FLINN SCIENTIFIC

REMOTE & DISTANCE LEARNING FOR SCIENCE TEACHERS IN 2021

AN OVERVIEW OF SOME ‘BEST PRACTICES’ AND ESSENTIAL UNDERSTANDINGS NEEDED FOR BEING AN EFFECTIVE EDUCATOR - REMOTELY

Online
www.flinnsci.com
Email
flinn@flinnsci.com
Phone
1-800-452-1261
Fax
1-866-452-1436 (toll free)
Mail
Flinn Scientific, Inc.
P.O. Box 219, Batavia, IL
60510-0219

Remote Distance Learning—A whole new perspective in Science & STEM education

Mastering the transition from a traditional face-to-face instructional format to a blended, hybrid, or completely remote situation is difficult for both teachers and students. Our schools continue to serve essential roles in the communities they are built in for multiple reasons. The balance between keeping everyone safe, supporting teachers, and achieving educational goals is a delicate balancing act.

OVERVIEW OF THIS SESSION

Pedagogy of Distance Education

Technology in Distance Education

Tools for Remote Learning / Teaching

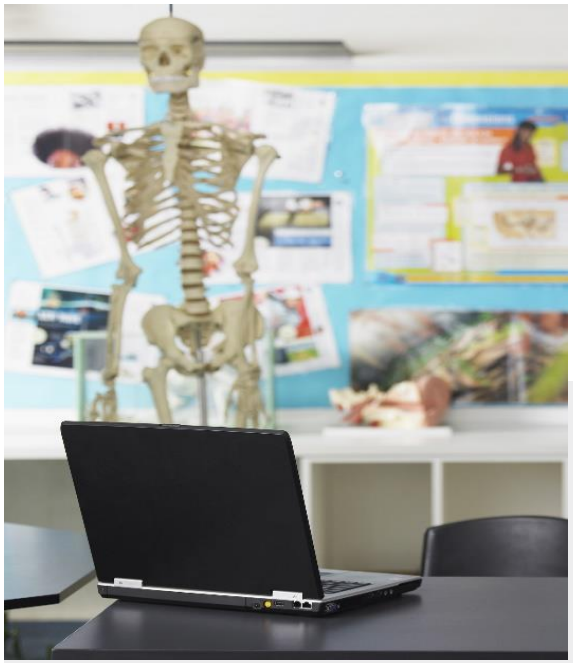
Planning & Scheduling for Success

Flinn Scientific is continuing its 44 year history of supporting teachers and administrators with the best and safest resources in order to be successful – regardless of the instructional modality.

Based on the evidence-based research and through recognized best-practices in the STEM and Science program areas, we are offering you this resource to help you plan for the continuity of learning of your students and their forward trajectory through post-secondary and/or workplace placements through the use of distance and remote learning modalities.

Full length Professional Learning opportunities on a wide-range of subjects are available from FLINN on-demand and on request. Contact us today to discuss your unique needs!

*These materials contain content provided by third parties and are being distributed for your convenience only. We make no representations about the accuracy of these materials and urge you to consult federal, state, and local public health guidelines.



Online
www.flinnsci.com

Email
flinn@flinnsci.com

Phone
1-800-452-1261

Fax
1-866-452-1436 (toll free)

Mail
Flinn Scientific, Inc.
P.O. Box 219, Batavia, IL
60510-0219

Leading Education in 2021: Remote Teaching

ABOUT OUR PRESENTER, JACQUELINE MONTEITH:

Jacqueline began teaching high school in Northern Manitoba, Canada, after graduating from the University of Winnipeg. In 2012, she received her Master's Degree in Distance Education. In 2013, Jacqueline began her current position as a Science Instructional Coach with Frontier School Division. Her role is to teach and support teachers, and thus our youth, using a variety of methods across a massive geographical area. Jacqueline's 18 years of experience throughout the province, her degree in Distance Education, and her zest for thinking differently has created an ideal leader for 2020.

Jacqueline can also help support your organization, your school and your Division in both Science and Distance Education pedagogy. Please contact her directly to discuss your specific professional development needs at truenorthedmb@gmail.com.

*These materials contain content provided by third parties and are being distributed for your convenience only. We make no representations about the accuracy of these materials and urge you to consult federal, state, and local public health guidelines.

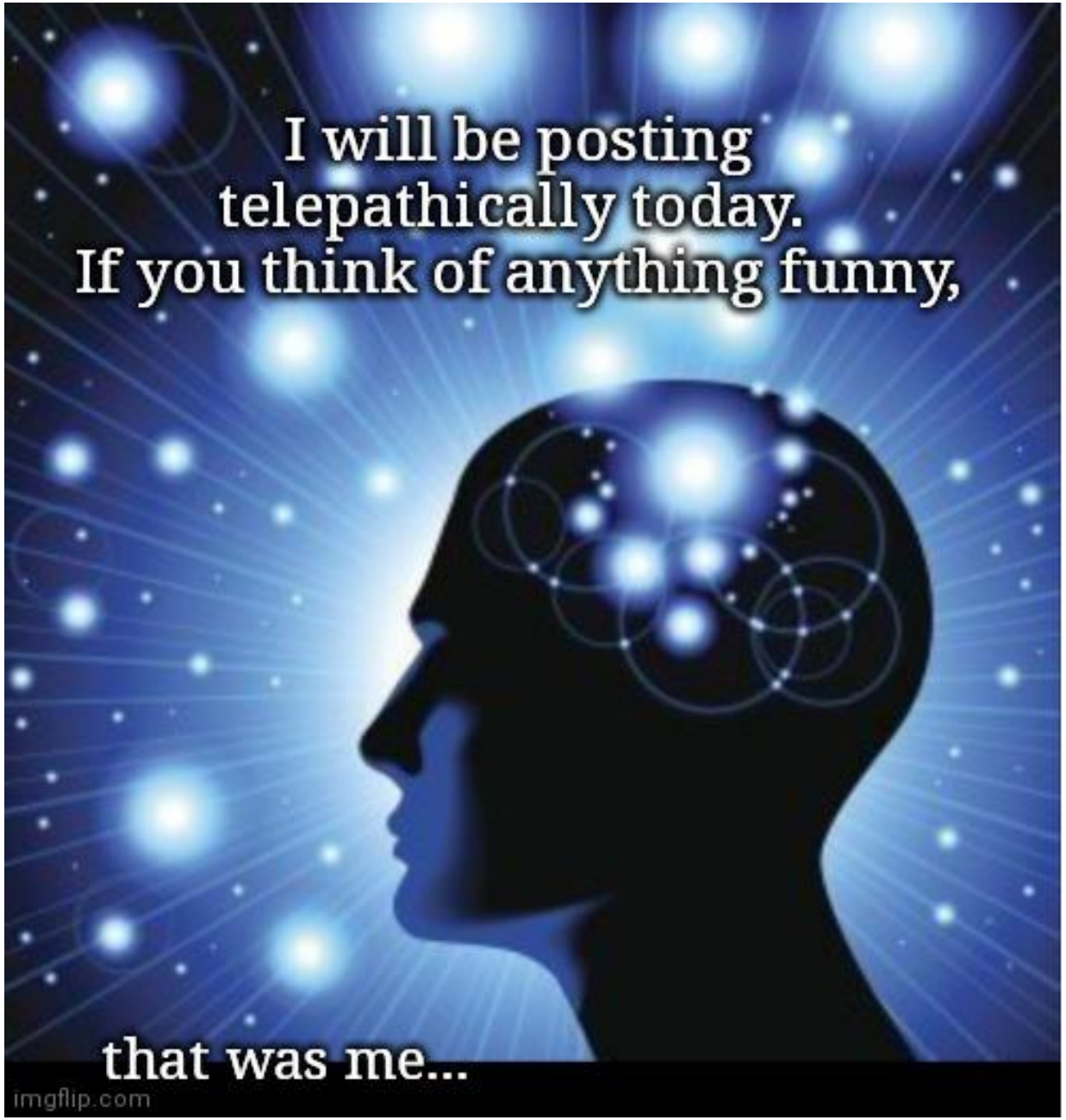
Groups

Variables

Experiments

Safety Measures

Minds


I will be posting
telepathically today.
If you think of anything funny,
that was me...
imgflip.com

Learning Intentions

Focus on what we can control:

- Pedagogy of Distance Education
- Patterns
- Professional Progress

Fundamental Truths

Learning relationships are key

Content relationships are key

Zoom fatigue is real: biopsychosocial effects

Keep tech options manageable

Students and families need support

Fundamental Truths

Celebration is an important part of relationship

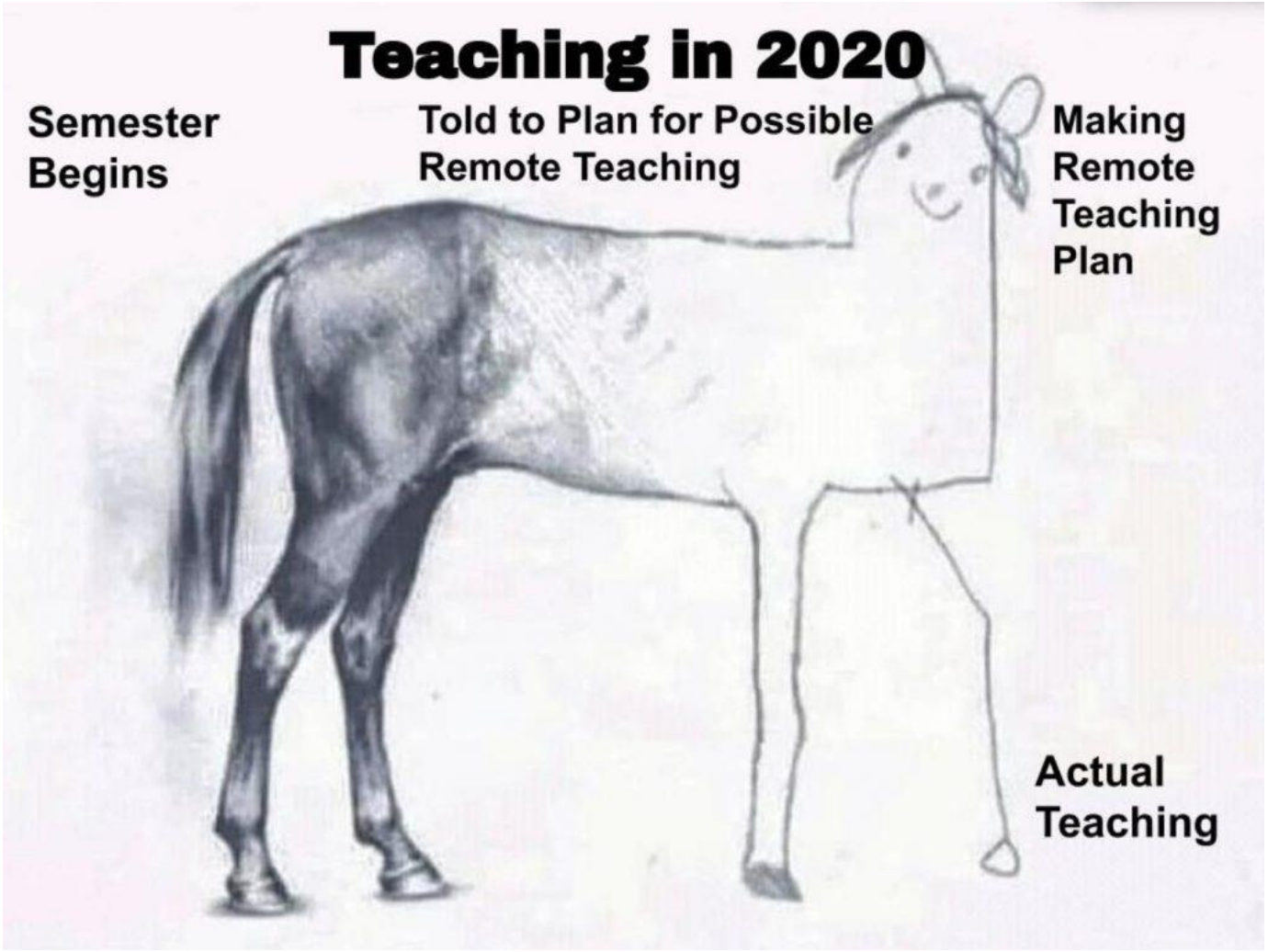
Teacher self care!!

