Make Me A Genius)
- How the Body Works - The Eye (Kids Health)
- Your Eyes
- How The Body Works -The Eye Handout
- From Cat Eyes to...reflectors on epic! Books

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: eyeball, cornea, pupil, iris, lens, retina, optic nerve and the brain

ELABORATE (Applications / Extensions)

Activity Description:

- Students view the *Elaborate Slideshow* and work either individually or in small groups to record what they notice and wonder on the Observation Chart.
- Teacher leads a discussion about what the students observed and wondered regarding why animals have/need bioluminescence. What message are they trying to convey? Teacher records their ideas.
    - Possible ideas:
        - To light up a dark area (help with vision)
        - To send a message/ flash (Communication)
        - To show where they are or show off (attract a mate to them)
        - To scare something away (warn)
        - To lure something in (predator/prey)
        - To appear larger or more fierce (protection)
        - To distract something away from something (protection of young)
        - To camouflage itself (protection)
- Briefly discuss how bioluminescence relates back to "What have humans designed by mimicking this phenomenon?"
- Students work in small groups of 3-4 students and watch one of the below videos to learn about how and why an animal uses bioluminescence to improve their chances of survival. Once they have seen the video, students fill out the How Is Bioluminescence Used?

Back to Top of Page

- Class shares their How is Bioluminescence Used? organizer.

Resources:

- Elaborate Slideshow
- Observation Chart
- How Is Bioluminescence Used? Organizer
- Angler Fish (From SciShowKids)
- Jellyfish (By Vince Patton)
- Fireflies (From SciShowKids)

Optional Resources:

- Bioluminescent Animals
- GLOW: Animals with Their Own Night-Lights
- Fireflies (Nocturnal Animals)
- Angler Fish (Real Life Sea Monsters)
- Bioluminescence - Nature and Science at Work
- What is Bioluminescence?
- Living Light: Is There a Future For Bioluminescence Technology?

Suggested Instructional Strategies:

- Talk Activities
- CCC Discussion Cards

Teacher Action(s):

- Expects the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?," Why do you think...?"

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draws reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence.

Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence:

- ❏ **SEP:** *Planning and Carrying Out Investigations; Developing and Using Models*
- ❏ **DCI:** *PS3.A: Definitions of Energy; PS3.B: Conservation of Energy and Energy Transfer; PS4.B: Electromagnetic Radiation; LS1.A: Structure and Function; LS1.D: Information Processing*
- ❏ **CCC:** *Energy and Matter; Systems and System Models*

Summative Assessment Description(s)

Teacher can use the following to evaluate the students' understanding of this sequence:

- Eye Model

Back to Top of Page

- Students should fill in their Summary Table - return back to the summary table and add in notes regarding the activities, important ideas and the relationship to the anchoring phenomenon (How humans mimic nature in their designs.). (*Teacher should collect and save these after each sequence.)

Resources:

- Eye Model
- Summary Table

Suggested Instructional Strategies:

- 60 Formative Assessment Ideas
- Final Scientific Modeling
    - Small Group Models

Additional Resources:

- G4 Unit Materials List
    - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 5

Brief Description:
In this learning sequence, students explore how plants perceive and react to their environment. Students examine videos to see plants respond to light, touch, and other stimuli and observe how they respond for survival.

Suggested Pacing:
3 - 3.5 hrs

Lesson-Level Phenomenon/Design Problem:
What human innovations were inspired by mimicking the way plants respond to different energy stimuli?

Relationship to Anchoring Phenomena/Design Problem:
Humans study plant structure and function and base designs off of that information. Some examples of human design mimicking plants are solar panels and velcro.

Learning Sequence Driving Question:
What sense receptors do plants have that help them survive?

Student Expected Outcome:

- Students will use a model to describe the components of a plant and how its structures help them survive.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Developing and Using Models Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ● Develop a model to describe phenomena. ● Use a model to test interactions concerning the functioning of a natural system. **Engaging in Argument from Evidence** Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ● Construct an argument with evidence, data, and/or a model.	**LS1.A: Structure and Function** ● Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	**Systems and System Models** ● A system can be described in terms of its components and their interactions.

Back to Top of Page

Related Performance Expectation(s) in this Unit:

- 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Possible Common Core State Standards Connections:

4-LS1-1:
ELA/Literacy -

- W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)

Mathematics -

- 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)

4-PS3-3:
ELA/Literacy -

- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-3)
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-3)

Prior Student Knowledge:

4-LS1-1: 1.LS1.A; 1.LS1.D ; 3.LS3.B
3-5-ETS1-2: K-2.ETS1.A ; K-2.ETS1.B ; K-2.ETS1.C

Possible Preconceptions/Misconceptions:

Students may believe that:

- plants do not respond to outside stimuli - they just grow straight up.
- plants obtain their energy directly from the sun.
- plants breathe like humans.
- a plant's leaves' main job is to collect water.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Students view *Even Plants Have Senses!* video.
- Students complete an *I Notice, I Wonder* organizer.
- Students pair-share with a science partner what they've observed.
- Student complete *Initial Model Of A Plant* worksheet. These models should include all labels and information they know about plants. Students or teacher keep these models to revise later in the sequence.

Resources:

- Even Plants Have Senses! video
- I notice, I Wonder Organizer
- Initial Model Of A Plant

Suggested Instructional Strategies:

- Talk Activities

Back to Top of Page

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

Activity #1:

- Students observe three different plants. (Teacher picks a variety of plants that best suits the classroom or uses pictures if plants are not available.)
  - A plant with flowers
  - A succulent plant/cactus
  - A plant with needles (conifer)
- Students complete the *Compare and Contrast Sheet* for the three plants, and then come back together as a class to discuss what they observed.
- Teacher asks students and records their answers on chart paper or a Padlet for future reference in the Elaborate portion of the sequence.
  - Why do the plants have those certain characteristics?
  - Do they need those characteristics to survive?
  - How might those characteristics help them?
  - What do plants need to grow?

Resources:

- Compare and Contrast Sheet

Activity #2:

- Students watch the below videos and record how the plants in each video respond to light, touch, sound and any other observations they find.
- Students record their findings on the *Video Recording Sheet.*
  - Videos:
  - *Video #1 -Plants and Light*
  - *Video #2 - Plants and Touch*
  - *Video #3 - Plants and Vibrations*
  - *Video #4 - Plants in Motion*
  - Optional Videos:
    - *Can Plants Think?*
    - *Plants Can Actually Hear*
    - *Can Plants Hear*
    - *Are Plants Conscious?*
- After completing the Video Recording Sheet, students discuss their observations and what it means for a plant's survival, as well as how humans have mimicked these observations in the design world.

Resources:

Back to Top of Page

- Video Recording Sheet
- Video #1 - Plants and Light (By Vito Pettito)
- Video #2 - Plants and Touch (play the first minute of video by NikTheKat)
- Video #3 - Plants and Vibrations (By GeoBeatsNews)
- Video #4 - Plants in Motion (From SciFri)
- Optional Videos:
    - Can Plants Think? (From AsapSCIENCE)
    - Plants Can Actually Hear (From Veuer)
    - Can Plants Hear (By The Washington Post)
    - Are Plants Conscious? (From BrainStuff)

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Tests predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

- Students watch: *Plant Parts and their Functions* (Stop the video at the 4:46 time stamp)
- Students view *Plants - Structures and Functions* slideshow
- Students fill in *Identify the Parts of a Plant* handout.
- Students discuss how plant structures allow them to survive.
- Students revise their *Initial Plant Models* to include plant part labels such as roots, trunk, branch, stem, leaves, flower, petal, fruit.

Resources:

- Plant Parts and their Functions Video (Stop the video at the 4:46 time stamp)
- Plants - Structures and Functions Slideshow
- Identify the Parts of a Plant Handout

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels

Back to Top of Page

- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: roots, trunk, stem, leaves, flower, fruit, branch, petal

ELABORATE (Applications / Extensions)

Activity Description:

- After watching the videos and presentation from the Explore Activity #2 and Explain sections and discussing how plants structures and functions promote survival, teacher shares the *Elaborate Slideshow* (slide #1-#5) following human designs, and asks students to work in small groups to break down why they believe the design was originally needed, and how a plant inspired that design.
    - Slide #1 - Coastal defense structures
    - Slide #2 - Solar cells
    - Slide #3 - A wind-driven planetary rover
    - Slide #4 - Hook and loop material (Velcro®)
    - Slide #5 - Paratroopers
- Students work in small groups to brainstorm what plant inspired the design on each slide.
- Groups fill in the Elaborate Organizer.
- Students share their ideas in a whole group discussion.
- Teacher shows Slides A-E (labeled in the upper left corner or slides 6-10) and students complete the last column of the handout with the matching slide.
- Elaborate Slideshow Answer Key
    - Slide #1/Slide C - Coastal defense structures inspired by mangrove trees
    - Slide #2/Slide A - Solar cells inspired by plant leaves (photosynthesis, capturing energy from sunlight as well as phototropism - directionally moving to maximize the sun's energy)
    - Slide #3/Slide E - A wind-driven planetary rover design that maximizes drag, learned from the tumbleweed
    - Slide #4/Slide D - Hook and loop material (Velcro®) inspired by cockleburs
    - Slide #5/Slide B - Paratroopers inspired by a dandelion
- Teacher shares the *14 Smart Ideas Inspired By Nature article*.
- Students work in small groups to complete a Discussion Diamond with the prompt question being: "Which ONE characteristic of plants do you believe to be the most helpful when applied to human design based on what it can accomplish?"
- Students share their consensus ideas with the class.

Resources:

- Elaborate Slideshow
- Elaborate Organizer
- 14 Smart Ideas Inspired By Nature article
- Discussion Diamond
- Discussion Diamond Directions

Suggested Instructional Strategies:

- Talk Activities
- CCC Discussion Cards
- CER Organizing Template
    - STEM Teaching Tool #17: Beyond the written CER

Back to Top of Page

- CER Rubric Example

Teacher Action(s):

- Expects the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?"

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draws reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)
Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Developing and Using Models; Engaging in Argument from Evidence*
- ❏ **DCI:** *LS1.A: Structure and Function*
- ❏ **CCC:** *Systems and System Models*

Summative Assessment Description(s)

- Students should fill in their *Summary Table* - return back to the summary table and add in notes regarding the activities, important ideas and the relationship to the anchoring phenomenon (How humans mimic nature in their designs.). (*Teacher should collect and save these after each sequence.)

Resources:

- Summary Table

Suggested Instructional Strategies:

- 60 Formative Assessment Ideas

Additional Resources:

- G4 Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 6

Brief Description:
Through a variety of activities, students experience an assortment of energy transfers. These include light, sound and electrical energy. They explore how energy is used in the natural world and how those uses influence the design world.

Suggested Pacing:
4.5 - 5.25 hrs for 5E's
1 - 1.5 hrs for Culminating Activity

Lesson-Level Phenomenon/Design Problem:
Electric animals

Relationship to Anchoring Phenomena/Design Problem:
Students learn about electricity and energy transfer. Then apply that information to animals that generate electricity, as well as how humans use electricity for similar and different reasons.

Learning Sequence Driving Question:
- How do animals use electricity?

Culminating Performance Task:
How Does A Device Mimic The Natural World?

Student Expected Outcomes:
- Students will collect evidence to identify and describe how electrical energy is transferred and produced.
- Students will describe observations from an investigation to determine how electrical energy is transferred from place to place and can change into other forms of energy (sound and light).
- Students will investigate how animals use electricity to survive.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:

Planning and Carrying Out Investigations
- Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

Constructing Explanations and Designing Solutions
- Generate and compare multiple solutions to a problem based on how well they meet the criteria

Disciplinary Core Ideas:

LS1.A: Structure and Function
- Plants and animals have both internal and external structures that serve various functions.

LS1.D: Information Processing
- Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain.

PS3.A: Definitions of Energy
- Energy can be moved from place to place.

Crosscutting Concepts:

Energy and Matter
- Energy can be transferred in various ways and between objects.

Systems and System Models
- A system can be described in terms of its components and their interactions.

Cause and Effect
- Cause and effect relationships are routinely identified.

Back to Top of Page

and constraints of the design solution. **Developing and Using Models** ● Develop a model to describe phenomena. ● Use a model to test interactions concerning the functioning of a natural system.	**PS3.B: Conservation of Energy and Energy Transfer** ● Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. **ETS1.B: Developing Possible Solutions** ● Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. ● At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.	

Related Performance Expectation(s) in this Bundle:

- 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
  - [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.]
  - [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.]
- 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
  - [Clarification Statement: Emphasis is on systems of information transfer.]
  - [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]
- 4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
  - [Assessment Boundary: Assessment does not include quantitative measurements of energy.]
- 3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Possible Common Core State Standards Connections:

ELA/Literacy -

- RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (3-5-ETS1-2)
- RI.5.1 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (3-5-ETS1-2)
- RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS1-2)
- W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)

Back to Top of Page

- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-LS1-2)
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2),
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

Mathematics -

- 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.
- MP.2 Reason abstractly and quantitatively. (3-5-ETS1-2)
- MP.4 Model with mathematics. (3-5-ETS1-2)
- MP.5 Use appropriate tools strategically. (3-5-ETS1-2)
- 3-5.OA Operations and Algebraic Thinking (3-ETS1-2)

Prior Student Knowledge:

4-LS1-1: 1.LS1.A (4-LS1-1); 1.LS1.D (4-LS1-1); 3.LS3.B
4-LS1-2: N/A
4-PS3-2: N/A
3-5-ETS-1-2: K-2.ETS1.A ; K-2.ETS1.B ; K-2.ETS1.C

Possible Preconceptions/Misconceptions:

Students may believe that:

- energy can be made, used or lost
- energy is only in living things
- things "use up" energy
- energy is lost

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Teacher asks the question - How do some animals use the electricity they can create? Then class reads *Electric Animals* on epic! Books.
- After reading the book, students pick the one animal that surprised them the most and draws a picture (initial model) of that animal and writes one statement about how their animal uses electricity.
- If time, students share their initial models with other students having the same animal.

Resources:

- *Electric Animals* by Natalie Kunis available on epic! Books

Suggested Instructional Strategies:

- Initial Scientific Model)
  - Small Group Models
- Talk Activities

Teacher Action(s):

- Creates interest
- Generate curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

Back to Top of Page

- Shows interest in the topic
- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

This activity will be spread out over multiple class periods. These explorations allow students to elaborate beyond what they already know to start applying the idea of energy transfer in the design world. By the end of the two activities, students should be able to recognize that energy travels from one place to another. In Activity #1 students create a chain reaction design to demonstrate the transfer of kinetic energy and in Activity #2 students create a circuit to demonstrate the transfer of electrical energy.

Activity #1 - CHAIN REACTIONS - Demonstrating the transfer of kinetic energy

- Students start by viewing *Game On!* video (Teacher Note: this video is 14 minutes long, so plan accordingly, you can speed up the video or just show a portion of the video).
- Students work in small groups to create a simple chain reaction design using dominoes, cards, and marbles.
    - Each group gets a baggie with:
        - 15 Dominoes or similar blocks/shapes
        - 5 Playing Cards
        - 3 Marbles
- BEFORE BUILDING:
    - Students discuss how they want to design their reaction
    - Students work in groups and sketch in their science notebooks their group's first design/idea.
    - Once a design is recorded, they can begin building.
- Students record each attempt in their science notebooks using words and sketches and can adjust their designs with additional items as approved by the teacher.
    - Students are required to include in their science notebooks the following:
        - Which combinations are successful.
        - Which combinations are not successful.
        - What was done to improve the design.
        - How does the final design best transfer energy and why.
- Students demonstrate their most successful design and explain to the class how it demonstrates the transfer of kinetic energy.

Teacher Note:

- Kinetic Energy is the energy an object has due to its motion. An example would be the collision of two pool balls - the energy is transferred from one pool ball to the other.

Resources:

- Game On! Video

Activity #2 - Let There Be Light! Demonstrating the transfer of electrical energy.

- Students work in small groups.
- Each group must create a circuit that will successfully light a bulb using the materials provided.
    - Each group gets (can purchase Eisco Beginner Circuit Kits or use something similar from the hardware store):
        - 1 light bulb
        - 1 battery (Battery Holder - optional)
        - 2 lengths of wire (Students do not have to use both wires.)
        - Tape

Back to Top of Page

- BEFORE BUILDING:
  - Each group discusses how they want to design their circuit
  - Each student in the group sketches in their science notebooks their group's first design/idea.
  - Once a design is recorded, students may begin working.
- Students record each attempt in their science notebooks using words and sketches
- Students MUST include multiple (at least 2) possible solutions
  - Students are required to include in their science notebooks the following:
    - Which combinations are successful.
    - Which combinations are not successful.
    - What was done to improve the design.
    - How does the final design best transfer energy and why.
- At the end of the activity, students demonstrate their design and explain to the class how it demonstrates the transfer of electrical energy.
- Optional Extension Activity: STEM: Holiday Light Circuit

Teacher Note:

- Electrical energy is energy that is caused by moving electric charges. An example of this is electric energy moving from a power plant, to electric wires, to a house, to a TV or some other electronic device.
- Guide the discussion to include the following:
  - Electric currents need to travel in a complete loop to make a complete circuit in order to light a bulb.
  - Identify the essential components of a circuit including a pathway and a source.
  - Draw a complete circuit needed to light a bulb.
- Include the placement of the wire on the bulb - one needs to touch the side and one needs to touch the bottom.

Resources:

- Eisco Beginner Circuit Kits
- STEM: Holiday Light Circuit
- Optional Interactive website: Technology
- More electricity experiments pages 114-127 in *Hands On Science Experiments* by Gary Gibson on epic! Books

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Expects the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EXPLAIN (Concepts Explained / Vocabulary Defined)

Back to Top of Page

Activity Description:

- Once both activities are finished, students compare and contrast both kinetic and electrical energy in a class discussion.
- Students watch *The Power of Circuits* video and Science for Kids: *Energy Transformations* video
- Class creates anchor charts for vocabulary listed below
- Students work in 3 or 6 groups with each of the three *Crosscutting Concept Cards* for Energy & Matter, Systems & System Models, and Cause & Effect to explain each of the two Explore Activities.
- Students share their ideas with the class and discuss.

Resources:

- The Power of Circuits by SciShow Kids
- Science for Kids: Energy Transformations Video
- *All Charged Up: A Look at Electricity* by Jennifer Boothroyd on epic! Books
- *How Circuits Work* by James Roland on epic! Books
- Crosscutting Concept Cards

Suggested Instructional Strategies:

- Talk Activities

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: circuit, open circuit, closed circuit, insulator, conductor, kinetic energy, potential energy

ELABORATE (Applications / Extensions)

Activity Description:

- Teacher shares the following:
  - Newsela's It's a shocker: Electric eels bend their bodies to amp up voltage article.
  - *SciShow's The Shocking Truth about Electric Animals video*
  - *12 Animals That Use Electricity*
- Teacher asks:
  - Natural electricity generated by animals to help it survive. How do humans use electricity to survive?
  - Do humans use electricity similarly to animals? If so, how?"
  - Students fill in a *Compare and Contrast* organizer.
  - Students revisit the initial Engage model of electric animals and add zoom out boxes to explain further how their animal generates and uses electricity.
  - Class generates a list of human designs that mimic electric animals. Some examples are tasers, electric fencing, batteries.

Back to Top of Page

Resources:

- Newsela's It's a shocker: Electric eels bend their bodies to amp up voltage article.
- SciShow's The Shocking Truth about Electric Animals video
- 12 Animals That Use Electricity
- Compare and Contrast Organizer

Suggested Instructional Strategies:

- Talk Activities
- CCC Discussion Cards

Teacher Action(s):

- Expects the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", "Why do you think…?"

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Planning and Carrying Out Investigations; Developing and Using Models; Constructing Explanations and Designing Solutions*
- ❏ **DCI:** *PS3.A: Definitions of Energy; PS3.B: Conservation of Energy and Energy Transfer; LS1.A: Structure and Function; LS1.D: Information Processing; ETS1.B: Developing Possible Solutions*
- ❏ **CCC:** *Energy and Matter; Cause and Effects; Systems and System Models*

Summative Assessment Description(s)

- Students science notebooks can be evaluated for details from the Explore Activities and Elaborate organizer and model.
- Students should fill in their Summary Table - return back to the summary table and add in notes regarding the activities, important ideas and the relationship to the anchoring phenomenon (How humans mimic nature in their designs.). (*Teacher should collect and save these after each sequence.)

Resources:

- Summary Table

Suggested Instructional Strategies:

- 60 Formative Assessment Ideas
- Final Scientific Modeling
  - Small Group Models
  - Sticky-notes + language scaffolds as tools for changing models

Back to Top of Page

Culminating Performance Task:

- Teacher begins the lesson showing a cell phone and asks students "What are some cellphone characteristics that mimic the natural world?"
- Students brainstorm a list of cellphone characteristics compared with organisms (any kind) in the natural world.
    - Things To Consider:
        - Structure and function
        - Communication
        - Energy transfer - receiving and giving of information
- Make a chart - *Animal Behavior vs Cell Phone Characteristics* - Sound, Vibration, lights, data transmission
- Students may refer back to their Summary Sheet to help jog their memories:
    - Learning Sequence #1 first introduced and explored the idea of biomimicry
    - Learning Sequence #2 explored how senses react to energy stimuli
    - Learning Sequence #3 explored the sending and receiving of sound
    - Learning Sequence #4 explored how light is received and perceived
    - Learning Sequence #5 explored how plants can receive and perceive vibrations (among other energies)
    - Learning Sequence #6 explored the transfer of energy (primarily electrical & kinetic)
- As a class fill in page 1 of How Does A Device Mimic The Natural World where the device is a Cell Phone.
- Teacher asks "In your life, what technology do you use that mimics the natural world?"
    - Possible examples:
        - Computer
        - Video Games
        - Vehicles: Car, Bus, Train, Airplane
        - Drone
        - SUV
        - Television
        - Watch
        - Fitness Trackers (FitBit, smart watches)
- Students compare the characteristics of an existing device to the natural world using the second page/side of How Does A Device Mimic The Natural World? handout.
    - Students draw the product and describe the design features on the third page of the How Does A Device Mimic The Natural World? handout.
    - Students focus on the use of energy transfer (light, sound, electricity).
    - Students explore ways these items not only receive information but also send/give information
    - Students may research their device on the computer.
    - Students are asked to identify which feature(s) are inspired by nature. If possible, have them be specific about what type of animal or plant it mimics and have them describe the design inspiration (plant or animal characteristics, etc.).
    - Students provide at least one creative idea on how their product could be made better using biomimicry.

Resources:

- How Does A Device Mimic The Natural World?

Additional Resources:

- G4 Unit Materials List
    - Click on specific tab for unit-specific materials

Back to Top of Page

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ **Board Meeting Date** **January 27, 2022**

Decision Requested **X** **Agenda Code** **8 h.**

AGENDA REPORTING FORM

Agenda Topic: SHS Textbook Proposal – AP Biology– Second Reading

Summary of Issue: The Curriculum & Instruction Committee has reviewed SHS Textbook Proposal – AP Biology

Background: _____

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: The Board of Education Curriculum & Instruction Committee is bringing SHS Textbook Proposal – AP Biology to the full Board for a Second Reading.

