*Lesson Title: Using Excel to Analyze Data*

*Grade level = \_*Middle or High*\_\_ Amount of time for this lesson = \_\_\_\_50\_\_ minutes (Each Day)*

Standards and Safety and Materials:

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| A. Standards - (Both Wyoming and NGSS. Number and write it out)  |  **HS-EST1-4:** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. |
| B. Safety Concerns: If none – “minimal safety concerns with regular class activity”  |  There are minimal safety concerns with this activity, but be sure to monitor computer progress to make sure that students are on the websites they should be on. |
| C. Materials (List of all materials needed for class including **technology** – like probes, tools, computer use, etc…)  | * Internet
* Computers/chromebooks/laptops
* Access to DataCorral website
* Access to Excel
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Objectives: (List them and make sure all are measurable! **Bold** the verbs. Three different levels!) Students will be able to…

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| A. SWBAT… ***use*** *a measurable verb*  |  SWBAT transfer DataCorral data onto a workable Excel document. |
| B. SWBAT…  |  SWBAT analyze the data to get convert tempeateus and produce an average temperature. |
| C. SWBAT…  | SWBAT create graphical representations on Excel using gathered data. |

Connections, Misconceptions, and Crosscutting Concepts:

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| A. Real world connections: (List them; e.g. Careers, Societal issues, etc…)  |  A lot of real world jobs these days require computer skills, especially that of excel. Those who contain mastery knowledge of the program are more likely to get jobs that require this skill: data analysts, insurance, banking, to name a few. These jobs also produce a decent income with mastery. |
| B. Student connections: (List them; With what do they connect? Music, food, etc…)  | Students are very familiar with Excel, but quickly forget the ins and outs of the program. When doing a project, they will spend more time Googling how to accomplish something rather than remembering how to do it. By bringing in Excel lessons throughout the year, we can help them remember the basics and save them time for future assignments by boosting their confidence with working with the program.  |
| C. Misconceptions: (List those AAAS misconceptions related to your content)  |   |
| D. Crosscutting Concepts: (List them and explain how they are used – e.g. patterns, cause/effect, scale/proportion/quantity, systems/system models, energy/matter, structure/function, and/or stability/change)  |  **Scale, Proportion, and Quantity:** While students will not directly work with this data in this particular lesson, they can visually represent scalar values, proportion, and quantities by using Excel. |
| E. Academic Language: [List the words/prefixes/suffixes that are addressed (focus on science vocabulary as well as instructions such as analyze, compare/contrast, etc…). *What* will the teacher do? *How* does the teacher address the words/prefixes/suffixes? *How* does the teacher get students to use those words, prefixes, and/or suffixes?]  |  Excel, Standard Deviation, Kalven, Fahrenheit, Celcius, error bars.  |

Catch/*Engagement*: (Hook them quickly – use all 5 senses at different times – should be no longer than 5 minutes.)

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| Hook: How to get student/class attention  |  Tell a computer/excel related joke. My personal favorites:1. I asked my dad if he knew any formulas in Excel.He said, “Yeah, sum.”
2. Boss: “How good are you at PowerPoint?”Me: “I Excel at it.”Boss: “Was that a Microsoft Office pun?”Me: “Word.”
	1. This one is particularly amusing because you can turn it into a story of when you were getting interviewed by the principle.
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Pre-test: (Same as post-test and short – to the point… **Bold** the objectives you are using – same as above!)

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| Pre-test and Post-test question(s) Put the pre-test at the end of this day’s lesson plan (along with PowerPoint etc…)!  |  Using QuizStar.4teachers.org, a similar program, or a school approved method, create an online short quiz that encompasses the objectives of the lesson, for example:1. **T**/F Excel can be used to create visual representations of collected data, such as temperature.
2. T/**F** The Data Discovery Tool can provide immediate data that is readily accessible in Excel Format.
	1. False because you have to send the link to your email first
3. What Excel formula can be used to convert Fahrenheit to Celsius to Kelvin?
	1. =CONVERT(Cell, “F”, “C”

=CONVERT(Cell, “C”, “F”)1. How can you average the temperature in Excel?
	1. =AVERAGE(cell range)Highlight cells, click on AutoAverage
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Activity/*Exploration*: (**Bold** the verbs that match the objectives. Can have as many parts as needed – step by step directions. *(Remember: Include at least 1 science writing activity and probe activity for the unit!)*

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| Beginning of lesson  |  Pre-Test, see above |
| Middle of lesson  |  **Gather Data*** Go to DataCorral.uwyo.edu
* Click on Data Discovery Tool
* Find a Microbe Site, click on blue hyperlink
	+ This will bring you to the data that has been collected at this site
* Go to the very bottom of the page and enter your email address, this will make the file accessible to you via excel
* Open the CSV file from your email