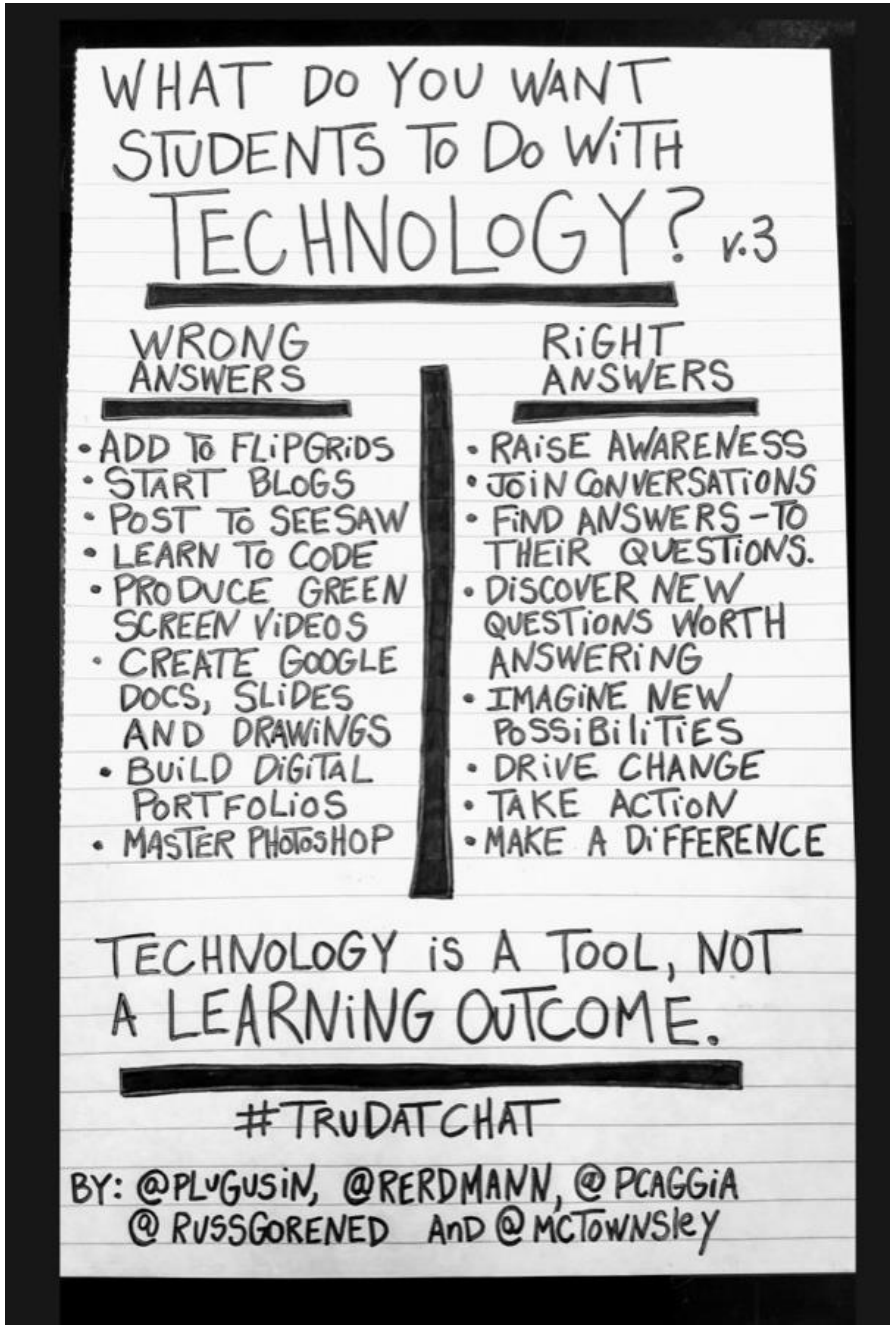
Tiger King was so bad it’s good

Avoiding a snapback

Emergency Teaching
vs
Distance Education

Approaches to Technology





Using technology can be beneficial when used thoughtfully and with a purpose.

Technology on its own is NOT the answer to the Distance/Remote teaching and learning challenges

Categories in Distance Ed Tech

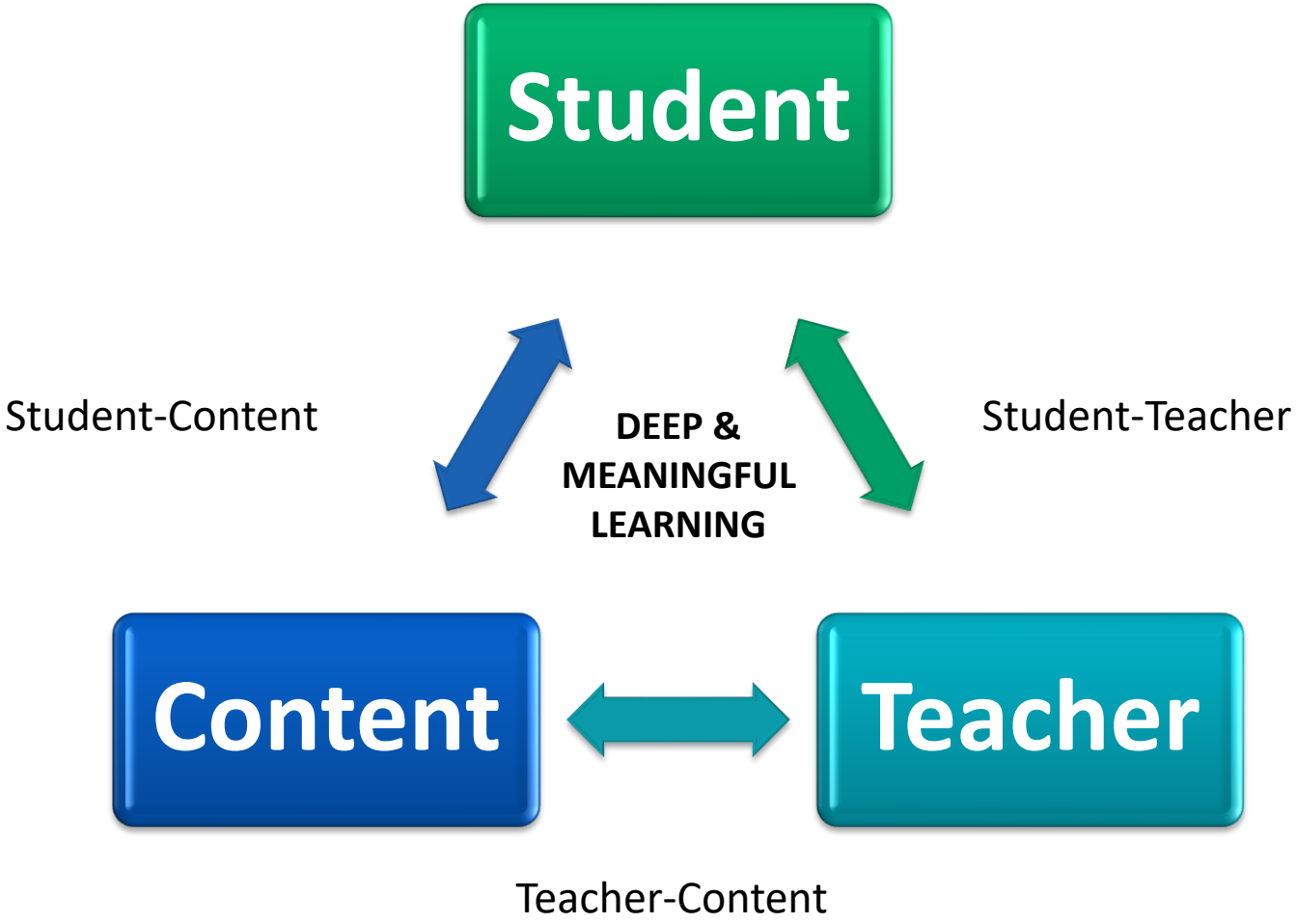
Parent & Family Messaging	Remind Teachers text reminders for students and parents	Talking Points Tool for supporting communication and engagement with families
Video Lesson Creation	Screencast-O-Matic Create and share high-quality screencasts	Edpuzzle Crop, customize, and remix online video content
Student Portfolios	Seesaw: The Learning Journal Versatile digital portfolio which using multimedia learning and communication.	Bulb Portfolio tool that has interesting features for teacher content creation.
Learning & Classroom Management	Edmodo Manage classes, content, and communication with social LMS platform.	Schoology LMS for digital classrooms.

Slideshows & Lesson Delivery	Nearpod Interactive slideshow tool engages students and promotes collaborations.	Pear Deck Interactive slideshows offer a variety of engagement and assessment methods
Lesson Planning	Common Curriculum Lesson planner allows collaborative planning and calendars.	Planboard One-stop digital lesson planner.
Communication & Discussion	Flipgrid Pose questions, spark thoughtful video responses to foster online discussions.	Parlay Comprehensive discussion platform to develop critical thinking skills.
Assessment & Feedback	Spiral Instant feedback with collaborative, multimedia assessment tools.	Kaizena Audio and text feedback in Google Docs.
Class Website Creation	Edublogs Platform for committed blogging and extended learning beyond the classroom.	Google Sites Make your own classroom website and/or student websites.

Teacher: Being a streamer or youtuber isnt a real job

Teachers now:

