

Data Management Processes

It is important to include data management in K-8 mathematics curricula for two large reasons. One reason concerns social utility. There is a staggering proliferation of information in contemporary society which shows no signs of abating. Consumers, engineers, social workers, teachers, and others are regularly bombarded with quantitative information packaged in such forms as tables and graphs. It therefore makes sense that students should become comfortable and proficient with managing and interpreting data.

Secondly, data management can serve pedagogical purposes. It can support children's inquiry and the integration of other curriculum areas. It can be a platform for developing mathematical concepts that are not directly a part of it. For example, arithmetic development can be motivated by data management activities. Numbers may have to be added, subtracted, etc. for making graphs, creating tables, calculating averages, and so on. In this way, data management provides a reason for learning about arithmetic.

Data management itself is a synthesis of concepts and skills that cannot be easily isolated from other mathematical concepts and skills. That makes it difficult to lay out in a sequenced way what might be considered to be foundational matters and concepts and skills that are exclusive to data management. Because of that, data management is probably best approached by engaging students in small projects with short DEVELOP lessons used to teach data display methods and concepts such as mean, median, mode.

Data management concerns three processes: collecting, organizing and displaying, and interpreting data. It is recommended that students engage in all three processes as soon as they are ready.

Process 1: Collecting data

Collecting data is the preliminary process. It is important that students collect their own data rather than use canned data for two reasons. First, the act of collecting data involves important organizing questions and skills that should be explored and developed (e. g. what to collect, how to collect it, measuring, counting). Second, canned data may have little relevance to students unless they are interested in what the data are about. Collecting their own data tends to generate more interest.

There are many ways of collecting data. Three examples follow.

Journal keeping

Students can keep a journal in which they record all sorts of quantitative data. For example, they can keep weather data in it, data on their own body growth, and so on. This kind of journal can also serve as a source of numbers for an arithmetic purpose, for a routine problem-solving purpose (making and solving word problems), and/or for a data management purpose (organizing and interpreting data).

Collecting survey data

Surveys are a good way to integrate mathematics with language development (written and/or oral) and they can also be a good way to motivate students.

Teachers can ask students to provide suggestions concerning what they would like to know about members of the classroom and how to collect the information. The suggestions can form the basis for designing surveys to be administered in the classroom and/or in the school. Teachers can also offer suggestions. The following are examples.

- What is your favourite game to play; to watch?
- What is your favourite season? Your favourite holiday?
- How much television do you watch in a day?
- How many times a year do you catch a cold?
- How many fillings do you have?
- Do you wear a helmet when bicycling?
- How many servings of fruit do you eat in a day?
- What is your resting heart rate; after jumping on the spot?
- How many hours of sleep do you get each night?

Collecting observational data

Students can collect data by observing something and recording their observations in some way. For example, a data management project might concern students' behaviours during lunch hour. The students who are engaged in the project could observe what other students do at lunch hour and record their behaviours. This kind of project, besides having a learning purpose, can also have a decision-making purpose that might be related to improving lunch hour procedures and activities.

Process 2: Organizing and Displaying data

See Early and Middle Years Data Display Methods.

Process 3: Interpreting data

Collecting and organizing and displaying data are insufficient to an investigation involving data. These two data management processes are incomplete unless students also analyze and interpret the organized version of the data (it is a little bit like organizing words into sentences and not being able to read the sentences). Analyzing and interpreting the data should culminate in answering those questions that were the reason for doing the data management activity in the first place and in generating new questions whenever possible.

Putting it all together - from collecting to interpreting

Students should experience the entire range of the data management processes - from collecting to interpreting - whenever appropriate. Data management activities make more sense to students that way. As well, it is only by experiencing the entire range of processes does data management come fully to life in all of its richness as a way of investigating real phenomena.

The following grade 6 example is sampling of the kind of project that can be used for “putting it all together”.

The project: Investigating telephone usage

Discuss communication with students and the technology used for it. The telephone would be an important technology that emerges from the discussion. Ask students what might be investigated about the use of the telephone. Many ideas could emerge. For example, students might be interested in investigating at what time of the day the telephone is used, how often it is used in a day, and for how long it is used during the hours of 6:30 to 9:00 during a school day evening.

Have students discuss how to collect the data. Students might decide that different students will collect data for different evenings and the results combined. This is the approach used below.

Have students collect the data for an evening, noting the time the telephone is used, how often it is used, and how long it is used for each call. Combine the data on how often the phone is used; the data on how long it is used each time; and the data on when it is used. Have students organize the data by using graphs and/or tables, and interpret the results. Conclusions concerning the data would need to be made. That could involve asking and addressing the following kinds of questions. What do the data tell us about peak periods of telephone usage? Why do the peak periods occur when they do? Why are the data important to telephone companies?