# FaSMEd

Raising Achievement through Formative Assessment in Science and Mathematics Education

# Improper fractions: a formative assessment lesson

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| **Subject:** | Maths |
| **Age of students:** | 9 - 11 years |
| **Technology:** | Clickers (software “Je lève la main”), teacher PC, projector |
| **Functionalities:** | Sending and displaying, processing and analysing |
| **Time:** | 50 minutes |
| **FaSMEd partner:** | École Normale Supérieure de Lyon |
| **Short Abstract:** | This lesson deals with improper fractions and aims at working on their decomposition into the sum of an integer and a fraction smaller than 1. Two quiz, at the beginning and at the end of the lesson, allow the teacher to engage students in the proposed work and to highlight the class’ progressions thanks to this activity. |

# 1. Content

This lesson deals with improper fractions. The exploited representation of fractions is their identification on the number line, where the unit is divided into smaller parts.

# 2. Activity

## 2.1 Aims

The objective of this lesson is to work on the competence of writing an improper fraction as the sum of an integer and a proper fraction. The technique to solve this task has already been presented to students and the teacher wants to make them practice it.

## 2.2 Structure / Methodology

**Pre-test**

The teacher has prepared a short multiple choice test (four questions) combining the use of cards and the use of the software “Je lève la main” (see Fig. 1 and the resource “improper_fractions-quiz”).

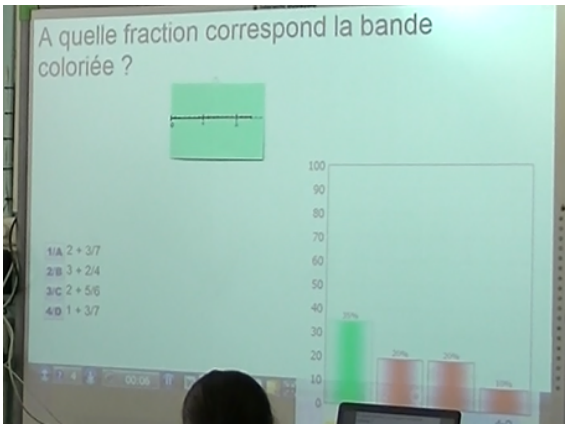


**Fig. 1: The graph of the results is displayed and commented.**

Each question proposes the representation of an improper fraction on the number line and four additive expressions. Students have to choose among them the one that corresponds to the coloured segment on the number line and answer with their clicker. For each question, the graph of the class’ results is displayed and commented by the teacher, not for finding the good answer but for discussing if the students agree on a particular answer or if they hesitate between two or more answers.

At the end of four proposed questions, the teacher comments the class’ results with the students: “After these first results, what do you think? Do we need to work more or do we all agree, we all got the competence?”. Her objective is to engage them in the activity.

**Individual work**

In order to work on the target competence, the teacher has prepared an exercise in paper and pencil (see “improper_fractions-worksheet1”):

*The jumps of this frog are ¼ of metre long. How many metres does it do with 9 jumps? with 15 jumps? How many jumps does it need to do 1 m? 2 m?*

Students work individually on their notebook and miniboard.

Other exercises about the decomposition of improper fractions (see "improper_fractions-worksheet2") are proposed within the interactive "exercise mode" of the TI-Primaire Plus calculator and the teacher asks students to share their solution with the classmates:

- by explaining it at the blackboard for the paper and pencil task;
- by showing the implemented procedure using the calculator simulator, available on the teacher PC and displayed in the classroom.

**Post-test**

At the end of the lesson, students take the quiz again with the student response system, and the teacher makes a comparative analysis of the results in preparation of the next lesson.

## 2.3 Technology

The student response system allows to collect all of the students' answers and to display the graph of the class' results on the spot. This is an immediate feedback given by the technology about the students' solutions, and the teacher exploits it for getting an overview of the class' achievement of the target competence. Sending and displaying information and processing and analysing it are the functionalities of the used technology that supports the teacher in establishing where the learners are in their learning. These functionalities of the technology facilitate the teacher's interpretation of the collected data, allowing her to give immediate feedback to the class about the ongoing achievement of the target competence, and to prepare the next lessons.

The students benefit from the whole process, receiving feedback on their work, being active as the owners of their own learning, but also as instructional resources for one other, sharing the learning objective of the task.

## 2.4 Aspects of Formative Assessment

**Establishing where the learners are in their learning and where they are going**
Students are activated as the owners of their own learning while they are confronted to the questions of the quiz. Moreover, they have a second possibility to answer the same questions at the end of the lesson, using what they have learnt during the lesson. The teacher displays and comments the students' answers on the spot in order to engage them in the work she is going to propose for practicing the target competence, recalling the objective of the task. The two quiz provide the teacher with a picture of the state of the students' achievement of the target competence at the beginning and at the end of the lesson.

**Establishing what needs to be done to get them there**
The teacher engineers new learning tasks that elicit evidence of student understanding: the problem of the frog and the exercises with the calculators are implemented in the classroom with the idea of practicing the target competence. Students are individually activated as the owners of their own learning while they are confronted to these tasks and as instructional resources for one other when the teacher invites them to explain their reasoning to classmates.

There are evidences of the teacher's use of feedback to inform and modify her teaching: the whole lesson (quiz - work - quiz) and the students' reactions are a feedback for the teacher. Data collection at the beginning and at the end of the lesson, through the student response

system, allows the teacher to prepare the next lesson. The comparative analysis that she can carry out from this data informs her future teaching.

## 3. Further Information

The teacher declares that she finds benefits in using the student response system for making the point with her students at the beginning and at the end of the lesson for showing the class' progression on the target competence. Instead, as far as the calculators are concerned, she believes that students need to learn how to overcome the tool, being able to solve the task without it.

## 4. References

"Je lève la main" for clickers:

http://www.speechi.net/fr/index.php/home/evaluer/boitier-de-vote-interactif/

https://www.jelevelamain.fr/en/

For further information (in French):

https://ife.ens-lyon.fr/fasmed/spip.php?rubrique34.