Modes of Interaction

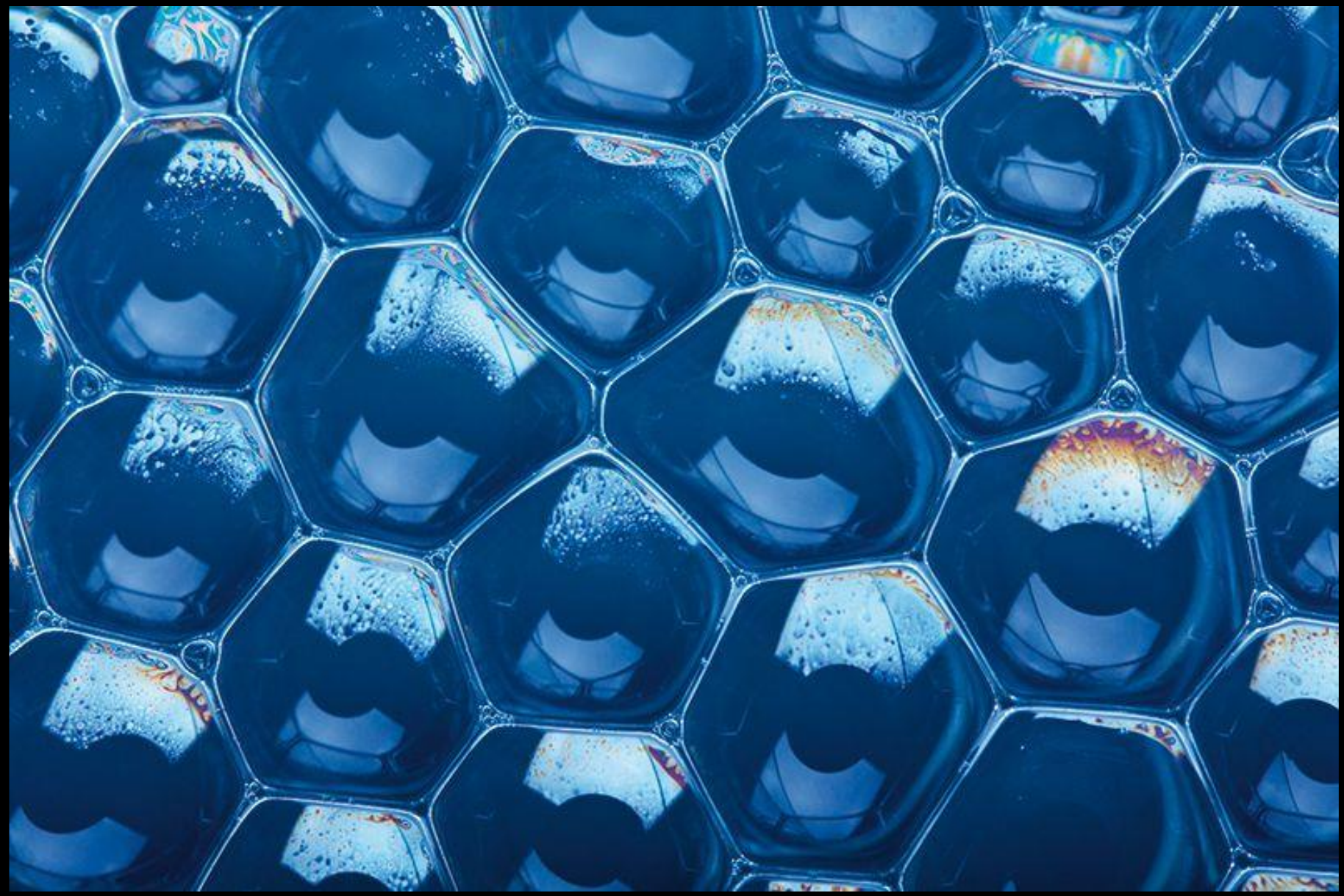


1. Anderson & Garrison, 1998

Seeking Patterns

When students seek patterns in the world around them, they see order instead of chaos which builds confidence in their understanding of how the world works and gives them greater control over it.

Barkman, 1998



Periodic Table of the Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H Hydrogen 1.01																	2 He Helium 4.00
3 Li Lithium 6.94	4 Be Beryllium 9.01											5 B Boron 10.81	6 C Carbon 12.01	7 N Nitrogen 14.01	8 O Oxygen 16.00	9 F Fluorine 19.00	10 Ne Neon 20.18
11 Na Sodium 22.99	12 Mg Magnesium 24.31											13 Al Aluminum 26.98	14 Si Silicon 28.09	15 P Phosphorus 30.97	16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.95
19 K Potassium 39.10	20 Ca Calcium 40.08	21 Sc Scandium 44.96	22 Ti Titanium 47.88	23 V Vanadium 50.94	24 Cr Chromium 51.99	25 Mn Manganese 54.94	26 Fe Iron 55.85	27 Co Cobalt 58.93	28 Ni Nickel 58.69	29 Cu Copper 63.55	30 Zn Zinc 65.38	31 Ga Gallium 69.72	32 Ge Germanium 72.63	33 As Arsenic 74.92	34 Se Selenium 78.97	35 Br Bromine 79.90	36 Kr Krypton 84.80
37 Rb Rubidium 85.47	38 Sr Strontium 87.62	39 Y Yttrium 88.91	40 Zr Zirconium 91.22	41 Nb Niobium 92.91	42 Mo Molybdenum 95.95	43 Tc Technetium 98.91	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.6	53 I Iodine 126.90	54 Xe Xenon 131.29
55 Cs Cesium 132.91	56 Ba Barium 137.33	57-71 Lanthanides	72 Hf Hafnium 178.49	73 Ta Tantalum 180.95	74 W Tungsten 183.85	75 Re Rhenium 186.21	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.20	83 Bi Bismuth 208.98	84 Po Polonium [208.98]	85 At Astatine 209.98	86 Rn Radon 222.02
87 Fr Francium 223.02	88 Ra Radium 226.03	89-103 Actinides	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [278]	110 Ds Darmstadtium [281]	111 Rg Roentgenium [280]	112 Cn Copernicium [285]	113 Nh Nihonium [286]	114 Fl Flerovium [289]	115 Mc Moscovium [289]	116 Lv Livermorium [293]	117 Ts Tennessine [294]	118 Og Oganesson [294]

57 La Lanthanum 138.91	58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium 144.91	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.06	71 Lu Lutetium 174.97
89 Ac Actinium 227.03	90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium 237.05	94 Pu Plutonium 244.06	95 Am Americium 243.06	96 Cm Curium 247.07	97 Bk Berkelium 247.07	98 Cf Californium 251.08	99 Es Einsteinium [254]	100 Fm Fermium 257.10	101 Md Mendelevium 258.10	102 No Nobelium 259.10	103 Lr Lawrencium [262]

Alkali Metal | Alkaline Earth | Transition Metal | Basic Metal | Metalloid | Nonmetal | Halogen | Noble Gas | Lanthanide | Actinide

© 2017 Todd Helmenstine
sciencenotes.org

Monday	Tuesday	Wednesday	Thursday	Friday
Whole Class: 1 hour direct teaching Small Groups & Individuals: 1 hour direct teaching	Whole Class: 1 hour direct teaching Small Groups & Individuals: 1 hour direct teaching	Whole Class: 1 hour direct teaching Small Groups & Individuals: 1 hour direct teaching	Whole Class: 1 hour direct teaching Small Groups & Individuals: 1 hour direct teaching	Student Catch Up Materials Exchange Office Hours
Students: I hour asynchronous work 1 hour experiential family activities	Students: I hour asynchronous work 1 hour experiential family activities	Students: I hour asynchronous work 1 hour experiential family activities	Students: I hour asynchronous work 1 hour experiential family activities	Students: I hour asynchronous work 1 hour experiential family activities

Student-Content Relationships

Humans are viewed as goal-directed agents

who actively seek information.

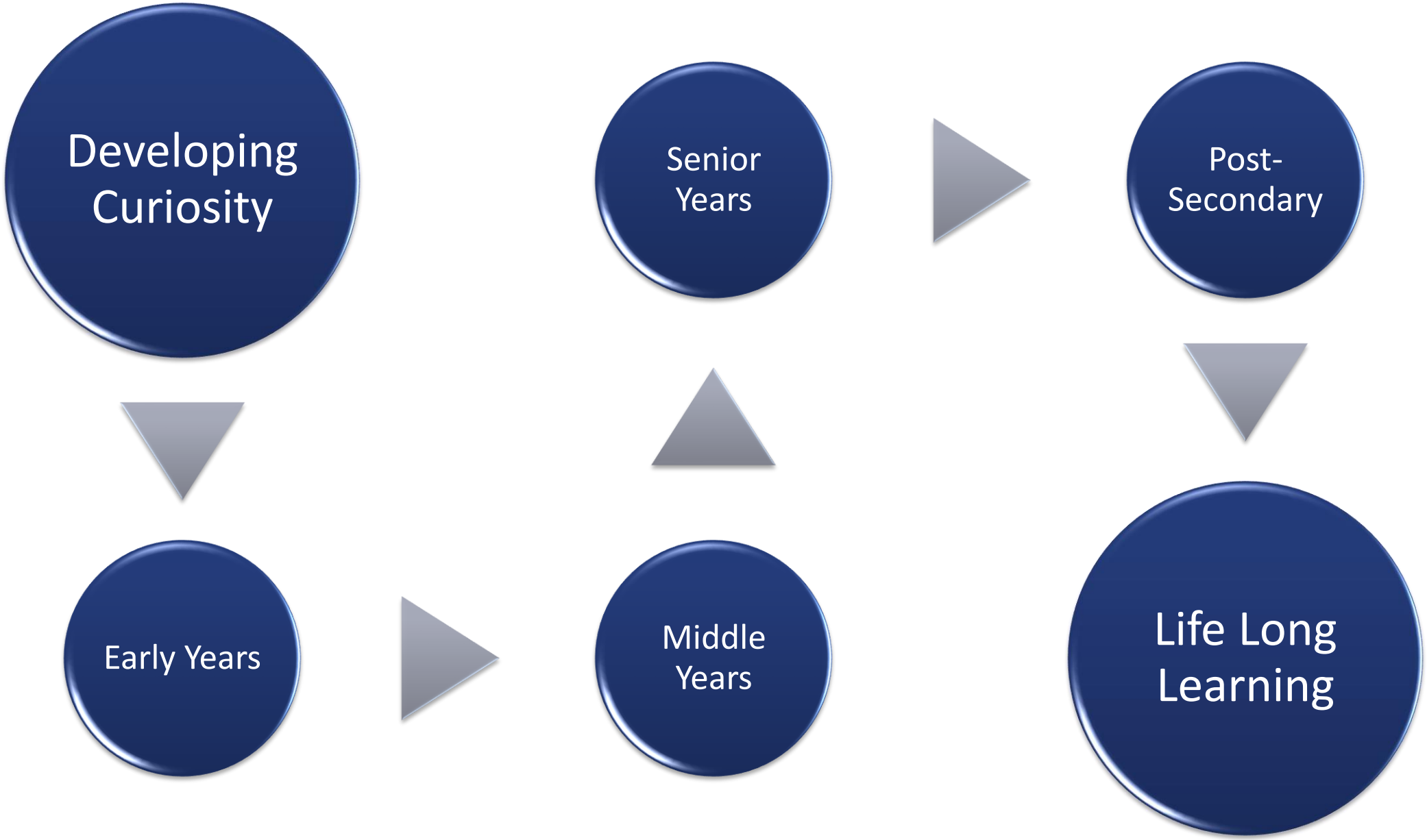
They come to formal education with a range of prior knowledge, stills, beliefs, and concepts that significantly influence what they notice about the environment and how they organize and interpret it.