Titles of Attachments:

1. SHS Textbook Proposal – AP Biology

Frank Ryan
Signature of Staff Member Submitting Report

Peter Madaras
Signature of Superintendent of Schools

R-6161 (2)

Southington Public Schools
Southington, CT

TEXTBOOK ADOPTION FORM – PART A

Date:	10/15/20

1.	Curriculum Committee or department submitting change:	SHS Science Department
2.	Grade levels and high school course(s) in which text will be used:	Gr. 10, 11, 12
3.	Proposed Text	
	a. *Title*	Campbell Biology in Focus, 3rd Edition
	b. *Author(s) full name(s)*	Lisa A. Urry, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, Rebecca B. Orr
	c. *Publisher (name and location)*	Pearson Education, Hoboken, NJ
	d. *Copyright Date*	2020
4.	Cost of recommended text:	13,585.42
5.	Amount Budgeted:	13,585.42
6.	Number of student copies to be purchased:	80
7.	This text is (check one):	x *A replacement for existing text* ☐ *A new text for new or revised course*
8.	Rationale for selection of this text (if replacement for current text, be sure to indicate why the text needs to be replaced and the advantages of the proposed new text):	
	Compared to other text books for AP biology students, the cost of *Biology in Focus* is substantially cheaper and is of equal quality. Other AP biology teachers that are members of the AP biology community support the use of this text as well. All units prescribed by College Board are supported by this text and the resources that accompany it.	

Department or Committee Members:	Sharon Kirsche, Dave DeStefano, Nicole Raccio

Approvals:

Department Chair Signature Nicole Raccio

Principal Signature

THE EVALUATION

I. What other textbooks were evaluated to the one the committee is recommending? List by title, publisher, and date of publication.

Open Stax
Campbell's Biology, AP Edition
Campbell's Biology in Focus

II. In summary, explain why the committee is recommending this textbook rather than the others it evaluated. If no other texts were evaluated, explain why not.

Biology in Focus is a text that is commonly referred to by teachers on the College Board panel and as well as teachers that are part of the AP Biology Facebook Community. Biology in Focus is aligned with the standards that are set forth by College Board. The text is comprehensive but slightly more concise than the more expensive, Campbell AP Edition Biology, also by Pearson.

III. If the textbook is rated as "weak" on any of the evaluation criteria, explain why the committee is recommending its adoption.

N/A

IV. Is the readability level of the textbook consistent with the reading ability of the students who will use the text (attach the readability study to this form)? Yes X No ☐

If no, please explain why the textbook is being recommended.

EVALUATION OF PROPOSED TEXT – PART B

Directions: For each question, rate from a low of 1-point to a high of 3-points.

1 = Little or No Extent
2 = To Some Extent
3 = Great Extent
N/A = Not Applicable

OBJECTIVES AND CONTENT		1	2	3	N/A
1.	To what extent are the objectives of the text stated?	☐	☐	X	☐
2.	To what extent do the objectives of the text correlate with goals and objectives of the course?	☐	☐	X	☐
3.	To what extent do the objectives require students to use higher cognitive skills (analysis, synthesis, etc.)?	☐	☐	X	☐
4.	To what extent does the content of the text cover the content requirement of the course?	☐	☐	X	☐
5.	To what extent is the content of the text geared to the interests, abilities, and needs of the students using the material?	☐	☐	X	☐
6.	To what extent does the content of the text reflect recent scholarship in this subject area?	☐	☐	X	☐
7.	To what extent does the text clearly and accurately develop and present essential concepts, generalizations, and relationships?	☐	☐	X	☐
8.	To what extent does the text present charts, maps, graphs, and tables accurately and clearly?	☐	☐	X	☐
9.	To what extent do the text learning aids (pictures, graphs, suggested activities, etc.) focus on the major objectives of the chapter or unit?	☐	☐	X	☐
10.	To what extent are skills and skill development stressed throughout the text?	☐	☐	X	☐
11.	To what extent does the text offer practice opportunities to reinforce the skills that are taught?	☐	☐	X	☐
12.	To what extent is this text interesting to read?	☐	☐	X	☐
13.	To what extent do the text and supplemental materials reflect current learning theory and principles?	☐	☐	X	☐

Comments:	The book logically builds on background knowledge and explains new concepts clearly. It links to real world examples throughout to make concepts more engaging to students. See the rationale for more details.

PUBLICATION DATA AND PHYSICAL CHARACTERISTICS	1	2	3	N/A
1. To what extent do the authors (or contributors) have background and experience in the subject area and teaching experience to know how to present material to the students who will be using it?	☐	☐	X	☐
2. To what extent is the quality and binding sufficient to withstand the wear and tear of student use?	☐	☐	X	☐
3. To what extent is the typeface and type size suitable for the students who will be reading it?	☐	☐	X	☐
4. To what extent are the illustrations pleasing, well selected, and well placed?	☐	☐	X	☐
5. To what extent is the book effectively organized for maximum student learning?				

Comments:	The book is more efficiently organized than our current text, Campbell Biology, AP Edition. It was clearly written and organized to align with the AP Biology curriculum.

TEACHING AIDS	1	2	3	N/A
1. To what extent does the teacher's manual explain the aims and objectives of individual units and lessons?	☐	☐	X	☐
2. To what extent are up-to-date reference sources listed in an easily used format?	☐	☐	X	☐
3. To what extent does the book have accompanying learning aids (transparencies, videocassettes, CD's, charts, etc.)?	☐	☐	X	☐
4. To what extent are the workbooks (if included) challenging for students and do they reinforce the text's major concepts?	☐	☐	X	☐
5. To what extent are appropriate test materials available for teachers?	☐	☐	X	☐
6. To what extent are interesting activities suggested that will challenge youngsters to do further research?	☐	☐	X	☐
7. To what extent do the suggested activities and accompanying materials accommodate the range of learning abilities of the students most likely to be using it?	☐	☐	X	☐

Comments:	The text (and accompanying resources), having been written to specifically accompany the AP Biology curriculum, is not only an excellent resource on its own, but it also a wonderful complement to all of the AP Biology Resources on AP Classroom.

TREATMENT OF SENSITIVE AREAS		1	2	3	N/A
1.	To what extent does the content of the text (both pictorial and written) reflect the pluralistic, multi-ethnic nature of our society, past and present?	☐	☐	X	☐
2.	To what extent is the role of gender and of various racial, ethnic, religious, and socio-economic groups past and present, accurately and fairly presented?	☐	☐	☐	X
3.	To what extent are all sides of a controversial issue treated fairly and objectively?	☐	☐	X	☐

Comments:	Relevant and applicable experimentation and works are referenced in the text. The text explicitly welcomes and embraces the nature of cultural diversity and gender neutral opinions and beliefs.

CONTENT AREA TEXT ASSESSMENT FOR TEACHING & LEARNING - PART C

Name of Text:	Campbell Biology in Focus, 3rd Edition
Author(s):	Lisa A. Urry, Michael L. Cain, Steven A. Wasserman, Peter V. Minorsky, Rebecca B. Orr
Copyright:	2020 Publisher: Pearson Education, Hoboken, NJ
Class:	AP Biology Grade(s): 10-12

EVALUATION OF TEXT CONTENT

Skills & Strategies	Criteria: Questions to ask about text	Yes / Sometimes / No
Meeting Curriculum Demands	Does the content of this text reflect what you feel are the essential concepts in your course?	Yes
	Does the content flow in a logical progression appropriate for this content (i.e. from simple to complex, chronological, topical, etc.)?	Yes
	Is the information up to date?	Yes
	Does the content, including illustrations and examples, appropriately present ethnic and gender diversity?	Yes

Teacher comments on ***Text Content***: _____

PRE-READING

Skills & Strategies	Criteria: Questions to ask about text	Yes / Sometimes / No
Activating Background Knowledge	Does the introduction to the chapter help students recall information previously learned about this subject?	Yes
	Does the introduction attempt to help students' relate their own life experiences to the chapter topic?	Yes
	Does the author build on the students' prior knowledge within the chapter subsections?	Yes
Setting Purpose for Reading	Does the chapter begin with a list of objectives, statements, or questions indicating what students will learn in this chapter?	Yes
	Do titles of sections within the chapter indicate the main idea of each section?	Yes
	Are section headings specific enough that students can convert them to focus-questions that direct their reading?	Yes

PRE-READING (Continued)

Skills & Strategies	Criteria: Questions to ask about text	Yes / Sometimes / No
Setting Purpose for Reading	Does the chapter begin with a list of objectives, statements, or questions indicating what students will learn in this chapter?	Yes
	Do titles of sections within the chapter indicate the main idea of each section?	Yes
	Are section headings specific enough that students can convert them to focus-questions that direct their reading?	Yes

Teacher comments on ***Pre-reading*** aids: A clear connection is made to all NGSS standards, key questions posed as well as key vocabulary defined at the start of every chapter.

ACTIVE READING

Skills & Strategies	Criteria: Questions to ask about text	Yes / Sometimes / No
Identifying the Main Idea	Is the main idea clearly stated for each paragraph?	Yes
	Will the main idea be obvious and easy for students to understand?	Yes
	Is the main idea (topic sentence) usually located at the beginning of the paragraph?	Yes
	Does the rest of the paragraph clearly explain the main idea? (Remember the students' limited knowledge base.)	Yes
Supporting & Reinforcing the Main Idea	Are explanations adequate?	Yes
	Are supporting details clear and sufficient in number?	Yes
	Do charts, pictures, and other graphics support the main ideas?	Yes
	Do charts, pictures, and other graphics support the main ideas?	Yes
	Are there special appendices to provide students with additional reference materials?	Yes
Organizing the Information	Is there a logical arrangement of text so students can easily take notes?	Yes
	Are signal words provided to indicate how ideas in the section are related to one another?	Yes

Is the presentation of main ideas and details consistent in each chapter?	Yes
Does the rest of the paragraph clearly explain the main idea? (Remember the students' limited knowledge base.)	Yes

ACTIVE READING (Continued)

Skills & Strategies	Criteria: Questions to ask about text	Yes / Sometimes / No
Organizing the Information	Is there a logical arrangement of text so students can easily take notes?	Yes
	Are signal words provided to indicate how ideas in the section are related to one another?	Yes
	Is the presentation of main ideas and details consistent in each chapter?	Yes
	Does the rest of the paragraph clearly explain the main idea? (Remember the students' limited knowledge base.)	Yes
Vocabulary Development	Are important words/concepts highlighted in the text?	Yes
	Are important words/concepts clearly defined or explained within the reading?	Yes
	Does the author provide more than just a definition? (e.g. pictures, examples, analogies, counter examples, etc.)	Yes
	Is the number of highlighted vocabulary terms appropriate for the concepts being explained? (Avoid too much jargon!)	Yes

Teacher comments on ***Active Reading*** components of text: ____

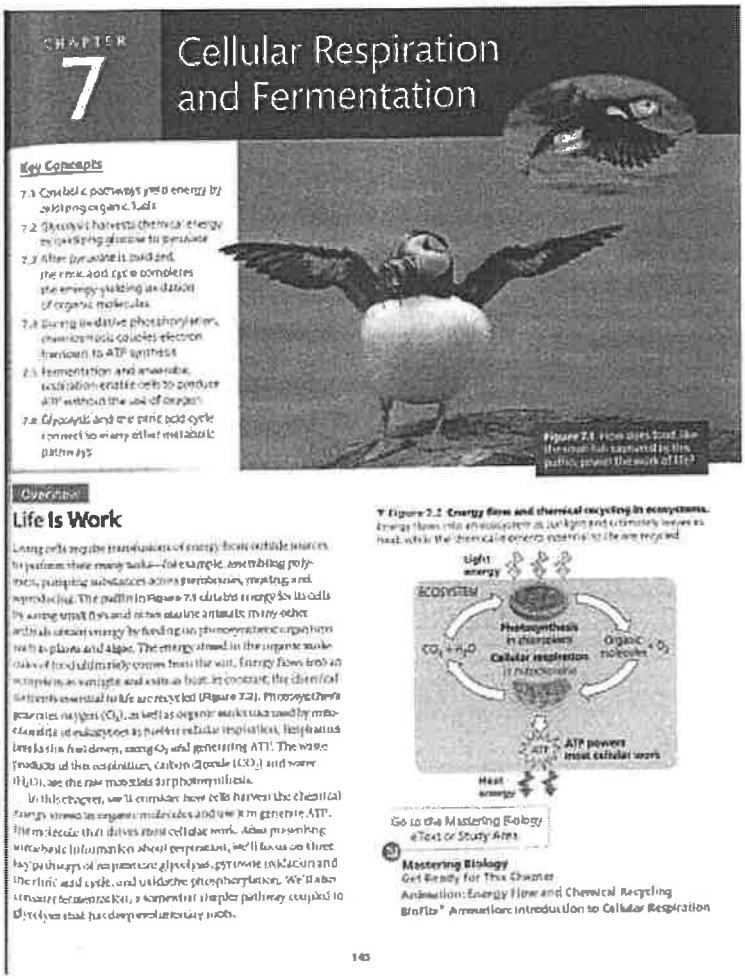
POST-READING

Skills & Strategies	Criteria: Questions to ask about text	Yes / Sometimes / No
Metacognition	Are there questions within the chapter to help students check their understanding as they read?	Yes
	Does the summary accurately reflect the main ideas and key supporting information within the chapter?	Yes
	Do the end-of-chapter questions correlate with the chapter objectives?	Yes
	Do the questions at the end of the chapter encourage higher order thinking skills?	Yes
	Are there questions within or at the end of a chapter to promote class or small group discussion or writing?	Yes

Teacher comments on ***Post-Reading*** components of text:

Textbook	Campbell Biology in Focus, 3rd Edition
Flesch Reading Ease	**N/A**
Flesch-Kincaid Grade Level	**N/A**

Insert text here: (eText)



CHAPTER 7

Cellular Respiration and Fermentation

Key Concepts

7.1 Catabolic pathways yield energy by oxidizing organic fuels

7.2 Glycolysis harvests chemical energy by oxidizing glucose to pyruvate

7.3 After pyruvate is oxidized, the citric acid cycle completes the energy-yielding oxidation of organic molecules

7.4 During oxidative phosphorylation, chemiosmosis couples electron transport to ATP synthesis

7.5 Fermentation and anaerobic respiration enable cells to produce ATP without the use of oxygen

7.6 Glycolysis and the citric acid cycle connect to many other metabolic pathways

Figure 7.1 How does food like the human fuel surrounding this puffin, power the work of life?

Overview

Life Is Work

Living cells require transformations of energy from outside sources to perform their many tasks—for example, assembling polymers, pumping substances across membranes, moving, and reproducing. The puffin in Figure 7.1 obtained energy for its cells by eating small fish, and it, in turn, animals in many other animals obtain energy by feeding on photosynthetic organisms such as plants and algae. The energy stored in the organic molecules of food ultimately comes from the sun. Energy flows into an ecosystem as sunlight and exits as heat, by contrast, the chemical elements essential to life are recycled (Figure 7.2). Photosynthesis generates oxygen (O_2), as well as organic molecules used by mitochondria of eukaryotes in further cellular respiration. Respiration breaks down the food molecules, using O_2 and generating ATP. The waste products of this respiration, carbon dioxide (CO_2) and water (H_2O), are the raw materials for photosynthesis.

In this chapter, we'll consider how cells harvest the chemical energy stored in organic molecules and use it to generate ATP, the molecule that drives most cellular work. After presenting introductory information about respiration, we'll focus on three key pathways of respiratory: glycolysis, pyruvate oxidation and the citric acid cycle, and oxidative phosphorylation. We'll also consider fermentation, a somewhat simpler pathway coupled to glycolysis that has deep evolutionary roots.

Figure 7.2 Energy flow and chemical recycling in ecosystems. Energy flows into an ecosystem as sunlight and ultimately leaves as heat, while the chemical elements essential to life are recycled.

Go to the Mastering Biology eText or Study Area

Mastering Biology
Get Ready For This Chapter
Animation: Energy Flow and Chemical Recycling
BioFlix® Animation: Introduction to Cellular Respiration

145

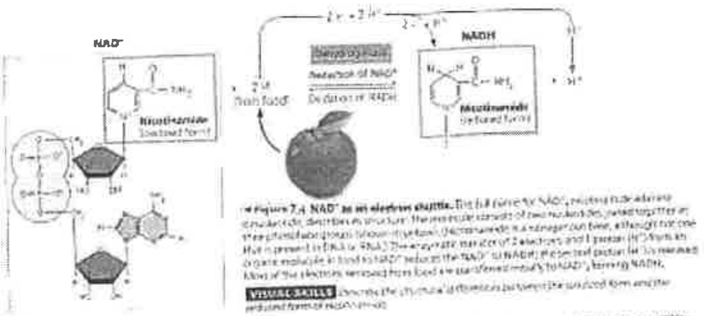


Figure 7.4 NAD+ as an electron shuttle. [illegible]

VISUAL SKILLS Describe the structural differences between the oxidized form and the reduced form of nicotinamide.

How does NAD+ trap electrons from glucose and other organic molecules in food? Enzymes called dehydrogenases remove a pair of hydrogen atoms (2 electrons and 2 protons) from the substrate (glucose, in the preceding examples), thereby oxidizing it. The enzyme delivers the 2 electrons along with 1 proton to its coenzyme, NAD+, forming NADH (Figure 7.4). The other proton is released as a hydrogen ion (H^+) into the surrounding solution:

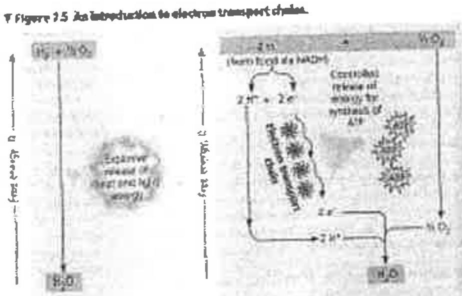
$$H{-}C{-}OH + NAD^+ \xrightarrow{\text{Dehydrogenase}} C{=}O + NADH + H^+$$

By receiving 2 negatively charged electrons but only 1 positively charged proton, the nicotinamide portion of NAD+ has its charge neutralized when NAD+ is reduced to NADH. The name NADH shows the hydrogen that has been received in the reaction. NAD+ is the most versatile electron acceptor in cellular respiration and functions in several of the redox steps during the breakdown of glucose.

Electrons lose very little of their potential energy when they are transferred from glucose to NAD+. Each NADH molecule formed during respiration represents stored energy that can be tapped to make ATP when the electrons complete their "fall" down an energy gradient from NADH to oxygen.

How do electrons that are extracted from glucose and stored as potential energy in NADH finally reach oxygen? It will help to compare the redox chemistry of cellular respiration to a much simpler reaction: the reaction between hydrogen and oxygen to form water (Figure 7.5a). Mix H_2 and O_2, provide a spark for activation energy, and the gases combine explosively. In fact, combustion of liquid H_2 and O_2 is harnessed to help power the rocket engines that boost satellites into orbit and launch spacecraft. The explosion represents a release of energy as the electrons of hydrogen "fall" closer to the electronegative oxygen atoms. Cellular respiration also brings hydrogen and oxygen together to form water, but there are two important differences. First, in cellular respiration, the hydrogen that reacts with oxygen is derived from organic molecules rather than H_2. Second, instead of occurring in one explosive reaction, respiration uses an

Figure 7.5 An introduction to electron transport chains.



(a) Uncontrolled reaction. The one-step exergonic reaction of hydrogen with oxygen to form water releases a large amount of energy in the form of heat and light: an explosion.

(b) Cellular respiration. In cellular respiration, the same reaction occurs in stages: An electron transport chain breaks the "fall" of electrons in this reaction into a series of smaller steps and stores some of the released energy in a form that can be used to make ATP. (The rest of the energy is released as heat.)

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ **Board Meeting Date** **January 27, 2022**

Decision Requested **X** **Agenda Code** **8 i.**

AGENDA REPORTING FORM

Agenda Topic: Policy 4118.8 – Alcohol and Drug Use – Policy Revision – Second Reading

Summary of Issue: The Policy & Personnel Committee has reviewed Policy 4118.8– Alcohol and Drug Use – Policy Revision.

Background: The Policy and Personnel Committee reviews policies with the administration to ensure they are current and appropriate.

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: The Board of Education Policy & Personnel Committee is bringing the draft Policy 4118.8 to the full Board for a Second Reading.

Signature of Staff Member Submitting Report

Titles of Attachments:

1. DRAFT Policy 4118.8

Signature of Superintendent of Schools

Policy 4118.8

Alcohol and Drug Use – Policy Revision

Draft

Series 4000: Personnel

Certified – Personnel

Permanent Personnel

Rights, Responsibilities and Duties

Alcohol and Drug Use

The unlawful manufacture, possession, use or distribution of intoxicating liquors or illegally obtained drugs by school employees in school buildings or on school grounds, or during any school activity is prohibited. Compliance with these standards of conduct is mandatory and any employee who violates them shall be subject to discipline which may include immediate dismissal, and referral for prosecution. Employees may further be required to complete an appropriate rehabilitation program for substance abuse.

The prohibition on smoking extends to "any area" of a school building, and extends the prohibition against using an electronic nicotine delivery system or vapor product on school grounds or in a school to also prohibit use of an "electronic cannabis delivery system" in such locations.
Because marijuana use is prohibited under federal law, the use of marijuana at work, or outside of work if it impairs an employee's ability to perform their job, constitutes a violation of this policy.

Employees may obtain information about drug and alcohol counseling, rehabilitation and re-entry programs from the office of the Personnel Manager.

The Board of Education directs the Superintendent of Schools to distribute this policy statement to all staff. Further, all potential new hires shall be given a copy of this policy and informed that they must abide by it. Further, all potential new hires must disclose any drug conviction as a condition of employment.

Public Act No. 21-1,
Conn. Gen. Stat. § 10-221(d)
Conn. Gen. Stat. § 10-154a

Policy adopted: December 1988
Policy revised: October 1990
Policy revised: May 1994
Policy reviewed: April 2003
Policy revised: 2022

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ **Board Meeting Date** **January 27, 2022**

Decision Requested **X** **Agenda Code** **8 j.**

AGENDA REPORTING FORM

Agenda Topic: Policy 5131.6 – Drugs, Alcohol, Tobacco – Policy Revision – Second Reading

Summary of Issue: The Policy & Personnel Committee has reviewed Policy 5131.6– Drugs, Alcohol, Tobacco – Policy Revision.

Background: The Policy and Personnel Committee reviews policies with the administration to ensure they are current and appropriate.

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: The Board of Education Policy & Personnel Committee is bringing the draft Policy 5131.6 to the full Board for a Second Reading.

Signature of Staff Member Submitting Report

Titles of Attachments:

1. DRAFT Policy 5131.6

Signature of Superintendent of Schools

Policy 5131.6

Drugs, Alcohol, Tobacco – Policy Revision

Draft

Series 5000: Students

Activities

Conduct

Drugs, Alcohol, Tobacco

It is the policy of the schools to take positive action through education, counseling, parental involvement, medical referral, and police referral in the handling of incidents in the schools involving the possession, sale and/or use of illicit drugs and alcohol. In addition, students will be made aware that the possession, use or distribution of drugs or alcohol is prohibited and that students who violate this policy on school property or during a school sponsored activity will be subject to disciplinary action, up to and including expulsion from school.

The use, sale or possession of alcohol or controlled drugs by students on school property shall not result in a student facing greater discipline, punishment, or sanction for the use, sale or possession of cannabis than they would face for the use, sale or possession of alcohol.

Personal privacy rights of students shall be protected as provided by law.

School properties, including student desks and lockers, may be inspected by school authorities in the interest of maintaining health and safety. Inspections for the location of drugs, narcotics, liquor, weapons, poisons and missing properties are matters relating to health and safety and may be regarded as reasonable purposes for inspection by school personnel (cf. 5145.12 – Search and Seizure).

