

## M & M Quality Assurance

You are a member of the Quality Assurance group for Mars M&M . They are interested in having you analyze the distribution of M&Ms across a number of bags to see if there is any pattern. Start with a bag of M & Ms. Look at the colors - the different colors and the number of each color. Count the number of M&Ms in your bag and sort them by color. Create a bar graph and a pie graph of your results. Compare the numbers of one color to another. What statements can you make? How many different ways can you describe these mathematically? Write as many mathematical statements as you can from the data. See if you can find other sources to confirm or refute some or all of your statements. After you have completed your research, present your findings to a supervisory board that will make recommendations to M&M Mars on how to more accurately distribute M&Ms in each bag.

|   | <b>Novice</b>  | <b>Apprentice</b>   | <b>Practitioner</b>  | <b>Expert</b>   |
|---|--|---|--|---|
| <b>Gathering and comparing the data</b> | compare data with other team or Mars Web site              | accurately count M&Ms and compare data with 1 other group and M&M color data from the Mars Web site | accurately count M&Ms and compare data with 2 other groups and the M&M color data from the Mars Web site   | accurately count M&Ms and compare data with more than 2 groups, including those contacted via the Internet, and the M&M color data from the Mars Web site |
| <b>Charting the data</b>                | create an accurate graph on computer with significant help | create one accurate graph on computer   | create accurate bar and pie graphs on computer of their bag, 1-2 other groups bags, and Mars' data   | all practitioner + include keys, color coding to match the M&Ms, and titles   |
| <b>Math statements</b>                  | only one type of statement                                 | 2 - 3 types of statements   | describe the data in fractions and percents; compare quantities to one another and to other groups' results; and compare their data to actual Mars M&M color combination plans | > 10 different math statements using the criteria in the Practitioner column  |
| <b>Hypotheses</b>                       | 1 hypothesis somewhat related to the data collected        | 2 hypotheses that explain the variations  | 2 feasible, logical hypotheses that explain the variations   | 2 feasible, logical hypotheses that explain the variations; strongly supported by the data  |
| <b>E- mail</b>                          | asks 1 question  | asks 1 well-formed question   | asks 2 well-formed questions from discrepancies found among bags of M&Ms   | Practitioner + includes hypothesis as to why color comparisons came out they way they did   |
| <b>Statistics</b>                       | find 2 of the 4 criteria in practitioner level             | find 3 of the 4 criteria in practitioner level  | find range, median, mean and mode of their bag of M&Ms   | write and submit meaning of statistical data found as relates to M&M color comparisons  |
| <b>Hypermedia Presentation</b>          | does not provide accurate and meaningful information       | presents accurate information; few computer-generated pieces  | accurate information; intro slide; menu slide; includes 5-6 graphs + M&M color comparison graph from Web site  | all Practitioner + under 3 minutes; succinctly presents the results; equally divided among all team members   |