National Research Council, 2000, p. 10

Skills

Concepts
(use two objects)

Student Progression



Strategies & Approaches

Classroom vs Distance: what is possible and what is not

Finding the most common elements for all students: experiences at home and in community

Community Classroom

Class

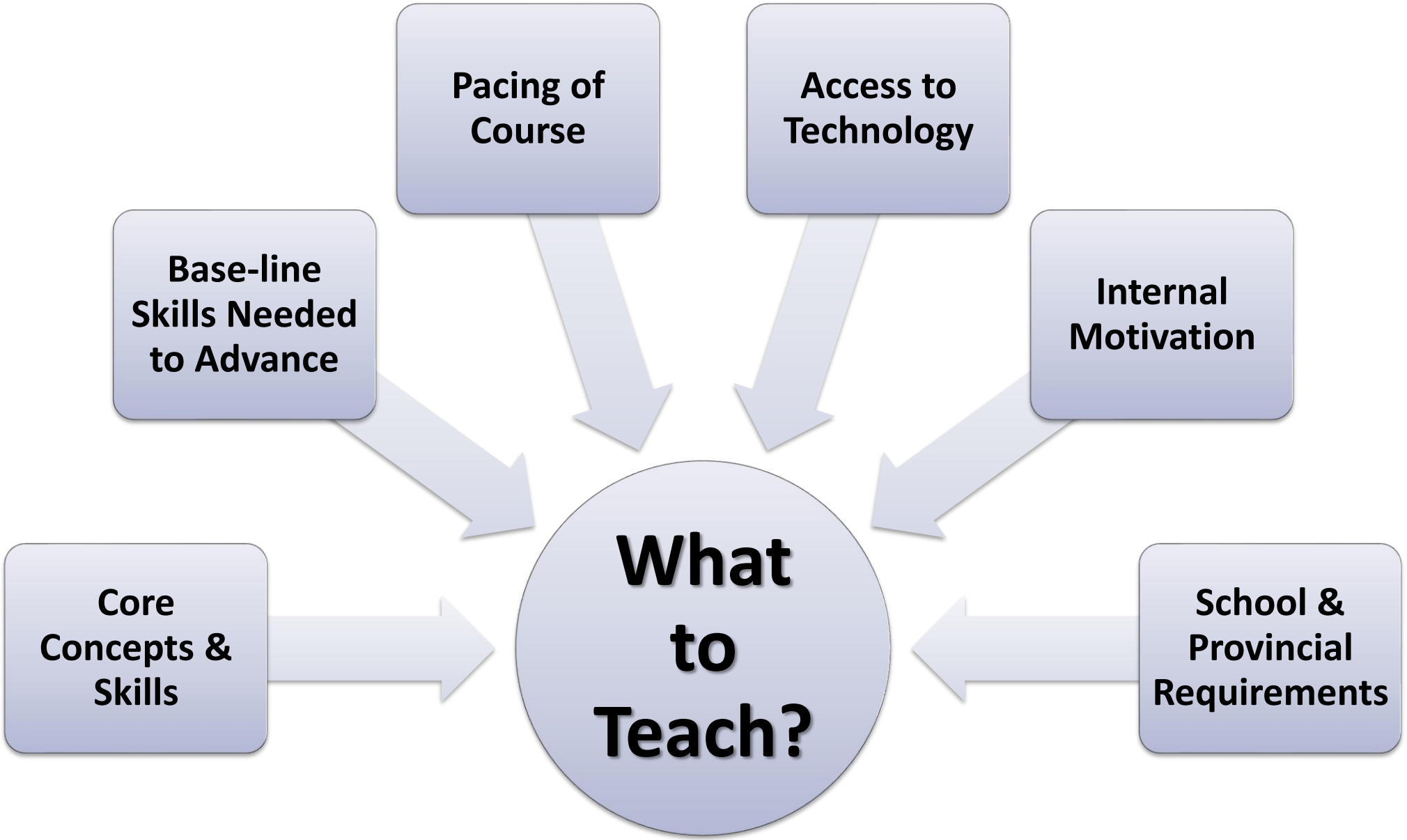
School

Homes

Community

Businesses

Culture


Pacing of Course
Access to Technology
Base-line Skills Needed to Advance
Internal Motivation
Core Concepts & Skills
What to Teach?
School & Provincial Requirements

Weekly Approach

Monday	Tuesday	Wednesday	Thursday	Friday
Central Experience	Cross-Curricular Skill Building	Cross-Curricular Skill Building	Cross- Curricular Skill Building	Reflection Assessment

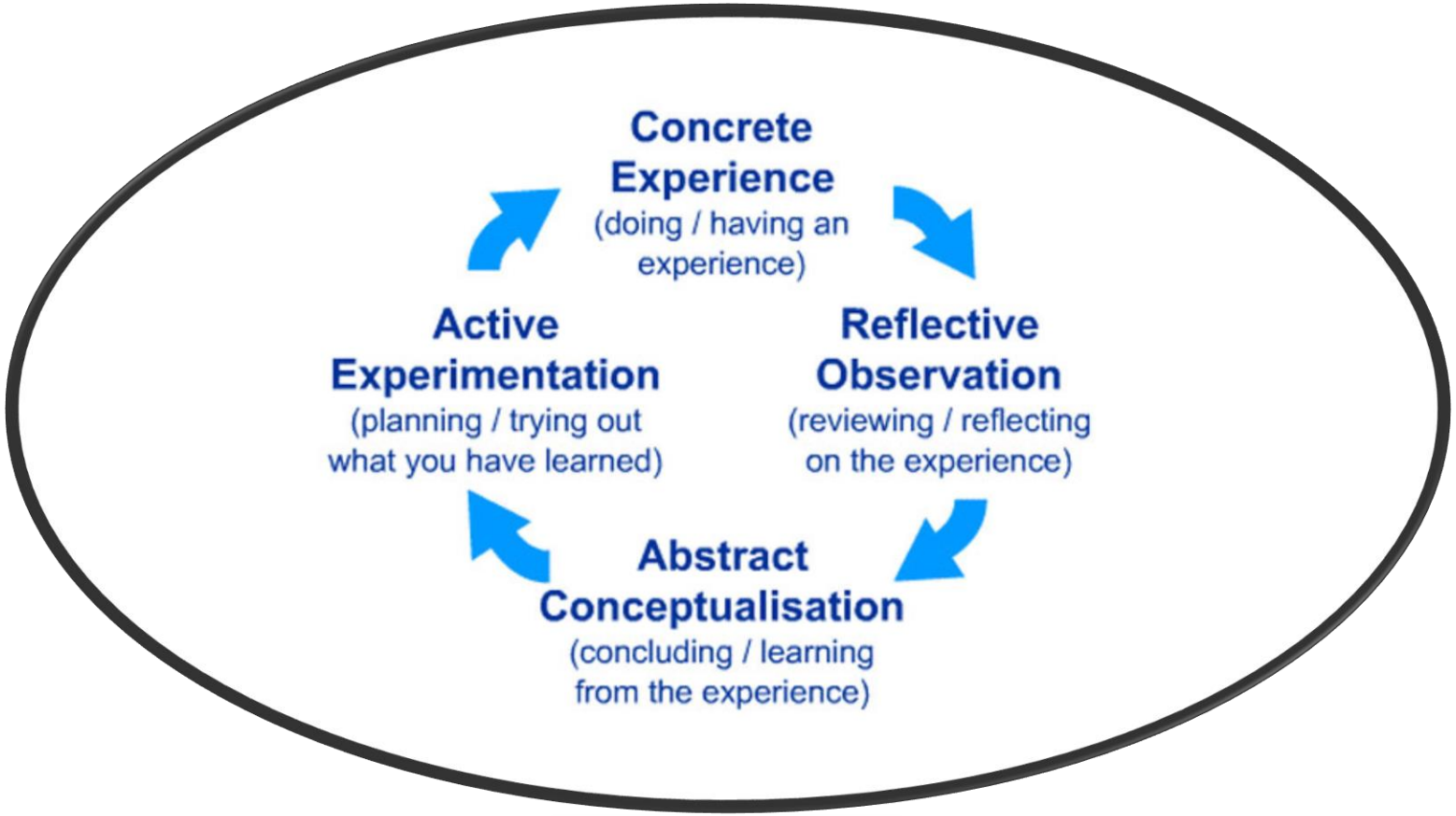
Monday

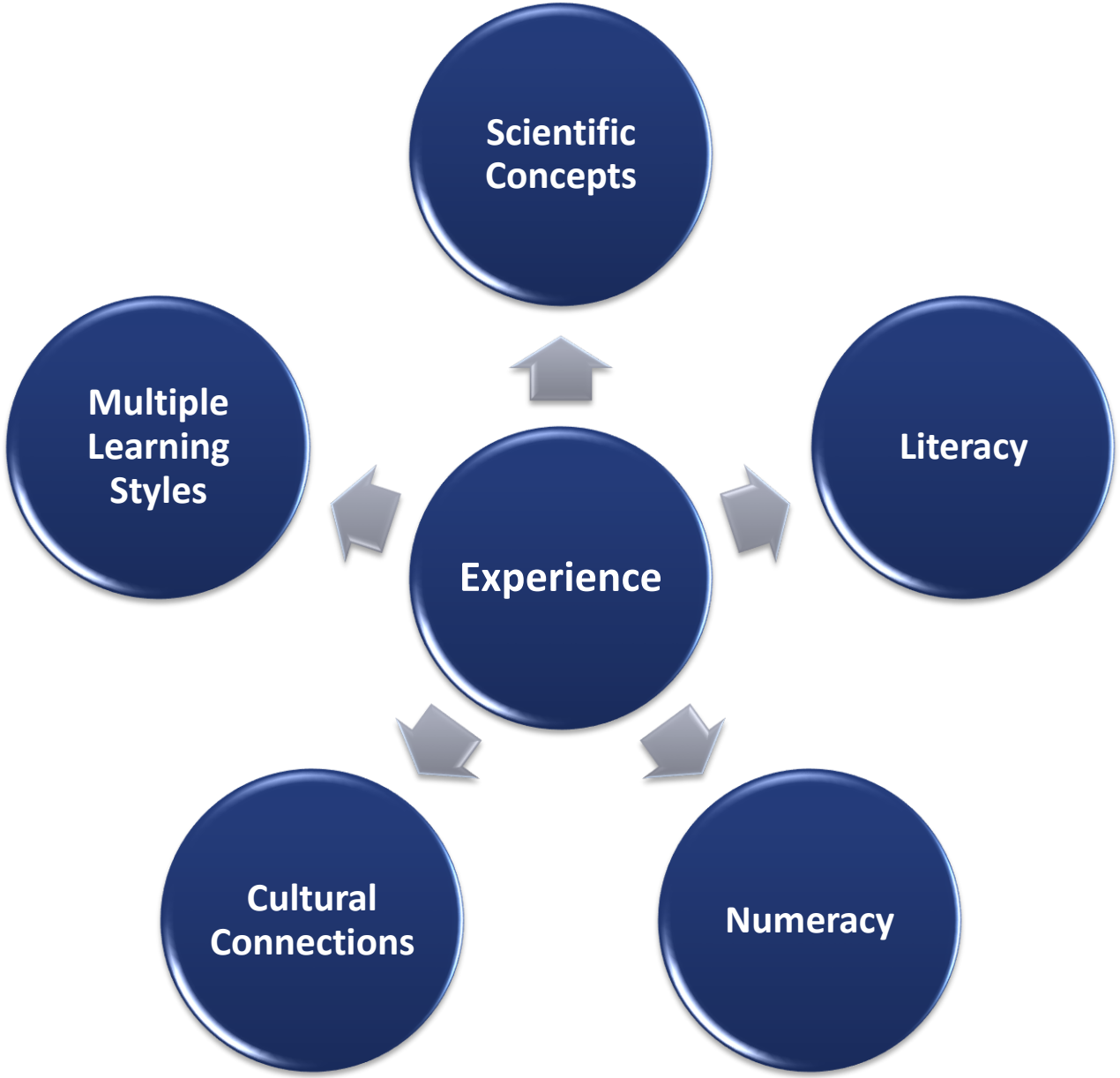
Tuesday	Wednesday	Thursday	Friday
Cross-Curricular Skill Building	Cross-Curricular Skill Building	Cross- Curricular Skill Building	Reflection Assessment

