

Web Class Chemistry

Orientation of Secondary School Students to University Chemistry

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Introduction

A successful university study starts with making the right choice for a discipline. Knowing more about the discipline can help students to make the right decision about their study. The image secondary school students have of chemistry is unfortunately often different from reality. Visits to the university by the secondary school students are time-consuming and not always fit in the school programme. We have developed a Web Class Chemistry to provide the secondary school students with information about university chemistry. It is not a guided information tour but a small distant learning course with the objective to introduce chemistry as a scientific discipline. The Web Class Chemistry is part of a broader project at the University of Amsterdam. This project has started in 2001 with the first seven web classes. This year already 21 different disciplines are available with more than 600 students enrolled.

The Web Class approach

A Web Class is a completely on-line course. It is based on an active-learning approach and allows different learning styles. It takes place in the electronic learning environment *Blackboard*, which is the standard at our university. To gather the credit points and finally get the certificate of the Web Class the participants work on different assignments.

Each Web Class takes four weeks and it is offered twice a year. It should take in total 10 hours, 2.5 hours per week.

The Web Class Chemistry (scheme 1) is divided in four subjects (Scheme 2) which correspond to the weeks of this Web Class. The central theme is the sweetener Aspartame.

Scheme 1: The home page of the Web Class Chemistry

The screenshot shows the Blackboard interface for the 'Webklas Scheikunde' course. The page header includes the UvA Blackboard logo and navigation links for 'Home', 'Help', and 'Logout'. Below the header, there are tabs for 'UvA onderwijs' and 'Community'. The main content area features a breadcrumb trail: 'COURSES > WEBKLAS SCHEIKUNDE > ANNOUNCEMENTS'. The course title 'Webklas Scheikunde' is prominently displayed in green. Below the title, there are buttons for 'VIEW TODAY', 'VIEW LAST 7 DAYS', 'VIEW LAST 30 DAYS', and 'VIEW ALL'. The date 'August 13 - 20, 2004' is shown. A recent announcement from 'Tue, Jul 06, 2004' reads: 'Welkom De volgende ronde Webklas is in het najaar.' Below this, a section titled 'Welkom in de Webklas Scheikunde!' contains a paragraph of text about the discovery of aspartame by James Schlatter and a small image of a man looking at a molecular model.

The subjects of the Web Class Chemistry are (Scheme 2):

Subject 1 (week 1): Aspartame as a Sweetener,

Subject 2 (week 2): The Three Dimensional Molecular Model of Aspartame,

Subject 3 (week 3): The Synthesis of Aspartame,

Subject 4 (week 4): Structure of Molecule and Taste

At the end of every week the assignments of the week should be submitted for assessment and feedback. The deadlines are necessary also to support the collaboration between the students.

Scheme 2: The subjects of the Web Class Chemistry^a

The Subjects	
Aspartame as a Sweetener	The 3D Molecular Model of Aspartame
The Synthesis of Aspartame	Structure of Molecule and Taste

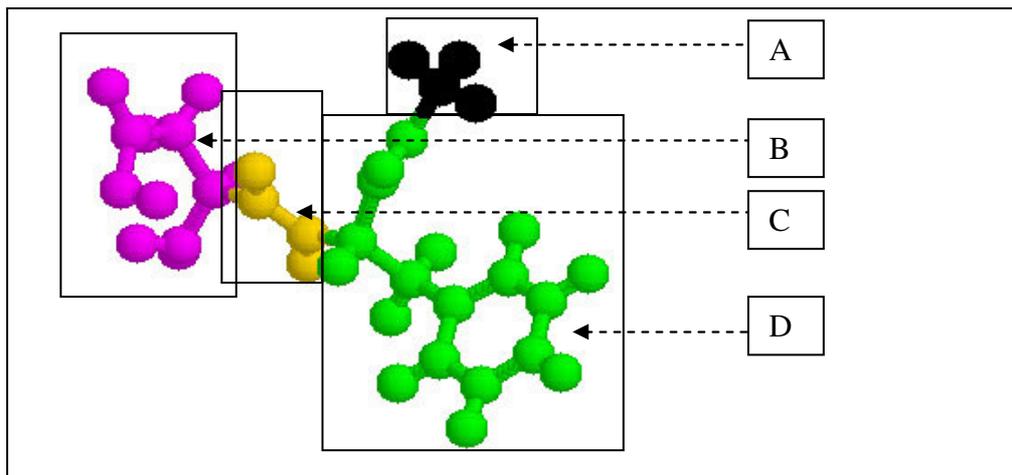
^athe titles of the subjects are originally in Dutch

In every subject of the Web Class Chemistry Aspartame is used to explain the chemical concepts. Doing the assignments within the subjects the participants meet the way chemists *think*, the way they *act* and how they *reason*.