Smoking is prohibited at all times by students in the school buildings and on school grounds and at school sponsored activities. The prohibition on smoking extends to "any area" of a school building, and extends the prohibition against using an electronic nicotine delivery system or vapor product on school grounds or in a school to also prohibit use of an "electronic cannabis delivery system" in such locations.

Legal Reference:
Connecticut General Statutes
1-2lb Smoking prohibited in certain places
10-220b Policy statement on drugs
21a-242 Schedules of controlled substances
Sec, 31-409 Smoking in the Workplace

Sec, 53-198 Smoking in Motor Buses, Railroad Cars and School Buses

Public Act No. 21-1,
Conn. Gen. Stat. § 10-221(d)
Conn. Gen. Stat. § 10-154a

Policy Adopted: February 1989
Policy Revised: October 1990
Policy Revised: April 1995
Policy Revised: August 2002
Policy Revised: 2022

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ **Board Meeting Date** **January 27, 2022**

Decision Requested **X** **Agenda Code** **8 k.**

AGENDA REPORTING FORM

Agenda Topic: Policy 6146.1 – Grade Reporting – Policy Revision – Second Reading

Summary of Issue: The Policy & Personnel Committee has reviewed Policy 6146.1– Grade Reporting – Policy Revision.

Background: The Policy and Personnel Committee reviews policies with the administration to ensure they are current and appropriate.

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: The Board of Education Policy & Personnel Committee is bringing the draft Policy 6146.1 to the full Board for a Second Reading.

Signature of Staff Member Submitting Report

Titles of Attachments:

1. DRAFT Policy 6146.1

Signature of Superintendent of Schools

Policy 6146.1

Grade Reporting – Policy Revision

Draft

Series 6000: Instruction

Curriculum

Graduation Requirements

Grade Reporting

The primary purpose of grading is to keep parents and students fully informed of a student's progress and to provide a continuous and accurate record of each student's achievement for use in instruction.
The Board of Education shall approve the grading and reporting systems developed by the administration and faculty and recommended by the Superintendent of Schools. In accordance with Connecticut law, this policy shall explain the manner in which grade point averages are calculated within the District.

As specifically related to Southington High School, the Board approves the following course weighting system for the purposes of grading. ~~and class rank:~~

Weighting Factors

~~Weight Factor~~

~~Level 1 Courses 1.00~~
~~Level 2 Courses 1.05~~
~~Level 3 Courses 1.10~~
~~Level 4 and AP Courses 1.15~~

Academic Level	Actual Grade
Accelerated Level	Add .50 to GPA conversion
College Level Courses (any college credit course)	Add 1.0 to GPA conversion

Series 6000: Instruction

The Board believes, due to the rigorous nature of advanced placement classes the grades earned in such classes deserve additional weight for the purposes of calculating grade point average. These classes include advanced placement dual enrollment, dual credit or early college. Therefore, it is the policy of the Board to grant grades earned in such courses additional weight for the aforementioned purposes.

Calculating Grade Point Average

A student's grade point average shall be calculated in the following manner:

	Academic Level	Accelerated	College Level Courses
A+ (97-100)	4.33	4.83	5.33
A (93-96)	4.0	4.5	5.0
A- (90-92)	3.67	4.17	4.67
B+ (87-89)	3.33	3.83	4.33
B (83-86)	3.0	3.5	4.0
B- (80-82)	2.67	3.17	3.67
C+ (77-79)	2.33	2.83	3.33
C (73-76)	2.0	2.5	3.0
C- (70-72)	1.67	2.17	2.67
D+ (67-69)	1.33	1.83	2.33
D (63-66)	1.0	1.5	2.0
D- (60-62)	.67	1.17	1.67
F (Less than 60)	0	0	0

Series 6000: Instruction

Legal Reference:

Connecticut General Statutes § 10-220g

Public Act 21-199, "An Act Concerning Various Revisions and Additions to the Statutes Relating to Education and Workforce Development"

(cf. 5124 – Reporting to The Parent

Policy adopted: May 1989
Policy revised: October 1999
Policy reviewed: October 2002
Policy Revised: 2022

Series 6000: Instruction

Grade Reporting System

Procedures for Report Cards and Parent Conferences

Elementary

Report cards will be issued three (3) times during the school year. Each marking period will be approximately 60 days. The report cards will be sent home electronically to designated parent/guardian email addresses, given to parents during the report card conference, or sent home with the students after the end of each marking period. Parent conferences will be held after the close of the first and second marking periods.

Middle School

Report cards will be issued three (3) times during the school year. Each term will be approximately 60 days. The report cards will be sent home electronically to designated parent/guardian email addresses, sent home with the students after the close of each term, or mailed home. Parent conferences will be held after the close of the first term.

High School

Report cards will be issued four (4) times during the school year. Each quarter will be approximately 45 days. The report cards will be sent home electronically to designated parent/guardian email addresses, sent home with the students after the close of each quarter, or mailed home. Parent conferences will be held after the close of the first quarter.

Regulation approved: December 1989
Regulation reviewed: October 2002
Regulation revised: March 9, 2017

Series 6000: Instruction

Curriculum

Graduation Requirements

Grade Reporting System

Procedures for Issuing Progress Reports

Grades 6-12

At a point approximately halfway through each marking period at the middle and high schools, teachers are required to complete progress reports for students who are failing or experiencing difficulty and to submit the progress reports to the school office. Teachers are also encouraged to use the progress reports for students who have improved their performance or are doing exceedingly well.

Regulation approved: December 1989
Regulation revised: December 1995
Regulation reviewed: October 2002

Series 6000: Instruction

Curriculum

Graduation Requirements

Grade Reporting System

Guidelines for Honor Roll
The purpose of an Honor Roll is to provide student recognition for academic achievement.

Middle School
~~Students in grades 6, 7 and 8 are eligible for the Honor Roll if they meet the grade requirements. High Honors apply to students who have earned "A's" and no more than one grade of "B" or one grade of "S". Second Honors apply to students who have earned "A's" and B's" and no more than one grade of "C" or one grade of "S". All courses will be treated equally. Recognition will be given at the end of each marking period.~~

Middle School

Students in grades 6, 7 and 8 are eligible for the Honor Roll each trimester. First Honors is awarded to students who earn a GPA of 3.75 and above. Second Honors is awarded to students who earn a GPA of 3.5 to 3.74. A grade of "D", "F", "NG," or "I" in any course will disqualify a student from Honor Roll.

High School
Students in grades 9, 10, 11 and 12 are eligible for the Honor Roll if they meet the grade requirements.

First Honors are awarded to students who earn an unweighted average for all courses of ~~89.5~~ 4.0 and above. Second Honors is awarded students who earn an unweighted average for all courses of ~~84.5 to 89.4~~ 3.5-3.99. A grade of "D" in any course including physical education, even though physical education course averages are not included in determination of Honor Roll status, will disqualify a student from Honor Roll consideration. Recognition will be given at the end of each marking period.

~~Weighting Factors~~

~~Level Weight Factor~~

~~Level 1 Courses 1.00~~
~~Level 2 Courses 1.05~~

~~Level 3 Courses 1.10~~
~~Level 4 Courses 1.15~~

Regulation approved: December 1989
Regulation revised: December 1995
Regulation reviewed: October 2002
Regulation revised: 2021

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ **Board Meeting Date** **January 27, 2022**

Decision Requested **X** **Agenda Code** **8 l.**

AGENDA REPORTING FORM

Agenda Topic: Policy 9321 –Time, Place, Notification of Meetings– Policy Revision – Second Reading

Summary of Issue: The Policy & Personnel Committee has reviewed Policy 9321– Time, Place, Notification of Meetings – Policy Revision.

Background: The Policy and Personnel Committee reviews policies with the administration to ensure they are current and appropriate.

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: The Board of Education Policy & Personnel Committee is bringing the draft Policy 9321 to the full Board for a Second Reading.

Titles of Attachments:

1. DRAFT Policy 9321

Signature of Staff Member Submitting Report

Signature of Superintendent of Schools

Policy 9321

Time, Place, Notification of Meetings

Policy Revision

Draft

Series 9000: Bylaws of the Board

Methods of Operation

Time, Place, Notification of Meetings

All meetings of the Board of Education shall be conducted in compliance with Public Act 75-342, Sec. 6 (An Act Concerning Freedom of Information).

1. **Regular Meetings** – Regular meetings of the Board of Education shall be held on the second and/or fourth Thursday of each month at a time to be determined and at the established Board meeting place. At a minimum, one (1) meeting date per month will be set by the Board. Meeting dates, times, and places may be changed at the discretion of the Board.
    a. Regular meetings will be classified as either *Committee of the Whole ~ Operations* or *Committee of the Whole ~ Instruction*. The classification will be indicated on the agenda within the meeting posting. The order of business for each is specified in number 8 within policy 9321.
    b. The schedule of regular meetings of the Board of Education for the ensuing calendar year shall be filed with the Town Clerk no later than December 1 of each year, and no such meeting of the Board shall be held sooner than thirty (30) days after such schedule has been filed.
2. **Special Meetings** – Special meetings of the Board of Education shall be called by the Chairperson upon written request of three (3) of the members or whenever deemed necessary by the Chairperson. The call shall state the purpose of the meeting and no other business shall be transacted. Special meetings may not be called for the purpose of election of officers or for a vote to fill a vacancy on the Board.
    a. Notice of special meetings shall be given not less than twenty-four (24) hours prior to the time of such meeting by posting a notice of the time of such meeting in the office of the Town Clerk. In the case of an emergency, a special meeting may be held without complying with the foregoing requirement for the posting of notice, but a copy of the minutes of any such special meeting adequately setting forth the nature of the emergency and the proceedings occurring at such meeting shall be filed with the Town Clerk no later than seventy-two (72) hours following the holding of such meeting.
    b. Workshops of the Board of Education are held when it is necessary for the Board to discuss and consider, in depth, matters pertaining to Board of Education business. The Chairperson shall call workshops whenever deemed necessary or when requested by three (3) or more Board of

Series 9000: Bylaws of the Board

Methods of Operation

Time, Place, Notification of Meetings (continued)

Education members. Notice of workshops shall be given not less than forty eight (48) hours prior to the time of such meetings by posting a notice of both the time and place in the office of the Town Clerk. The agenda will state the purpose(s) of the meeting and no other business will be transacted. The Chairperson of the Board may invite those individuals, groups or agencies that have relevant information, knowledge or experience to contribute to the discussion and to the Board's decision making process. Other public input will be allowed at the discretion of the Board Chairperson. No formal votes will be taken during or at the conclusion of workshops.

3. **Committee Meetings** – The Chairperson of each committee will notify the Board as to the location, date, and time of all meetings. (cf 8133)

4. **Adjourned Meetings** – Any meeting of the Board of Education may be adjourned to a time and place specified in the order of adjournment.

5. **Quorum** – Five (5) members of the Board shall constitute a quorum for the transaction of business except where otherwise noted in Board policies.

6. **Parliamentary Procedure** – Robert's Rules of Order shall govern the proceedings of the Board, except when those rules are in conflict with the Board's approved policies and regulations. The Superintendent of Schools is designated as Board of Education parliamentarian.

7. **Agenda Notice** – The agenda for regular meetings of the Board of Education shall be given to all members a minimum of six (6) days prior to the meeting. ~~Business other than that~~ Other business included on the agenda may be transacted by a two thirds vote of all members present unless the subject is specifically referenced in other Board policies.

Series 9000: Bylaws of the Board

Methods of Operation

Time, Place, Notification of Meetings (continued)

8. **Order of Business** – The order of business at each regular meeting of the Board of Education shall be as follows:

Committee of the Whole - Operations

8.1 Call to Order
8.2 Pledge of Allegiance
8.2.1 Celebration of Excellence (as appropriate)
8.3 Approval of Minutes
8.4 Public Communications
a. ~~Public~~
~~b. Board of Education~~
~~c. Administration~~
~~d. Student Representatives~~
a. Student Representatives
b. Board of Education
c. Administration
d. Public
8.5 Committee Reports
8.6 Personnel Report (as appropriate)
8.7 Old Business
8.8 New Business
8.9 Adjournment

Committee of the Whole - Instruction

8.1 Call to Order
8.2 Pledge of Allegiance
8.3 Approval of Minutes
8.4 New Business
8.5 Public Communications
~~a. Public~~
~~b. Board of Education~~
~~c. Administration~~
~~d. Student Representatives~~
e. Student Representatives
f. Board of Education
g. Administration
h. Public

8.6 Adjournment

Series 9000: Bylaws of the Board

Methods of Operation

Time, Place, Notification of Meetings (continued)

9. **Requests for Hearing on Transportation** – Requests for hearings on transportation must be made in writing. The Board of Education shall hold such hearing within ten (10) days after receipt of written request and shall make a finding within ten (10) days after such hearing and in accordance with regulations of the State Board of Education.

(cf. 9327 – Electronic Mail Communications)

Legal Reference:
Connecticut General Statutes

- 1-200 (2) Definitions. "Meeting"
- 1-206 Denial of access to public records or meetings.
- 1-225 Meetings of government agencies to be public, as amended by June 11 Special Session, PA 08-3
- 1-227 Mailing of notice of meetings to persons filing written request.
- 1-228 Adjournment of meetings. Notice.
- 1-229 Continued hearings. Notice.
- 1-230 Regular meetings to be held pursuant to regulation, ordinance or resolution.
- 10-218 Officers. Meetings

Bylaw adopted by the Board: January 1990
Bylaw revised by the Board: April 1993
Bylaw reviewed by the Board: April 2003
Bylaw revised by the Board: March 2005
Bylaw revised by the Board: February 2009
Bylaw updated and recoded: June 22, 2017
Bylaw revised by the Board:_____2022__

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ **Board Meeting Date** January 27, 2022

Decision Requested X **Agenda Code** 9 a.

AGENDA REPORTING FORM

Agenda Topic: Out of State: Approval of Out of State/Overnight Field Trip

Summary of Issue: The Board of Education must give approval to field trips that are over 200 miles in distance from Southington, trips to foreign countries, or overnight field trips. Presented here are the following trips:

- SHS – Robotics Team – FIRST Robotics Championship Competition, Houston, TX
  - April 19, 2022 to April 24, 2022
- SHS – Southington FBLA – National Leadership Conference/Competition, Chicago, IL
  - Approx. June 28, 2022 to July 2, 2022

Background: N/A

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** _____

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: Move that the Board of Education approve the field trip requests as presented by the administration.

Titles of Attachments:
1. Field Trip Applications

Frank Rapp
_____
Signature of Staff Member Submitting Report

Peter Madaras
_____
Signature of Superintendent of Schools

SOUTHINGTON HIGH SCHOOL

Cyberknights Robotics Team

FIRST Robotics Championship Competition

George Brown Convention Center

1001 Avenida DeLas Americas, Houston, TX

April 19, 2022 to April 24, 2022

R-6153

Southington Public Schools
Southington, Connecticut

Application for Out-of-State/In-State/Overnight Field Trip

Submit to Assistant Superintendent

Date: 1/5/22
Out of State: Yes ☒ No ☐
Overnight: Yes ☒ No ☐
Miles Round Trip: 3,600

Southington High School (School) | Robotics Team (Class/Group) | 4/19/22 - 4/24/2022 (Date of Trip)

Name and Address of Destination George Brown Convention Center 1001 Avenida De Las Americas, Houston, TX

Reasons for Field Trip FIRST Robotics Championship Competition

Itinerary (attach if needed) _____

Departure Date/Time 4/19/22 4:00 am **Return Date/Time** 4/24/22

# of Students 43 **# of Teacher/Chaperones** 11 **# of Buses** 2

Have definite arrangements been made at the field trip destination? ☐ Yes ☒ No

☐ **Have met with nurse to address student health needs.**
Nurse's Signature _____ *Date* _____

☒ **Have NOT met with the nurse. Will meet with the nurse to address student health needs when the student roster is complete. This meeting will take place approximately one-moth prior to the scheduled trip.**

Destination is handicap accessible: Yes ☒ No ☐ **Lift Van Needed?** Yes ☐ No ☒

****

COST AND FINANCING

Source of Funds	Totals	Additional Notes
TOTAL Anticipated Cost of Trip	**$60,000**	
Board of Education Contribution	$ 0	
Other	$	
Fundraising Activity	($)	Ongoing fundraising
BALANCE	**$**	
Student Contribution		
Transportation	$750	43 Students @ $32,250
Entrance Fees, Room & Board	$600(4 per room)	43 Students @ $25,800
TOTAL Cost of Trip to Each Student	**$1350**	Students can fundraise toward trip

SIGNATURES

Teacher Ed Barry, Robotics Advisor **Date** 1/9/2022

Dept. Head n/a **Date** _____

Principal _____ **Date** _____

Comments _____

Assistant Superintendent Frank Rys **Date** 01.10.22 **Approved** ☒ Pending COVID Restrictions **Not Approved** ☐

Board of Education Approval* YES☐ NO☐ **Date** _____

Investigate trip insurance

Itinerary for SHS Robotics 4/19/22 Houston travel.

Below is the group travel from our travel coordinator awaiting our confirmation and payment with the providers listed. Obviously for this trip we are pursuing "Coivd clause" for our group travel in any reservations. Does the Southington BOE have a provider for travel cancellation insurance?

The flights proposed are with Southwest Airlines, leaving 4/19/22 Tuesday morning, arriving at 10:40 am Houston TX. Return flight 4/24/22 leaves early morning Sunday, arriving in the evening in Hartford. (That is a short term hold with the airline, all subject to change.)
We have not pursued refund info with the airline because we do not have a contract.

The bus company is Dattco. And the local transport company is a non entity right now, as they will be booked once we know what we are doing with the trip.

The hotel is the Hilton Garden Inn Galleria. They do have an attrition clause, so we need to know how many rooms we will need, but I will make sure to have a "covid clause," in our contract. Students typically are 4 per room and we require confirmation if that will be allowed this trip since it will impact cost per student and number of rooms required. But again, this is too preliminary, as we do not have a contract (we are still in the "gathering info" phase, with just a hold on the rooms.) When we are ready to contract, I will send you a copy to check over, and we can make sure that the covid language is acceptable, should we have to cancel.

Thank You
Ed Barry
SHS Robotics Advisor
860-218-3179

SOUTHINGTON HIGH SCHOOL

Southington FBLA

National Leadership Conference / Competition

McCormick Place

2301 S. King Drive, Chicago, IL

Approx June 28, 2022 to July 2, 2022

R-6153

Southington Public Schools
Southington, Connecticut

Application for Out-of-State/In-State/Overnight Field Trip

Submit to Assistant Superintendent

Date: 1/05/22
Out of State: Yes ☒ No ☐
Overnight: Yes ☒ No ☐
Miles Round Trip: 1750

Southington High School	Southington FBLA	approximte 6/28-7/2/2022
School	**Class/Group**	**Date of Trip**

Name and Address of Destination McCormick Place - 2301 S King Dr Chicago IL

Reasons for Field Trip National Leadership Conference/Competition

Itinerary (attach if needed) schedule has not been released yet

Departure Date/Time (estimate) 6/28/22 **Return Date/Time** 7/2/2022

# of Students 1-10 **# of Teacher/Chaperones** 2 **# of Buses** N/A

Have definite arrangements been made at the field trip destination? ☐ Yes ☒ No

☐ **Have met with nurse to address student health needs.**
Nurse's Signature _____ *Date* _____

☒ **Have NOT met with the nurse. Will meet with the nurse to address student health needs when the student roster is complete. This meeting will take place approximately one-moth prior to the scheduled trip.**

Destination is handicap accessible: Yes ☒ No ☐ **Lift Van Needed?** Yes ☐ No ☒

****

COST AND FINANCING

Source of Funds	Totals	Additional Notes
TOTAL Anticipated Cost of Trip	**$TBD**	
Board of Education Contribution	$ 0	
Other	$	
Fundraising Activity	($7500)	Ongoing fundraising
BALANCE	**$TBD**	
Student Contribution		
Transportation	$	Students @ $
Entrance Fees, Room & Board	$	Students @ $
TOTAL Cost of Trip to Each Student	**$**SEE ATTACHED**	

SIGNATURES

Teacher Joy M. Cooney **Date** 1/5/2022

Dept. Head Lillian Schena **Date** 1/5/2022

Principal Rich Aroian **Date** 1/10/2022

Comments Pending COVID Restrictions and securing trip insurance

Assistant Superintendent Frank Ryan **Date** 01.14.2022 **Approved** ☒ **Not Approved** ☐

Board of Education Approval* ** **YES**☐ **NO**☐ **Date** _____

FBLA National Leadership Conference in Chicago, IL

Students have been fundraising for two year to assist in covering expenses related to this conference. The club currently has at least $7,500.00 to use towards chaperone expenses, hotels, airfare, registration fees etc... We will not know until March who qualifies for the competition. At that time we can make travel arrangements and determine the actual cost per student. Students who hope to attend also want to fundraise in the spring to earn additional income to offset the trip cost.

Estimated Expenses:

Airfare:	American Airlines Hartford to Chicago @$350/person
Hotel:	Best Western Grant Park @$250/night (4 students per room to split cost)
	5-6 nights = $1,000 - $1,250 (4 students per room to split cost)
Transportation:	Estimate $50/person (to and from airport and conference)
Conference Fee:	Usually $75/person

TOTAL ESTIMATED EXPENSE PER STUDENT = $787.50

Submitted by: Joy Cooney, FBLA Advisor

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only X **Board Meeting Date** January 27, 2022

Decision Requested _____ **Agenda Code** 9 b.

AGENDA REPORTING FORM

Agenda Topic: Science Kindergarten Units – First Reading

Summary of Issue: The Curriculum & Instruction Committee has reviewed Science Kindergarten Units

Background:

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: N/A

Ending Date of Program or Project: N/A

Recommendation or Comment: The Board of Education Curriculum & Instruction Committee is bringing the Science Kindergarten Units to the full Board for a First Reading.

Titles of Attachments:

1. Science Kindergarten Units

Frank Ryan
Signature of Staff Member Submitting Report

Peter Madaras
Signature of Superintendent of Schools

Table of Contents

Unit 1 - Mystery Class Pet
Students plan for a "mystery" class pet (pet choice is up to the teacher). As students prepare for their mystery class pet, they need to understand what both plants and animals need to live and grow. Students learn that plants need sunlight, water, and air; while animals need water, food, and shelter. Students investigate and observe how animal/plant needs change with the seasons. The new pet may require specific changes to their environment in order to survive the season. A class plant may also change with the seasons. Students will investigate how living things change and impact the environment and animal habitats (pets and wild). Taking care of a pet means not disrupting its natural balance or habitat. This unit looks at some of the ways humans have impacted living things by changing the environment. At the conclusion of the unit, students find out which class pet they will have to plan and care for the remainder of the year. Students will generate a care guide for their new pet. You can view the flowchart for this unit here. Teacher Note: *While marked as Unit 1 per the NGSS thematic bundle format, this could also be swapped with the second unit in science for kindergarten.*
Suggested Pacing: 11-13 hrs
Anchoring Phenomenon/Design Problem: Planning for a mystery class pet
Unit Driving Question: How do plant and animal needs help us pick an appropriate class pet?
Culminating Performance Task: Students will create a Care Guide for their new class pet.