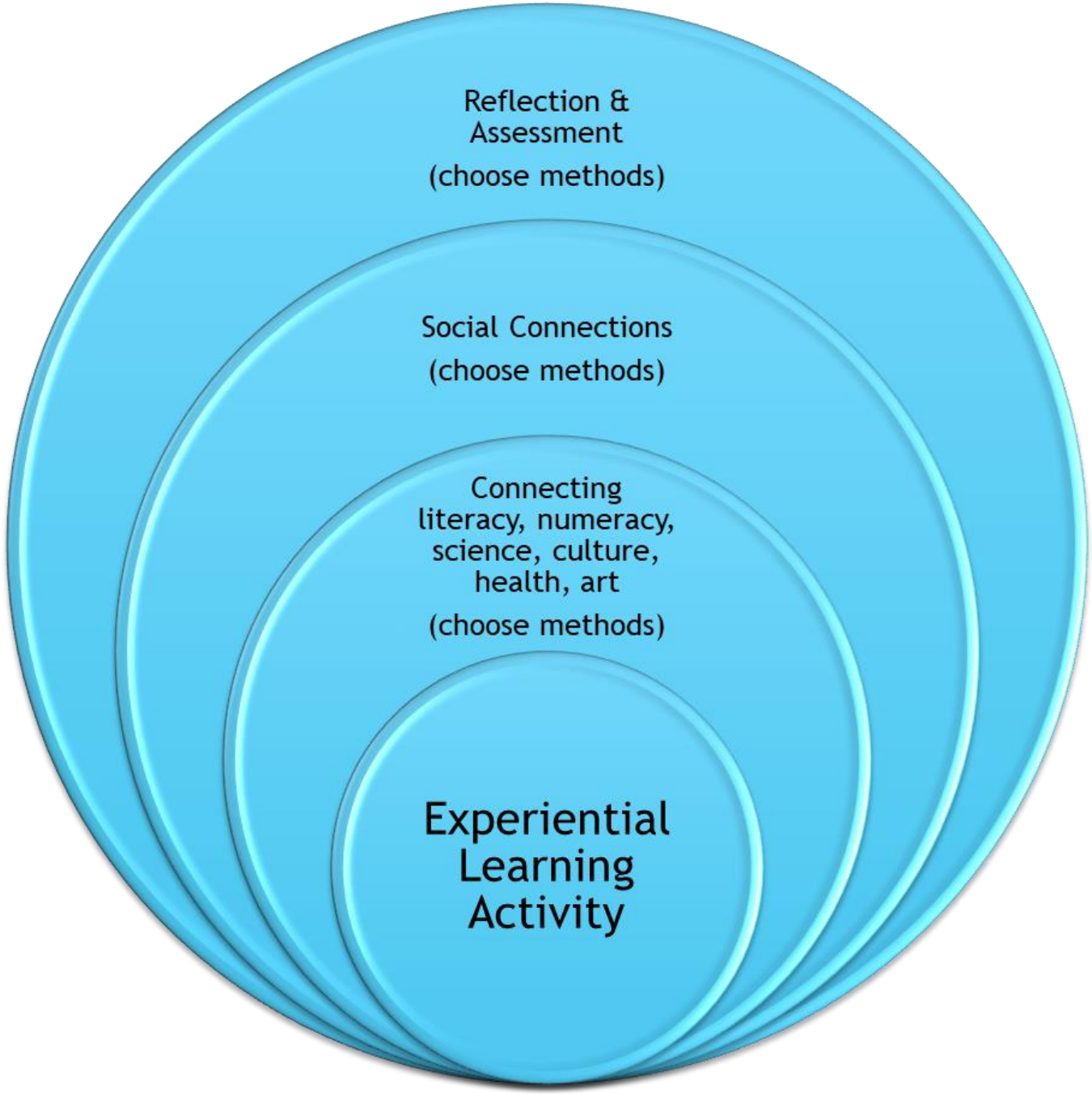
Central Experience

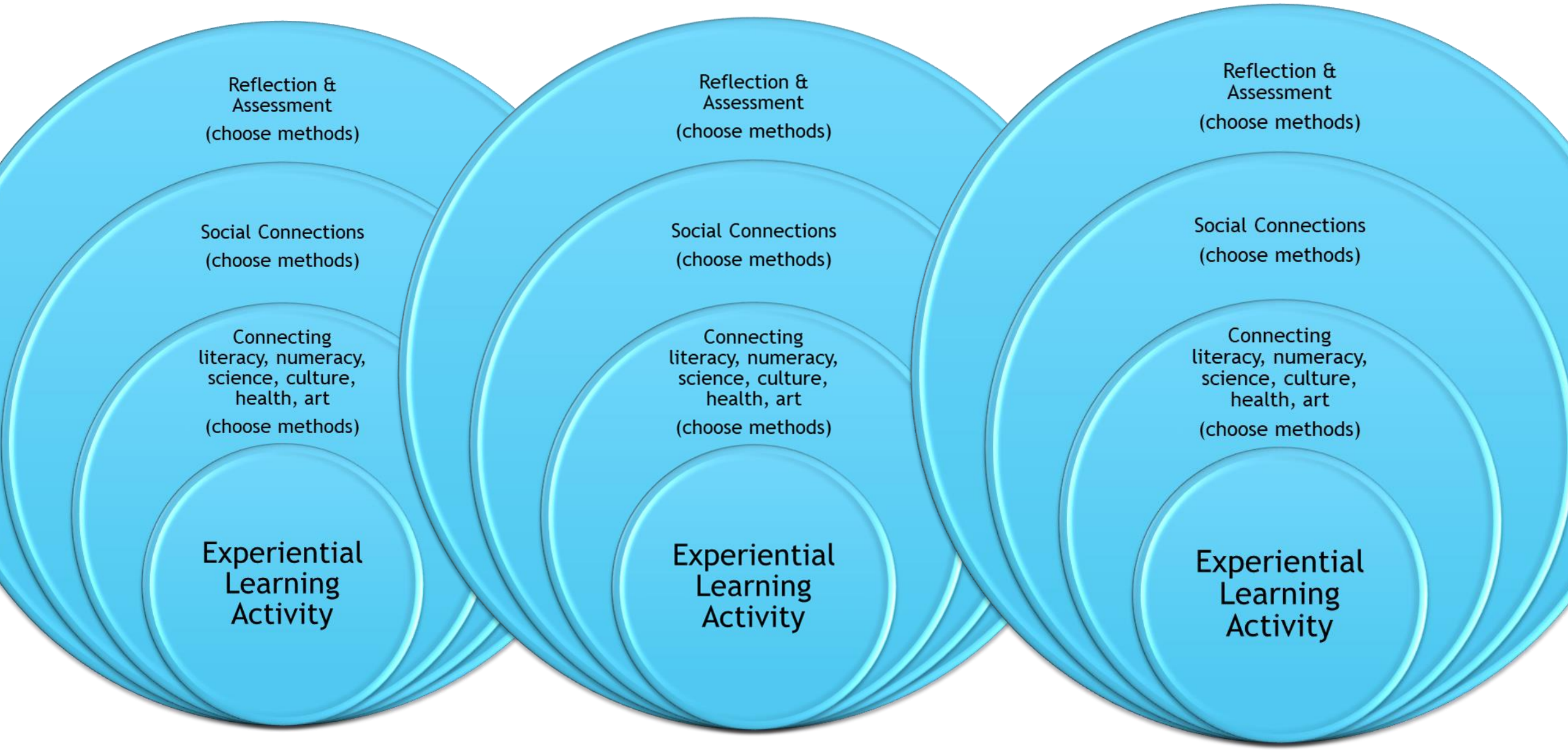
If 2020 was
a slide...

Kolb's Experiential Learning Cycle




Scientific Concepts
Literacy
Numeracy
Cultural Connections
Multiple Learning Styles
Experience


Reflection &
Assessment
(choose methods)
Social Connections
(choose methods)
Connecting
literacy, numeracy,
science, culture,
health, art
(choose methods)
Experiential
Learning
Activity


Reflection & Assessment
(choose methods)
Social Connections
(choose methods)
Connecting literacy, numeracy, science, culture, health, art
(choose methods)
Experiential Learning Activity
Reflection & Assessment
(choose methods)
Social Connections
(choose methods)
Connecting literacy, numeracy, science, culture, health, art
(choose methods)
Experiential Learning Activity
Reflection & Assessment
(choose methods)
Social Connections
(choose methods)
Connecting literacy, numeracy, science, culture, health, art
(choose methods)
Experiential Learning Activity

Grade 7

Cluster	Ideas
Interactions within Ecosystems	• Find And Discuss One-Way And Two-Way Relationships • Find Evidence Of Complex Change: Sprouting Seed, Cocoon, Etc. • Find Evidence Of Simpler Change: Decaying Plant Or Animal • Reinforce Needed Vocabulary With Specific Examples In A Natural Setting
Particle Theory of Matter	• Observe Allocations Made For Heating/Cooling In The Community: Tar In Sidewalk, Hydro Lines, Docks, Etc. • Collect Water Samples From Around The Community (Lake Areas, Pond, Tap, and Rain). Test Boiling Points, Discuss Results • Each Student Collects Snow in a Container. At Timed Intervals, Record Temperature. Create A Graph, Compare With Entire Class
Forces & Structures	• Visit A Structure In Your Community (Bridge, Dock). Identify How It Is Able To Withstand Natural Forces. Observe Any Effects Of Force Onto The Structure • Identify Static, Live, Dead And Dynamic Loads Around The School. Use A Bicycle To Demonstrate Some Concepts • Challenge Students to Design a Structure (Tallest Or Strongest) Using Only Natural Objects They Have Collected
Earth's Crust	• Collect Rocks and Minerals in the Community. Describe Using Observations On Lustre, Cleavage, Etc. • Near A Water Source, Find Evidence Of Erosion • Visit A Local Garden. Identify Soil Properties To Make That Garden Successful

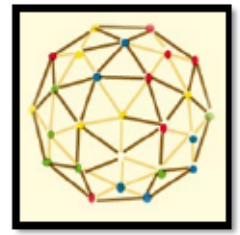
FRONTIER SCHOOL DIVISION

There's No Place Like Dome

SCIENCE • TECHNOLOGY • ENGINEERING • MATH

CHALLENGE

Build a geodesic dome.



Materials

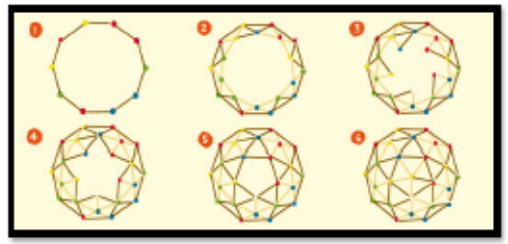
- 35 twigs or toothpicks that are 6.5 cm long
- 30 twigs or toothpicks that are 5 cm long
- Play-doh, clay, marshmallows, gumdrops, or other similar binding agent

Method

- Follow the steps in the diagram below.

Brown lines in the diagram represent longer sticks

Yellow lines in the diagram represent shorter sticks



Indigi-Tech

First Nations and Inuit have used dome shapes for different types of buildings. The dome was used because it is very strong, and can be built from materials found in nature, like wood or snow. Wood from an ash tree or willow tree can be bent easily to build a wigwam (Ojibway) or mikiwap (Cree) house. Inuit build igloos from snow that is hard-packed and place them in spirals to make the dome shape. Bull boats are an example of an upside-down dome that was used for crossing rivers.

