

ORAL PRESENTATION AS AN ALTERNATIVE ASSESSMENT IN MATHEMATICS

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Abstract: This paper presents an action research in an above average ability P4 class in a Singapore primary school. The general objective is to explore how to integrate oral presentation as an alternative assessment into the teaching and learning of Mathematics in the context of Singapore education system. The paper offers a relatively comprehensive description of the action research, including the actual tasks used, the kind of information the teacher can gather about pupils' learning, the advantages and disadvantages of using this mode of assessment. The action research also reveals that oral presentation is a key to help pupils clarify their thinking processes and hence enhance their understanding of Mathematics.

Introduction

According to the NCTM's Assessment Standards for School Mathematics, assessment is "the process of gathering evidence about a student's knowledge of, ability to use, and disposition toward mathematics and of making inference from the evidence for a variety of purposes" (NCTM, 1995, p.3). Therefore, assessment of pupils' learning should include a wide array of tasks to give teachers a more comprehensive profile of the pupils. Written assignments and tests are useful in the assessment of contents and procedures, but do not cover the communicative and affective aspects of mathematics learning.

One of the aims of mathematics education in Singapore schools as spelt out in the Primary Mathematics Syllabus 2001 is to enable pupils to use mathematical language to communicate mathematical ideas and arguments precisely, concisely and logically. To communicate mathematically means to be able to illustrate, to interpret, to explain and to discuss mathematical ideas and experiences in doing mathematics. As such, this action research is an attempt to integrate oral presentation as an alternative assessment into the teaching and learning of Mathematics.

Oral presentation as an alternative assessment

Oral presentation as an alternative assessment goes beyond questions and answers or awarding a grade. It is a process of interaction between a teacher and pupils and the goals of which include supplying the teacher with information about what a pupil can do and how he or she does it. The teacher can then use this information to direct teaching instruction.

Oral presentation is an experience that will allow pupils to understand, process or otherwise act on what is read or heard so that they can effectively use and speak about the mathematics of these situations. Pupils' ability to use given information, connect ideas and procedures among the different topics and make conjectures is essential to determine mathematical communication.

There is no formal format for oral presentation. However, for pupils to be comfortable in oral presentation, the teacher needs to recognize that pupils bring

knowledge and perspective to situation and can apply this knowledge to solve problems. Pupils are given the chance to communicate their thinking to other pupils.

In Mathematics, the theme of an oral presentation can be on one or more of the following areas:

- pupils' knowledge and understanding of a concept or a topic
- pupils' questions and difficulties about the topics being taught, ideas that they need help with, and areas they don't understand
- pupils' ability to connect ideas and procedures within the Mathematics curriculum
- pupils' perception of Mathematical terms or vocabulary

Profile of class

This action research was done on a Primary 4 class with average to above average ability in Mathematics. The class size is 37 with 20 boys and 17 girls. Most of them come from Chinese-speaking environment. Generally, they communicate better in Mandarin than English. Pupils had finished the P4 Mathematics syllabus and were in the process of preparing for the 2nd Mathematics Continual Assessment and then the P4 Streaming Examination. Instead of giving pupils only written revision which is the general practice, some of the paper-and-pencil tests were replaced by oral presentations.

Oral Presentation Task 1

The topic for presentation is "What do you know about the number line? How can you use the number line to help you study Mathematics? Explain how would you put these numbers 3 , $4\frac{1}{2}$, $5\frac{2}{5}$, 7.2 , 8 on a number line?" The focus is on pupils' ability to make mathematical connections within the mathematics curriculum.

Pupils have studied whole number, fractions and decimals as discrete topics. They have also learned how to convert a fraction to a decimal and vice versa. Most of them are able to do the procedures of the conversion. Pupils have experiences identifying points on the number line given other points and predicting endpoints for whole numbers. Pupils were placed at random in groups of four. Within the group, they appointed their own group leader and spokesperson. Pupils were given ten minutes for discussion as this was the first time an oral presentation was conducted. The question was explained to the pupils and any doubt was clarified before they proceeded with the task.

During their group discussions, pupils' behaviour was observed. A number of pupils seemed to be more interested in writing down their thoughts instead of discussing. A few of them carried out some verbal exchange but the discussions were quite limited. A pupil asked why the Mathematics lesson was so different and the monitress expressed that she felt 'funny' because it looked more like an English lesson.

