

Adapting inquiry-based science for distance education

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Abstract

The sudden shift to distance and hybrid learning due to the COVID-19 pandemic created a need to identify virtual and at-home science experiences that reflect the vision of inquiry in science education. The adaptation of science materials for a distance learning environment can promote and enhance development of science concepts as well as science practices. We present the teaching material as a three-level gradually developing design that provides opportunities for students to engage in distance (home), school (classroom, school lab) and specialised (specialised lab, university) settings.

There is a set of 10 scientific research questions with increasing complexity (three levels) that are relevant and authentic for pupils (age 11 – 17). Level 1 represents introducing phenomena through research activities suitable for independent implementation at home environment, demanding less help and with no safety issues. It ensures that all pupils experience and explore phenomena as directly as possible in their own surroundings. Level 2 represents more complex, specific and/or precise research activities that require facilitation or teacher guidance. They are more demanding on tools, precision of work, safety and evaluation. Level 3 presents complex and specific research activities carried out in collaboration with specialised laboratories, using special tools and equipment. Three levels of research questions are connected to the following phenomena:

1. Microorganisms in the environment
2. Vitamins in fruits
3. Phosphoric acid in beverages
4. Turbidimetry
5. Water hardness
6. Water in food
7. Electrochemistry
8. Melting and boiling points
9. Chromatography
10. pH measurement

The contribution presents an example of implementation of the three-level model of research activities connected with qualitative and quantitative characterisation of Microorganisms in the environment and water quality evaluated by Turbidity.

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Keywords

distance learning, inquiry-based science education, science education