NGSS Performance Expectations: (Hyperlinks will bring reader to NGSS Evidence Statements)
• K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.
  ○ [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]
• K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.
  ○ [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days vs cloudy days in different months.]
  ○ [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]
• K-ESS2-2 Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
  ○ [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]
• K-ESS3-1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.
  ○ [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]

Back to Top of Page

- K-ESS3-3 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*
  - [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]

- K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Three Dimensions that form the Foundation for these NGSS Performance Expectations:

Science & Engineering Practices:

Analyzing and Interpreting Data
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) (K-ESS2-1)

Engaging in Argument from Evidence
- Construct an argument with evidence to support a claim. (K-ESS2-2)

Developing and Using Models
- Use a model to represent relationships in the natural world. (K-ESS3-1)

Asking Questions and Defining Problems
- Ask questions based on observations to find more information about the designed world. (K-ESS3-2)
- Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

Obtaining, Evaluating, and Communicating Information
- Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)

Disciplinary Core Ideas:

LS1.C: Organization for Matter and Energy Flow in Organisms
- All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1)

ESS3.A: Natural Resources
- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)

ESS3.C: Human Impacts on Earth Systems
- Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (secondary) (K-ESS2-2)

ESS2.D: Weather and Climate
- Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe

Crosscutting Concepts:

Patterns
- Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) (K-ESS2-1)

Systems and System Models
- Systems in the natural and designed world have parts that work together. (K-ESS2-2) (K-ESS3-1)

Cause and Effect
- Events have causes that generate observable patterns. (K-ESS3-2)

Back to Top of Page

	and record the weather and to notice patterns over time. (K-ESS2-1) **ESS2.E: Biogeology** ● Plants and animals can change their environment. (K-ESS2-2) **ETS1.A: Defining and Delimiting an Engineering Problem** ● Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary) (K-ESS3-2) ● A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) ● Before beginning to design a solution, it is important to clearly understand the *problem. (K-2-ETS1-1)* **ETS1.B: Developing Possible Solutions** ● Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.(secondary)	

Possible Common Core State Standards Connections:

ELA/Literacy -

- W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS3-3)(K-ESS2-2)
- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1)(K-ESS2-1)
- R.K.1 With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2)
- W.K.1 Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2-2)

Back to Top of Page

- SL.K.5 Add drawings or other visual displays to descriptions as desired to provide additional detail. (K-ESS3-1)
- RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1)
- W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1)
- W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1)

Mathematics -

- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-LS1-1)
- MP.2 Reason abstractly and quantitatively. (K-ESS3-1)(K-ESS2-1)(K-2-ETS1-1)
- MP.4 Model with mathematics. (K-ESS3-1)(K-ESS2-1)(K-2-ETS1-1)
- MP.5 Use appropriate tools strategically. (K-2-ETS1-1)
- K.CC Counting and Cardinality (K-ESS3-1)
- K.CC.A Know number names and the count sequence. (K-ESS2-1)
- K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)
- K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)
- 2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1)

PROGRESSION OF LEARNING

ONGOING THROUGHOUT THE SCHOOL YEAR:

Students collect weather data throughout the school year in their *Student Journal for Weather Pattern Data* packets.

- Teacher completes the first page with the students as an example of how to do this throughout the year.
- Visit a chosen section of the school grounds with plants and animals.
- Throughout the year, visit this location and have students make some observations about the living things and weather conditions (seasonal).
- Plan *at least* 4 visits to the same location. If you don't have an appropriate outdoor space - you may use the Edpuzzle Video of a backyard over 15 months.

Resources:

- Student Journal for Weather Pattern Data packets
- Edpuzzle Video of a backyard over 15 months

Learning Sequence 1

- **Learning Sequence Driving Question:**
  - What are living and nonliving things?
- **Learning Sequence 1**
- **Relationship to Anchoring Phenomena/Design Problem:**
  - This is the introduction to the anchoring phenomenon of planning for a mystery pet.
- **Student Expected Outcomes:**
  - Students will observe patterns in a variety of things to categorize/sort them as either living or nonliving.

Back to Top of Page

Learning Sequence 2

- **Learning Sequence Driving Question:**
  - What do living things need to survive?
- Learning Sequence 2A
  - Plants
- Learning Sequence 2B
  - Animals
  - Complete BOTH lesson plans.
- **Relationship to Anchoring Phenomena/Design Problem:**
  - Students learn that plants need sunlight, water and air and animals need water, food and shelter to prepare for their mystery class pet.
- **Student Expected Outcomes:**
  - Students will ask scientific questions based on observations to understand the needs of living things deepening their understanding of patterns in the natural world.
  - Students will draw a model showing the needs of a pet plant.
  - Students will ask scientific questions based on observations to understand the needs of living things deepening their understanding of patterns in the natural world.
  - Students will draw a model showing the needs of an animal.

Learning Sequence 3

- **Learning Sequence Driving Question:**
  - How do plants and animals get what they need from their habitat?
- Learning Sequence 3
- **Relationship to Anchoring Phenomena/Design Problem:**
  - Animal and plant needs change with the seasons. These needs must be understood to prepare adequately for a class pet.
- **Student Expected Outcomes:**
  - Students will obtain scientific information to describe patterns in the natural world to understand why living things live where they do.
  - Students will obtain scientific information to describe patterns in the natural world to relate changes in the environment to the survival of living things.
  - Students will use a model to represent the relationship between the needs of plants and the needs of animals and the places they live.

Learning Sequence 4

- **Learning Sequence Driving Question:**
  - How do plants, animals, and humans impact their environment?
- Learning Sequence 4
- **Relationship to Anchoring Phenomena/Design Problem:**
  - Students investigate how living things change and impact the environment and animal habitats (pets and wild). Taking care of a pet means not disrupting its natural balance or habitat. This learning sequence looks at some of the ways humans have impacted living things by changing environments.
- **Student Expected Outcomes:**
  - Students will investigate the impacts humans have on the environment.
  - Students will propose a plan for reducing one of the impacts humans have on the environment.

Learning Sequence 5

- **Learning Sequence Driving Question:**
  - What does our class pet need to survive and thrive?

Back to Top of Page

- Learning Sequence 5
- **Relationship to Anchoring Phenomena/Design Problem:**
  - Students find out which class pet they will have to plan and care for the remainder of the year. (Class pets can be small animals, plants or a digital animal through observed through www.explore.org)
- **Student Expected Outcomes:**
  - Students will develop a care guide for the new class pet.

Assessments:

- **Culminating Performance Task**
  - Students will create a Care Guide for their new class pet in Learning Sequence #5.

- Kindergarten Performance Expectations Rubrics and Prompts
- Elementary Assessment Resources

Additional Resources:

- G0K Unit Materials List
  - Click on specific tab for unit-specific materials
- EPIC! Digital Library - GK U1 List
  - Includes ebooks and videos
  - Must have an educator user account for free access

Back to Top of Page

Learning Sequence 1

Brief Description:
Present the students with the idea that they will be getting a class pet, and that pets are living things. Students explore a set of objects (6) that allow the students to "discover" why things are considered alive. This set of objects ranges from whole organisms to parts of an organism.

Suggested Pacing:
0.5 - 1 hr

Lesson-Level Phenomenon/Design Problem:
Sorting living and nonliving things.

Relationship to Anchoring Phenomena/Design Problem:
This is the introduction to the anchoring phenomenon of planning for a mystery pet.

Learning Sequence Driving Question:
What are living and nonliving things?

Student Expected Outcomes:

- Students will observe patterns in a variety of things to categorize/sort them as either living or nonliving.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Analyzing and Interpreting Data • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) (K-ESS2-1)	**LS1.C Organization for Matter and Energy Flow in Organisms** • All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1)	**Patterns** • Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) (K-ESS2-1)

Related Performance Expectation(s) in this Unit:

- K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.
  - [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

Possible Common Core State Standards Connections:

K-LS1-1:
ELA/Literacy -

- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1)

Mathematics -

- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-LS1-1)

Back to Top of Page

Prior Student Knowledge:
None can be assumed.

Possible Preconceptions/Misconceptions:
Students may believe that:

- plants, eggs, and seeds are not living.
- trees are not alive but seedlings are alive.
- only large land mammals are animals.
- insects are not animals.
- humans are not animals.
- birds, fish, insects, worms are not animals.
- any object that moves is living. (Machines, smoke, clouds, fire, moving water...)
- non-living is dead.
- plants are not living.
- grass, trees, and other plants die in the winter and are born in the spring.
- a seed is dead.
- they cannot link the same properties that are associated with animals being alive to plants.
- trees, grass, vegetables, weeds are not plants.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Teacher shares the *Mystery Pet Slideshow* (Slides 1 and 2) with the students, and gets the students feeling excited about the prospect of getting a mystery class pet.
- Students share their ideas about pets and discuss the question: What can be a pet?
    - Get students to the idea that pets are living things, but not necessarily an animal.

Teacher Note:

- Students plan for a "mystery" class pet (pet choice is up to the teacher and can be a plant, animal or virtual pet from explore.org depending on your classroom).

Resources:

- Mystery Pet Slideshow

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

Back to Top of Page

- Students expand their discussion from the Engage activity to also include living and nonliving characteristics of things and how those differences would impact their class pet choice, using slides 3 + 4 of the Mystery Pet Slideshow.
    - The last slide can be done as a class using an interactive whiteboard or projector.
- Students work in small groups with an assortment of things (living, nonliving, or once living).
    - Provide students with the opportunity to explore each item and discuss with their group their ideas about whether or not the object is living or was once living and then have the groups sort the objects.
        - The list of objects can be found in the materials list in the unit overview.
        - These are suggested items, you may modify the list based on the objects you have available to you.
        - Optional Setup - Students can rotate through a station set-up with sample item(s) at each station to limit the total supplies needed.
- After the students have explored the objects, allow them to share their ideas in a whole class discussion.
    - You can slide and sort the objects on the smartboard around as the students share their ideas.

Resources:

- Mystery Pet Slideshow

Optional Instructional Strategy

- Summary Table
    - recommended to complete as a class

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

Additional Resources:

- G0K Unit Materials List
    - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 2A

Brief Description:
Students observe and learn how to care for plants and be able understand how to meet the needs of a plant. This is important if a plant ends up to be the class pet.

Suggested Pacing:
2.5 - 3 hrs

Lesson-Level Phenomenon/Design Problem:
What do plants need to survive?

Relationship to Anchoring Phenomena/Design Problem:
Students learn that plants need sunlight, water and air to prepare for their mystery class pet.

Learning Sequence Driving Question:
What do plants need to survive?

Students Expected Outcomes:

- Students will ask scientific questions based on observations to understand the needs of living things deepening their understanding of patterns in the natural world.
- Students will draw a model showing the needs of a pet plant.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Analyzing and Interpreting Data • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) (K-ESS2-1) **Developing and Using Models** • Use a model to represent relationships in the natural world. (K-ESS3-1)	**LS1.C: Organization for Matter and Energy Flow in Organisms** • All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1) **ESS3.A: Natural Resources** • Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)	**Patterns** • Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) (K-ESS2-1) **Systems and System Models** • Systems in the natural and designed world have parts that work together. (K-ESS2-2) (K-ESS3-1)

Related Performance Expectation(s) in this Bundle:

- K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.
  - [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

Possible Common Core State Standards Connections:

Back to Top of Page

ELA/Literacy
- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1)

Mathematics
- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more or "/"less of" the attribute, and describe the difference. (K-LS1-1)

Prior Student Knowledge:
None can be assumed.

Possible Preconceptions/Misconceptions:
Students may believe that:
- living things they are not familiar with, do not grow or reproduce.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:
- Teacher shows Slides #1 and #2 of the *Plant Slideshow* and/or show a live plant.
- Students discuss how the seedling progresses to a mature plant.
- Teacher asks the following questions:
  - What do these plants have in common (slide 1)?
  - What is a plant?
  - Where do plants come from?
  - How might it have changed over time?
  - What did this plant need to get to this point?

Resources:
- Plant Slideshow

Teacher Action(s):
- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):
- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:
- Students work in small groups to explore a variety of seeds, bulbs, live plants, and dead plants.
  - This can be done in stations or have samples for each group.
  - This can also be done using Slides #3-5 in *Plant Slideshow* if actual items are not available.
- Students experiment with plants to visualize the importance of a healthy system that includes water and sunlight to promote a plant's survival.
  - Set up two investigations with partner plants:
    - (1) water, no water (both plants should receive equal amounts of sunlight),
    - (2) sunlight, no sunlight (both plants should receive equal amounts of water).

Back to Top of Page

- Select bean plants that have already begun to sprout as the common plant for all of the experiments.
- Over a week or two, students should record their observations in a *My Plant Growth Journal*.
- You may want to alternate observation days, but both investigations should have a minimum of three journal entries each.

- Students should discuss the patterns they notice in the data.

Resources:

- Plant Slideshow
- My Plant Growth Journal

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

- Students discuss their observations from their *My Plant Growth Journals*.
- Teacher shares information about what plants need to live and grow (light and water) using books from epic! Books. Some options are listed in Resources.

Resources:

- My Plant Growth Journal
- *Seed to Plant by National Geographic* on epic! Books
- Plants Are Alive by Molly Aloian on epic! Books
- Research other resource options about plants on epic! Books

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities

Back to Top of Page

- Uses recorded observations in explanations

Vocabulary: flower, food, life, light, plant, grow, seed, survive, sun, soil, sunlight, requirements for life

ELABORATE (Applications / Extensions)

Activity Description:

- Students draw a model on Page 8 of their *My Plant Growth Journal* that indicates what a "pet plant" would need to live and grow in the classroom.
  - Help students to make the connection that plants need both water and sunlight for a healthy system.
  - Encourage students to draw where they would place their pet plant in the classroom and explain why that would help the plant get what it needs for survival and growth.
- Student explanations will have to be verbal and should call upon the patterns they identified in the plant investigation.
  - Encourage students to begin labeling their models using arrows and letters representing the object.

Resources:

- My Plant Growth Journal

Teacher Action(s):

- Expect the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Analyzing and Interpreting Data; Developing and Using Models*
- ❏ **DCI:** *LS1.C: Organization for Matter and Energy Flow in Organisms; ESS3.A: Natural Resources*
- ❏ **CCC:** *Patterns; Systems and System Models*

Summative Assessment Description(s)

- The pet plant model defining what plants need to live and grow from the *My Plant Growth Journal*.

Resources:

- My Plant Growth Journal

Optional Instructional Strategy

- Summary Table
  - recommended to complete as a class

Back to Top of Page

Additional Resources:

- G0K Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 2B

Brief Description:
Students observe and learn how to care for different animals, and apply that information to understanding how to meet the needs of a potential class pet.

Suggested Pacing:
1.75 - 2.5 hrs

Lesson-Level Phenomenon/Design Problem:
What Pet Should I Get - Dr. Seuss

Relationship to Anchoring Phenomena/Design Problem:
Students learn that animals need water, food and shelter to prepare for their mystery class pet.

Learning Sequence Driving Question:
What do animals need to survive?

Students Expected Outcomes:

- Students will ask scientific questions based on observations to understand the needs of living things deepening their understanding of patterns in the natural world.
- Students will draw a model showing the needs of an animal.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Developing and Using Models ● Use a model to represent relationships in the natural world. (K-ESS3-1)	**LS1.C: Organization for Matter and Energy Flow in Organisms** ● All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1) **ESS3.A: Natural Resources** ● Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)	**Patterns** ● Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS3-1)

Related Performance Expectation(s) in this Bundle:

- K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.
  - [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

Back to Top of Page

- K-ESS3-1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.
  - [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]

Possible Common Core State Standards Connections:

ELA/Literacy

- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1)
- SL.K.5 Add drawings or other visual displays to descriptions as desired to provide additional detail. (K-ESS3-1)

Mathematics

- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-LS1-1)
- MP.2 Reason abstractly and quantitatively. (K-ESS3-1)
- MP.4 Model with mathematics. (K-ESS3-1)
- K.CC Counting and Cardinality (K-ESS3-1)

Prior Student Knowledge:
None can be assumed.

Possible Preconceptions/Misconceptions:
Students may believe that

- living things they are not familiar with, do not grow or reproduce.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)
Activity Description:

- Class reads *What Pet Should I Get?*-Dr. Seuss.
- Based on the book, students discuss with their table which pet they would take home from the pet store and why.
- Students share their ideas with the class.

Resources:

- *What Pet Should I Get?* by Dr. Seuss (may be available as a YouTube read)

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)
Activity Description:

- Show the *Animal Slideshow*.
  - Help the students understand that some of these animals would not make a good class pet.

Back to Top of Page

- Have students discuss the animals shown and make suggestions about which ones could be a class pet and which ones could not, and why they think that.
- *The Salamander Room* by Anne Mazer can help to make the point that not all animals make good pets. Make sure students explain their reasoning.

- Teacher asks:
  - Do all animals have the same needs?
  - What do animals need to live and grow?
- Students work in small groups to complete a *What's Needed handout* for at least one of the animals.
- Groups share their predictions with the class.
- Record student ideas to help identify patterns within the needs of all animals.
  - Help students identify patterns in their predictions (all animals need water, food, shelter).

Resources:

- Animal Slideshow
- *The Salamander Room* by Anne Mazer (may be available as a youtube read)
- What's Needed handout

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

- Students work in small groups with one set of small "sorting" cards (Slides #1 & 2 from the *Sort Activity Slideshow*).
  - Project one of the large animal cards from the *Sort Activity Slideshow* (Slides #3-6).
  - Students sort through the small cards and find the ones that relate to the projected animal card.
- Students talk about their selections.
  - Help students to understand the pattern that all animals need water, food and shelter in order to live and grow.
  - Potential prompts for student discussion:
    - What foods did you pair with this animal?
    - Where is this animal likely to live?
    - How does this animal get water?
    - What patterns do you notice about what all animals need to live and grow?
    - What do all of these animals need?
    - Do all animals have the same food? What are the different types (plant, other animals, both plants and animals) of food?
- Optional: This may be a great time to bring in resources specific to each of the animals.

Back to Top of Page

Resources:

- Sort Activity Slideshow
- Optional: Books about pets on epic! Books

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: food, grow, survive, plant, sunlight, body, environment, living thing

ELABORATE (Applications / Extensions)

Activity Description:

- Read *Mingo the Flamingo*, as students listen they should think about what they think Mingo needs in his "just right" environment.
    - Before you read the last page of the book, have students share ideas of Mingo's "just right" environment. DO NOT show the students the last page of the book.
- After reading the last page (DO NOT show the students the pictures from the last page), have students make a model drawing of *Mingo's Just Right Environment.*
- Students share their completed models with their peers.
    - Be sure to ask students to explain their scientific reasoning for the "just-right environment" they have predicted for MIngo; look for food, water, and shelter in each of their models.
- Share the pictures from the last page of the book and discuss their models compared to the book's pictures. Point out that their models should include food, water and shelter.
- Students revise/add to their models to include what Mingo needs to survive.

Resources:

- *Mingo the Flamingo* by Pete Oswald and Justin K. Thompson (may be available as a youtube read)
- Mingo's Just Right Environment

Teacher Action(s):

- Expect the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?"

Student Action(s):

- Applies new labels, definitions, and explanations to Mingo's unique situation.
- Uses previous information to ask questions, propose solutions and make decisions about what Mingo would need in his just-right environment.

Back to Top of Page

- Draw reasonable conclusions from evidence posed from the reading and previous learning experience in the sequence.
- Through discussion students should check for understanding among peers.

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Developing and Using Models*
- ❏ **DCI:** LS1.C: Organization for Matter and Energy Flow in Organisms; ESS3.A: Natural Resources
- ❏ **CCC:** *Patterns; Systems and System Models*

Summative Assessment Description(s)

- Teacher shares the *Kindergarten Patterns CCC Discussion Card Slide* to discuss as a class the patterns living things need that they explored in both 2A Plants and 2B Animals.
- Their *Mingo's Just Right Environment* models will provide a deep understanding of what students learned about what animals need to live and grow. *Look for food source, water source, and shelter in their final model.*

Resources:

- Kindergarten Patterns CCC Discussion Card Slide
- Mingo's Just Right Environment

Optional Instructional Strategy

- Summary Table
  - recommended to complete as a class

Optional Elaborate Further / Reflect / Enrichment:

- Students complete the *Plant and Animal Similarities and Differences handout*.

Resources:

- Plant and Animal Similarities and Differences

Additional Resources:

- G0K Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 3
Brief Description: Students make observations and gather evidence to demonstrate that as the environment changes with the seasons, local plants and animals can continue to get what they need to survive from their habitat.
Suggested Pacing: 2 - 2.5 hrs
Lesson-Level Phenomenon/Design Problem: Bears' seasonal needs
Relationship to Anchoring Phenomena/Design Problem: Animal and plant needs change with the seasons. These needs must be understood to prepare adequately for a class pet.
Learning Sequence Driving Question: How do plants and animals get what they need from their habitat?
Student Expected Outcomes: ● Students will obtain scientific information to describe patterns in the natural world to understand why living things live where they do. ● Students will obtain scientific information to describe patterns in the natural world to relate changes in the environment to the survival of living things. ● Students will use a model to represent the relationship between the needs of plants and needs of animals and the places they live.
CONNECTIONS TO STANDARDS
Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Analyzing and Interpreting Data ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) (K-ESS2-1) **Engaging in Argument from Evidence** ● Construct an argument with evidence to support a claim. (K-ESS2-2) **Developing and Using Models** ● Use a model to represent relationships in the natural world. (K-ESS3-1)	**ESS2.D: Weather and Climate** ● Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1) **ESS3.A: Natural Resources** ● Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)	**Patterns** ● Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) (K-ESS2-1) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS2-2) (K-ESS3-1) **Cause and Effect** ● Events have causes that generate observable patterns. (K-ESS3-2)

Obtaining, Evaluating, and Communicating Information • Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)		

Related Performance Expectation(s) in this Bundle:

- K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.
  - [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]
- K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.
  - [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days vs cloudy days in different months.]
  - [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]
- K-ESS3-1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.
  - [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]

Possible Common Core State Standards Connections:

ELA/Literacy -

- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1)(K-ESS2-1)
- SL.K.5 Add drawings or other visual displays to descriptions as desired to provide additional detail. (K-ESS3-1)

Mathematics -

- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-LS1-1)
- MP.2 Reason abstractly and quantitatively. (K-ESS3-1)(K-ESS2-1)(K-2-ETS1-1)
- MP.4 Model with mathematics. (K-ESS3-1)(K-ESS2-1)(K-2-ETS1-1)
- K.CC Counting and Cardinality (K-ESS3-1)
- K.CC.A Know number names and the count sequence. (K-ESS2-1)
- K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)
- K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)

Prior Student Knowledge:
None can be assumed.

LESSON PLAN – 5-E Model

Engage (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Show students the *Engage Slideshow*.
- Teacher asks students to notice how the living thing changes in response to changes in their environment.

Resources:

- Engage Slideshow

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

- Divide the class into four groups and assign each group a different season.
- Groups identify how a bear acts and what it needs during their given season. Students identify some cause and effect relationships that happen as the seasons change.
- Students may use the *Seasons According To Bears* handout to draw a model that includes the bear's needs:
    - environment
    - food
    - water source
    - shelter
- Provide students with a variety of nonfiction picture books about bears.
    - Each group can refer to the pictures in the books and make their models based on what they notice in the books (making observations and obtaining information).
- Students make seasonal observations of bears with the *BearCam* from the National Park Service and discuss any patterns in local weather conditions they notice. Ask students how those patterns impact the animal they are observing.
    - If bears are not of interest to your student population, you can choose different live animals to observe at www.explore.org.
- Add these models to a class bulletin board about Bears Through The Seasons.