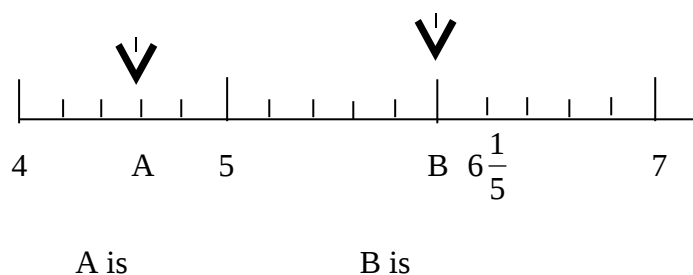
It was very challenging to both the teacher and pupils at the beginning of this action research. The presentations were below expectations. Although each spokesperson was given 2 minutes for presentation, most of them gave a one or two

sentences answer like ‘number lines help us to count more accurately’, ‘it helps us to find the time interval’, ‘it helps us to count decimals’, ‘we can show fractions on the number line’, ‘there are small lines on the number line to show equal parts’ etc

Most of the pupils were able to place the given numbers: 3 , $4\frac{1}{2}$, $5\frac{2}{5}$, 7.2 , 8

on the number line. Pupils were able to put markings on the number line to show that it is divided equally into 8 parts and the corresponding whole numbers were placed in the respective marking. However, they did not show the sub-division between each numerical interval. The $4\frac{1}{2}$, $5\frac{2}{5}$ and 7.2 were not properly placed.

After all the groups had presented, pupils were asked to do the question below and explain their solutions.



Many pupils were able to answer B but only a few got the correct answer for A. For those who got the correct answer for B, they were asked to explain their answers. They knew it was 6 because it was on a longer line and the division between 2 long lines was 1. However, there were some who got the right answer for B but were unable to explain their solution. Many pupils had difficulties with ‘A’ because they were unable to process that one part was further divided into 5 smaller equal parts. And, each small part was one out of 5 small parts. This revealed that their concept of ‘a part of’ is not fully internalised in the topic ‘fraction’. They also had the mindset that fraction of a part was always for circle, square or rectangle. They found it difficult to translate this concept ‘a part of’ for a number line. It was also interesting to note that no pupil gave 4.6 as the answer. When asked if this could be the answer, many were not sure. They were unable to connect this to a decimal.

Instructional direction

From the information gathered through the first oral presentation, a lesson was created in which whole numbers, fractions and decimals could be explored in a similar context.

Pupils were asked to think of ideas associated with one quarter and a number line was drawn on the board. Some suggested 0.25 or a quarter past one or $\frac{1}{4}$ kg.

The pupils then discussed where to place $\frac{1}{4}$ on the number line. Some prompting was needed to help pupils marked the point midway between 0 and 1 as $\frac{1}{2}$.

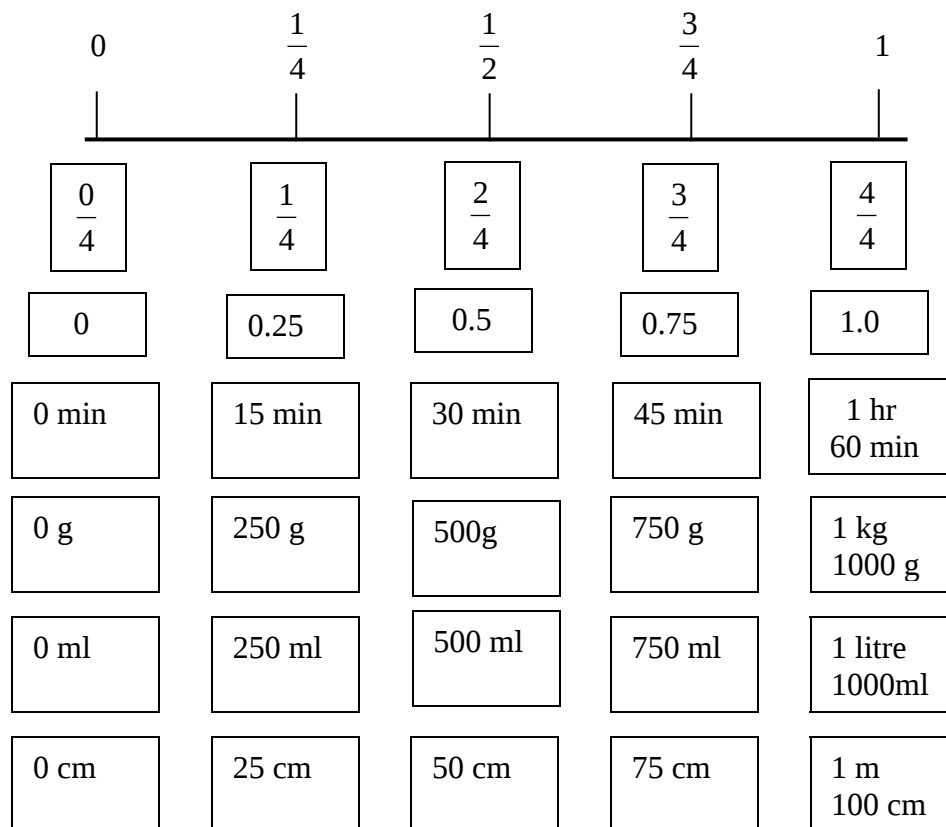
With these points identified, they easily located the point for $\frac{1}{4}$.