Bark covered Mikiwap/Wigwam

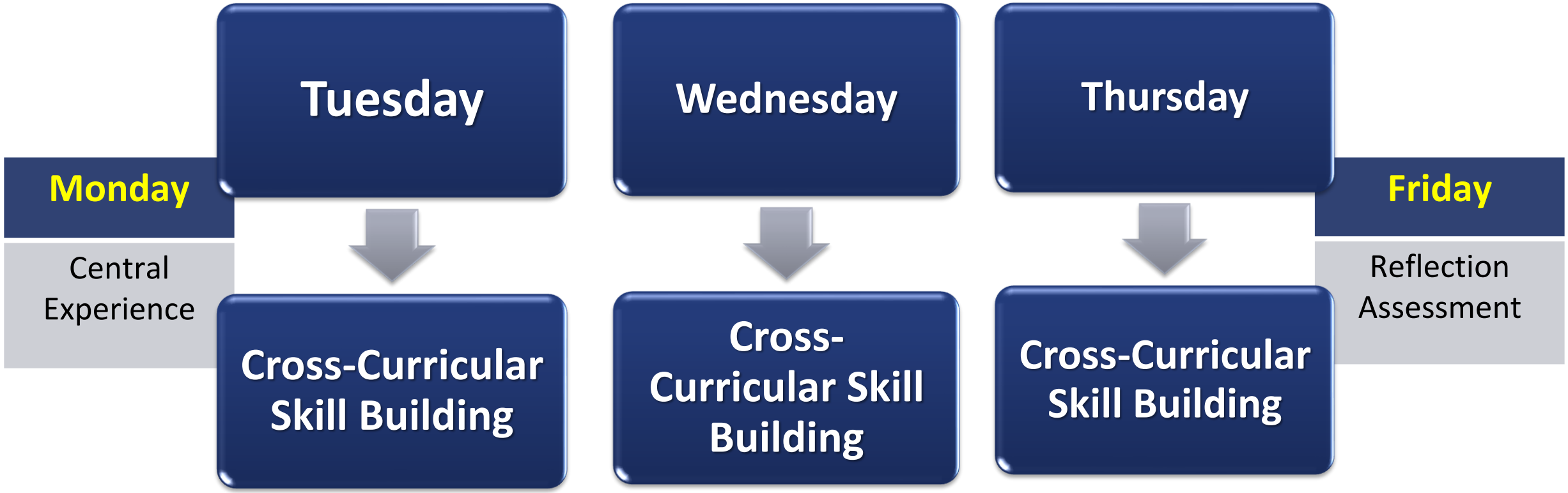
How it Works

Domes are very strong structures. Domes must be strong enough to withstand pressure from weight, wind, rain, and snow. The triangles in a geodesic dome are very stable. They help distribute any pressure throughout the dome.

Bio-Links

Spiders make strong and flexible webs with a different network shape: "radial" threads come out from the center, connected with "spiral" threads. This means that even if some threads break, the whole web stays together.

A collaborative effort between our FSD Science and Indigenous Way of Life departments, with thanks to Parks Canada


Monday
Central Experience
Tuesday
Cross-Curricular Skill Building
Wednesday
Cross-Curricular Skill Building
Thursday
Cross-Curricular Skill Building
Friday
Reflection Assessment

IF 2020 WAS A SWING

Figure 3 A framework for effective teaching

Tool	ACTIVATING	ESTABLISHING	DEEPENING	REFLECTING/ REVIEWING
Brainstorming	●		●	
Building and Testing Models (mathematical and physical) ◈	●	●	●	●
Case Studies		●	●	
Coding			●	
Designing Games			●	
Digital Simulations		●		
Discussions (small group to full class)	●	●	●	●

Tools for Experience:

Case Studies

Field Studies

Hands-On Activities

Hook

Ranking Tasks

Sharing Circle

Storytelling

Tools for Teaching

Total of 47 tools!

30 tools could work well with a Distance Education program

Tool: Interactive Lecture

Description	Teacher Actions
Short, 3-5 minute discussions followed by any interactive activity that requires students to do something with the content. Students generate relationships between ideas before continuing.	Map out key ideas that you want to address. Build a logical progression through those ideas. Pause often, and have students respond to questions or prompts to ensure internalization.
Strengths	**Alerts**
• Effective way of transmitting information • Students build an understanding based on logical progression of ideas	• Teachers can fall into traditional lecture without being interactive

Tool: Building & Testing Models

Description	Teacher Actions
Build a conceptual or physical model about an object, process, or concept. Test and evaluate the model with further observations, and modify as needed.	Challenge student ideas using Socratic Questioning. Add to ideas without doing the work of the model. Encourage scientific testing of the model.
Strengths	**Alerts**
• Learning becomes enduring when building own models rather than memorizing someone else's model. • Process of refining thinking. • Process of building and testing models is real science.	• Some students want clear-cut answers rather than a loose model. • Building and testing means taking risks. • May show lack of interest when model does not test well.

Tool: Interdisciplinary Projects

Description	Teacher Actions
Present students with a loosely defined topic or goal related to a real-world context. The full scope of the project requires students to combine curricular areas over a period of time.	Develop the scope of the task so students can accomplish it within a given time. Provide guidance for all subject areas, or work with additional teacher experts. Consider inviting an expert into your conversations.
Strengths	**Alerts**
• Students see relevance of learning with real-life contexts. • Allow students to dig deeply into a subject they are passionate about. • Learning is not subject-specific.	• Students can invest a lot of time without making progress. • Students need to value all parts of the project and subject areas.

Monday	Tuesday	Wednesday	Thursday
Central Experience	Cross-Curricular Skill Building	Cross-Curricular Skill Building	Cross-Curricular Skill Building

Friday

Reflection & Assessment

If 2020 was a bag of chips
Lay's
Orange Juice
& Toothpaste

Concepts

Skills

Assessment Best Practices

Clear outline of learning intentions

Clear outline of success criteria

Excessive use of formative assessment:

feedback drives learning!

Formative Assessment

To monitor student learning to provide ongoing feedback that can help students identify their strengths, and target areas that need work.

Use of qualitative, in-process feedback, and use results to take action.

Virtual Retellings
Responses to Questions
Practice Tests
Do’s and Don’ts of Concept or Skill
Explain What Matters: 2 sentences

Summative Assessment

Seeks to monitor educational outcomes, often for purposes of external accountability.

Use of quantitative measurements for an end-of-activity score.

Proctor shorter exams in live sessions

Expand repertoire of assessment formats: open book, untimed, collaborative

Google-less assessment

Progressive assessment

En.m.Wikipedia.org (2020)

Distance Learning Playbook (2020)

Tool: Building & Testing Models

Description	Teacher Actions
Build a conceptual or physical model about an object, process, or concept. Test and evaluate the model with further observations, and modify as needed.	Challenge student ideas using Socratic Questioning. Add to ideas without doing the work of the model. Encourage scientific testing of the model.
Strengths	**Alerts**
• Learning becomes enduring when building own models rather than memorizing someone else's model. • Process of refining thinking. • Process of building and testing models is real science.	• Some students want clear-cut answers rather than a loose model. • Building and testing means taking risks. • May show lack of interest when model does not test well.

Assessment

Students demonstrate their thinking as they discuss, test, and evaluate their own models.

Teachers may use highly guided inquiry the first few times so that students see the entire building and testing models process.

Formative Assessment?

Summative Assessment?

Tool: Interactive Lecture

Description	Teacher Actions
Short, 3-5 minute discussions followed by any interactive activity that requires students to do something with the content. Students generate relationships between ideas before continuing.	Map out key ideas that you want to address. Build a logical progression through those ideas. Pause often, and have students respond to questions or prompts to ensure internalization.
Strengths	**Alerts**
• Effective way of transmitting information • Students build an understanding based on logical progression of ideas	• Teachers can fall into traditional lecture without being interactive

Assessment:

Students demonstrate their thinking
as they respond to prompts or ask questions.

For students who need extra support,
provide an outline of key ideas before the lesson begins.

Formative Assessment?

Summative Assessment?

Tool: Interdisciplinary Projects

Description	Teacher Actions
Present students with a loosely defined topic or goal related to a real-world context. The full scope of the project requires students to combine curricular areas over a period of time.	Develop the scope of the task so students can accomplish it within a given time. Provide guidance for all subject areas, or work with additional teacher experts. Consider inviting an expert into your conversations.
Strengths	**Alerts**
• Students see relevance of learning with real-life contexts. • Allow students to dig deeply into a subject they are passionate about. • Learning is not subject-specific.	• Students can invest a lot of time without making progress. • Students need to value all parts of the project and subject areas.

Assessment:

Students are demonstrating their thinking through the connections they build by completing the project and presenting the final product.

Promote greater engagement by encouraging students to select their own topics and goals. Use a timeline of fixed check-in points.

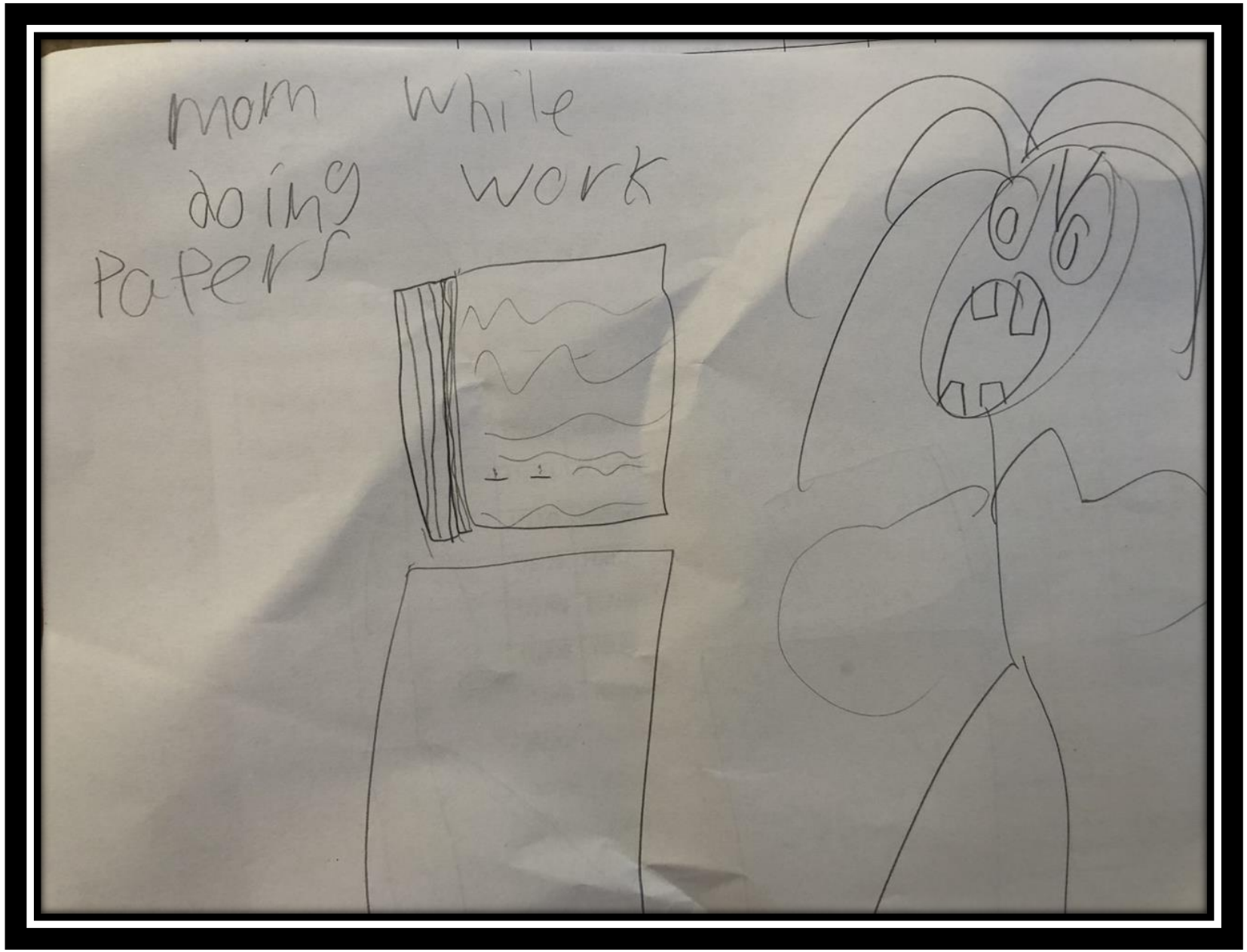
Formative Assessment?