Teacher Note:

- Ongoing throughout the school year reminder - Students collect weather data in their *Student Journal for Weather Pattern Data packets*.

Resources:

- Seasons According To Bears
- Research Bears on epic! Books - there are several collections available, as well as individual texts.
- BearCam from the National Park Service
- www.explore.org

Back to Top of Page

- Student Journal for Weather Pattern Data packets

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

- Students present their models from Explore and explain what they added to their picture and the reasons they included each item.
- As a class, discuss the cause and effects related to the similarities and differences among all four season models.
- Read texts such as *Bear Wants More* and *Bear Snores On* both by Karma Wilson to get students noticing the differences in bear behavior during different seasons.
- Teacher asks students to make predictions about what they will see on the National Park Service's *BearCam*, based on the season, and then students can visit the site and make verbal observations.
    - Students should be prompted to make observations of the plants in the environment as well as the animals.

Resources:

- *Bear Wants More* and *Bear Snores On* both by Karma Wilson
- BearCam from the National Park Service

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: food, survive, hibernate, needs, same, different

Back to Top of Page

ELABORATE (Applications / Extensions)

Activity Description:

- Students revisit Mingo the Flamingo and his "just right" environment and discuss:
  - Could a bear live in Mingo's environment?
  - Could Mingo live in the bear's environment?
  - Explain why or why not for each.
    - Discussion should include similarities and differences among the two environments and the animals' needs.
    - Help students get to the understanding that animals and plants live in environments that meet their specific needs.
- Read *Flamingoes* on epic! Books.
- Prompt students to share their ideas about how plants and animals get what they need from their environment.
  - What about the farm do students think caused Mingo to feel not quite right?
  - If the environment changes with the seasons, how do plants and animals respond?
  - Do all animals respond the same way?
  - Do plants or animals change their environment to meet their changing needs?
- Students complete a *Comparison of Mingo and Bear Environmental Needs* handout. They may talk with their tablemates to help with ideas
- Students discuss potential class pet needs, and if they think the pet's needs will change with the seasons.

Resources:

- Flamingos on epic! Books
- Comparison of Mingo and Bear Environmental Needs handout

Teacher Action(s):

- Expects the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Analyzing and Interpreting Data; Engaging in Argument from Evidence; Developing and Using Models; Obtaining, Evaluating, and Communicating Information*
- ❏ **DCI:** *ESS2.D: Weather and Climate; ESS3.A: Natural Resources*
- ❏ **CCC:** *Patterns; Systems and System Models; Cause and Effect*

Summative Assessment Description(s)

Back to Top of Page

- Students' completion of the *Comparison of Mingo and Bear Environmental Needs* handout as well as their participation in the Elaborate discussion.

Resources:

- Comparison of Mingo and Bear Environmental Needs handout

Optional Instructional Strategy

- Summary Table
  - recommended to complete as a class

Additional Resources:

- G0K Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 4

Brief Description:
Students will investigate how living things change and impact the environment and animal habitats (pets and wild). Students will brainstorm ideas for reducing human impact on the school grounds.

Suggested Pacing:
1.75 - 2.25 hrs

Lesson-Level Phenomenon/Design Problem:
Living things change their environment - such as an ant farm, beaver dam, earthworms, or tree roots on a sidewalk.

Relationship to Anchoring Phenomena/Design Problem:
Students investigate how living things change and impact the environment and animal habitats (pets and wild). Taking care of a pet means not disrupting its natural balance or habitat. This learning sequence looks at some of the ways humans have impacted living things by changing the environments.

Learning Sequence Driving Question:
How do plants, animals, and humans impact their environment?

Student Expected Outcomes:

- Students will investigate the impacts humans have on the environment.
- Students will propose a plan for reducing one of the impacts humans have on the environment.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:

Analyzing and Interpreting Data

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) (K-ESS2-1)

Engaging in Argument from Evidence

- Construct an argument with evidence to support a claim. (K-ESS2-2)

Asking Questions and Defining Problems

- Ask questions based on observations to find more information about the designed world. (K-ESS3-2)

Disciplinary Core Ideas:

ETS1.A: Defining and Delimiting an Engineering Problem

- Asking questions, making observations, and gathering information are helpful in thinking about problems. (secondary) (K-ESS3-2)
- Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

ESS2.E: Biogeology

- Plants and animals can change their environment. (K-ESS2-2)

ETS1.B: Developing Possible Solutions

- Designs can be conveyed through sketches, drawings, or physical

Crosscutting Concepts:

Patterns

- Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) (K-ESS2-1)

Systems and System Models

- Systems in the natural and designed world have parts that work together.(K-ESS2-2) (K-ESS3-1)

Cause and Effect

- Events have causes that generate observable patterns. (K-ESS3-2)

Back to Top of Page

Obtaining, Evaluating, and Communicating Information • Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)	models. These representations are useful in communicating ideas for a problem's solutions to other people. (secondary)	

Related Performance Expectation(s) in this Bundle:

- K-ESS2-2 Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.
  - [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]
- K-ESS3-3 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*
  - [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]

Possible Common Core State Standards Connections:

ELA/Literacy -

- R.K.1 With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2)
- W.K.1 Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2-2)
- W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS2-2)

Prior Student Knowledge:
None can be assumed.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)
Activity Description:

- Teacher reads *Roots* by Grace Hansen and shows the *Tree Root images* to show how plants can change their environments.
- Teacher also reads one or more of the animal books listed in Resources (or other books about beavers, moles, ants and/or earthworms that the teacher selects).
- Guide students to ask questions about how these living things change their environment.
  - This can be scaffolded as an *I Notice, I Wonder* discussion.

Resources:

- *Roots* by Grace Hansen (on Epic)
- Tree Root Images
- Animal Book Options:
  - *Beavers* by Gail Gibbons (on Epic)
  - *Mole's Hill* by Lois Ehlert
  - *Ant Cities* by Arthur Dorros
  - *Wonderful Worms* by Linda Glaser
- I notice, I wonder Handout

Back to Top of Page

Teacher Action(s):
- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):
- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:
- Show students Slide #1 of the Explore Slideshow and briefly discuss their ideas.
- Students vote for the claim they believe by circling the Beaver or Tree on the card (Slide #2) provided by the teacher:
  - Plants change their environment the most to survive.
  - Animals change their environment the most to survive.
- Teacher collects votes and creates a bar graph for students to view.
- Students work with a classmate who voted the same way to construct a verbal argument supported by the evidence (from what they learned in Engage and data from the bar graph) for how plants and animals can change the environment to meet their needs.
- Students share their arguments, observations and questions about the different living things and how they change the environment during whole class discussion.

Resources:
- Explore Slideshow

Teacher Action(s):
- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):
- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:
- Teacher prompts children to think about how humans are animals, and they too impact the environment.
- Read the *Lorax by Dr. Seuss* to the kids understand that all living things change the environment to meet the needs for survival, but sometimes those changes can negatively impact other living things.

Back to Top of Page

- In planning for a class pet we need to think about what an animal/plant needs to live and grow, as well as the ways we might negatively impact the pet's environment (too much water, dirty cage, not enough food, shade block the sun, etc.).
- Students review *Human Impact Pictures* and discuss how humans have impacted the environment and affect other living things.
    - Help students to make observations of the natural systems and discuss (argue) how humans have caused changes in that environment
    - Students must use evidence from the images to backup their claims.
    - This could be done as a station activity, or students can select the image they would like to make a human impact claim about using evidence from the images.
    - Teacher Note: Additional pictures can be found on the *How animals and plants can change their environment to meet their needs* link.

Resources:

- *The Lorax* by Dr. Seuss (may be available as a YouTube read)
- Human Impact Pictures
- How animals and plants can change their environment to meet their needs

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: food, land, life, plant, environment, human, living thing, survive, recycle

ELABORATE (Applications / Extensions)

Activity Description:

- Students can share their findings and arguments with the whole class.
- Read the text: *How to Help the Earth-by the Lorax* (Dr. Seuss), by Tish Rabe.
- Students can think about the ways the school community impacts the environment and brainstorm a way to reduce their impact (ex: litter) on the school grounds and possibly carry out one of their ideas.
- Students work individually or in groups to create a model (sketches, drawings or physical models) of their ideas.

Resources:

- *How to Help the Earth-by the Lorax* (Dr. Seuss) by Tish Rabe

Teacher Action(s):

- Expect the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations

Back to Top of Page

- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Analyzing and Interpreting Data; Engaging in Argument from Evidence; Asking Questions and Defining Problems; Obtaining, Evaluating and Communicating Information*
- ❏ **DCI:** *ETS1.A: Defining and Delimiting an Engineering Problem; ESS2.E: Biogeology; ETS1.B: Developing Possible Solutions*
- ❏ **CCC:** *Patterns; Systems and System Models; Cause and Effect*

Summative Assessment Description(s)

- Student identification of human impacts on the school community and their proposed plan for addressing one of those impacts.

Optional Instructional Strategy

- Summary Table
  - recommended to complete as a class

Additional Resources:

- G0K Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 5		
Brief Description: The students will finally find out what class pet they will get. Class pets can be plants, small animals, digital animals via www.explore.org. It is not necessary to have a "living" class pet.		
Suggested Pacing: 1.25 - 1.5 hrs		
Lesson-Level Phenomenon/Design Problem: The BIG REVEAL-What class pet will we get?		
Relationship to Anchoring Phenomena/Design Problem: Students find out which class pet they will have to plan and care for the remainder of the year. (Class pets can be small animals, plants or a digital animal observed through www.explore.org)		
Learning Sequence Driving Question: What does our class pet need to survive and thrive?		
Student Expected Outcomes: ● Students will develop a care guide for the new class pet.		
CONNECTIONS TO STANDARDS		
Three Dimensions Related to the Specific Learning Performance(s):		
Science & Engineering Practices: **Developing and Using Models** ● Use a model to represent relationships in the natural world. (K-ESS3-1)	**Disciplinary Core Ideas:** **LS1.C: Organization for Matter and Energy Flow in Organisms** ● All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1) **ESS3.A: Natural Resources** ● Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1) **ETS1.A: Defining and Delimiting Engineering Problems** ● A situation that people want to change or create can be approached as a problem to be solved through engineering.	**Crosscutting Concepts:** **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS2-2) (K-ESS3-1)

Back to Top of Page

	• Asking questions, making observations, and gathering information are helpful in thinking about problems. • Before beginning to design a solution, it is important to clearly understand the problem.	

Related Performance Expectation(s) in this Bundle:

- K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.
  - [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]
- K-ESS3-1 Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live.
  - [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]
- K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Possible Common Core State Standards Connections:

ELA/Literacy -

- W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS3-3)(K-ESS2-2)
- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1)(K-ESS2-1)
- R.K.1 With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2)
- W.K.1 Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2-2)
- SL.K.5 Add drawings or other visual displays to descriptions as desired to provide additional detail. (K-ESS3-1)
- W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1)
- W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1)

Mathematics -

- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-LS1-1)
- MP.2 Reason abstractly and quantitatively. (K-ESS3-1)(K-ESS2-1)(K-2-ETS1-1)
- MP.4 Model with mathematics. (K-ESS3-1)(K-ESS2-1)(K-2-ETS1-1)
- MP.5 Use appropriate tools strategically. (K-2-ETS1-1)
- K.CC Counting and Cardinality (K-ESS3-1)
- K.CC.A Know number names and the count sequence. (K-ESS2-1)
- K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)

- K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)
- 2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1)

Prior Student Knowledge:
What students learned throughout this unit.

LESSON PLAN – 5-E Model This sequence will not following the full 5-E model as it is the Culminating Performance Task.

ENGAGE/EXPLORE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Build excitement and reveal the selected class pet.
- Show students that there are a variety of texts that can help students prepare for and care for a pet. Help students to identify that each text provides information about (1) food, (2) water, (3) habitat-weather conditions and enclosure.
- Allow students to review and explore a variety of texts and videos related to the selected class pet.

Resources:

- epic! Books

Culminating Performance Task:

- Students will construct a *Care Guide* for their new class pet. Students complete the Care Guide template.
- If time, students can construct a prototype of the class pet's enclosure that meets the basic needs of their new class pet.

Resources:

- Care Guide template

Optional Instructional Strategy

- Summary Table
  - recommended to complete as a class

Additional Resources:

- G0K Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

Unit 2 - Waiting for Weather

Kindergarteners will discover that weather impacts what we wear, how we feel, and what we do daily by observing daily weather conditions through collecting data with student made weather instruments and notice that weather influences us every day. People and scientists measure wind, precipitation (snow, rain, etc) and daily temperatures to describe and record the observed weather conditions to notice patterns over time. Students will understand that some weather can be considered severe such as blizzards, heavy rain, heat waves, etc. Weather scientists follow the patterns to help communities prepare and deal with these types of weather conditions. The goal is for the students to think about and identify what they notice, how they feel and is this behavior normal given what they understand about weather conditions. The overall focus of this unit is how weather affects what we wear and what we do.

Students will be introduced to five toys who are patiently waiting as they look out the window for various events to happen, three of which are weather related. While the toys waited they observed "many wonderful, interesting things", such as interesting cloud shapes, rainbows, lighting, snow, and fireworks. As adults we understand that we don't have to "wait" for the weather to make our choices but in the story *Waiting* by Kevin Henkes the characters just wait and miss out on all the fun of enjoying the great outdoors.

Teacher Notes:

- **While marked as Unit 2 per NGSS thematic bundle format, this unit carries throughout the year. This may also be a better entry point for science for kindergarten. The other units will need to be completed around this unit. **
- This unit is NOT about how weather works, but identifying patterns in weather and how weather impacts the child's daily activity.
- The concept of weather runs throughout the entire school year -The lenses of how weather impacts "Me" (unit 2), "Plants and Animals" (unit 1) and "Play" (unit 3).
- It is important for the coherence of the unit that this section is seasonally repeated in order to support the students' understanding of how weather impacts their daily lives. The Explore section in Learning Sequence 2 will be repeated seasonally: Focus on:
    - Bear in Fall has a kite: waiting for wind
    - Puppy in Winter sits on a sled: waiting for snow
    - Pig in Spring has an umbrella: waiting for rain

You can view the flowchart for this unit here.

Suggested Pacing:
11-14 hrs

Teacher Notes:

- September to November - Bear in Fall has a kite: waiting for wind
- December to February - Puppy in Winter sits on a sled - waiting for snow
- March to May - Pig in Spring has an umbrella: waiting for rain

Anchoring Phenomenon/Design Problem:
Waiting by Kevin Henkes and how weather affects us every day

Unit Driving Question:
How does weather affect our everyday choices?

Culminating Performance Task:

- Weather Preparedness Handout

NGSS Performance Expectation(s): (Hyperlinks will bring reader to NGSS Evidence Statements)

- K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface.
    - [Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water.] [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.]

Back to Top of Page

- K-PS3-2. Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth's surface.*
  - [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]
- K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.
  - [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.]
  - [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]
- K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*
  - [Clarification Statement: Emphasis is on local forms of severe weather.]
- K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Three Dimensions that form the Foundation for these NGSS Performance Expectations:

Science & Engineering Practices:

Developing and Using Models

- Develop a simple model based on evidence to represent a proposed object or tool. (K-ETS1-2)

Planning and Carrying Out Investigations

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1)

Constructing Explanations and Designing Solutions

- Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. (K-PS3-2)

Analyzing and Interpreting Data

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1)

Disciplinary Core Ideas:

P S3.B: Conservation of Energy and Energy Transfer

- Sunlight warms Earth's surface. (K-PS3-1)

ESS2.D: Weather and Climate

- Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1)

ESS3.B: Natural Hazards

- Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3-2)

ETS1.A: Defining and Delimiting an Engineering Problem

- Asking questions, making observations, and gathering

Crosscutting Concepts:

Cause and Effect

- Events have causes that generate observable patterns. (K-PS3-1) (K-PS3-2) (K-ESS3-2)

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

Back to Top of Page

Asking Questions and Defining Problems • Ask questions based on observations to find more information about the designed world. (K-ESS3-2) • Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1) **Obtaining, Evaluating, and Communicating Information** • Read grade-appropriate texts and/or use media to obtain scientific information to describe patterns in the natural world. (K-ESS3-2)	information are helpful in thinking about problems. *(secondary) (K-ESS3-2)* • A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) • Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1) **ETS1.B: Developing Possible Solutions** • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-ETS1-2)	

Possible Common Core State Standards Connections:

Common Core State Standards Connections:
ELA/Literacy -

- R.K.1 With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2)
- RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1)
- W.K.1 Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2-2)
- W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which name what they are writing about and supply some information about the topic. (K-ESS2-2)
- W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1),(K-2-ETS1-3)
- W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1),(K-2-ETS1-3)
- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1)(K-PS3-1),(K-PS3-2)
- SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2)

Mathematics -

- MP.2 Reason abstractly and quantitatively. (K-ESS2-1(K-2-ETS1-1),(K-2-ETS1-3)
- MP.4 Model with mathematics. (K-ESS2-1), (K-2-ETS1-1),(K-2-ETS1-3)
- MP.5 Use appropriate tools strategically. (K-2-ETS1-1),(K-2-ETS1-3)
- K.CC.A Know number names and the count sequence. (K-ESS2-1)
- K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)
- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS3-1),(K-PS3-2)

Back to Top of Page

- K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)

PROGRESSION OF LEARNING

ONGOING THROUGHOUT THE SCHOOL YEAR:

Students collect weather data throughout the school year in their *Student Journal for Weather Pattern Data* packets.

- Teacher completes the first page with the students as an example of how to do this throughout the year.
- Visit a chosen section of the school grounds with plants and animals.
- Throughout the year, visit this location and have students make some observations about the living things and weather conditions (seasonal).
- Plan *at least* 4 visits to the same location. If you don't have an appropriate outdoor space - you may use the Edpuzzle Video of a backyard over 15 months.

Resources:

- Student Journal for Weather Pattern Data packets
- Edpuzzle Video of a backyard over 15 months

Learning Sequence 1

- Learning Sequence Driving Question:
  - How does weather help me know what to wear each day?
- Learning Sequence 1
- Relationship to Anchoring Phenomena/Design Problem:
  - This is an introduction to the anchoring phenomenon of how weather affects us every day.
- Student Expected Outcomes:
  - Students will make observations about weather and the effect it has on the choices we make about our clothing and activities.

Learning Sequence 2

- Learning Sequence Driving Question:
  - How do we know what the weather will be each day?
- Learning Sequence 2
- Relationship to Anchoring Phenomena/Design Problem:
  - Students collect and record data on the type of weather happening each day and develop an understanding of weather patterns by season.
- **Student Expected Outcomes:**
  - Students will make and record observations of different types of weather in order to identify patterns in the natural world.
  - Students will be able to use and analyze their observations of different types of weather in order to identify seasonal patterns based in the natural world over time.
  - Students will ask questions in order to understand what is classified as severe weather in our local area.
  - Students will collect information from texts/media about local severe weather warnings to understand that these events can be predicted and forecasted based on regional and local weather patterns.

Learning Sequence 3

- Learning Sequence Driving Question:
  - How does the Sun affect our lives?
- Learning Sequence 3
- Relationship to Anchoring Phenomena/Design Problem:

Back to Top of Page

- The heat from the sun impacts our choices every day.
- Student Expected Outcomes:
  - Students will make observations and conduct investigations exploring the role of the Sun in warming the Earth's surface.
  - Students will make material comparisons for designing a shelter to protect a living organism.

Assessments:

- **Culminating Performance Task**
  - Weather Preparedness Handout after Evaluate in *Learning Sequence 3*

- Kindergarten Performance Expectations Rubrics and Prompts
- Elementary Assessment Resources

Additional Resources:

- G0K Unit Materials List
  - Click on specific tab for unit-specific materials
- EPIC! Digital Library - GK U2 List
  - Includes ebooks and videos
  - Must have an educator user account for free access

Back to Top of Page

Learning Sequence 1

Brief Description:

In the book *Waiting*, students are introduced to five toys who are patiently waiting as they look out the window for various events to happen, three of which are weather related. While the toys wait, they observe "many wonderful, interesting things", such as interesting cloud shapes, rainbows, lightning, and snow. As adults we understand that we don't "wait" for the weather to make our choices but in the story *"Waiting"* the characters just wait and miss out on all the fun of enjoying the great outdoors.

The children will start this unit by developing an understanding of what weather is and how we observe it. The overall focus of this unit is how weather affects what we wear and what we do, not how weather works.

Suggested Pacing:

1.25 - 1.75 hrs

Lesson-Level Phenomenon/Design Problem:

Waiting by Kevin Henkes and how weather affects us every day.

Relationship to Anchoring Phenomena/Design Problem:

This is an introduction to the anchoring phenomenon of how weather affects us every day.

Learning Sequence Driving Question:

How does weather help me know what to wear each day?

Student Expected Outcomes:

- Students will make observations about weather and the effect it has on the choices we make about our clothing and activities.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Analyzing and Interpreting Data • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1) **Developing and Using Models** • Develop a simple model based on evidence to represent a proposed object or tool.	**ESS2.D: Weather and Climate** • Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1)	**Cause and Effect** • Events have causes that generate observable patterns. (K-PS3-1) (K-PS3-2) (K-ESS3-2) **Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)

Related Performance Expectation(s) in this Unit:

- K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.
  - [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.]

Back to Top of Page

- [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]

Possible Common Core State Standards Connections:

ELA/Literacy -

- R.K.1 With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2)
- W.K.1 Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2-2)
- W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which name what they are writing about and supply some information about the topic. (K-ESS2-2)
- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1)

Mathematics -

- MP.2 Reason abstractly and quantitatively. (K-ESS2-1)
- MP.4 Model with mathematics. (K-ESS2-1)
- K.CC.A Know number names and the count sequence. (K-ESS2-1)
- K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)
- K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)

Prior Student Knowledge:

None can be assumed.

Possible Preconceptions/Misconceptions:

Students may think:

- it rains when there are enough clouds.
- rain occurs when clouds are shaken.
- clouds move because we move.
- clouds are made of cotton, wool, or smoke.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Introduce the story *Waiting* by Kevin Henkes. As you read the story, ask the students to notice what the toys are waiting for.
- Ask: When will the characters know it is their turn to go out and play? When will they STOP waiting? List the student responses on chart paper.
- Present *Waiting Slideshow* and ask the students to turn and talk with the prompts from Slide #2:
  - What type of weather do you notice outside the window?
  - Which toy looks prepared for this type of weather?
  - Which toys are not prepared for this type of weather?
  - How do you know? The type of weather that will let them use their prop:
    - rain - Pig has an umbrella
    - wind - Bear has a kite
    - snow - Puppy sits on a sled
- Teacher completes the Explanatory Model from the *Waiting Slideshow* (Slide #3) with class ideas.
- Share that unlike the toys that are waiting, the students are going to figure out how to know what the weather is like by being kindergarten weather scientists, or classroom meteorologists throughout their school year, so they can be prepared for any type of weather situation.

Back to Top of Page

- Pose the question(s):
  - What is weather?
  - How do we observe the weather?
  - Does weather change?
  - How does the weather help me to know what to wear and what I can do each day?

Resources:

- *Waiting* by Kevin Henkes (may be available as a youtube read)
- Waiting Slideshow

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

- Ask the students how they decided what to wear today. Teachers can model a response by showing what they are wearing.
- Students work in small groups with a packet of *Sky Condition Cards* to match with weather regalia.
- Teacher shares "weather regalia" (see materials for a list of suggested items or use *Smartboard Regalia Images*). Select a variety of items to spark student discussion that would support further investigation of temperature, sky conditions (sunny, cloudy, partly sunny/cloudy, windy), and precipitation (rain, snow) and asks students to hold up appropriate *Sky Condition Card.*
- Another alternative would be to have students do a small group picture sort and have the groups share their sorting (item and weather condition/season) .
- Save the student sorts to refer to in the Explore/Explain Lessons.