A series of guiding questions were asked to get pupils to rename 0 as $\frac{0}{4}$, $\frac{1}{2}$ as $\frac{2}{4}$ and 1 as $\frac{4}{4}$. As we renamed each point on the number line, a pupil taped a card with the new name below the points marked. Thus, the pupils had a visual display of all the names that we had given these particular points and the spatial relationship between all the points under discussion. Pupils were also able to deduce the point for $\frac{3}{4}$. Next, we reinterpreted the points on the number line in terms of decimals. The pupils labeled $\frac{1}{2}$ as 0.5, $\frac{1}{4}$ as 0.25 and $\frac{3}{4}$ as 0.75. Some pupils had difficulty with the point $\frac{3}{4}$, but once they saw the pattern, they quickly realized that $\frac{3}{4}$ represent 0.75.

Since a quarter past one was suggested, this activity was extended to time. Pupils were now more responsive, a pupil volunteered to present how the number line can be used to represent time. He labelled 0 minutes, 1 hour, 15 minutes and 45 minutes.

The lesson ended with pupils making connections to their prior study of weight, length and capacity. Pupils seemed to have come out of their shells and used mathematical terms to express their thinking. Figure 1 shows the number line constructed by the class.

Figure 1



Oral Presentation Task 2

The question was “Do you see any number line used in real-life situations? Give some examples and say how they are related to the Mathematics topics you study in class.” The focus is on pupils’ ability to apply mathematics in practical tasks and in real life situations.

As pupils were more familiar with oral presentation, minimal help from teacher was required and they were given two days to prepare. ‘Think, pair and share’ co-operative learning strategy was also adopted. Every pupil had a ‘Maths Buddy’ to discuss or help each other.

Each oral presentation took about 2 to 3 minutes. The sequence of pupils’ presentations was based on volunteering. As it was a one-hour lesson, twenty pupils managed to do the oral presentation. A scoring rubric was used for awarding grades (see table 2).

It was very encouraging to see that pupils were more organized in their presentations. Most pupils began with an explanation of what a number line was before giving examples of its application in real life situations. Mathematical vocabulary was more evident and some pupils even made an effort to bring kitchen scales, measuring tapes, measuring cups and clock faces for their oral presentations.

A pupil expressed that number lines could be represented vertically, horizontally or even circularly eg on a clock. Each numerical interval was further divided to show 5 minutes. So, there were 60 minutes in 1 hour. If a line was drawn from the 12 to the 6 and from the 3 to the 9, there would be 4 equal parts on the clock face. She explained that the area from the 12 to the 3 was one quarter of an hour and it represented 15 minutes. If the minute hand was at 12 and it moved to 3, then it had made a 90° turn to the right.

Another pupil explained number line in terms of a measuring tape. She noticed that each numerical interval was further divided into 10 equal parts, so each small division was 0.1cm. She expressed that this was necessary if we wanted an accurate measurement such as sewing a dress or for Physical Fitness Test.

Measuring cups were also brought for the presentations. A presenter noticed two kinds of calibrations used for the number lines. One calibration was in terms of fractions at an interval of a quarter of a cup and the other was in cubic centimeters at an interval of 250 cc. This was necessary for the measurement of different quantities and to have the correct proportion of ingredients for cooking or baking purposes. A pupil brought a kitchen scale and he observed that the maximum weight the kitchen scale could measure was 2kg. Decimal is used to mark the 1.5kg point and each small division was 0.1kg or 100g.

Oral Presentation Task 3

The question for presentation was “ Study these two phrases carefully: $\frac{3}{4}$ kg of peanuts and $\frac{3}{4}$ of the peanuts. Do they have the same or different meaning? Explain

with examples to show what they mean.” The focus is on pupils’ interpretation of mathematical terms.

Some pupils said that $\frac{3}{4}$ kg of peanuts is 750g. If there was 1 kg of peanuts, then $\frac{3}{4}$ of the peanuts is 750g. Since the answers were the same, so they had the same meaning. A few explained that $\frac{3}{4}$ kg is for a unit of measurement and it was equal to 750g. However, ‘ $\frac{3}{4}$ of the peanuts’ would mean that the whole is divided into 4 equal units and it was 3 units we were talking about. A pupil illustrated this with a paper folded into 4 equal parts with 3 parts shaded. Hence, they had different meaning.

Another group of pupils thought that it could be the same as well as different in meanings. They argued that it depended on the situations. They gave the reasons that they would have the same meaning only if the whole was 1 kg. But if the total quantity was 2 kg or more, then they had different meanings because they had different answers.

