Primary school children and teachers discover the nature and science of planets Earth, Mars and Mundus

Maarten G. Kleinhans, Alex J. Verkade, Mirjam A.S. Bastings, Maarten Reichwein

University of Utrecht, Faculty of Geosciences, NL-3512 PN Utrecht, the Netherlands

The Netherlands Academy of Arts and Sciences, De Jonge Praktijk: Science Communication and Education, Uum: Science Communication, the Netherlands

1 Professor of Water and Sand, Universiteit Utrecht, Faculty of Geosciences, NL-3512 PN Utrecht, the Netherlands
2 De Jonge Praktijk: Science Communication and Education, Universiteit Utrecht, NL-3512 PN Utrecht, the Netherlands
3 Utrecht University Centre for Teaching and Learning, Faculty of Social and Behavioural Sciences, NL-3512 TV Utrecht, the Netherlands
4 Wetenschapsknooppunt Universiteit Utrecht (Science Education Hub and University Museum), Lange Nieuwstraat 18A, NL-3512 TV Utrecht, the Netherlands

Motivation

Science is organised curiosity.

But this is not the case. Far from it! Our aims:

- spark children’s curiosity
- help teachers develop self-efficacy in science education
- eventually: curriculum change, national exams change, and national school assessment change
- present and future: science communication and education

Program at primary schools

Necessary and sufficient conditions:

- dating directions and teachers at pathfinder schools
- open-minded scientists, avoiding jargon, connecting to daily life
- science hubs at universities: wetenschapsknooppunten.nl
- eventually: curriculum change, national exams change, and national school assessment change
- no-brainer: use planets, pancakes, a game and the sandbox

Empirical cycle explained with pancakes

1 playing the Expedition Mundus game to simulate inquiry-based science and the group process
2 introduction of empirical cycle with pancake baking to simulate the basic procedure of experimentation
3 introduction with images of rivers and experiments run a collective experiment in the sandbox
4 run a collective experiment in the sandbox
5 visit rivers through Google Earth to raise questions
6 develop doable questions, hypotheses + experiment, and do

Experiences

Other science aspects:

- peer review through the teacher in the role of editor
- higher-level questions require ‘published’ answer cards for simpler questions
- pupils often specialise and recognise the risk
- pupils often compete for points and collaborate for progress and recognise the tension

How to use:

- contains manual tested by teachers
- read-aloud story for younger pupils
- use in teacher team meeting
- 1 hour is sufficient but the game can well be repeated and increased in difficulty

Dissemination

1500 to secondary education schools (1st year)
2000 to primary schools
100 to teacher education

English version free online: www.expeditionmundus.org

translations in progress: German, Hebrew, Japanese

translation guidelines and licence agreement online to safeguard quality

Effective price: €30 per game, first years funded by SNS REAAL Fonds and Royal Netherlands Academy of Arts and Sciences

www.EXPERTEO MUNDUS ORG

• Design:
  + De Prakijk: science communication and education
  + De Jonge Akademie of the KNAP/W Royal Netherlands Academy of Arts and Sciences
  + PI Maarten Kleinhans

• Principles:
  + puzzle and role-playing classroom game
  + sources of information distributed in classroom
  + most disciplines of arts and sciences
  + find answers to research questions (on card)
  + more difficult questions yield more points
  + collaboration and competition

Questions

1 What is the question you have?
2 Summarise your hypothesis
3 Write your procedure
4 Run your experiment
5 Record your results
6 Draw your conclusions

Sources

www.EXPERTEO MUNDUS ORG

www.expeditionmundus.org

www.geo.uu.nl/fm/mkleinhans

www.EXPERTEO MUNDUS ORG

www.expeditionmundus.org

Further dissemination

• Youtube and other movies for teachers
• Books for teachers and for scientists on didactic aspects focusing on attitude and with various other examples
• Summerschool Junior (400 pupils)
• Klakhuis national science television for children
• experiences:
  + combination URL and IRL is stronger
  + collaboration with social scientists and science hub is effective and fun for all partners

References


Investigating water and sand

• couple sandbox experience to the delta we live in: sense of place

Phases in the project at primary school De Klokkbeker

• design the sandbox, design the water cycle and design to prevent spilling
• first water: first discovery! water needs a slope to flow
• collective experiment: river with delta, or alluvial fan, or dike breach
• unpeel questions and start individual experimentation