In the first week the participants get acquainted with each other. In several discussion groups they discuss the importance of sweeteners. At home they make several solutions with different concentrations of Aspartame and a solution of sugar. They compare the sweetness of the solutions with a number of test persons. The results of all participants are published together in the *Blackboard* site and analysed by the participants.

In the second week the participant *think* as chemists do. They use simple 3D models in which they can change the substituents to study the principles of stereochemistry. They use this knowledge to analyse and understand the more complex models of Aspartame molecule and its stereoisomers. In one of the assignments they visualize the building blocks of Aspartame in 3D using the plug-in Chime (Scheme 3).

Scheme 3: The model representing building blocks of Aspartame



- A- methyl group (colour of the 3D model *Black*)
 B- building block derived from aspartic acid (*Magenta*)
 C- amide bond (*Gold*)
 D- phenylalanyl building block (*Green*)

In the third week the students *act* as chemists. They observe a laboratory synthesis of Aspartame in a movie and make decisions about what happens at different moments during this process. They learn about the role of enzymes in chemical synthesis.

In the last week of the course they are *reasoning* as scientists. With the knowledge about how the taste works and about the chemistry of sweeteners they predict a structure of a new sweetener. During the whole course the participants search for information about Aspartame on the Internet. They evaluate the sites they find and publish the links with their comment on the External Links site of the Web Class Chemistry to be used by everybody enrolled in the course. Based on this information they formulate an advisory report “for the Ministry of Health” about the safety of Aspartame.

All the assignments have the same design and navigation (Scheme 4) but different teaching activities: *Left*: navigation buttons of the Web Class Chemistry, *Centre*: material to read or carry out, *Right*: The navigation of the assignment: Introduction, Instruction, Resources.

Scheme 4: The design of the assignments

Assignment 2 (Subject 2 / week 2): “The Building Blocks of Aspartame”, part Instruction

As a part of the assignments the participants can use different interactive teaching materials such as three-dimensional molecular models, short explanations combined with diagnostic tests with automatic feedback and they can find links to relevant databases and interesting websites to get more information if they want to. They gather the credit points by taking part in discussion groups, doing simple experiments at home and writing reports about them and by making on-line tests. The participants regularly get feedback from the instructor. The communication instructor-participant and participant-participant takes place exclusively on-line in an organized as well as in a spontaneous way.

Results and Conclusions

The experience with the Web Class Chemistry is very positive. An extended independent evaluation took place about all the web classes in the project. In the evaluation the participants were positive about the parts of this on-line course. They found it pleasant to work on line and were satisfied with the digital contact that they had with their instructor. The statistics showed us that the participants logged in at different times of the day. Quite a lot of the participants worked also late in the evening and in the weekend. We, the instructors, found the web class exciting and challenging. Giving feedback was rather time-consuming.

While a part of the enrolled participants never showed up or stopped at a very early stage, most of those who really worked on the assignments also finished the course successfully. They still came to visit the site even after the course was finished and quite a number of them became afterwards our students.

Developing and working in the virtual environment of the Web Class Chemistry gave us new knowledge and experience about teaching methods and activities suitable to be used in an electronic learning environment. We use these for advising the lecturers who use *Blackboard* in their courses to support contact education at the Faculty of Science. The outcomes of the project Web Class are used in the new projects in education development and renewal.

References

1. URL Webklas Scheikunde: <http://blackboard.ic.uva.nl/>
log in: Username: webclass, Password: webclass; find Webklas Scheikunde on the list of your courses (in Dutch), august 2004.
2. URL University of Amsterdam (UvA): <http://www.english.uva.nl/>, august 2004.