

Title: Microcomputer-Based Laboratory in Secondary School Chemistry Education

Abstract

School experimental practice should reflect the real laboratory practice so that school science keeps in touch with reality. Today's laboratories are fully equipped with instrumental devices that are often presented in media, so it is necessary that students have experience also with this way of experiments. For school purposes seem suitable probeware (school experimental systems), that combine modern technology with concept of student-centered learning (eg inquiry based science education) that should successfully prepare students for lifelong learning. During recent years probeware has become one of discussed topics in Czech science education, but there has been a lack of research examining whether both teachers and pupils are prepared to accept and implement probeware into school chemistry curriculum. Almost none research has been done in field search describing the way of using the probeware and microcomputer-based laboratory in Czech school curriculum.

Presented mixed method research focuses on attitudes of chemistry teachers (N = 65), pre-service chemistry teachers (N = 38) and students (N = 50) regarding attitudes to general devices and measuring devices (or probeware) to find out the obstacles when innovating school curriculum. The quantitative data from questionnaire survey were analyzed and the results show that all focus groups assess devices in life and in education very high, they also consider experimenting in chemistry as important and probeware in education as useful, with no tender differences. The qualitative research that was performed in two schools (3 chemistry teachers, 50 students), was based on observations and interview with cooperating teachers who implemented nine POE (Predict-Observe-Explain) worksheets and probeware in school education. Based on the observations four case studies were presented. Students involved in qualitative study filled in the pre- and post-questionnaire that had similar items as teachers' questionnaires. The results showed that neither teachers nor pupils are used to POE approach, but to scholarly methods. Nevertheless, the micro-computer based laboratories were appreciated by teachers who had the opportunity to show students a modern way of experimentation. All three teachers agreed that without the help of assistant (myself) who helped with preparing the laboratory and worksheets, they would not be able to lead the laboratory and learn how to work with probeware. The results of all parts of the research show that successful integration of microcomputer-based laboratories in chemistry education requires long-term preparation of teachers, ideally during undergraduate studies.

Keywords: school experimental system, probeware, microcomputer-based laboratory, secondary school, chemistry education, action research, questionnaire, case study, attitudes, students, teachers