**Learning Focus**

data collection, analysis, and reporting

**Grade Level**

grades 5-7, although the task could be modified for younger and older students

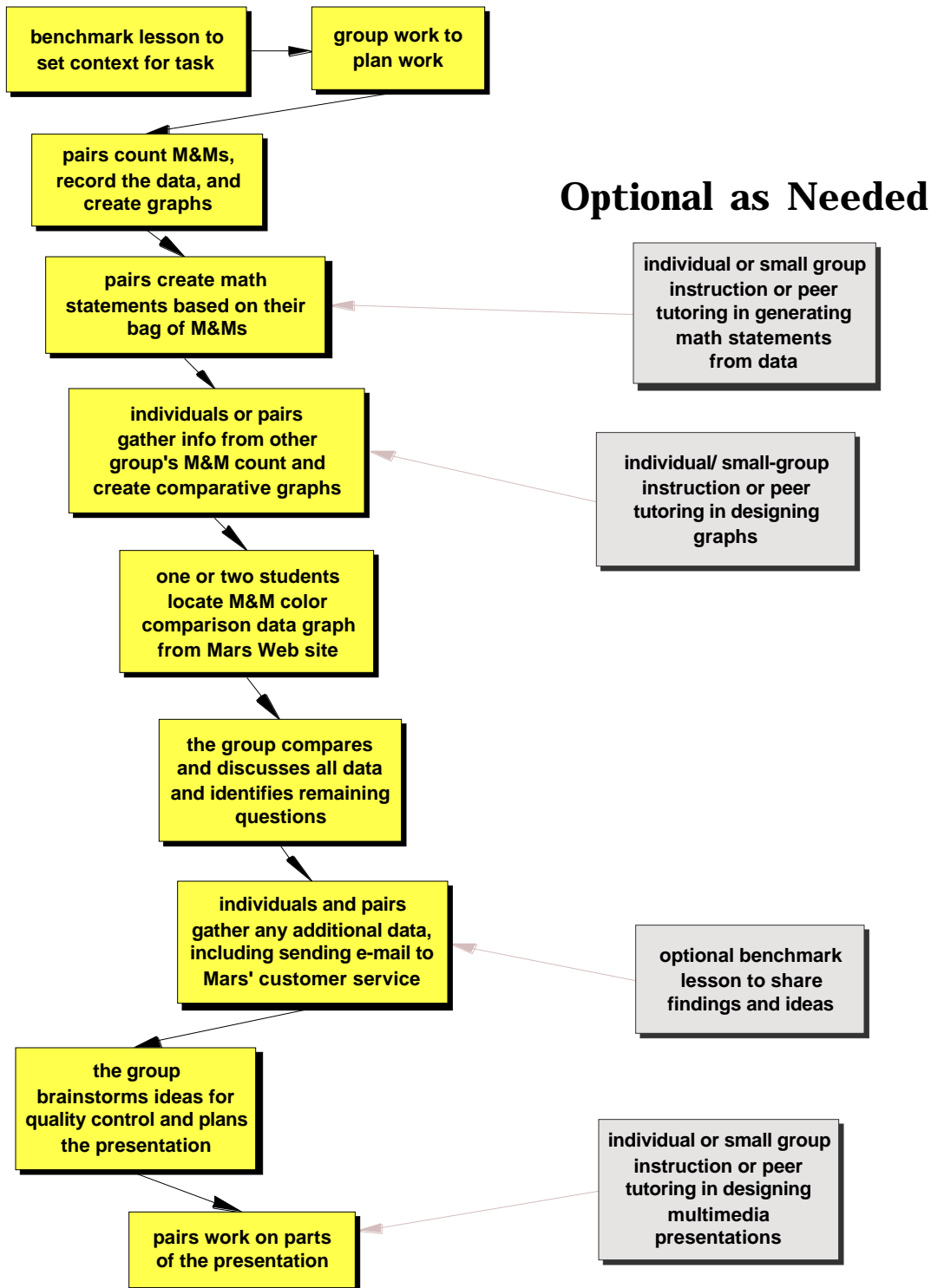
**Essential Learnings**

- gathering, comparing, and reporting on data
- generating hypotheses
- working with percents
- computing mean, median, mode and range
- Internet searching
- saving an image from the Internet
- inserting an image into a presentation program such as PowerPoint or HyperStudio
- writing and sending email
- hypermedia authoring
- oral speaking

**Participatory Structures**

Learning is a social construct; therefore, this project could benefit young learners in collaborative teams of three to four. Teams of 3-4 could work on the initial counting of the M&Ms and the generating of hypotheses; pairs could work together on the math statements, graphs, e-mail, and aspects of the hypermedia presentation. The task requires little introduction, perhaps to set the flow and context. The work flow might look like this:

## General Flow of Task



### Technology Infusion

|  |
|--|
| spreadsheet  |
| multimedia/hypermedia presentation program                   |
| saving image from Internet                                   |
| inserting images and charts/graphs into presentation program |
| calculators  |

**Timeframes**

5 full classroom days with 6-1 student/computer ratio

**Classroom Management**

Students should be given a blank time schedule and plan the tasks to be completed. Students usually begin by sorting and counting the M&Ms. Then they move to the computers to create the bar and pie graphs. Given the constraints of a 4 - 6 computer classroom, you might create a schedule for students to sign up for or be assigned computer time. Students will need encouragement to generate the math statements (and they usually wait until the end if not encouraged to generate them earlier). Mini-lessons should be limited to students who need a particular skill set rather than presenting a skill set to the whole class out of the learning context.

**Instructional Notes**

Begin with an introductory lesson on product content, truth in advertising. Show a bag of M&Ms, the size indicated on the packaging. Have students hypothesize how many M&Ms are in a bag; if each bag has the same number of M&Ms; if each bag has the same amount of color differentiation; which color is most prevalent in each bag of M&Ms. Explain that they are to act as the quality control group for Mars Corp. Hand out the rubric and allow students time to plan what they must do. You might ask students to highlight those items they do not know how to do. As students are working, offer small group instruction on any skills students might need as they encounter the task (different for each student depending upon their skill level). As students are working, facilitate both from a content perspective and from a process perspective.

Possible facilitation questions:

|               |   |
|---------------|---|
| Comprehension | What did you find out about the number of M&Ms per color in your bag? How did this differ from your initial hypothesis?   |
| Application   | What do you think the color comparisons will look like in similarly sized bags? How do you reconcile the different numbers of M&Ms in each bag with the fact that each bag specifies a certain weight of M&Ms will be inside? |
| Connection    | What experiences have you had with colors in bags of M&Ms? Have you ever purchased a product that was not of good quality?  |
| Synthesis     | How might the company more accurately put M&M's into each bag?  |
| Metacognition | How did you arrive at your solution to the M&M problem? How did you come to this conclusion?  |

**Assessment**

In addition to the rubric, you might give a quiz on specific math skills. You will also observe students, for example, generating statements from data to gain a better understanding of their skills.

**Resources**

- M&Ms
- math book
- Internet access
- samples of graphs

**How-to Sheets**

- creating graphs in a spreadsheet
- creating a multimedia presentation
- copying and pasting an image from the Internet into a presentation application
- working with percents

- calculating mean, median, mode and range
- sending an e-mail from the Mars Web site to customer relations