**Open Data in Excel and Format*** Open Microsoft Excel, save as “Microbe Spreadsheet”.
* Relabel cells as your see fit (below examples will be used for the remainder lesson plan; however, it can be easily modified to fit larger or smaller sets of data):
	+ In cell A1, type title “My Microbe Temperatures”
	+ In cell A3, type Microbe Name
	+ In cell B3, type Date
	+ In cell C3, type Temperature
* In column A, row four, type the name of the Microbes you selected (if you’re using the entire data set, relabel accordingly)

**Change to Kelvin or Celsius (skip if you want to remain in Fahrenheit)*** Type in cell C4: =CONVERT(A2, “F”, “C”)
	+ This converts Fahrenheit to Celsius
* Type in Cell C5: =CONVERT(C4, “C”, “K”)
	+ Click and drag to highlight all the cells
* C= Celsius, K=Kelvin, and F=Fahrenheit. You can easily choose your method of conversion

**Formatting the Spreadsheet*** Merge and center the the title across columns A, B, and C
* Click on the My Microbe Temperature title
	+ Change the font according to set parameters by teacher
	+ Shade the cell to set color
	+ Make the Row Height larger by clicking on the line separating row 1 and 2 and drag down
* Click on A3
	+ Click Format → Cells → Alignment Tab
	+ Choose font
	+ Repeat for B3 and C3
* Right Align Rows A4-whatever number you stop at

**Computing the Average Temperatures*** Click on new cell, title Average
* Click on blank cell and type on function formula to compute the average or use the AutoAverage button, press enter

**Chart the Temperatures*** Select only the names, and temperatures of your cells (not the titles)
* Click on Chart Wizard
* Choose type of graph, click next
* Choose the Column button where it says “series in”, click next
* Enter “My Microbe Temperatures” in the Chart Title area
* Label axis as “Microbe Name” and “Temperatures”
* Click on Data Labels and select “Show Value”

**Add Standard Deviation and Error Bars*** Click the ‘+’ on the top right corner of the graph, Chart Elements
* Check the box “Error Bars”
* This opens another tab, choose “Standard Deviation”, or other chosen statistic
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| End of lesson  |  Post-Test, see above |
| Are lecture (<11 min), lab, etc… clearly explained? Are directions and student expectations explicit? *Did you do this? Yes or No*  |   |
| PowerPoints, lab sheets, notes, answer keys, etc… included? *Did you do this? Yes or No*  |   |

Review/Essential Questions/*Explanation*: (Should be closely related to pre/post tests!)

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| A. Low Level Questions – (Knowledge/Remembering and/or Comprehension/Understanding)  |  Can you transfer over data from DataCorral to be manipulated on Excel? |
| B. Middle Level Questions – (Application/Applying and/or Analysis/Analyzing)  |  What are the functions that Excel uses to create Averages? What are the functions that Excel uses to convert temperatures from Fahrenheit to Celsius to Kelvin? |
| C. High Level Questions – (Synthesis/Evaluating and/or Evaluation/Creating)  |  Can you go through the process of visually representing your data to include correct labeling of axis as well as including Error Bars, Standard Deviation, and/or Percent Error? |

Assessments (Post-test)/*Evaluation*: (**Bold** the verbs that match the objectives and are in the activity.)

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| A. Formative: (Check for learning in class?) e.g. Oral questions?  |  Oral questions can be used for formative assessment as well as results from the Pre/Post test. |
| B. Post-test: ( “Same as pre-test”; Compare w/pre-test to inform teaching!)  |  Same as pre-test, see above.  |
| C. Summative: (Check for final learning/understanding) – e.g. Students turn in **constructed** project and **take** 20 question multiple choice test.  |  Students must submit their finished Excel. Their submission must include, but is not limited to the following:1. Graph that represents their temperatures of microbe environments
	1. Clearly labeled axis and defined title
	2. Data is clearly visible and includes error bars and Standard Deviation lines
2. Temperature has been converted from Fahrenheit to Celsius to Kelvin
3. Average temperatures have been calculated from one of the following ways presented
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| D. Explain how the data informs tomorrow’s teaching. For example, “The class post-test average must be a 80% or the next class begins with a 10 minute review/discussion of today’s material followed by another post-test of the same material.”  |   |

Timeline for your lesson:

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| A. Catch 2 min B. Pre-test 3 min C. Activity – 4 parts 40 min D. Review and Post-test 8 min Add/change as needed  |  Please modify how it best suits your classroom and teaching style:Catch: 5 minPre-Test: 5 minActivity: 30 minPost-Test / Review: 10 min |

Enrichment/*Elaboration*: (Include one enrichment activity for students that might finish early)

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| What enrichment activities are offered for students in this lesson (beyond what is taught)?  | Students can continue to explore the many in-depth features that Excel has to offer. Perhaps for extra credit, students can produce a different graph or plot of information that interests them. |

IEP Accommodations/Differentiation/Diversity: What accommodations will you use to support struggling learners?

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| What accommodations are used to support struggling learners?  |  While this is a solo project, students who are struggling will be given the opportunity to ask questions and receive detailed answers. They can also be given more time to work on the project. If needed, printed instructions can be provided (as opposed to an online copy). Please modify your lesson to fit the specific needs of your struggling student.  |