Instructional direction

This oral presentation was conducted as a result of pupils’ poor performance in this written question ‘Mr Lim bought 8 kg of rice. He used $\frac{3}{4}$ kg of rice for cooking chicken rice. How much rice was left?’ Many gave the answer as 6 kg.

From these responses, the concepts of a fraction of a set, a part of a whole and fraction as a number with a unit of measurement were reinforced. The lesson ended with pupils realizing that $\frac{3}{4}$ of the peanuts was the partitioning of a whole into a fractional amount whereas $\frac{3}{4}$ kg of peanuts would involve adding/ subtracting a part to/from a whole.

Findings about pupils’ learning

In the beginning, the presentation may be limited. It becomes broader as confidence in mathematical communication increases. From the outset, it is necessary for the teacher to be a careful listener, as well as to encourage pupils to share their thoughts and listen to others. As fear of being wrong or humiliated is reduced, non-threatening sharing of pupils’ thinking becomes an enriching experience for the pupils.

Pupils also learn to re-evaluate their own thinking on the basis of new insight and recognize such re-appraisal as a normal process of learning. As pupils listen to other pupils explain their strategies, they are exposed to new ways of looking at problems. The oral presentations become an exciting part of the Mathematics lessons as pupils were eager to have their ways of thinking accepted and showcased. Even the very shy pupils made an attempt to speak in front of a class. The encouragement

from the class and valuing different strategies lead to increased self-esteem. They also realized the importance of constant and conscious monitoring of the strategies and thinking processes used in carrying out a task. They also learn to check the appropriateness and reasonableness of answers as in oral presentation task 3.

As mathematical communications replaced some of the written work and revision tests, there was some initial concern if this would affect pupils' performance in the 2nd Mathematics Continual Assessment and P4 Streaming Examination. However, the results proved otherwise. Quality passes increased and there was an increase of 56.7% pupils achieving Band I in at the end-of-year examination. Table 1 shows the performance in Mathematics for Primary 4 Faith for the year.

Table 1
Mathematics Result Analysis of Primary 4 Faith

	SA 1 (before oral presentation)	CA (in the process of oral presentation)	SA 2 (end of oral presentation)
Date of assessment	4 th May 2001	19 th Sept 2001	11 th October 2001
Band 1 (85 - 100)	6	12	27
Band 2 (70 - 84)	21	18	10
Band 3 (50 - 69)	10	7	0

Advantages of oral presentation

The main purpose of assessment should be to improve the teaching and learning of Mathematics. Children do not always think the way adults do. Thus, it is necessary to encourage pupils to explain and clarify their thinking. Through pupils' responses in oral presentations, teachers are able to gauge their understanding of concepts and mastery of skills. This will also provide an insight into the effectiveness of the teaching method. Hence, the teacher is able to tailor the subsequent instructional procedures to cater to the needs of the pupils.

Through their oral presentations, pupils are able to identify their errors and misconceptions in mathematical processes. They can therefore clarify their own doubts and acquire a better understanding.

Disadvantages of oral presentation

Unlike written assessments, oral presentations cannot be administered all at the same time for all pupils. A pupil commented that it was unfair. Those who presented last would benefit from the previous presentations. When pupils realized that marks would be given, it was not so easy to get pupils to be the first to response. Moreover, pupils become restless after listening to a number of oral presentations, one after another.

How to evaluate oral presentation

At the beginning, it was not an easy task for the teachers to grade and evaluate oral presentation. In this action research, a scoring rubric was developed for awarding marks.

Table 2
Scoring rubric for oral presentation

Exceeds Expectation 10 points – 8 points	<ul style="list-style-type: none"> • Is very well organised (includes an introduction, main section, and conclusion) • Uses audio-visual materials effectively • Speaks clearly and paces presentation properly • Stimulates further interest among classmates and holds audience's attention very well
Meets Expectation 7 points – 5 points	<ul style="list-style-type: none"> • Is quite organized (may lack an introduction or conclusion) • Uses audio-visual materials quite effectively • Not very clear in speech but pace presentation fairly well • Stimulates some interest among classmates and holds audience's attention fairly well
Below Expectation 4 points – 2 points	<ul style="list-style-type: none"> • Is not organized (no distinct introduction, main section and conclusion) • Do not use audio-visual material or inappropriate use of audio-visual materials • Speech is unclear and pace presentation poorly • Do not stimulate any interest among classmates and fail to hold audience's interest
1 point – 0 point	<ul style="list-style-type: none"> • No attempt; totally out-of-point

Concluding Remarks

Assessment is an integral part of the teaching-learning process. Changing assessment does take time. However assessments do not necessarily have to intrude into instructional time; they should be opportunities for learning. Pupils need to have algorithms and topic-related manipulative skills when solving problems in examinations, but they also need more. Moving beyond worksheets and developing procedural proficiency enables pupils to use mathematical language and models to create their own sense of mathematical understandings and hence learn mathematics to their true potential.

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