



Implementation in the classroom

Soveltaminen luokkahuoneessa, Uporaba v razredu, Implementierung in der Schule, Enseñansa, Ders fikri, Implementation i klasserummet, Enseignement,

Please regard also the chapter “Implementation in the classroom” of the ScienceMath Volume.

The ScienceMath Approach is an interdisciplinary approach between mathematics and sciences like physics, but also biology, chemistry and geography. Theoretical background is the idea of supporting mathematical learning through physical, biological etc. contents and methods. Sciences offer the possibility for realistic teaching. Concrete physical or biological correlations may initiate mathematic activities and lead to authentic experiences.

Thus the ScienceMath Approach is characterised by interdisciplinarity as well as self-dependent work of the students, motivated by worksheets and material for experiments. Both need preliminary considerations concerning learning content, grade of cooperation and teaching methods.

To the learning content:

The ScienceMath modules relate to normal and typical topics of regular European curricula. So it is important to know that they have to be chosen not as an additional subject matter but as an alternative approach in the normal lessons.

First of all you have to choose a module:

The website offers a very quick access to the modules with information and worksheet (see screenshot below). You'll find a module theme and an indication about the age for a first hint. The key-words show the learning areas for the related subjects.

The **ScienceMath** Project
Implementation in the classroom

| | |
|---|--|
| Functional Relations 2 | |
| 15-18 years | concept of function, functional thinking, linear, square, anti-proportional and other functions, physical experiments in interdisciplinary lessons |
| Function $x^{3/2}$ and $x^{1/2}$: practical examples with pendulum | |
| 15 - 18 years | function, potential function (rational powers), oscillation of pendulum |
| Growth | |
| 15 - 18 years | exponential and linear growth, functional relationships, applications of growth, mathematical models, modelling |
| GPS and fair Insurance Premia | |
| 15 - 19 years | Modelling, functional relations, reflecting |
| $x^{-0,5}$, Square root function in divisor | |
| 16 years old | Square root function in divisor |
| Introduction of Trigonometric Function | |
| 16 - 17 years | Trigonometric functions, circulation, oscillation |

To the grade of cooperation

The key-words at the website already give hints about the grade of cooperation. E.g. “physical experiments in interdisciplinary lessons” informs about the need of a narrow cooperation between mathematics and physics teacher. “Modelling, functional relations, reflections” indicates more a mathematical perspective in interdisciplinarity.

Special advises for teaching the module can be found after a click (see next screenshot: Advice).

| | |
|---|--|
| Parabola between Mathematics and Physics - The Case of Horizontal Launch | |
| Keywords | parabola, horizontal launch |
| Lesson applicable for | 15 to 16 years old students. |
| Advice | The lessons demand very correlated teaching between two subjects: physics and mathematics. It is not designed to introduce parabola in math lessons but to show its applicability. The mathematics teacher uses the material (measuring results) prepared by the physics teacher in the way described below. |
| Background | General didactic background Mathematical background The idea of teaching implementation |
| Teaching material | Possible course Needed equipment Worksheets |
| Further Information | Experiences Literature |

The ScienceMath volume offers more information and help for implementation (available at Franzbecker Verlag, see website > literature or home-page).

Please read chapter 2 of the ScienceMath Volume.

It includes

- a conceptional framework of interdisciplinary teaching, which shows that there are different forms of cooperation, e.g. simple and more complex forms.
- “the roof”, a framework for a quick overview over each module (see next screenshot, explanation in chapter 2 of the volume and frames for each module in annex 2 of volume).

To the teaching methods

The ScienceMath modules are developed for self-dependent work of the students. The link “teaching material” (see screenshot above) offers worksheets for the direct use in the classroom.

Hint: At www.sciencemath.ph-gmuend.de/word.htm word versions are available for download and individual changes.

Needed material is described very clear. Most of the proposed equipment is already available in European schools or can be easily collected in private houses. For ScienceMath modules with many experiments it is advised to prepare the material in boxes so that it can be used very easy many times.

| Contents | | | heuristic competencies | organization |
|---|---------------------------------|--|---|---|
| math. aspects | common aspects | nonmath. aspects | Exemplification | portion for math teacher / portion other persons involved |
| represent intervals aim: leading to context free structures | generalized number | contextual measuring values | inductive reasoning determining factors that affect cooling by induction | Coordination getting material maybe doing lessons in science room |
| parameter | specific constant | contextual, factor influencing cooling | analogies when comparing measurements done with different masses and by conceptualizing last experiment | communication students' knowledge in experimenting |
| aim: context free structures | graph: showing relationships | changing | identifying essential components Esp. at the last experiment, what measurands have been used in the experiments before all the time? | type of cooperation Leading subject form <input type="checkbox"/> <input type="checkbox"/> |
| Information about learning and competence areas | | | changing representations from table to graph | Information about cooperation |
| | | | communicate but factor which might influence cooling process | |
| further comments and advice: | | | and interpreting in the worksheet there are lots of questions to reflect about the experiments just done | |
| | | | sensible use of aids and tools using materials and measuring devices properly and knowing sources of errors | |

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