Resources:

- Sky Condition Cards
- Smartboard Regalia Images

Optional Instructional Strategy

- Summary Table
  - recommended to complete as a class

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

Back to Top of Page

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

Additional Resources:

- G0K Unit Materials List
    - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 2

Brief Description:

This learning sequence consists of three parts and will be repeated based on seasons: Fall, Winter and Spring. Students learn to observe and track daily weather which will be ongoing as well as looking at local weather from the lens of "severe" weather. It is very important to reinforce the reasons students are exploring the weather and seasons is because they are investigating the patterns of weather throughout the year and those observations help us make choices in our daily lives.

Suggested Pacing:

- Fall: 2 - 2.5 hrs
- Winter: 2 - 2.5 hrs
- Spring: 2 - 2.5 hrs
- Evaluate: 0.5 hours

Lesson-Level Phenomenon/Design Problem:

Apply seasonal weather to the *Waiting* characters:

- Bear in Fall has a kite: waiting for wind
- Puppy in Winter sits on a sled: waiting for snow
- Pig in Spring has an umbrella: waiting for rain

Relationship to Anchoring Phenomenon/Design Problem:

Students collect and record data on the type of weather happening each day and develop an understanding of weather patterns by season.

Learning Sequence Driving Question:

How do we know what the weather will be each day?

Student Expected Outcomes:

- Students will make and record observations of different types of weather in order to identify patterns in the natural world.
- Students will be able to use and analyze their observations of different types of weather in order to identify seasonal patterns based in the natural world over time.
- Students will ask questions in order to understand what is classified as severe weather in our local area.
- Students will collect information from texts/media about local severe weather warnings to understand that these events can be predicted and forecasted based on regional and local weather patterns.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Planning and Carrying Out Investigations • Make observations (firsthand or from media) to collect data that can be used to make comparisons. **Obtaining, Evaluating, and Communicating Information** • Read grade-appropriate texts and/or use media to	**ESS2.D: Weather and Climate** • Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1) **ESS3.B: Natural Hazards**	**Cause and Effect** • Events have causes that generate observable patterns. **Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)

Back to Top of Page

obtain scientific information to describe patterns in the natural world. **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1) **Asking Questions and Defining Problems** ● Ask questions based on observations to find more information about the designed world. (K-ESS3-2) **Developing and Using Models** ● Develop a simple model based on evidence to represent a proposed object or tool. (K-ETS1-2)	● Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3-2) **ETS1.A: Defining and Delimiting an Engineering Problem** ● Asking questions, making observations, and gathering information are helpful in thinking about problems. *(secondary) (K-ESS3-2)*	

Related Performance Expectation(s) in this Unit:

- K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.
  - [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.]
  - [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]
- K-ESS3-2. Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*
  - [Clarification Statement: Emphasis is on local forms of severe weather.]

Possible Common Core State Standards Connections:

ELA/Literacy -

- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1)
- RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-ESS3-2)
- SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-ESS3-2)

Mathematics -

- MP.2 Reason abstractly and quantitatively., (K-ESS2-1)
- MP.4 Model with mathematics. (K-ESS2-1)(K-ESS3-2)
- K.CC Counting and Cardinality (K-ESS3-2)
- K.CC.A Know number names and the count sequence. (K-ESS2-1)

Back to Top of Page

- K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)
- K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)

Prior Student Knowledge:
None can be assumed.

Possible Preconceptions/Misconceptions:
Students may think:

- it rains when there are enough clouds.
- rain occurs when clouds are shaken.
- clouds move because we move.
- clouds are made of cotton, wool, or smoke.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:
This will be repeated seasonally. Focus on:

  - Bear in Fall has a kite: waiting for wind
  - Puppy in Winter sits on a sled - waiting for snow
  - Pig in Spring has an umbrella: waiting for rain

- For the first round of seasonal observations (as described in the overview), be sure to identify a suitable space outside to take the class prior to actually going out, if possible, a spot that will change over time like a deciduous tree.
- Take the students outside for a walk on the school grounds ending at the spot where they will be making their seasonal observations throughout the school year.
- Ask the students to observe the weather.
- Record the students ideas and thoughts on a class list.
- Ask the students to make a picture frame with their hands to focus on a specific areas of the environment (the sky, the clouds, or anything that is moving with the wind). Make anecdotal notes for yourself to refer to when you return to the classroom.
  - Ask the students to describe what they see at each focal point which is the area of environment that was framed by their hands. (Consider using technology to perhaps photograph their focal point.)
  - Ask the students to think about how it feels outside.
  - How does their skin feel?
  - What do they hear?
- When you return to the classroom, have the students record their observations and ideas in their *Student Journal for Weather Pattern Data* packets.
- Have the students share their observations - Chart these ideas and any questions they may have.
- Have the students *Turn and Talk* to respond to this question:
  - What is weather?
- Chart their responses - be sure to not get into explanatory details - just accept their responses. As you move through the unit your students will figure out themselves, with your facilitation, more about the weather.
- *Optional:* If you don't have an outdoor space that contains plant life that will change over time, you may use the Edpuzzle Video of a backyard over 15 months.
  - Use the sections that are appropriate for the season you are in and follow the question protocol with your class.
  - You do not have to type in your answers. They are simply there as prompts for guiding student discussion.

Resources:

- Student Journal for Weather Pattern Data packets

Back to Top of Page

- Time Lapse Backyard Over 15 Months

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)
EXPLAIN (Concepts Explained / Vocabulary Defined)

Part #1: Focus on Day to Day changes in the weather -Repeat the following steps in Fall, Winter and Spring.

- Students use the *Character Calendar template* to track the weather according to the different characters.
  - Teacher Notes:
    - The weather chart will be a pictograph. This will help students identify monthly and seasonal patterns related to rain, wind, sun and snow.
    - Keep data for Unit 3, Learning Sequence 4
    - This chart (or whatever calendar tracking you choose) needs to be kept after each month or a photo taken so comparisons can be made at a later time. This is an ongoing experience that should be carried out for the entire year. It is suggested that the months are grouped by seasonal changes.
- Students are asked:
  - How do scientists figure out the weather each day?
  - How do you figure out the weather each day?
  - How does knowing the weather help you figure out what to wear?
  - What should we wear today?
- Review collected data from the *Character Calendar template.*
- Use the *Thermometer Demonstration* to record temperature readings and help students to recognize relative temperature descriptors (hot, warm, cool, cold, very cold).
- Character Calendar: Which toy will get to play outside today? How do we know?
  - Teacher Note: As an add-on to calendar time and weather discussions, students can determine the characteristics of the day and decide which character will go out to play. Each character calendar acts as a data collection tool in the form of a pictograph. This will help students identify patterns in weather according to season.

Part #1 Resources:

- Character Calendar template
- Thermometer Demonstration

Part #2: Focus on Seasonal changes in the weather over time

- Help students to identify patterns by using the *Character Calendar template* from Part #1.
- Based on the time of year, students learn the different ways scientists observe each weather condition. Focus on reading and writing exercises around the timeline and weather concepts listed below.
  - Fall: The Bear (students investigate wind)
    - Student Prompts: How do we know if it is windy? Is the sun out? How can we measure the wind? Is it windy in every season?
    - Students investigate how scientists measure the wind using the *DIY Wind Instruments* activity. Provide time for students to collect data using their wind instruments throughout the season.

Back to Top of Page

        - Students should complete at least one Science journal entry per month (see sequence 1).
        - Texts associated with Wind
            - *Wind* by Erin Edison
            - *The Wind Blew* by Pat Hutchins
            - *Feel the Wind* by Arthur Dorros
    - Winter: The Puppy (students investigate snow)
        - Student prompts: How do we know it will snow? Is the sun out when it snows? Does it snow in every season?
        - Investigate how scientists measure snow.
        - Have students predict how much water there will be when the snow melts. Fill a variety of containers (all different heights i.e jar and bucket) with snow. Ask the students to make predictions about what will happen to the snow inside the warm building? Have students turn and talk to express their ideas. Once you have established that the snow will turn to water, have the students use the *Snow/Water Prediction Sheet* to show the amount of water they expect each container to hold once the snow melts. Students can draw their ideas. After the snow melts and students record their results, prompt students to ask questions about their results. Collect student questions on chart paper.
        - Students should complete at least one Science journal entry per month (see sequence 1).
    - Spring: The Pig (students investigate rain and clouds)
        - Student Prompts: How do we know it will rain? Does it rain in every season? Is the Sun out all the time?
        - Investigate how scientists measure and collect rain-DIY Rain Gauge. Provide time for students to collect data using their rain gauges throughout the season.
        - Investigate how clouds relate to rain.
- Students should complete at least one entry per month in their *Student Journal for Weather Pattern Data* packets (from Engage).
- Students can use optional text resources listed below for further information.

Part #2 Resources:

- DIY Wind Instruments
- Texts associated with Wind
    - *Wind* by Erin Edison
    - *The Wind Blew* by Pat Hutchins
    - *Feel the Wind* by Arthur Dorros
- Snow/Water Prediction Sheet
- Texts about snow:
    - *The Story of Snow* by Mark Cassino
    - *Snow Day* by Lester Laminack
    - *Snow* by Uri Shulevitz
    - *Sadie and the Snowman* by Allen Morgan
- DIY Rain Gauge
- Texts associated with rain:
    - *Rain!* by Linda Ashman
    - *Rain* by Sam Usher
    - *Down Comes the Rain* by Franklyn Branley
    - *Clouds* (weather basics) by Erin Edison
- Student Journal for Weather Pattern Data packets (from Engage)

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Back to Top of Page

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement
- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: weather, prediction, forecast, observation, pattern, season (fall, winter, spring, summer), thermometer, rain gauge, anemometer, precipitation, freeze, melt, rain, snow, cloudy, sun, earth, light, wind, heat, cold

ELABORATE (Applications / Extensions)

Activity Description: CT Severe Weather (seasonal)

- During each season, if a local "severe" weather event occurs, take this opportunity to investigate the event.
- Present the *Waiting Slideshow (Slide #2)* with the toys observing a window with stormy weather and a window with the rainbow. Just like the waiting toys, we sometimes have weather that we need to prepare for because it's going to be different than just a regular rainy day or snowy day.
- Consider showing the PBS video *Peep and the Big World: Stormy Weather.*
- Compare how Peep and his friends behaved versus how we (humans) behave in stormy weather. (The point is to be sure to get across is that we have ways of knowing about upcoming stormy weather so that we can prepare for it). The exploration will focus on a few region specific events and has the student generate a survival guide.
- Teacher Note: You want to be consistent as to when you observe the weather each day as that is the way scientists and meteorologists conduct their observations and help us understand if we need to take some special action for local weather events that are classified as severe.

Fall severe weather connection - Hurricanes: *Hurricanes! By Gail Gibbons on epic! Books*

- Students are asked: What is a hurricane? What happens during a hurricane? How can we prepare for a hurricane?
- Read texts pertaining to windy weather events.
- Students work together to make a class severe weather survival guide for hurricanes.
- Weather/Season Assessment-Help Bear predict and measure the wind

Winter severe weather connection - Blizzards: *Blizzard by Joyce Markovics on epic! Books*

- Students are asked: What is a blizzard? What happens during a blizzard? How can we prepare for a blizzard?
- Read texts pertaining to blizzards.
- Students work together to make a class severe weather survival guide for blizzards.
- Weather/Season Assessment-Help Puppy dress for and measure snow.

Back to Top of Page

Spring severe weather connection - Thunderstorms: *Flash, Crash, Rumble and Roll* by Franklyn Branley or *A Party for Clouds: Thunderstorms* by Belinda Jensen on epic! Books

- Students are asked: What is a thunderstorm? What happens during a thunderstorm? How do we prepare for a thunderstorm? What do the clouds look like before or during a storm? How can clouds help us predict rain?
- Read texts pertaining to thunderstorms.
- Students work together to make a class severe weather survival guide for thunderstorms.
- Weather/Season Assessment - Help Pig predict and measure the rain.

Resources:

- Waiting Slideshow (Slide #2)
- Talking to Young Children about Severe Weather (for teachers)
- Peep and the Big World: Stormy Weather
- Weather/Season Assessment
- Hurricanes! By Gail Gibbons on epic! Books
- Blizzard by Joyce Markovics on epic! Books
- *Flash, Crash, Rumble and Roll* by Franklyn Branley
- A Party for Clouds: Thunderstorms by Belinda Jensen on epic! Books

Teacher Action(s):

- Expect the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Designing and Carrying Out Investigations; Obtaining, Evaluating and Communicating Information; Analyzing and Interpreting Data; Asking Questions and Defining Problems; Developing and Using Models*
- ❏ **DCI:** *ESS2.D: Weather and Climate; ESS3.B: Natural Hazards; ETS1.A: Defining and Delimiting an Engineering Problem*
- ❏ **CCC:** *Cause and Effects; Patterns*

Summative Assessment Description(s):

- Revisit the story *Waiting For Weather;* specifically when the cat with patches joins the toys.
    - Introduce the Waiting Slideshow (Slide 6) and ask students to design the cat so it is prepared for a specific type of weather.
        - Model this task while referring to the variety of weather data collected by the class prior to allowing the kids to generate their designs.
    - Teacher can assign different cats to each student: sunny cat, cloudy cat, rainy cat, thundercat, snowy cat, hurricane cat, blizzard cat.

Back to Top of Page

- Assign cat themes according to student readiness.
- After students design their cats according to the weather conditions, students should verbally describe the scientific significance of their designs and how the design helps the cat in a specific type of weather.

- As the students become adept as weather reporters, they can compare and contrast the seasonal changes as they experience the seasons throughout the year. Refer to the character calendar. Scaffold questions to help students identify emerging patterns. Focus question: Why should we pay attention to the changes in the weather/seasons?

Resources:

- Waiting Slideshow (Slide #6 or #7)

Optional Instructional Strategy

- Summary Table
  - recommended to complete as a class

Additional Resources:

- G0K Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 3

Brief Description:
Students explore the role the Sun plays in heating Earth's surface and everything on it. Students do this through observation and investigations involving the sun. Students become engineers to complete the task of designing a shelter to protect a living organism from the heat of the sun.

Suggested Pacing:
- 2.75 - 3.75 hrs for the 5-Es
- 0.25 - 0.5 hrs for the Culminating Performance Task

Lesson-Level Phenomenon/Design Problem:
Frying an egg on a sidewalk

Relationship to Anchoring Phenomena/Design Problem:
The heat from the sun impacts our choices every day.

Learning Sequence Driving Question:
How does the sun affect our lives?

Student Expected Outcomes:
- Students will make observations and conduct investigations exploring the role of the Sun in warming the Earth's surface.
- Students will make material comparisons for designing a shelter to protect a living organism.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:

Planning and Carrying Out Investigations
- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1)

Constructing Explanations and Designing Solutions
- Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem. (K-PS3-2)

Developing and Using Models
- Develop a simple model based on evidence to represent a proposed object or tool. (K-ETS1-2)

Disciplinary Core Ideas:

PS3.B: Conservation of Energy and Energy Transfer
- Sunlight warms Earth's surface. (K-PS3-1)

ETS1.A: Defining and Delimiting an Engineering Problem
- Asking questions, making observations, and gathering information are helpful in thinking about problems. *(secondary) (K-ESS3-2)*
- A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)
- Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)

Crosscutting Concepts:

Patterns
- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)

Structure and Function
- The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

Back to Top of Page

Asking Questions and Defining Problems	ETS1.B: Developing Possible Solutions	
• Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)	• Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-ETS1-2)	

Related Performance Expectation(s) in this Unit:

- K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface.
  - [Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water.] [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.]
- K-PS3-2. Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on Earth's surface.*
  - [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]
- K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- K-2-ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Possible Common Core State Standards Connections:

ELA/Literacy -

- RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1)
- W.K.2 Use a combination of drawing, dictating, and writing to compose informative/explanatory text in which name what they are writing about and supply some information about the topic. (K-ESS2-2)
- W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1),(K-2-ETS1-3)
- W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-1),(K-2-ETS1-3)
- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1)(K-PS3-1),(K-PS3-2)
- SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2)

Mathematics -

- MP.2 Reason abstractly and quantitatively. (K-ESS2-1(K-2-ETS1-1),(K-2-ETS1-3)
- MP.4 Model with mathematics. (K-ESS2-1), (K-2-ETS1-1),(K-2-ETS1-3)
- MP.5 Use appropriate tools strategically. (K-2-ETS1-1),(K-2-ETS1-3)
- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS3-1),(K-PS3-2)

Prior Student Knowledge:

None can be assumed.

Possible Preconceptions/Misconceptions:

Students may think:

- it rains when there are enough clouds.

Back to Top of Page

- rain occurs when clouds are shaken.
- clouds move because we move.
- clouds are made of cotton, wool, or smoke.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Show this video of an egg frying on the sidewalk in Florence, Arizona in June.
    - Use this as a springboard for students to develop questions and theories on the idea of an egg frying in this most unlikely place.
    - To tie this back to the text *Waiting*, tell the students that Sunny cat will be travelling to Arizona and is very worried about how the weather may affect him/her, especially if it can fry an egg. Sunny cat is very sensitive!
- Teacher asks the question: How is it possible to fry an egg on the sidewalk in Arizona?
- Students generate questions and express their ideas about this phenomena.
- Teacher uses the *Driving Question Board Slideshow* to showcase the students' questions about the phenomena.
    - Sort the students' questions into categories - this can be done w/o the students in preparation for developing your Explore experience.
    - Categories could be but aren't limited to temperature, surface materials, location, time of year.
- Students pose questions about these phenomena.

Resources:

- Frying a egg on a sidewalk
- Driving Question Board Slideshow

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

Activity #1:

- Ask the students to elaborate on other surface materials to try to cook an egg. *(While discussing, consider the following: Could we cook an egg on the grass? What makes the pavement hot enough to cook an egg? Do all surfaces get hot enough to cook an egg in the summer sun? How do we know? How can we test how the sun impacts different types of surfaces?)*
- As a class devise a plan for testing how light changes temperatures on different surface materials.
    - Help students come to consensus about the different surface materials they could test to determine temperature differences (For example: sand, gravel, woodchips, black and white construction paper to represent asphalt and concrete).
- Teacher sets up four surfaces under a lamp
    - Tell the students the light source represents the Sun.
- Students select two surfaces to test relative temperature.

Back to Top of Page

- Students complete the *Surface Materials Worksheet*.
- Students are responsible for relative temperature, but if teacher wants to use a thermometer, the class can periodically record the temperature of the surfaces. Color in a thermometer for each reading.
- Once all of the data has been collected, ask students to look for patterns in the data.
    - (Consider the following: Did the sun/light affect the surfaces differently? How do you know? Which surface got hotter? Why do you think that surface got hotter? Have you ever experienced something that told you the sun heated surfaces differently (sand at the beach, black top compared to grass, etc)?)

Resources Activity #1:

- Surface Materials Worksheet

Activity #2:

- Allow students to engage with the UV beads. To prevent losing the beads put one or two beads on a pipe cleaner and loop the cleaner closed.
    - Tell the students that in the right conditions, the beads will change color.
    - Challenge the students to find the condition that changes the beads.
- Ask students to brainstorm what condition may change the beads. Using student input, develop stations for students to test their ideas. For example, set up a variety of stations: (1) Ice water, (2) Warm Water, (3) Dark Area (box), (4) UV light(or a space where the students are in DIRECT sunlight), etc.
- Students complete *Bead Color Changes* handout to record their observations as they explore the different stations.

Resources Activity #2:

- Bead Color Changes

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

- Read texts about the Sun and heat - possible suggestions listed in Resources.
- Students share their experiences from the Explore activity. *(Ask the following: Did you get the beads to change color? What did you have to do to get the beads to change color? How can we use these special beads to help Sunny Cat when he/she travels to Arizona.)*
- Sunny Cat likes sunny days, but she does not want to get sunburned. Elicit student ideas about how the UV beads could be used to help Sunny Cat make sure she does not get too much sun.
- Students use the UV beads to construct a collar or other device to put on Sunny Cat, so she doesn't spend too long in the sun.

Back to Top of Page

Resources:

- *Sun* by Marion Dane Bauer
- *What the Sun can Do* by Sharon Coan
- *Heatwave* by Eileen Spinelli
- *Come on Rain* by Karen Hess
- What Does Sunlight Do? by Jennifer Boothroyd (book available on Epic)
- The Sun Song Video by Scratch Garden

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: sun, heat, weather, light, Earth, sunlight, cool, temperature, warm, energy, thermometer

ELABORATE (Applications / Extensions)

Activity Description:

- Tell the students that we are still worried that Sunny Cat will be exposed to too much sun on her trip to Arizona. Not only does she need the UV bead collar to help her know when she is in the sun, but maybe she needs a shelter to protect her as well.
- Students think like engineers to plan and build Sunny Cat a shelter to protect her from the hot Arizona sun.
    - Engineers always plan their designs first.
- Show the students the materials they can use to create their shelters.
- Ask the students to draw a model of their shelter idea and label the parts (first letter of the part name is a great start).
- Students share their drawings with the class.
- Students provide feedback, in a respectful way, to one another.
    - Help students to clarify the structures on their shelter and what their intended function may be.
    - You may need to scaffold the discussions.
- Students finalize their plans incorporating the feedback they received.
- Students construct and test their designs.
    - If Sunny Cat's collar changes color under the shelter, then the shelter need to be revised.
    - If the collar stays "white" the students did a good job protecting Sunny cat from the sunlight.

Teacher Action(s):

- Expects the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Back to Top of Page

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s):
Formative monitoring will occur at various times (checks for understanding through questioning and discussion) throughout this learning sequence. Please note the following SEP, DCI and CCC need to be monitored throughout the learning sequence.

- ❏ **SEP**: *Planning and Carrying Out Investigations; Constructing Explanations and Designing Solutions; Developing and Using Models; Asking Questions and Defining Problems*
- ❏ **DCI**: *PS3.B: Conservation of Energy and Energy Transfer; ETS1.A: Defining and Delimiting an Engineering Problem; ETS1.B: Developing Possible Solutions*
- ❏ **CCC**: *Patterns; Structure and Function*

Summative Assessment Description(s):

- Students Elaborate final designs.

Culminating Performance Task:

Show students the *Playing in the Snow* Image.
Ask students to predict the weather conditions.
Students use the *Weather Preparedness Handout* to recreate the image as a scientific model to show weather preparedness (*students will either have to change the weather in the image or the children's clothing*).
Students explain the changes they make to the photograph using scientific reasoning and rationale, as well as their knowledge of weather and what's needed to be prepared for different weather scenarios.

Resources:

- Playing in the Snow Image
- Weather Preparedness Handout

Optional Instructional Strategy

- Summary Table
  - recommended to complete as a class

Additional Resources:

- G0K Unit Materials List
  - Click on specific tab for unit-specific materials

Unit 3 - Push, Pull, Play!

In play, children rely on the science of forces and their interactions. All forms of play require force and motion through the lens of pushes and pulls. These forces are very evident in gross motor play on the playground or in gym class, however these interactions are also necessary for fine motor play as well. As play engineers students will design and test flying play objects. Students will define the roles of pushes, pulls and force strength in their design and test process

Students investigate that all of their play actions feature pushes and pulls. Over the course of the four sequences students learn about the direction of motion related to pushes and pulls, that these forces can have different strengths, and that we can change the motion of an object by adding or changing force. Students also come to realize that certain weather conditions exhibit force and can impact the way that we play. As play engineers students will design and test a flying play object. Students will define the roles of pushes, pulls and force strength in their design and test process.

