

Science notes

Calendar project for teaching chemistry

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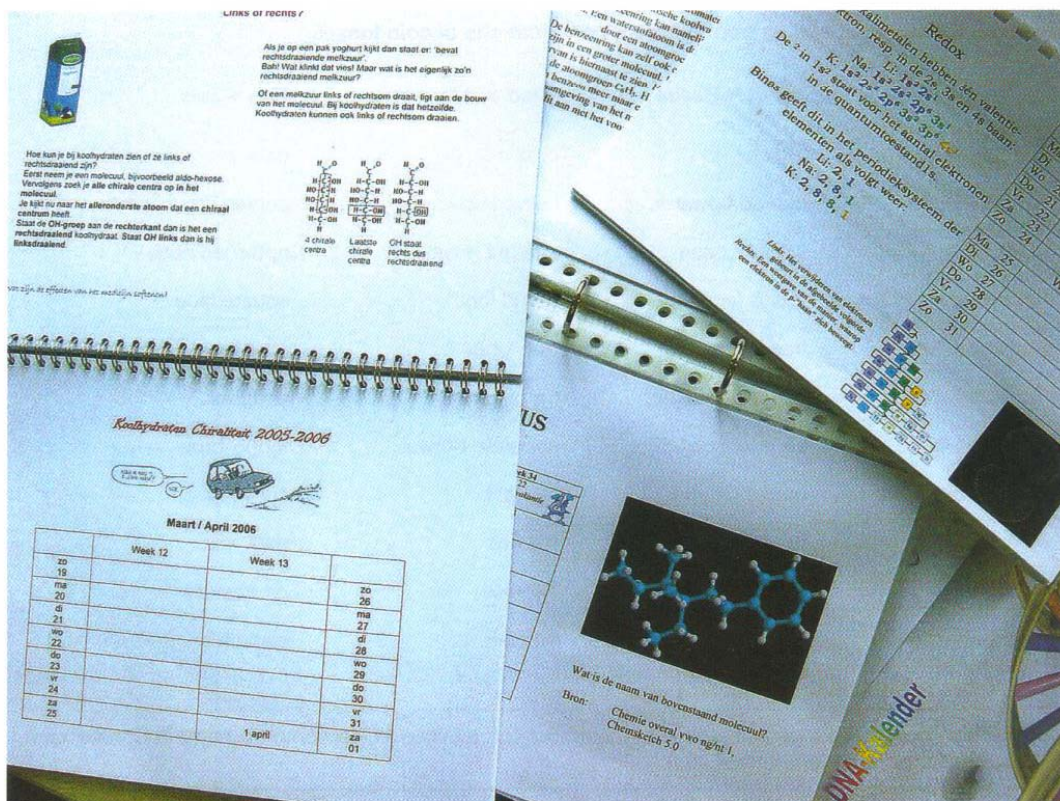
Attractive lessons can motivate students to study chemistry. Producing a year-around calendar is one possible way to stimulate students to deepen their knowledge in basic and advanced chemistry.

In the science department of the teacher-training institute of the University of Professional Education, Noordelijke Hogeschool Leeuwarden (NHL) in the Netherlands, all first-year students follow the same courses, regardless of whether they intend to be chemistry, physics or biology teachers. They select and then pursue their final subject in the second and subsequent years. After four years of study successful students qualify with a Bachelor of Education (BEd).

The programme in the first year consists of 60 ECs (European Credits), with each EC involving 28 hours workload. A total of 8 + 6 ECs is required for learning basic chemistry. Traditionally, the two

10-week courses consist of talk-and-chalk lessons, solving problems and performing practical work. Students follow an advanced secondary school chemistry book (*Chemie Overal vwo*) for studying the usual fields of study. The courses are completed with a written examination.

The number of first-year students tends to be quite low. No more than 10 students, mainly biology, followed the course during 2004–2005. To make studying chemistry more attractive and to give students a greater responsibility for their learning processes, I decided to start a calendar project. Students were given the choice between regular lessons, including a written exam, or the production of a calendar and digital products, without a written examination. All the students chose the calendar project option. This calendar project also gave the students the opportunity to prove that they were able



Examples of students' chemistry calendars.

to establish an electronic workspace (using the online electronic support tool, *Blackboard*) as an instructor, part of the first-year's course requirement.