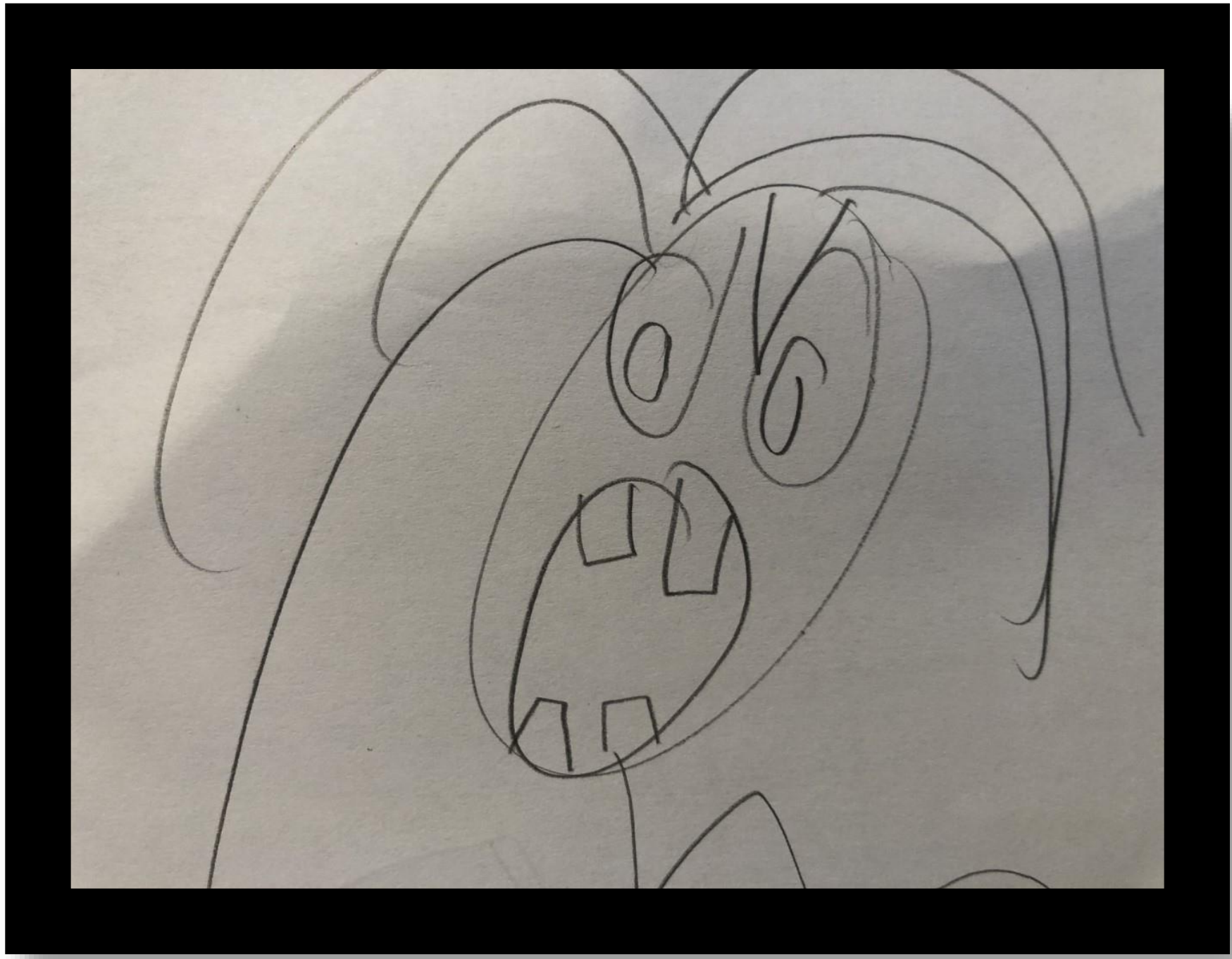
Summative Assessment?

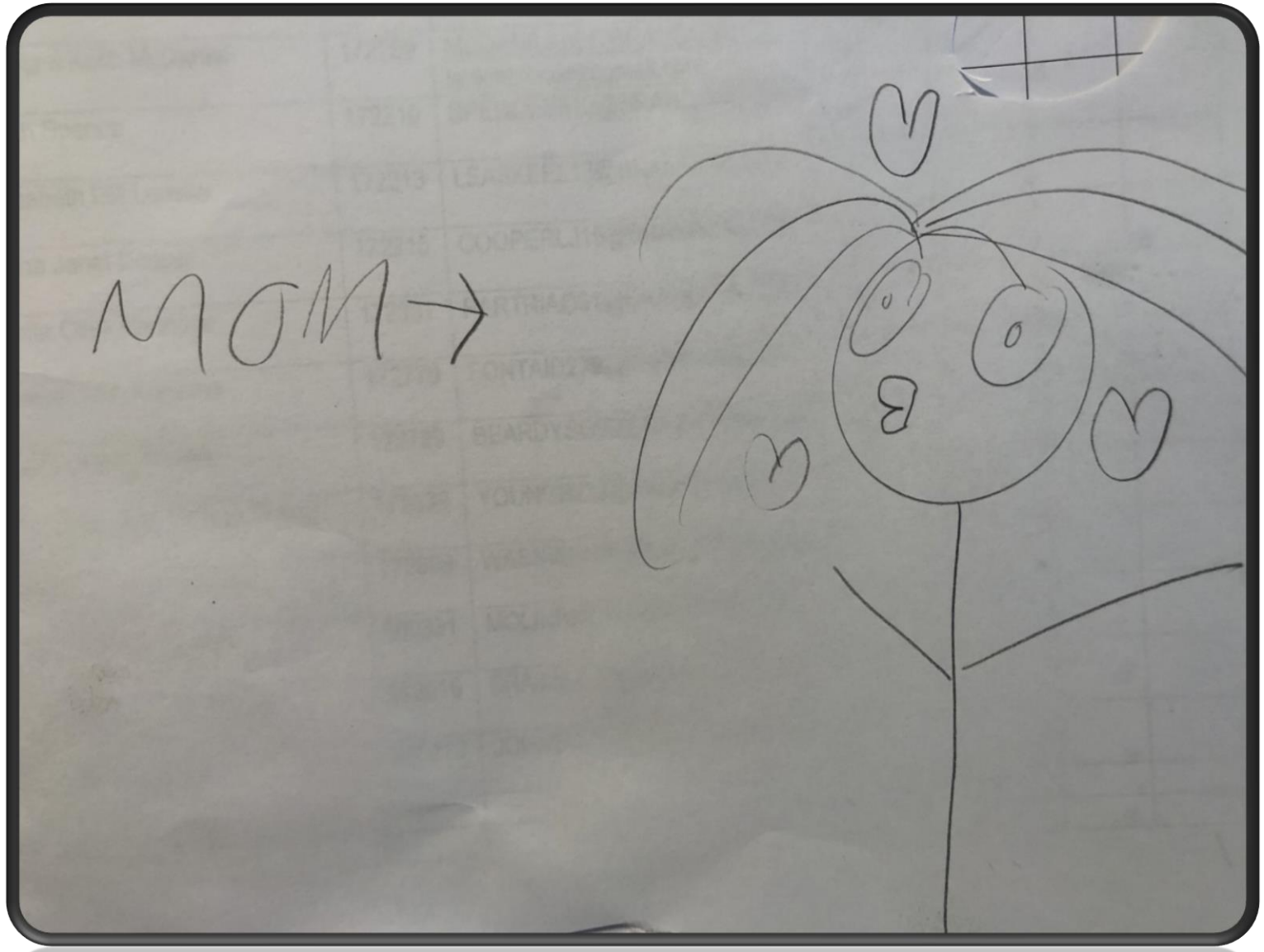
NORTH POLE
90N

Plan of Action

SO WHAT DOES THIS MEAN
FOR ME?


mom doing Papers
while work




MOM →

Monday	Tuesday	Wednesday	Thursday	Friday
Whole Class: 1 hour direct teaching Small Groups & Individuals: 1 hour direct teaching	Whole Class: 1 hour direct teaching Small Groups & Individuals: 1 hour direct teaching	Whole Class: 1 hour direct teaching Small Groups & Individuals: 1 hour direct teaching	Whole Class: 1 hour direct teaching Small Groups & Individuals: 1 hour direct teaching	Student Catch Up Materials Exchange Office Hours
Students: I hour asynchronous work 1 hour experiential family activities	Students: I hour asynchronous work 1 hour experiential family activities	Students: I hour asynchronous work 1 hour experiential family activities	Students: I hour asynchronous work 1 hour experiential family activities	Students: I hour asynchronous work 1 hour experiential family activities

Daily Teacher Schedule

One hour whole-class

One hour small groups

One hour individual help

2-3 hours office, prep & additional needs

Daily Student Schedule

One hour whole-class

Up to one hour small groups

1-2 hours independent work time

One hour family-based experiential activities

Teachers need 2-3 times more planning time than synchronous teaching time

WHY??

Purposeful planning which focuses on learning relationships

Using Maslow's to get to Bloom's

Preparing all pre-delivered activity packages

Preparing for whole-group connecting time

Preparing for small-group & individual connecting time

WHY??

Learning new technology features to enhance their practice

Outreach to families

Open office hours

Assessment and evaluation from a distance

Secondary Scheduling Options

Option 1: 1-2 subject blocks of time

Option 2: One subject per day
(all work can be completed that day)

Maximum 1 hour whole-class teaching

Maximum 1 hour small group/individuals

Approximately 1-2 hours independent work time

1 hour family-based experiential activities

Mystery Schedule Considerations

Consider planning from a Distance Ed standpoint for the remainder of school year

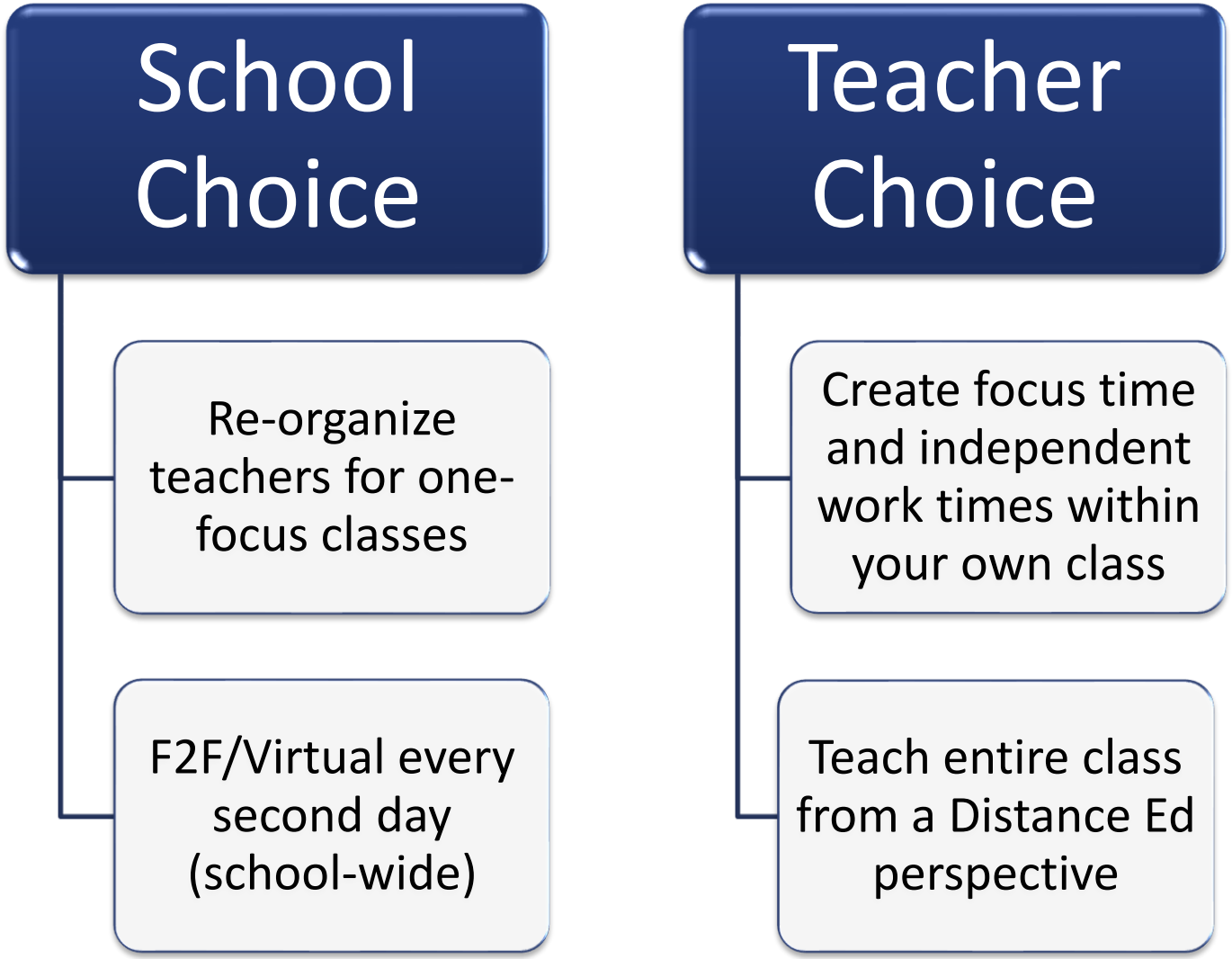
(can transfer to face-to-face much easier)

Consider longer Distance Ed periods of time

For example:

Monthly re-entry points after any school or cohort shut-down

Hybrid Teaching



What does this mean for me?

