

“Do you need Chemistry in order to be a good bone surgeon?”

Using PARSEL module to contextualize and promote the study of introductory electrochemistry

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PARSEL module: presentation and goals

The PARSEL module selected and adapted by us is designed so as to motivate students for the study of introductory electrochemistry – chemistry’s field that is normally difficult for students (Burke et al., 1998). The study of the module concerns the concepts of oxidation and reduction reactions, electrochemical series and metals’ activities and it is intended to promote pedagogical approaches through Inquiry-Based Science Education (IBSE), which is a focus of the PROFILES project (Branch & Oberg, 2004; PROFILES, 2010).

The new approaches are: the application of new methodologies in the teaching of chemistry, such as the use of Information and Communications Technology (ICT), in particular a computer simulation, before the laboratory work; the IBSE methodology, arousing scientific curiosity individually and

in group, promoting the consultation of scientific materials in order to independently seeking an extension of knowledge on this matter, whether the area of chemistry or other sciences, so promoting interdisciplinary.

Development stages: content and applications

It began by the interest on the project in itself, the available information (the official website and the adjustments made to the Portuguese site) and by the consultation of existing materials. Then we proceeded to the choice of module, revealing itself as the main constraint towards the timing of its implementation in the programs already developed and their integration and/or adaptation to the curriculum.

Our personal choice derived from to its immediate application after adaptation and mainly for being one of the issues where we felt more difficult to attract students, and where there were a large number of alternative conceptions and inability to organize in a logical manner the concepts of oxidation-reduction.

The translation module of various materials was fast, although the most time consuming phase has been the choice of a motivating scenario that could attract the students. The adaptation was chosen as a soccer player known worldwide (Ronaldo Lima, known as “the phenomenon”). The scenario proved to be an immediate success for its easy recognition, intrigued by the person and their individual characteristics (not forgetting the social and vocational issues). The first “inquiry brainstorming” brought about numerous questions (around 20 different tones), with the same number of questions, between biology / medicine and chemistry.

The application module was perhaps the easiest part, and it was a surprise to see the collaborative activity of students in different initiatives. If there wasn't a guide procedure for the activity, this natural interest by new technologies could have slipped to dispersion. The freedom given in the operation of the computer simulation was very useful for all students to adjust the time spent in the different computer applications and proposals in its different activities (such as the macroscopic and microscopic analysis of the reactions of metals in different solutions). In response to questions asked in the student guide, it was found that almost all resorted to the information contained in different parts of the application, mainly on microscopic analysis. In the second session, students tried to answer the questions above, with the teacher having two roles: to present three more questions (which would complement the missing contents) and guide the students review work, remembering what was experienced in the previous class, in a logical and coherent way (net concepts). As there were many issues within the Human Biology and Medicine. There was need to use supplementary texts in order to clarify and help the students to work independently. At the end of the application of this module it became necessary to perform the experimental activity proposed in the official program to verify the results already obtained and the accuracy / prediction of the same. This method responded well to requests from the official program and cemented the concepts preciously learned.

The sharing of these successes with colleagues from the project was very important due to the feedback received and the encouragement to continue working to improve it. In relation to this

two presentations were made: the first referring to the initial stages of implementation of the module and the second, made the final stages of implementation: the main constraints, the resulting adjustments and complementary methodologies, summarizing a slide to create a methodology IBSE+ or, an improvement in initial modulus.

Reflections, concerns and evaluations

Reflection on the module has three distinct stages: the initial stage consisted on an analysis of the results obtained by the students and the detection of bottlenecks in the implementation of the module; the next step was to train where adaptations to the original draft can be made, so as to meet the students' expectations and foster the improvement of the results emerging; in the final stage, the explanation of the results to the PROFILES group, with the presentation of the different stages of implementation of the module, the results obtained from the constraints of the senses and improvements of this action-research methodology, in the teaching of chemistry.

Summing up, the weaknesses of this methodology are: the little information of scientific content (especially the content related to Biology), the duration of the initial motivation by the students, the limited autonomy in solving calculation problems, the reflection on the initial question, and even the huge gap between its main objective and the result derived from the implementation of the module.

What stood out was the intrinsic interest of the students by initial context; their collaboration at different stages, felt the freedom to explore different techniques, to guide their actions by the issues raised, not

only from the questionnaire proposed by the module, but also from the questions raised by the initial brainstorming, which was answered, selectively, after the application of the module. Also important was the predictability of results in laboratory activity proposed in the curriculum, not only on the experimental results as in answers to questions before and after laboratory, which appeared in the report during the day of experiment. It appears then that the constraints are clearly diminished in relation to positive opportunities, stressing the usefulness of verification methodology IBSE, which is one of the key project fulcrums PROFILES.

Next perspectives' outlook

The development of this project is divided into three parts.

The first phase of development will require an improvement in the implementation of the module by next school year students. An alternative scenario focused more in metallic structures and metalrestoration / conservation is our suggestion).

Another aspect is the dissemination of the module by other teachers, thereby allowing the contribution of other colleagues with possible adjustments to cope with new samples of students (as is the case of possible differences in the implementation of co-education and single-sex education in schools).

The third stage will be the training of teachers, thus promoting the sharing of knowledge, applications and evaluations.

Literature

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