Contract

Choosing the calendar option meant signing a contract in which the obligations and product requirements were outlined, as follows:

- The calendar should be A4 in size.
- Each page should cover two weeks for a total of 18 months (1.5 years).
- Birthdays, national and religious holidays, and whatever students choose to mention on the specific days should be inscribed on the two-weeks page.
- The front of each page should be about part of the chosen chemistry subject.
- The back of each page should be fully dedicated to chemistry with a suitable picture, clarifying text, a web link, and a question about a part of the calendar from a previous week.
- The overall layout should be uniform, although the student was free to select the specific layout (font type, number and size of pictures, position of questions and web links).

One of the peculiarities of the Dutch is a birthday calendar in every bathroom. Therefore, the student's calendar should be able to be understood and appreciated by all members of the family, regardless of age. This exercise required the chemistry knowledge to be translated to a suitable level for 12–15 year-olds (the age that these student teachers will encounter when they start teaching).

The subjects for the second 10-week chemistry course included carbohydrates, proteins, DNA, chirality, materials and redox reactions. Students chose one of these topics. No more than two students chose the same topic.

Choosing one of the topics meant that knowledge about the other parts of the course would be compromised. In an attempt to address this problem, students were asked to compile at least 12 questions (with answers) from the other five chemistry topics in their *Blackboard* course (every student has one electronic learning space as instructor). I intended to import and compile these digital questions into my own *Blackboard* space. All students were then asked to make a *PowerPoint* presentation in their *Blackboard* space. The *PowerPoint* presentation should be sophisticated enough to allow fellow students to answer the digital tests in the specific *Blackboard* space.

To prevent the above from being a simple 'cut and paste' exercise, restrictions on use of language were set. Only descriptive texts using the present tense were allowed. Students were given the assessment criteria in advance, with the maximum number of marks given in brackets (100):

- Language; spelling; ease of reading (10)
- Creativity; variation on instruction (10)
- Layout (10)
- Consistency (10)
- Digital questions and *PowerPoint* presentation (10)
- Basic chemistry (30)
- Advanced chemistry (20).

Outcomes

The course lasted 10 weeks with 2- and 3-hour periods each week for theory. Students used the first weeks of the course to decide on a suitable format. Not everyone was able to make an appropriate and creative design in a short time. Some students tended to spread minimal knowledge and diluted facts over many pages. Some had trouble finding a way to build up theory from a basic to an advanced level. Other students decided to go their own way and surprised me with advanced chemistry, not only making use of textbooks, but using articles from the Internet.

Constructing digital questions (and answers) in the *Blackboard* space was more difficult than anticipated. Discussing the calendar showed a number of misconceptions about the content and theory of the first chemistry course earlier in the university year.

By the time of the final written examination, only six of the ten students had finished the task, producing a quality calendar. The digital *Blackboard* tests could not be attempted as only 60 per cent of the students had completed the tasks according to the schedule. Students became acutely aware that they are solely responsible for their own learning process. This is an aim that the University of Professional Education NHL strives to achieve in the student population.

Conclusion

Making a product related to chemistry can inspire students to learn chemistry more effectively than do talk-and-chalk lessons. Expanding this project with more effective planning and constructing a timetable for study progress could enhance the learning outcomes. The fact that not all topics are studied is compensated for by encouraging the students to increase their knowledge through literature and

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Internet research. Moreover, even in secondary schools in the Netherlands, not all topics in chemistry are included in the national exams each year, so the students are familiar with this way of studying. (Because of the overload in subject matter, there are insufficient chemistry periods, so some topics, such as redox reactions and acid/base chemistry, are omitted in the national examinations.)

The calendar project enabled the student teachers to experience making a chemistry-related product, and to learn how they could use such a project in their teaching in secondary school, not only in chemistry.

Last but not least, as the lecturer in charge, this project provided me with a fresh way of looking at chemistry and thereby a pleasing alternative approach to preparing the student teachers for a life at the 'chalk face'.

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