Differentiation: While the phenomenon of the unit is play, play experiences utilized throughout the unit can be differentiated according to the resources available to the students or to meet the interests of specific students. For example, if a student does not prefer gross motor activity, he/she can play with coloring and drawing. These fine motor actions will yield the same relative understanding of pushes and pulls.

You can view the flowchart for this unit here.

Suggested Pacing:
8-10 hrs

Anchoring Phenomenon/Design Problem:
Push, Pull, Play

Unit Driving Question:
How do we use pushes and pulls during play?

Culminating Performance Task:
Students will present their final wind propelled object (kite, pinwheel, sailboat, etc.) to the class.

NGSS Performance Expectation(s): (Hyperlinks will bring reader to NGSS Evidence Statements)

- K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
  - [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.]
  - [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

- K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*
  - [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.]
  - [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]

- K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.
  - [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days vs cloudy days in different months.]

Back to Top of Page

- [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]

- K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

- K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Three Dimensions that form the Foundation for these NGSS Performance Expectations:

Science & Engineering Practices:

Planning and Carrying Out Investigations

- With guidance, plan and conduct an investigation in collaboration with peers.(K-PS2-1)

Analyzing and Interpreting Data

- Analyze data from tests of an object or tool to determine if it works as intended.(K-PS2-2) (K-2ETS1-3)
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1)

Asking Questions and Defining Problems

- Ask questions based on observations to find more information about the natural and/or designed world(s).
- Define a simple problem that can be solved through the development of a new or improved object or tool.

Disciplinary Core Ideas:

PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions.(K-PS2-1) (K-PS2-2)
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.(K-PS2-1) (K-PS2-2)

PS2.B: Types of Interactions

- When objects touch or collide, they push on one another and can change motion.(K-PS2-1)

PS3.C: Relationship Between Energy and Forces

- A bigger push or pull makes things speed up or slow down more quickly. *(secondary)* (K-PS2-1)

ESS2.D: Weather and Climate

- Weather is the combination of sunlight, wind, snow or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1)

ETS1.A: Defining Engineering Problems

- A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. *(secondary)* (K-PS2-2)

Crosscutting Concepts:

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.(K-PS2-1) (K-PS2-2)

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)

Back to Top of Page

	• Asking questions, making observations, and gathering information are helpful in thinking about problems. • Before beginning to design a solution, it is important to clearly understand the problem. **ETS1.C: Optimizing the Design Solution** • Because there is always more than one possible solution to a problem, it is useful to compare and test designs.(K-2ETS1-3)	

Possible Common Core State Standards Connections:

ELA/Literacy -

- RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-PS2-2)
- SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2)
- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1)(K-ESS2-1)
- W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-3)
- W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-3)

Mathematics -

- MP.2 Reason abstractly and quantitatively. (K-PS2-1) (K-ESS2-1)(K-2-ETS1-3)
- MP.4 Model with mathematics. (K-ESS2-1)(K-2-ETS1-3)
- MP.5 Use appropriate tools strategically. (K-2-ETS1-3)
- K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-PS2-1)(K-ESS2-1)
- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS2-1)
- K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)
- 2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-3)
- K.CC.A Know number names and the count sequence. (K-ESS2-1)

PROGRESSION OF LEARNING

ONGOING THROUGHOUT THE SCHOOL YEAR:

Students collect weather data throughout the school year in their *Student Journal for Weather Pattern Data* packets.

- Teacher completes the first page with the students as an example of how to do this throughout the year.
- Visit a chosen section of the school grounds with plants and animals.
- Throughout the year, visit this location and have students make some observations about the living things and weather conditions (seasonal).
- Plan *at least* 4 visits to the same location. If you don't have an appropriate outdoor space - you may use the Edpuzzle Video of a backyard over 15 months.

Back to Top of Page

Resources:

- Student Journal for Weather Pattern Data packets
- Edpuzzle Video of a backyard over 15 months

Learning Sequence 1:

- Learning Sequence Driving Question:
  - How do we use pushes and pulls during play?
- Learning Sequence 1
- Relationship to Anchoring Phenomena/Design Problem:
  - Students build awareness of pushes and pulls and their impact on play and an object's motion.
- Student Expected Outcomes:
  - Students will investigate pushes and pulls to identify patterns of similarities and differences in motion and direction.

Learning Sequence 2

- Learning Sequence Driving Question:
  - What happens when you change the force of a push or pull during play?
- Learning Sequence 2
- Relationship to Anchoring Phenomena/Design Problem:
  - Students investigate and explore big and little forces while playing.
- Student Expected Outcomes:
  - Students will make observations of patterns in the natural world to understand how pushes and pulls can have different strengths, which causes objects to start, stop, speed up or slow down.
  - Students will collaborate with peers to plan and conduct an investigation to understand how pushes and pulls can have different strengths, which causes objects to start, stop, speed up or slow down.
  - Students will analyze data from tests of an object to understand how pushes and pulls can have different strengths, which causes objects to start, stop, speed up or slow down.

Learning Sequence 3

- Learning Sequence Driving Question:
  - What happens when play objects crash into one another?
- Learning Sequence 3
- Relationship to Anchoring Phenomena/Design Problem:
  - Students apply their understanding of pushes and pulls in play to predict the outcomes of collisions.
- Student Expected Outcomes:
  - Students will make observations and describe patterns in the natural world to understand how pushes and pulls can have different directions and can be affected by change of motion.
  - Students will collaborate with peers to plan and conduct an investigation to understand how pushes and pulls can have different directions and can be affected by change of motion.
  - Students will analyze data from tests of an object or tool to understand how pushes and pulls can have different directions and can be affected by change of motion.

Learning Sequence 4

- Learning Sequence Driving Question:
  - How can weather make things move? Why do some play objects fly in the wind better than others?
- Learning Sequence 4

Back to Top of Page

- Relationship to Anchoring Phenomena/Design Problem:
  - Play can be impacted by weather.
- Student Expected Outcomes:
  - Students will make observations and describe patterns in the weather to understand how wind pushes and can have different directions and can change the motion or speed of an object.
  - Students will collaborate with peers to plan and conduct an investigation to understand how wind pushes and can have different directions and can change the motion or speed of an object.
  - Students will engineer objects/playthings that will fly in the wind.

Assessments:

- **Culminating Performance Task**
  - Students will present their final wind propelled object to the class. Their presentation must include:
    - The final model of their design - a drawing showing a push and pull with arrows.
    - Highlight one modification they made based on their testing results.
- Engineering Design Task
- **Kindergarten Performance Expectations Rubrics and Prompts**
- **Elementary Assessment Resources**

Additional Resources:

- G0K Unit Materials List
  - Click on specific tab for unit-specific materials
- EPIC! Digital Library - GK U3 List
  - Includes ebooks and videos
  - Must have an educator user account for free access

Back to Top of Page

Learning Sequence 1

Brief Description:
Students will draw and investigate how they change the motion of objects during play. Students work toward understanding the patterns of similarities and differences in motion and direction as they play in the classroom or on the playground. Students develop simple scientific models to represent their understanding of the direction of motion relative to a push or a pull and categorize images using scientific rationale.

Suggested Pacing:
2-3 hrs

Lesson-Level Phenomenon/Design Problem:
Push, Pull, Play

Relationship to Anchoring Phenomenon/Design Problem:
Students build awareness of pushes and pulls and their impact on play and an object's motion.

Learning Sequence Driving Question:
How do we use pushes and pulls during play?

Student Expected Outcomes:

- Students will investigate pushes and pulls to identify patterns of similarities and differences in motion and direction.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Analyzing and Interpreting Data • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1)	**PS2.A: Forces and Motion** • Pushes and pulls can have different strengths and directions.(K-PS2-1) (K-PS2-2) • Pushing or pulling on an object can change the speed or-direction of its motion and can start or stop it.(K-PS2-1) (K-PS2-2)	**Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.(K-ESS2-1)

Related Performance Expectation(s) in this Unit:

- K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
  - [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.]
  - [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

Possible Common Core State Standards Connections:

ELA/Literacy -

- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1)

Back to Top of Page

Mathematics -

- MP.2 Reason abstractly and quantitatively. (K-PS2-1)
- K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-PS2-1)
- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS2-1)

Prior Student Knowledge:
None can be assumed

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Place a ball in the center of the classroom floor and ask students to Turn-and-Talk to come up with ways they could get the ball to move.
  - Record students' thinking on smart notebook or chart paper. Students should come up with things like kick the ball, tap the ball, bump the ball with another object, etc.
- As students share their ideas, ask them to begin to classify their ideas.
  - Which ideas are similar? Different?
  - Use the push and pull images from the *Explore Slideshow* to scaffold discussion.
  - Which actions that moved the ball would be considered PUSHES? PULLS? This will help students begin to identify the opposing concepts of push and pull. If students incorrectly identify a push and a pull, let it go for now. We want the students to build their understanding and change their responses over time.
  - Push: to press upon or against (a thing) with force in order to move it away
  - Pull: to draw or haul toward oneself or itself, in a particular direction, or into a particular position

Resources:

- Explore Slideshow (Slide #1)

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

Activity #1:

- Ask students to think about their playtime (in the classroom or outside on the playground).
- Prompt the students to draw pictures (print Slide 2 from *Explore Slideshow* on 11x17 paper) of how they make things move when they play. You may need to hone student thinking to a few instances. Use actions or play that is common to your classroom routines. You can choose to do this after play time or recess so that students have play actions that are readily accessible.
  - *Some examples:*
    - *kicking a ball*
    - *opening a door*
    - *moving a crayon to color*
    - *sliding down a slide*

Back to Top of Page

        - *swinging on the swing set*
        - *pushing cars along a track*
- Post the push and pull images from the *Explore Slideshow* (slide #1) at opposite ends of the classroom.
- Have the students put their drawing where they think it belongs according to the actions they drew and share their rationale for selecting PUSH or PULL as the action depicted in the image they drew.
    - What patterns do they notice as they place their drawings?
    - Where do all objects that are pushed go?
    - Where do all objects that are pulled go?
    - If students incorrectly place their drawing, DO NOT fix it or comment at this time. The goal of NGSS instruction is to help students figure science out! Over time we can ask the students to relocate any images that they think are incorrectly placed.

Resources for Activity #1:

- Explore Slideshow

Activity #2:

- Students complete the *Station Activity* to investigate and experience pushes and pulls in hands-on play.
    - Students identify their actions at each station as a push, pull, or both.
    - Students share their ideas and use evidence from their experiences to explain their thinking.
    - While this is written as a station activity, It may be that you investigate one or two of the play features per day. Students must wear safety goggles at the marshmallow shooter station.
        - PUSH investigations:
            - soda bottle bowling
            - matchbox cars and ramps
            - coloring (can also be a PULL)
        - PULL Investigations
            - magnetic fishing
            - clothes line message (can also be a PUSH)
            - marshmallow shooters (SAFETY: design includes latex balloons, please check student allergies prior to use in the classroom)
- *Optional Activity:*
    - *Bring the students out to the playground with the cutouts of the push/pull cards from slide 3.*
    - *Visit the different pieces of playground equipment and have students demonstrate the use of the equipment.*
    - *Discuss ideas about the play action and hold up the card that best describes the movement (did movement result from a push or a pull).*
        - *Keep track of incorrect student responses. and help students to change their thinking.*
        - *Make sure students provide a rationale for their responses. They may be thinking from a different perspective. It is important for us, as teachers, to understand where students are coming from as they make their push/pull determinations.*
            - *Making the swings move: Push*
            - *Moving across the monkey bars: Pull*
            - *Making yourself move down the slide: Push*
            - *Making a ball/merry-go-round move: Push*
            - *Climbing the rock wall: Hands Pull, feet push*
            - *Making the zipline move (no kids riding): Pull*

Resources for Activity #2:

- Station Activity

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary

Back to Top of Page

- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

- Read an informational text about pushes and pulls. Some options are listed in resources.
- Facilitate class discussion, using and formally defining scientific vocabulary (see below).
- Students work together (Turn and Talk) without direct instruction to respond to each of the prompts below.
    - As students respond to the prompt, generate a smart notebook page or anchor chart to track students' understanding of pushes and pulls.
    - Students should minimally understand that a push moves an object away from the person, and a pull draws an object toward a person.
        - Include arrows in the anchor chart depictions.
    - Students may start to bring in the concepts of force as they discuss their interactions with the stations. Force will be the focus of future lessons, but allow the students to share their ideas about how the strength of the push or pull influenced the action of the object.
    - Students should share the patterns they have identified for both pushes and pulls.
        - What does a push look like?
        - What does it mean to push something?
        - What does it mean to pull something?
        - What does it look like to pull something?
        - What does the word direction mean?
        - What direction is a push? Pull?

Resources:

- *Pushing and Pulling* by Natalie Hyde available on epic! Books
- *Give it a Push, Give it a Pull: A Look at Forces* by Jennifer Boothroyd available on epic! Books
    - More options available on epic! Books
- *Motion: Push and Pull, Fast and Slow* by Darlene R. Stille
- *Pushes and Pulls:* TIme for Kids by Sharon Coan
- *Force Makes Things Move* by Kimberly Brubaker Bradley & Paul Meisel
- *Push and Pull* by Patricia J. Murphy

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities

Back to Top of Page

- Uses recorded observations in explanations

Vocabulary: push, pull, force, position, motion

ELABORATE (Applications / Extensions)

Activity Description:

- Provide student groups with the *Card Sort Activity*. Ask the students to identify the actions in the pictures as pushes or pulls.
- Have students revisit their initial drawing of making objects move during play (engage/explore).
- Ask them if they think their drawing was in the correct place (under push sign or pull sign).
    - Find out if any of the students would want to move their drawings to a different area and have them explain their rationale for the change.
    - If no student wants to move their pictures, have them explain why their picture is placed correctly.
- You could also add a BOTH sign where students can move their images if BOTH PUSHES and PULLS are evident in their play action drawings.
- Have the students collect their drawings and ask them to add some science features to their pictures. Scientists use labels and zoom out boxes to help others understand the events that occur.
- Have the students add PUSH or PULL arrows and labels to their drawing.
    - Labels should be simply "PUSH" or "PULL". Students can practice writing the words push and pull using slide 1 prior to this activity. Sample drawing/science model.

Resources:

- Card Sort Activity
- Sample drawing/science model

Teacher Action(s):

- Expect the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC needs to be monitored throughout the learning sequence.

- ❏ **SEP:** *Analyzing and Interpreting Data*
- ❏ **DCI:** *PS2.A: Forces and Motion*
- ❏ **CCC:** *Patterns*

Summative Assessment Description(s)

- Student models and card sort results.

Optional Instructional Strategy

- Summary Table

Back to Top of Page

○ recommended to complete as a class
Additional Resources: ● G0K Unit Materials List ○ Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 2

Brief Description:
Students investigate and explore big and little forces. They begin to understand that different objects require different amounts of force to start or stop motion. Students engage in an interactive read-aloud that introduces the concepts of bigger/smaller pushes and pulls, faster/slower start and stop. Students play with toy cars to feel the differences in pushes and pulls necessary to start and stop different sized cars. Students also begin to understand that adding a push of the same direction to an object already in motion will increase the speed of the object. Students apply their new learning to their initial play actions (depicted in their drawings).

Suggested Pacing:
1.5 - 2 hrs

Lesson-Level Phenomenon/Design Problem:
Photo of parent and child on the swings. Do we need the same push to get each person moving?

Relationship to Anchoring Phenomena/Design Problem:
Students investigate and explore big and little forces while playing.

Learning Sequence Driving Question:
What happens when you change the force of a push or pull during play?

Student Expected Outcomes:

- Students will make observations of patterns in the natural world to understand how pushes and pulls can have different strengths, which causes objects to start, stop, speed up or slow down.
- Students will collaborate with peers to plan and conduct an investigation to understand how pushes and pulls can have different strengths, which causes objects to start, stop, speed up or slow down.
- Students will analyze data from tests of an object to understand how pushes and pulls can have different strengths, which causes objects to start, stop, speed up or slow down.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:

Planning and Carrying Out Investigations

- With guidance, plan and conduct an investigation in collaboration with peers.(K-PS2-1)

Analyzing and Interpreting Data

- Analyze data from tests of an object or tool to determine if it works as intended.(K-PS2-2) (K-2ETS1-3)
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1)

Disciplinary Core Ideas:

PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions.(K-PS2-1) (K-PS2-2)
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it.(K-PS2-1) (K-PS2-2)

PS2.B: Types of Interactions

- When objects touch or collide, they push on one another and can change motion.(K-PS2-1)

PS3.C: Relationship Between Energy and Forces

- A bigger push or pull makes things speed up or slow

Crosscutting Concepts:

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes.(K-PS2-1) (K-PS2-2)

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.(K-ESS2-1)

Back to Top of Page

	down more quickly. *(secondary)* (K-PS2-1)	

Related Performance Expectation(s) in this Unit:

- K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
  - [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.]
  - [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]
- K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*
  - [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.]
  - [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]

Possible Common Core State Standards Connections:

ELA/Literacy

- RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-PS2-2)
- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1)
- SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2)

Mathematics

- MP.2 Reason abstractly and quantitatively. (K-PS2-1)
- K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-PS2-1)
- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS2-1)

Prior Student Knowledge:

None can be assumed

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Share Slide #1 of the *Learning Sequence #2 Slideshow* to prompt student thinking and discussion.
- Ask the students to share their ideas about the pushes necessary to get the two different people moving on the swings. Below are some possible prompts to get the kids thinking. Students may not have appropriate vocabulary to express their ideas. For now, students can describe the force of a push/pull as BIG or LITTLE.
  - How are the pushes the same and how are they different?
  - If I pushed the two people with the same amount (force), would their motion be the same?
  - Ask the students to predict the motion of the two people if they have pushes of the same strength? Different strengths?
  - How would the strength of the pushes differ to achieve the same height on the swing?
  - Why would we have to change the strength of the push on the different people?
  - Are all pushes the same?
  - Why do pushes have to be different?

Back to Top of Page

- Show the students Slide #2 of *Learning Sequence #2 Slideshow* the image of the three cars. Ask the students to share their ideas about how the pushes would be different to make all of the cars travel the same distance. Students should provide a rationale for their ideas. Would all of the cars get the same push, would one car get a BIG push and another car get a little push? Make sure students provide an explanation of their thinking as they share their ideas.

Resources:

- Learning Sequence #2 Slideshow

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description: Race Day!

Activity #1 Two Identical Cars (or same size)

- Show Slides #3 and #4 of the *Learning Sequence #2 Slideshow*
- Provide each group with three toy cars (two identical cars and one car of a different size).
- Students explore how the strength of a push changes the motion of the two identical cars. Use the slides to prompt student investigation.
- Students play with the cars. Make sure students frame their investigations through the lens of cause and effect (a big push caused…).
- Optional experiment set up ideas:
    - Experiment 1-
        - Partner A: Put an object in motion (start)
        - Partner B: Put an object in motion (start)
    - Experiment 2-
        - Partner A: Put an object in motion with a smaller push
        - Partner B: Put an object in motion with a bigger push
- Students share their findings with the class and record their observations on an I Notice format.
    - How did the size of the push impact the motion of the object?
        - If students are inaccurate in their findings, do not fix at this point. Record the misconception and check the student's understanding AFTER the explain phase.

Activity #2 - Two Different Sized Cars

- Show Slide #5 of the *Learning Sequence #2 Slideshow*
- Students explore how the size of the object affects the distance/speed it travels.
- Students apply the same amount of force to both the large (needs to be heavier) and small car.
    - Make sure students frame their investigations through the lens of cause and effect the same push on the big car caused…).
- Students share their findings with the class and record their observations on an I Notice format.
    - How did the size of the car impact the motion of the object when the push force remained the same?
        - If students are inaccurate in their findings, do not fix at this point. Record the misconception and check the student's understanding AFTER the explain phase.
- Ask probing questions to redirect students' investigations
    - How can you make the object go faster or slower?
    - What happens when you push or pull harder? Or Softer?

Back to Top of Page

- What do you notice and/or wonder?
- Does this remind you of anything?
- What personal connections can you make?

- At the end of investigating, conduct a race with a few students using the same object.
- Identify the object that went the farthest-ask students to consider what made the object go that far.

Optional Activity:

- *Bring the students out to the playground .*
- *Visit the different pieces of playground equipment and have students change the strength of a push or a pull as they play with the equipment.*
- *You can choose to have all of the students make observations at one piece of equipment at a time or you can have the kids investigate on their own during a recess. Remind students of safe behaviors on the playground. While they are investigating the strength of pushes and pull they should not put one another in danger by adding excessive force.*
  - *Making the swings move: Big Push vs Little push*
  - *Making yourself move down the slide: Big Push vs Little push*
  - *Making a ball/merry-go-round move: Big Push vs Little push*

Resources:

- Learning Sequence #2 Slideshow

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

- Class discussion about Race Day observations and playground exploration (optional).
  - Ask students to recall Race Day activity
  - Facilitate class discussion, using Race Day Observations to guide discussions.
    - What happened when you pushed hard on your object?
    - What caused the object to move faster?
    - What happened when you pushed softly on your object?
    - What caused the object to move slower?
    - Is that what happened to everyone's object?
- Ask for student volunteers to model what happens when you push hard on an object.
- Ask for student volunteers to model what happens when you push softly on an object.
- We saw that heavier things needed a bigger push or pull to get moving
  - What other things can affect how strong a push or a pull needs to be to move an object?
- Interactive Read Aloud-*And Everyone Shouted, ¨Pull!¨* by Claire Llewellyn or *Newton and Me* by Lynne Mayer
  - As you read the text, call attention to science vocabulary (push, pull, force, etc.).
  - Help students to connect the happenings in the text to their play actions.

Back to Top of Page

- In the text the start motion and stop motion of the cart required extra force.
- Help students to understand that BOTH starting and stopping motion requires a force.
- Challenge the student groups to put an object in motion (start) and cause the object in motion to go faster without stopping the object first.

- Continuation from Race Day Activity - Experiment 3-
  - Partner A: Put an object in motion (start)
  - Partner B: Speed up the object that was put in motion by Partner A
  - Ask students "What do you think caused the object to move faster?"
- Continuation from Race Day Activity - Experiment 4-
  - Partner A: Stop the object that was put in motion by Partner B
  - Partner B: Put an object in motion (start)
  - Facilitate by asking a student to put an object in motion (start) and asking another student to cause the object in motion to stop.
  - Ask students "What do you think caused the object to stop?"

