



FaSMEd

Raising Achievement through
Formative Assessment
in Science and Mathematics
Education



Equivalence of fractions: Formative assessment for accompanying ongoing learning

Subject:	Maths
Age of students:	9 - 10 years
Hardware:	Clickers, teacher's PC, projector
Software:	"Je lève la main" (for clickers)
Functionalities:	Sending and displaying, Processing and analysing
Time:	90 minutes
FaSMEd partner:	École normale supérieure de Lyon
Short Abstract:	This 2-lesson sequence is about equivalent fractions. Some moments of formative assessment are organised throughout the sequence for having an overview of the class about the competence of finding fractions equivalent to a given one and for moving the learners forward in their learning.



1. Content

These two lessons are focused on the mathematical theme of equivalent fractions.

2. Activity

2.1 Aims

The objective of the lessons is working on the mathematical task of finding equivalent fractions to a given one. The technique to solve this task has already been presented to students and the teacher wants to understand if the students have internalised this technique and are able to practice it.

2.2 Structure / Methodology

Session 1

The teacher has prepared some closed-ended questions based on the following type of exercise:

$$\frac{9}{10} = \frac{45}{?}$$

She uses the software “Je lève la main” on her PC linked to the projector as a student response system. Questions are displayed and students answer individually with their remote control. They have to type directly the required missing number at numerator or at denominator to make the new fraction equivalent to given one.

The teacher exploits the possibility offered by the software of displaying the students' answers to each question (see Fig. 1). This allows her to comment students' answers, to analyse them on the spot with the students. She gives feedback to the whole class about the procedure to solve the task, recalling and re-explaining it at the blackboard. She gives individual and personalised feedback, in particular to low achievers who have given a wrong answer, trying to understand the origin of their difficulties (“Do you need more time?”, “Is it a problem of multiplication?”) and advising them for being better prepared for answering the following questions (ex. “Take your multiplication tables with you”).

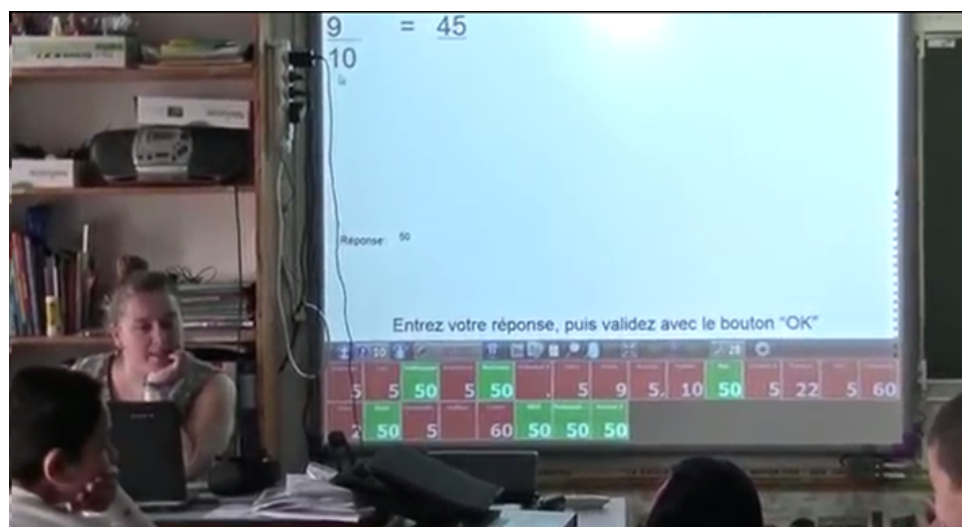


Fig. 1: The teacher can display and comment students' answers.



Session 2

Session 2 is designed and implemented by the teacher as a remediation session after the quiz of session 1. Students are required to solve some tasks, such as: $\frac{1}{2} = \frac{?}{?}$, $\frac{3}{2} = \frac{?}{?}$ within the interactive “exercise mode” provided by the TI-Primaire Plus calculator (see “eq fractions-activity”). This tool provides students with an interactive environment where they can get feedback and suggestions on their solutions (see Fig. 2).



Fig. 2: Calculators give feedback to students.

The teacher calls some students at the blackboard for explaining their reasoning in solving the tasks, giving a complementary feedback to students.

2.3 Technology

The student response system allows to collect all of the students' answers and to display them on the spot. The software processes them, comparing them with the correct answer: answers appear in red or green. 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 and for personalising her feedback to individual students. Sending and displaying information and processing and analysing it are the functionalities of the used technology that have supported 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 engineer situations, tasks, discussions enhancing students' understanding and to prepare the next lesson as a remediation session. Technology, in this intervention case, has also the functionality of providing an interactive environment to students, thanks to the “exercise mode” of the calculators which reacts when students type their solution. The teacher draws on the calculators' feedback about the solution of the task for giving a feedback about the process for solving the task, and students benefit of both of them. 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

Students are activated as the owners of their own learning while they are confronted to the questions (session 1). The teacher analyses the students' answers on the spot in order to detect their difficulties and to accompany them question after question. In particular, she understands that some students are typing the number by which the given fraction has to be multiplied and not the result of this multiplication (see Fig. 1, for example: several students have answered 5 instead of 50 that is 5×10).

Establishing where learners are going

The teacher recalls the objective of the task after each question (session 1), and re-explains the correct procedure to find an equivalent fraction to a given one. In particular, she distinguishes two steps: finding the number by which we have to multiply and do the multiplication.

Establishing what needs to be done to get learners there

The teacher engineers effective discussions and new learning tasks that elicit evidence of student understanding: session 2 is designed and implemented as a remediation and complementary work on the task. The teacher provides students with an interactive environment where they can find feedback on their solution. She gives them complementary feedback about the process to solve the task. Students are activated as instructional resources for one other during the whole sequence of lesson, as they are invited to explain their reasoning to classmates.

There are evidences of the teacher's use of feedback to inform and modify her teaching: session 2 is designed starting from students' results that constitute a feedback for the teacher. Indeed, she gains more insights into students' difficulties in solving the task and she wants to work again on it. There are also evidences of the students' exploitation of feedback to improve their understanding: for answering the last questions of the quiz in session 1, students use more the multiplication tables as a support, following the teacher's suggestion. During session 2, students discuss with the teacher for understanding the calculator's feedback when they give a wrong answer (see Fig. 2). They wonder about the meaning of the writing " $\frac{5}{7} > \frac{1}{2}$ " and together with the teacher they get to consider it as a suggestion for changing their proposal.

3. Further Information

Talking about the first session, the teacher says that the student response system, and particularly its functionality of displaying immediately all of the students' responses, has helped her in grasping students' difficulties and to accompany them more accurately question after question. At the end of the quiz, she notices a progression of the class on the target competence, but she believes that a complementary work is necessary to consolidate this progression and make it evolve further.



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?rubrique32>.