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| <b>Title:</b>                         | <b>It's a Toss Up!</b><br>Handheld Lesson on Probability   |
| <b>Grade Levels:</b>                  | 5 <sup>th</sup> -8 <sup>th</sup>   |
| <b>Curriculum Areas:</b>              | Science<br>Math  |
| <b>Measurable Objectives:</b>         | <ul style="list-style-type: none"> <li>☞ TLW associate probability with the inheritance of genetic traits.</li> <li>☞ TLW increase the knowledge of probability and how it affects a simple coin toss and then apply computer skills in using spreadsheets.</li> <li>☞ TLW team up and (1) create probability outcomes, (2) record data and (3) create a spreadsheet using the probability data and then a (4) graph for visual reference.</li> </ul>  |
| <b>LA Content Standards:</b>          | <ul style="list-style-type: none"> <li>☞ <b>LS-M-B2</b> - describing the role of chromosomes and genes in heredity;</li> <li>☞ <b>LS-M-B3</b> - describing how heredity allows parents to pass certain traits to offspring.</li> <li>☞ <b>D-1-M</b> - systematically collecting, organizing, describing, and displaying data in charts, tables, plots, graphs, and/or spreadsheets;</li> <li>☞ <b>D-2-M</b> - analyzing, interpreting, evaluating, drawing inferences, and making estimations, predictions, decisions, and convincing arguments based on organized data (e.g., analyze data using concepts of mean, median, mode, range, random samples, sample size, bias, and data extremes);</li> <li>☞ <b>D-6-M</b> - demonstrating the connection of data analysis, probability, and discrete math to other strands and to real-life situations.</li> </ul> |
| <b>Grade Level Expectations (GLE)</b> | <ul style="list-style-type: none"> <li>☞ Identify patterns in data to explain natural events (SI-M-A4)</li> <li>☞ Construct, use, and interpret appropriate graphical representations to collect, record, and report data (e.g., tables, charts, circle graphs, bar and line graphs, diagrams,</li> </ul>  |

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|                                       | <p>scatter plots, symbols) (SI-M-A4)</p> <ul style="list-style-type: none"> <li> Organize and display data using spreadsheets, with technology (D-1-M)</li> <li> Compare and contrast survey data from two groups relative to the same question (D-2-M)</li> <li> Represent probabilities as common fractions and recognize that probabilities fall between 0 and 1, inclusive (D-5-M)</li> </ul>  |
| K12 Educational Technology Standards: | <ul style="list-style-type: none"> <li> Technology Productivity Tools (<i>Resource Access and Utilization Foundation Skill</i>) <ul style="list-style-type: none"> <li>-Students use technology tools to enhance learning, increase productivity, and promote creativity.</li> <li>-Students use productivity tools to work collaboratively in developing technology-rich, authentic, student-centered products.</li> </ul> </li> <li> Technology Research Tools (<i>Linking and Generating Knowledge Foundation Skill</i>) <ul style="list-style-type: none"> <li>-Students use technology tools to process data and report results.</li> </ul> </li> <li> Basic Operations and Concepts <ul style="list-style-type: none"> <li>-Students demonstrate a sound understanding of the nature and operation of technology systems.</li> </ul> </li> </ul> |
| Technology Connection:                | <ul style="list-style-type: none"> <li> Pocket PC</li> <li> Pocket Notes Program</li> <li> Pocket Excel Program</li> <li> Pocket Word Program</li> <li> Computer</li> <li> Excel Program, Graph Club, or Graph Master</li> </ul>  |
| Procedures:                           | <ul style="list-style-type: none"> <li> Start the lesson off by having the students think about what traits they inherited from the parents. (ex. red hair, blue eyes, etc)</li> <li> Encourage the students to think about whether or not those traits are present in other members of their families such as their siblings.</li> <li> Discuss with the students the concept of probability to traits.</li> <li> Divide the students into groups of no more than four in each group.</li> </ul>   |

-  Explain to the students that each group will conduct a hands-on experiment to get a greater understanding of how probability works. Each group will toss two quarters in the air. They will tabulate how each of the quarters lands (heads or tails up) and will repeat this process for a total of 50 tosses.
-  Each group must have a counter, a recorder (using the handheld), a time manager and a person who will be responsible for tossing the coins.
-  The recorder of each group will setup a tally chart using the Notes program on their Pocket PC. Each tally chart should represent a possible outcome. In order to tie this into heredity, assume the following.
  - For a single toss:*
  - Heads = blue eyes
  - Tails = brown eyes
  - For each pair of tosses:*
  - Heads/Heads = blue eyes
  - Heads/Tails = hazel eyes
  - Tails/Heads = hazel eyes
  - Tails/Tails = brown eyes
-  This is a simple way to look at heredity, but it will help students understand how probability ties directly into heredity. The goal of this lesson is to see which eye colors each group will end up with.
-  Before the students begin their tosses, allow the class to predict the results of the experiment. Record the class prediction using a marker and chart paper. Post their prediction in the front of the classroom for future discussion.
-  Once all of the tosses are completed in each group, the recorder should beam the tally chart file to each member of their group.
-  Each group member will take the data from the tally charts and create his or her own table in the Pocket Excel program on their Pocket PC.
-  Allow groups to compare their data table with others by beaming their table to another group member. Students should compare their data tables and see what color of eyes appeared most often. Do all students have the same numbers?
-  If a graphing application is not available on their Pocket PC,

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|                 | <p>allow each group time to go to the computer station to use Microsoft Excel, Graph Club, or Graph Master to create a graph using the data from their table.</p> <ul style="list-style-type: none"> <li>☞ There should be some variation in results. Explain to students that this is why everyone in their family does not look the same.</li> <li>☞ Have each student create a short report (1 paragraph) on his or her group's experiment using the Pocket Word program on their Pocket PC. The report must include the group's prediction, the results, an explanation of the lesson's purpose and what was learned. Each student will be responsible for beaming his or her final report to the teacher.</li> </ul> |
| Materials:      | <ul style="list-style-type: none"> <li>☞ 2 quarters per group</li> <li>☞ Chart paper &amp; marker</li> </ul>  |
| Assessment:     | <ul style="list-style-type: none"> <li>☞ After collecting the students' work, check to see that each write-up meets the following criteria: Did it: <ul style="list-style-type: none"> <li>-Include the group's original eye color prediction?</li> <li>-Explain what the experiment was about, along with its purpose?</li> <li>-Explain the results?</li> <li>-Explain what was learned?</li> </ul> </li> </ul>   |
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