Resources:

- *And Everyone Shouted, ¨Pull!¨* by Claire Llewellyn
- *Newton and Me* by Lynne Mayer available on epic! Books

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: Push, Pull, Force, Hard, Soft, Fast, Slow, Farther, Shorter

ELABORATE (Applications / Extensions)

Activity Description:

- Share the Elaborate Slideshow and ask students to place the arrows on the pages that best match their relative pushes and pulls. (Car-BIG Push, Cart-Little Push, Horse Wagon-Big Pull, Child's Wagon-Little Pull)
  - All 4 images have to be shown together, without having two images at a time the students cannot compare the relative force needed!
- Students redraw a play action model (Slide #8 from Elaborate Slideshow) representing a push or a pull to START or STOP motion (it can be the same action the drew initially or it can be a new action if the child chooses so).
- Students write about the force they add to make the object START or STOP the motion on the line (because students have practiced BIG, LITTLE and PUSH, PULL) they will represent their force this way when they write.
  - You will need to hear verbal responses from students as they write and draw.
  - There is no relative action to compare the BIG and LITTLE too, you will have to draw out the relative nature through discussion.
- Ask students if they would redesignate their initial models as a push or a pull. You can also ask them to add more detail about the force (BIG, LITTLE), the action (START, STOP), direction of the motion (PUSH, PULL) necessary to make their play action occur.
- Students share their ideas in a Turn and Talk activity.
  - As the students debrief prompt deeper thinking by asking questions about patterns they

Back to Top of Page

noticed, cause and effect, etc.
    - Hold students accountable to using science words as they describe their play actions.

Resources:

- Elaborate Slideshow

Teacher Action(s):

- Expect the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring (Questioning / Discussion):

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC need to be monitored throughout the learning sequence:

- ❏ **SEP**: *Planning and Carrying Out Investigation; Analyzing and Interpreting Data*
- ❏ **DCI:** *PS2.A: Forces and Motion; PS2.B: Types of Interactions; PS3.C: relationship Between Energy and Forces*
- ❏ **CCC:** *Cause and Effect; Patterns*

Summative Assessment Description(s):

- Check for student understanding during classroom discussions and investigations. Hold students accountable to the use of appropriate academic vocabulary after the explain phase.
- Use the students' results from the Elaborate activity as a summative assessment of their understanding.

Optional Instructional Strategy

- Summary Table - recommended to complete as a class

Additional Resources:

- G0K Unit Materials List
    - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 3

Brief Description:
Students investigate the forces associated with collisions and predict the outcomes of different collisions. Student apply their understanding to describe pushes and pulls in play and predict the outcomes of play collisions. Students investigate with toy cars, and generic classroom items. Class data is collected and analyzed by the students. Students apply the crosscutting concepts of patterns and cause and effects to describe the outcomes of their crash investigations.

Suggested Pacing:
1.5 - 2 hrs

Lesson-Level Phenomenon/Design Problem:
Crash Day! How do you change the direction of an object (collisions) using pushes and pulls?

Relationship to Anchoring Phenomena/Design Problem:
Students apply their understanding of pushes and pulls in play to predict the outcomes of collisions.

Learning Sequence Driving Question:
What happens when play objects crash into one another?

Student Expected Outcomes:

- Students will make observations and describe patterns in the natural world to understand how pushes and pulls can have different directions and can be affected by change of motion.
- Students will collaborate with peers to plan and conduct an investigation to understand how pushes and pulls can have different directions and can be affected by change of motion.
- Students will analyze data from tests of an object or tool to understand how pushes and pulls can have different directions and can be affected by change of motion.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:

Planning and Carrying Out Investigations

- With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1)

Analyzing and Interpreting Data

- Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2) (K-2ETS1-3)
- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1)

Asking Questions and Defining Problems

Disciplinary Core Ideas:

PS2.A: Forces and Motion

- Pushes and pulls can have different strengths and directions. (K-PS2-1) (K-PS2-2)
- Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1) (K-PS2-2)

PS2.B: Types of Interactions

- When objects touch or collide, they push on one another and can change motion. (K-PS2-1)

PS3.C: Relationship Between Energy and Forces

- A bigger push or pull makes things speed up or slow down more quickly.

Crosscutting Concepts:

Cause and Effect

- Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1) (K-PS2-2)

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)

Back to Top of Page

• Ask questions based on observations to find more information about the natural and/or designed world(s). • Define a simple problem that can be solved through the development	*(secondary)* (K-PS2-1) **ETS1.A: Defining Engineering Problems** • A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. *(secondary)* (K-PS2-2) • Asking questions, making observations, and gathering information are helpful in thinking about problems. • Before beginning to design a solution, it is important to clearly understand the problem.	

Related Performance Expectation(s) in this Bundle:

- K-PS2-1. Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
  - [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.]
  - [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]
- K-PS2-2. Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.*
  - [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.]
  - [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]
- K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

Possible Common Core State Standards Connections:

ELA/Literacy -

- RI.K.1 With prompting and support, ask and answer questions about key details in a text. (K-PS2-2)
- SL.K.3 Ask and answer questions in order to seek help, get information, or clarify something that is not understood. (K-PS2-2)
- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-PS2-1)

Mathematics -

- MP.2 Reason abstractly and quantitatively. (K-PS2-1)
- K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-PS2-1)

Back to Top of Page

- K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-PS2-1)

Prior Student Knowledge:
None can be assumed.

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Show the students the toy car *Collision Video* (the video stops at various points for questioning).
- Students make observations from the video and record their ideas on an *I Notice, I Wonder Template*.
- Ask students to pose a variety of questions about the slow motion video.
  - You may need to prompt them to think about force, pushes, and pulls.
  - Students should ask questions like: Why does the stopped (red) car move when the blue car hits it? Why did the blue car turn after hitting the red car? Why did the blue car spin around after it hit the red car?
- Get kids thinking about pushes, pulls and force in collisions. For now students will use the word crash, by the end of the sequence please hold students accountable to using the word collision.
- Show the students the paused image of the collision, and ask them to identify the push or the pull.
  - There is a pause in the edpuzzle to elicit student thought.
- After showing the video, students work in pairs to play with the toy cars to make their own collisions and to add to the class' I Notice, I Wonder chart. Possible interactions can include:
  - What happens when:
    - a moving object strikes a non-moving object?
    - two moving objects collide?
    - one car is moving fast and the other slow?
    - the cars collide but are moving perpendicular to one another?
- *Optional discussion: To build on the outdoor play experiences ask the students to share their experiences with sudden changes in motion as they have played on the playground. What caused those sudden changes? Think about the swings, have you ever bumped the side or another object, what happened?*

Resources:

- Video:
  - Collision Video YouTube (start the video at the 18-second time mark)
  - Collision Video edpuzzle
- I Notice, I Wonder Template

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:
Crash Day!

- Students work in small groups to test the effect of collisions on an object's motion/change in motion.
- Teacher provides each group with:

Back to Top of Page

    - 1 marble
    - 1 track (ruler with groove down center and books)
    - Objects for marble to collide with- books, folded paper, sponges, Legos, boxes, cotton balls, etc. (refer to slides 1 and 2 of the *Learning Sequence #3 Slideshow*)
- Have the students explore the actions and reactions associated with different collisions.
- Students make predictions and test their predictions.
- Students record their predictions and observations on slides 3 and 4 of the *Learning Sequence #3 Slideshow*.
    - Ask probing questions to redirect students' investigations:
        - How can you make the marble collide with the object?
        - What happens when you tilt the object in another direction?
        - What do you notice and/or wonder?
        - Does this remind you of anything?
        - What personal connections can you make?
    - Remind students to place the object the same distance away from their track to ensure accurate results (use a piece of tape to mark placement spot)

Resources:

- Learning Sequence #3 Slideshow

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

During this discussion, students focus on the two crosscutting concepts: Patterns and Cause and Effect.

- Students share ideas about what happened in the Explore activity.
    - Use the Crosscutting Concept Discussion Cards (the top portion of the cards is geared toward early elementary thinking) to help scaffold the discussion so that the students can share their ideas specifically to build a strong foundation for future grades.
- Teacher posts the last slide from the investigation, the class data page. As the students share their observations, record the data by coloring the boxes on the data sheet. Color one box per group that experiences the marble changing direction after striking the object.
- Ask the students to identify:
    - Which objects made the marble turn more?
    - Which object(s) did not make the object turn?
    - How were the objects that made the object turn the same? different?
    - How were the objects that DID NOT allow the marble to turn the same? different?
- Teacher uses the following guiding questions:
    - What things caused the marble to change direction? Which things did not?
    - What did you notice about the objects that caused the marble to change direction?
    - Do you think it would make a difference if we moved the object farther away from the end of the ramp?

Back to Top of Page

    - What if we rolled something bigger down the ramp? What if we rolled something like a bowling ball? Would any of these objects cause the bowling ball to change direction? What are some things that might be able to cause a bowling ball to change direction?
- Help students begin to understand that sometimes a push or a pull is not strong enough for the object to (visibly) change its motion. Collisions are pushes, some collisions are strong pushes, others are weak pushes. Some collisions cause objects to change their direction of motion, others will just make the object's speed change. Look at the data table you generated which collisions were strong (big) pushes, and which were weak (little) pushes?

Resources:

- Crosscutting Concept Discussion Cards
    - Crosscutting Concept Slides (Kindergarten Questions: Patterns and Cause and Effect)

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: collide, straight-line, direction, left, right, push, pull, strong, weak, turn, change direction, data, investigation

ELABORATE (Applications / Extensions)

Activity Description:

- Students generate their own investigations (Slides 7-9 of the *Learning Sequence #3 Slideshow*) using the marble (or alternate object) to test change in motion resulting from a collision.
- Students work in small groups and to decide on the items (from the classroom) that they would want to run the marble (or alternate object) into to see if the marble/alternate object changes direction.
- Students can change the objects at the bottom of the ramp or they can keep those objects consistent and change the object they roll down the ramp to a ping pong ball, tennis ball, etc.) The goal here is to have the KIDS decide what they want to investigate.
- Before testing, have the students make predictions. Have the students share their predictions with the class. Make sure the students provide a rationale for their prediction.
- Students test multiple times, after testing have students record their results on Slide #9.
- Prompt students to identify if their predictions were correct.
    - Let students know that having a correct prediction in science is not as important as explaining what happened in the final outcome or explaining why your prediction was correct or not.
- Students should identify patterns as the results are shared (i.e. heavier objects caused the object to change direction)
- Use Slide #10 to bring the discussion back to the playground.
- Students become Crash Test Engineers to investigate how collisions can be dangerous. Show the students Slide #11.
- As a class, students discuss the impending collision and ask questions and make observations about the situation.
- Ask students what they can design to reduce the effect of this possible collision? Students must be creative and use what they've learned to solve this problem.
- Student Turn and Talk with a neighbor to create a plan to reduce the effects of the collision.
- Students share their ideas with the class.

Back to Top of Page

Resources:
- Learning Sequence #3 Slideshow

Teacher Action(s):
- Expect the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations
- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):
- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC need to be monitored throughout the learning sequence:
- ❏ **SEP:** *Planning and Carrying Out Investigations; Analyzing and Interpreting Data; Asking Questions and Defining Problems*
- ❏ **DCI:** *PS2.A: Forces and Motion; PS2.B: Types of Interactions; PS3.C: Relationship Between Energy and Forces; ETS1.A: Defining Engineering Problems*
- ❏ **CCC:** *Cause and Effect; Patterns*

Summative Assessment Description(s)
- Student discussion and sharing from the two investigations

Optional Instructional Strategy
- Summary Table - recommended to complete as a class

Additional Resources:
- G0K Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

Learning Sequence 4

Brief Description:
Play can occur in many different locations both indoors and outdoors. This means that play can be impacted by weather. In this sequence, students look at wind as a force used to move play objects such as kites, pinwheels, sailboats, etc. Students review the monthly wind data to identify trends. Students define the different forces of wind-breeze, gust, etc. As play engineers students will design and test flying play objects. Students will define the roles of pushes, pulls and force strength in their design and test process.

Suggested Pacing:
- 1.5 - 2 hrs for the 5-Es
- 0.5 hrs for the Culminating Performance Task

Lesson-Level Phenomenon/Design Problem:
Playing with wind.

Relationship to Anchoring Phenomena/Design Problem:
Play can be impacted by weather.

Learning Sequence Driving Question:
How can weather make things move? Why do some play objects (toys) fly in the wind better than others?

Student Expected Outcomes:
- Students will make observations and describe patterns in the weather to understand how wind pushes and can have different directions and can change the motion or speed of an object.
- Students will collaborate with peers to plan and conduct an investigation to understand how wind pushes and can have different directions and can change the motion or speed of an object.
- Students will engineer objects/playthings that will fly in the wind.

CONNECTIONS TO STANDARDS

Three Dimensions Related to the Specific Learning Performance(s):

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Planning and Carrying Out Investigations • With guidance, plan and conduct an investigation in collaboration with peers. (K-PS2-1) **Analyzing and Interpreting Data** • Analyze data from tests of an object or tool to determine if it works as intended. (K-PS2-2) (K-2ETS1-3) • Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-ESS2-1) **Asking Questions and Defining**	**PS2.A: Forces and Motion** • Pushes and pulls can have different strengths and directions. (K-PS2-1) (K-PS2-2) • Pushing or pulling on an object can change the speed or direction of its motion and can start or stop it. (K-PS2-1) (K-PS2-2) **PS2.B: Types of Interactions** • When objects touch or collide, they push on one another and can change motion. (K-PS2-1) **ESS2.D: Weather and Climate** • Weather is the combination of sunlight, wind, snow or rain, and temperature in a	**Cause and Effect** • Simple tests can be designed to gather evidence to support or refute student ideas about causes. (K-PS2-1) (K-PS2-2) **Patterns** • Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (K-ESS2-1)

Back to Top of Page

Problems • Ask questions based on observations to find more information about the natural and/or designed world(s). • Define a simple problem that can be solved through the development of a new or improved object or tool.	particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. (K-ESS2-1) **ETS1.C: Optimizing the Design Solution** • Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2ETS1-3)	

Related Performance Expectation(s) in this Bundle:

- K-ESS2-1. Use and share observations of local weather conditions to describe patterns over time.
  - [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days vs cloudy days in different months.]
  - [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.]
- K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Possible Common Core State Standards Connections:

ELA/Literacy -

- W.K.7 Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-ESS2-1)
- W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-3)
- W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (K-2-ETS1-3)

Mathematics -

- MP.2 Reason abstractly and quantitatively. (K-ESS2-1)(K-2-ETS1-3)
- MP.4 Model with mathematics. (K-ESS2-1)(K-2-ETS1-3)
- K.CC.A Know number names and the count sequence. (K-ESS2-1)
- K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object. (K-ESS2-1)
- K.MD.B.3 Classify objects into given categories; count the number of objects in each category and sort the categories by count. (K-ESS2-1)
- MP.5 Use appropriate tools strategically. (K-2-ETS1-3)
- 2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-3)

Prior Student Knowledge:

None can be assumed.

Possible Preconceptions/Misconceptions:

Students may believe that:

- a kite can fly with or without wind

Back to Top of Page

LESSON PLAN – 5-E Model

ENGAGE (Opening Activity – Access Prior Learning / Stimulate Interest / Generate Questions)

Activity Description:

- Read the story, *Kite Day* by Will Hillenbrand, to activate prior knowledge about how weather/wind relates to pushes and pulls and how wind can cause motion in objects.
- Students discuss the pushes and pulls in the different scenes of the text.
    - Bear looks into the sky and exclaims "Kite day!
        - What does he observe about the weather? Why is that good for kite flying?
    - When the story says "The breeze grew into a gust"
        - What is the difference between a breeze and a gust? Why would a gust break the string of a kite?
    - What type of weather could the gusts of wind be a sign of? Should you fly a kite in inclement weather?
    - Where did you see pushing in the book? Where did you see pulling?
        - pushing the shovel into the ground
        - pulling the string of the kite
        - the wind pushing the kite
- Refer to Unit 2, Learning Sequence 2 Explore/Explain Part #1 to review data collected on when Bear goes out to play (Character weather tracker).
    - What months are the best months for flying a kite based on the weather data we have collected?
    - What type of wind do you think Bear needs to fly a kite?
    - What are the characteristics of a kite?
    - How does wind make a kite fly?
    - Are some months windier than others?
    - Are there any windy months you would not want to fly a kite?
    - What are some ways that weather can determine how we play?
- This sequence must be as much about the weather as it is about pushes and pulls. Helps students to understand that weather plays a role in how we play, where we play and the type of play we can engage in.

Resources:

- *Kite Day* by Will Hillenbrand on epic! Books
- Character Calendar template (U2 LS2 Explore/Explain - *Character Calendar Template*)

Teacher Action(s):

- Creates interest
- Generates curiosity
- Raises questions
- Elicits responses that uncover what the students know or think about the concept

Student Action(s):

- Asks questions such as, "Why did this happen?" "What do I already know about this?" "What can I find out about this?"
- Shows interest in the topic

EXPLORE (Lesson Description / Materials Needed / Probing or Clarifying Questions)

Activity Description:

- Students think about the characteristics of objects that are moved by the wind.
- Show the students a variety of objects: marker, tissue, straw, spoon, paper, wooden block, button, and pencil.
- Students make predictions on the *Student Activity Sheet* to identify which objects they think can be blown by the wind and which objects cannot be blown by the wind.

Back to Top of Page

- After students make their predictions, set-up fan in the classroom.
    - **Safety Note**: Do not allow students to touch or get within ONE foot of the fan.
    - Mark off a region where students cannot go related to the fan.
    - Set up the fan so there is a location to place objects in front of the fan to determine if the "wind" is able to move the object.
- Students now record the objects that the wind moved by circling them on the *Student Activity Sheet*.

Resources:

- Student Activity Sheet

Teacher Action(s):

- Encourages the students to work together without direct instruction from the teacher
- Observes and listens to the students as they interact
- Asks probing questions to redirect the students' investigations when necessary
- Provides time for the students to puzzle through problems
- Acts as a consultant for students

Student Action(s):

- Thinks freely, within the limits of the activity
- Test predictions and hypotheses
- Forms new predictions and hypotheses
- Tries alternatives and discusses them with others
- Records observations and ideas
- Suspends judgement

EXPLAIN (Concepts Explained / Vocabulary Defined)

Activity Description:

- Students discuss how the wind moved the object.
    - What patterns did you notice about all of the objects the wind was able to move?
    - How were these objects alike?
    - What objects did the wind not move?
    - Why do you think the wind could not push these objects?
    - Is the wind acting on these objects as a push or a pull? How do you know?
        - Helps students to think about the wind as a force. They can qualify (strong/weak) the strength of the force to help them understand the types of objects the winds can move.
        - Ask students to share their predictions and outcomes. Did anything surprise them?
        - Ask the students to share their ideas about different items that are designed to fly in the wind: kites, pinwheels, windsocks, leaves, sailboats, wind mill, etc.
- Engineering Design Task
    - Students design an object that can be pushed by the wind.
    - Provide students with a variety of arts and craft supplies; to differentiate include some materials that are heavier and will not fly well. It is important for students to think about not only the shape of their flying objects but the materials.
    - Students design and construct their own kites or pinwheels
        - Let the students know that not only will they design their kites, but they will test them using the classroom fan.
        - Before getting access to the supplies, have the students draw an initial model of their design on the *Engineering Design Task* handout. Engineering is about planning and thinking about how to achieve a goal.
        - Students will need to think about their designs PRIOR to constructing.

Back to Top of Page

        - Students can draw their ideas and label designs (a single letter label will suffice, i.e. P=paper).
    - Provide a forum for the students to share their designs and materials ideas with the class. You can also allow students to be a critical friend as those designs are shared.

Resources:

- Engineering Design Task

Teacher Action(s):

- Encourages the students to explain concepts and definitions in their own words
- Asks for justification (evidence) and clarification from students
- Formally provides definitions, explanations, and new labels
- Uses students' previous experiences as the basis for explaining concepts

Student Action(s):

- Explains possible solutions or answers to others
- Listens critically to others' explanations
- Questions others' explanations
- Listens to and tries to comprehend explanations the teacher offers
- Refers to previous activities
- Uses recorded observations in explanations

Vocabulary: prediction, improve , engineer, design, test, push, pull, strong, weak, wind, blow, gust, kite

ELABORATE (Applications / Extensions)

Activity Description:

Continue with the engineering design task.

- Once students have planned their designs, they construct and test their designs using the fan.
    - Keep the classroom fan set-up and blowing, so that as students complete their designs they can see if their designs "fly in the wind".
        - Just as in previous lessons, DO NOT ALLOW STUDENTS TO HAVE DIRECT CONTACT WITH THE FAN! Remind students they are NOT allowed to touch ANY part of the fan and they can only place their items on a specific location to test the design.
- Let the students know that engineers often fail in their early attempts and that they have to make adjustments to their designs to make them successful.
- Students modify their designs as needed if time allows
- Students test and share their ideas about why it worked or why it did not work.
    - To make the tests consistent consider placing an "X" or a square in tape on the table near the fan.
    - Have the students place their items there to see if the fan makes the item fly.
    - Students should describe how their objects work using appropriate vocabulary!
    - They should also share their ideas about the best days to bring their designs outdoors to test in the real wind.
- Because there is always more than one possible solution to a problem, it is useful to compare and test designs. Students discuss which designs performed the best in the given conditions and what design features were the most helpful.

Optional: On a windy day, allow students to bring their flying objects outside to further test their designs.

Teacher Action(s):

- Expect the students to use formal labels, definitions, and explanations provided previously
- Encourages the students to apply or extend the concepts and skills in new situations

Back to Top of Page

- Reminds the students of alternate explanations
- Refers the students to existing data and evidence and asks "What do you already know?", Why do you think…?

Student Action(s):

- Applies new labels, definitions, explanations, and skills in new but similar situations
- Uses previous information to ask questions, propose solutions, make decisions, and design experiments
- Draw reasonable conclusions from evidence
- Records observations and explanations
- Checks for understanding among peers

EVALUATE

Formative Monitoring Description(s) (Questioning / Discussion)

Formative monitoring will occur at various times throughout this learning sequence. Please note the following SEP, DCI and CCC need to be monitored throughout the learning sequence:

- ❏ **SEP:** *Planning and Carrying Out Investigations; Analyzing and Interpreting Data; Asking Questions and Defining Problems*
- ❏ **DCI:** *PS2.A: Forces and Motion; PS2.B: Types of Interactions; ESS2.D: Weather and Climate; ETS1.C: Optimizing the Design Solution*
- ❏ **CCC:** Cause and Effect; Patterns

Summative Assessment Description(s)

- Final engineering design explanation of how it worked (pushes, pulls, strong, weak) and what aspects of the design worked and which did not. Allow the students to share their thoughts about improving their designs.

Optional Instructional Strategy

- Summary Table - recommended to complete as a class

Culminating Performance Task:

Students will present their final wind propelled object to the class. Their presentation must include:

- The final model of their design - a drawing showing a push and pull with arrows.
- Highlight one modification they made based on their testing results.

Resources:

- Engineering Design Task

Additional Resources:

- G0K Unit Materials List
  - Click on specific tab for unit-specific materials

Back to Top of Page

BOARD OF EDUCATION
SOUTHINGTON, CONNECTICUT

Informational Only _____ Board Meeting Date January 27, 2022

Decision Requested **X** Agenda Code 9 d.

AGENDA REPORTING FORM

Agenda Topic: Review/Adoption of the 2022-2023 Board of Education Budget

Summary of Issue: The Superintendent presented the 2022-2023 Superintendent's Operating Budget at the January 13, 2022 regular Board of Education meeting. The Board of Education held budget workshops on January 18, 2022 and January 20, 2022 with Question and Answer follow-up to the Board members.

Background: If appropriate, the Board of Education will be asked to adopt their 2022-2023 budget at this meeting.

Alternative Strategies: N/A

Cost (if applicable): N/A **Funding Source:** N/A

Beginning Date of Program or Project: July 1, 2022

Ending Date of Program or Project: June 30, 2023

Recommendation or Comment: Recommend that the Board of Education adopt the 2022-2023 Operating Budget.

Jennifer Mellott

Signature of Staff Member Submitting Report

Steven Madaras

Signature of Superintendent of Schools