1. Focus on your peer,
student, & family **RELATIONSHIP**

2. Identify what we can and cannot **CONTROL**

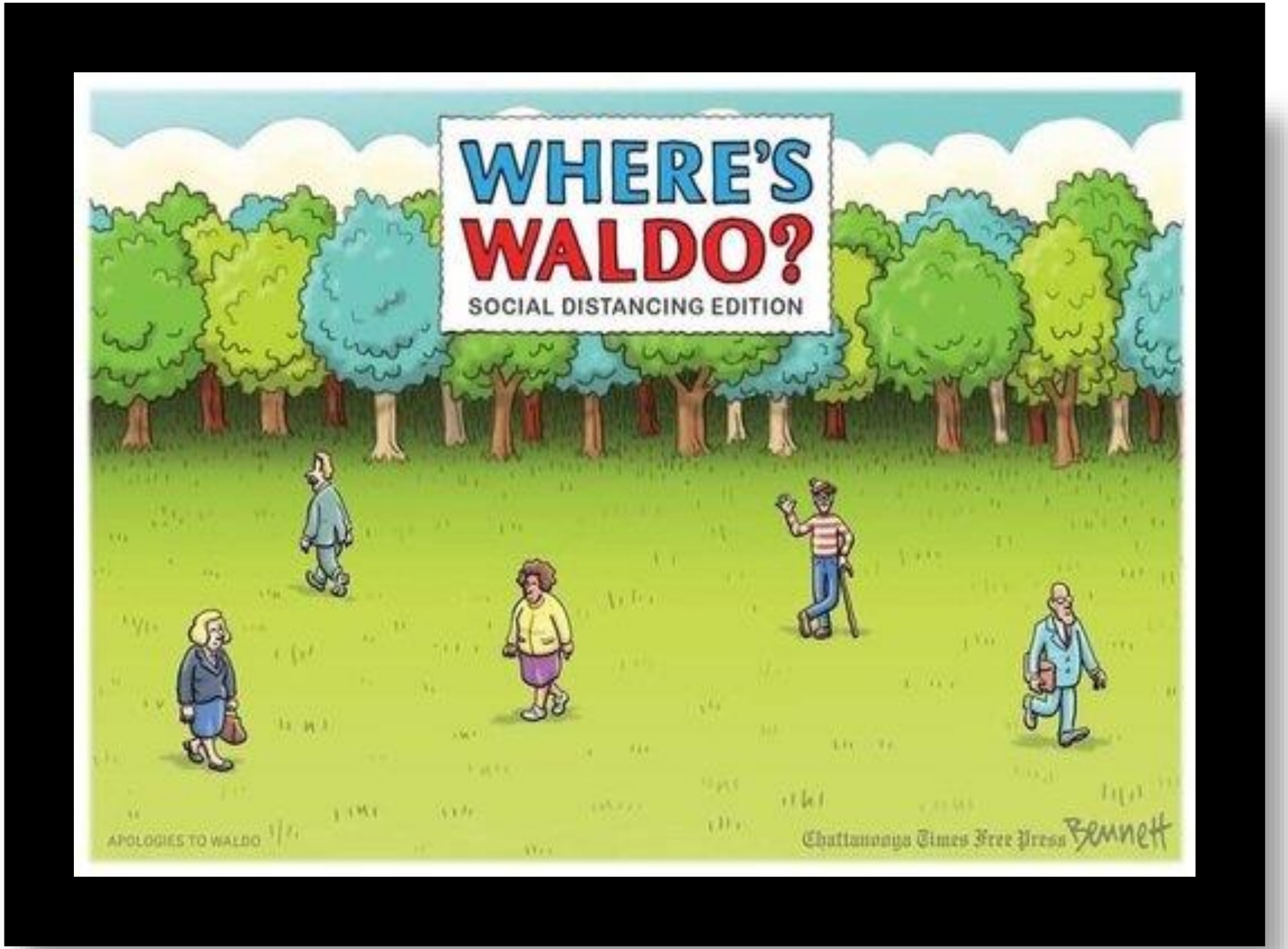
3. Use **EXPERIENTIAL LEARNING** as your base

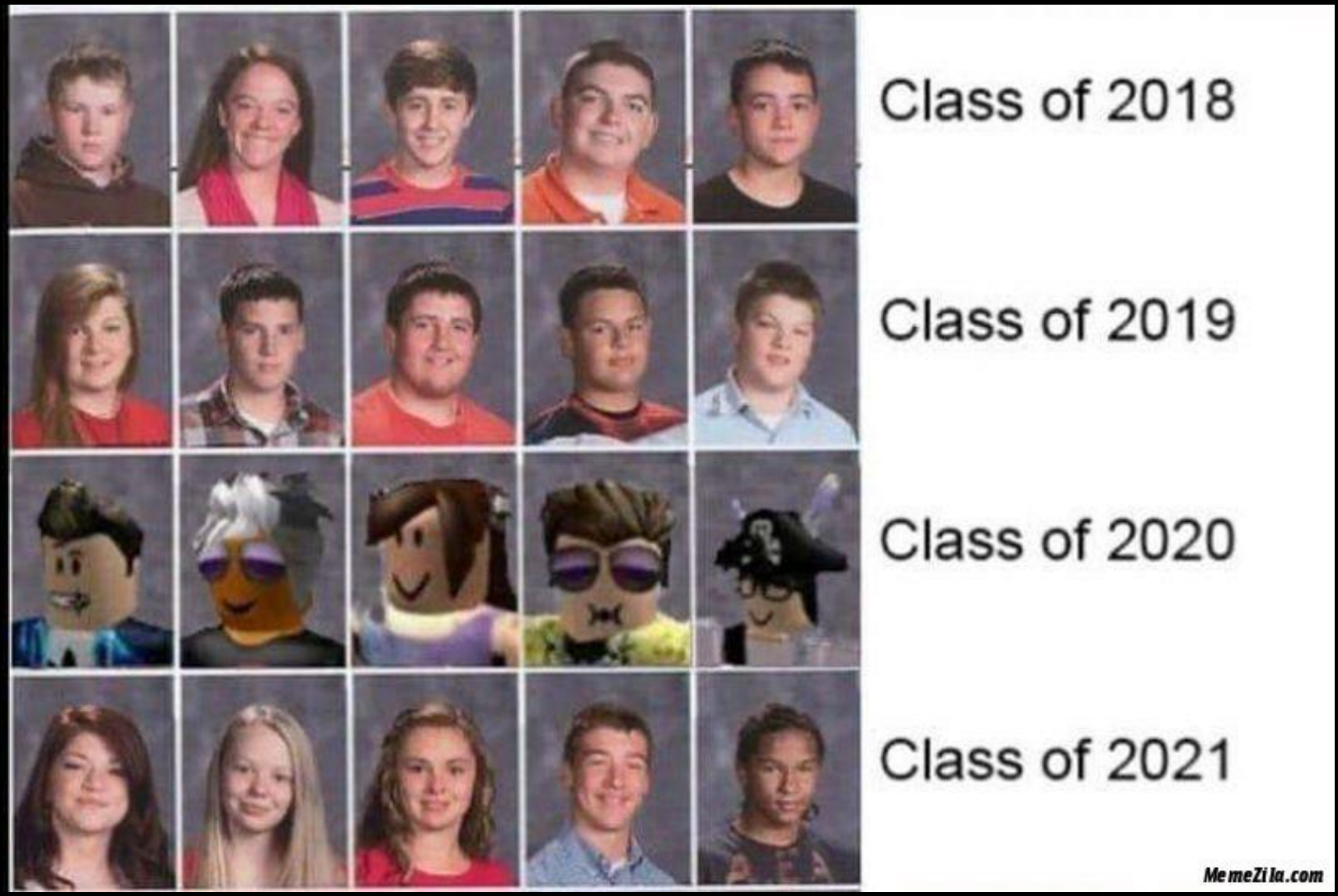
4. Create learning patterns to **CALM THE CHAOS**

Importance of Celebration

Celebrate our learners, our year, and their academic success.

Celebrate as Educators: our ability to transform, to help our students in a world crisis, and to help ourselves.


WHERE'S WALDO?
SOCIAL DISTANCING EDITION
APOLOGIES TO WALDO
Chattanooga Times Free Press
Bennett


Class of 2018
Class of 2019
Class of 2020
Class of 2021
MemeZila.com

SOCIAL DISTANCING
WORLD CHAMPION

Personalized Professional Development

Truenorthedmb@gmail.com

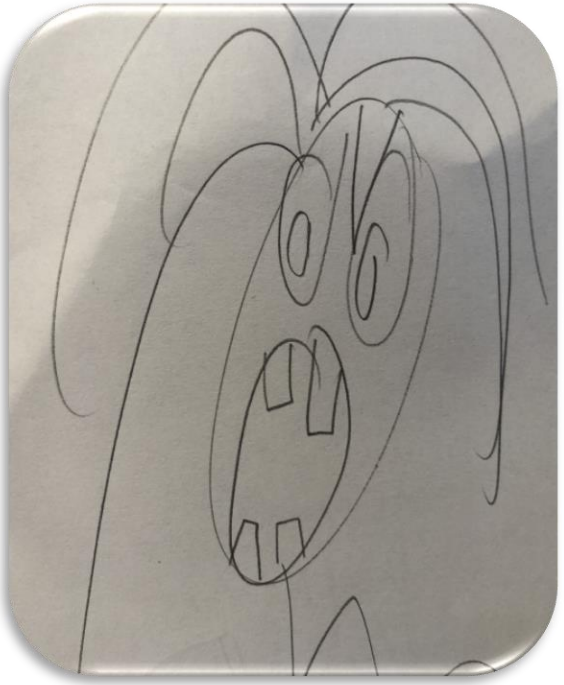
K-12 Science

Big idea teaching

Remote outreach

Out-of-the-box solutions

Distance education



FLINN SCIENTIFIC

Ask about our custom district solutions designed to support a safe return to school:

- **Custom safety and professional development/learning proposals to ensure full school safety**
- **Full PPE for students, faculty, and support staff**
- **Blended science learning solutions that provide continuity of lab instruction for both onsite & remote learners**

©2021 Flinn Scientific

www.flinnsci.com | **1-800-452-1261**