

HOW CZECH INSTITUTIONS OVERCOME THE LACK OF STUDENTS' MOTIVATION TO LEARN CHEMISTRY

Zdeněk Hrdlička, Eva Krchová, Helena Kroftová

Institute of Chemical Technology Prague
Prague, Czech Republic

zdenek.hrdlicka@vscht.cz

International Conference on Innovative Learning in Chemistry
Prague, 5.12.2012

Actual state of the art

- There are significant **problems with students` motivation** to learn chemistry in the Czech Republic.
- Chemistry is considered **difficult** and **unpopular** at elementary and high schools, which causes that only few students choose chemistry as their field of study for higher education.
- Question: What are the **reasons** for lack of students` motivation?



Causes of motivation lack

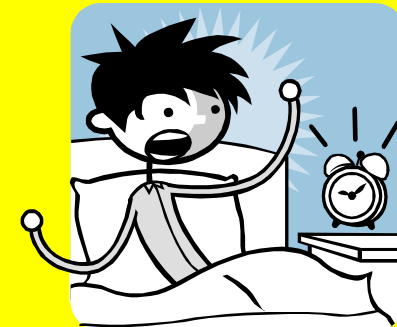
1. Teaching methods

- Teaching is mostly conducted in **too abstract terms**.
- The students try to **remember** the facts **by heart without understanding** them.
- The education in chemistry classes consists in **too much theoretical lecturing** instead of presentation of real life examples.
- The **textbooks** are often old and contain **abstract plain text** without simple explanation.

Causes of motivation lack - continued



- Theory is preferred to practice for several reasons:
 - a) **low allocation** for chemistry lessons
 - b) lack of teachers who want to teach chemistry by different way
 - c) **Teachers** who want to change the way of teaching **are limited**
 - i. Many **chemicals** are **no more allowed** to use or even store in schools.
 - ii. Many schools cannot afford to buy **expensive chemicals and equipment**.
 - iii. Number of possible experiments is limited.
- Pupils and students are not only **unsuccessful** in chemistry but also gradually become **disgusted** by it and prefer other subjects for their following study and professional career.
- Pupils consider chemistry and physics as the **least popular** subjects.
- There is also close connection between **difficulty** and **popularity** of subjects: An easy subject is also favourite and vice versa.
- Pupils are not able to **transform** their **abstract facts** to the **real situation**.



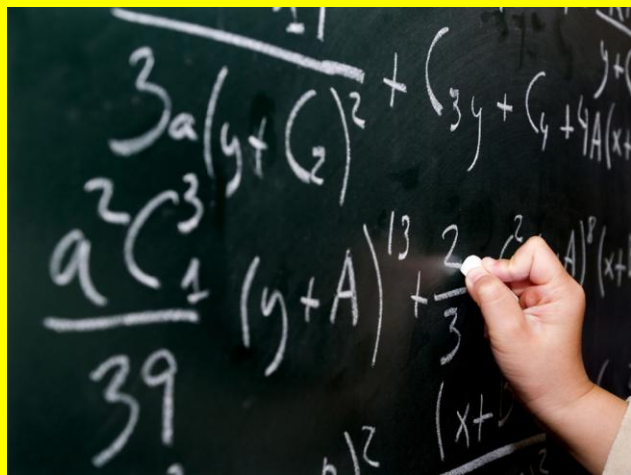
2. Unpopularity of chemistry

- Pupils first meet chemistry in **puberty** which is a period of resistance.
- Pursuing a career in chemistry does not appear to be “**in style**” for the youth.
- Nowadays, mainly the **tertiary sector** of economy, i.e. the service sector speeds up economics.
- **Heavy industry** which prevailed for decades has **receded**.
 - a) turnover in political and economical development in 1990s
 - b) demand to lower harmful emissions
 - c) pressures from ecologic organizations
- Prospective students **prefer humanistic branches** as sociology, political science, laws etc.
- People don't realize that chemistry is **versatile** and **ubiquitous**.

Ways to increase students` motivation

1. Teachers` approach

- Teachers would suggest more **real life examples**, teaching more about issues that are useful or even essential in **daily life**.
- Various **teaching methods** can be utilized, e.g. games, trans-subject project education, proper experiments.
- The teaching method is crucial for students, it is better if they **learn non-violently**, seemingly incidentally.
- However, innovation of teaching desires great portion of enthusiasm.



Ways to increase students` motivation - continued



2. ICT-based materials

- Usage of computers can **increase students` motivation** to learn chemistry.
- Even complex phenomena can be **visualized** via pictures, video or other applications.
- Many ICT-based teaching and learning materials are available online; however they differ a lot in topic, quality, extent, target group and purpose.
- It is necessary to **review** and **assess** the materials.
- There are only a few suitable online-available materials in Czech language.
- The offer in English is much wider, however problems occur:
 - ❖ Not every Czech chemistry teacher masters his **English** so much that (s)he could translate the materials for his/her students.
 - ❖ Computer **translators** are not sufficient because they are not able to translate the text clearly and correctly.
 - ❖ The teachers are very **busy**.

Ways to increase students` motivation - continued

3. Electronic learning tools

- Several schools have been provided with **modern** electronic **learning tools** as interactive whiteboards, tablets etc.
- We assume that this could increase the **attractiveness** of learning for pupils and students.
- These technical innovations cannot help without quality **software** and newly created or adopted teaching and learning **resources**.
- For instance, pupils and students can simulate some chemical reactions without risk of injury.

4. International students' exchange

- We mean that international exchange of students should be **extended**.
- We assume every hardworking university student should have a chance to experience study in a foreign country.

Ways to increase students` motivation - continued

5. Popularization events

- Students' motivation can be also enhanced by popularization events, e.g.
 - ❖ Lessons of Modern Chemistry
 - ❖ Laboratory exercises for secondary schools
 - ❖ Summer scientific camps
 - ❖ Summer school and workshops for secondary school teachers
 - ❖ Scientific trades (open-air fairs)
 - ❖ and many others
- According to our experience, it is desirable to **focus mainly on teenagers** at the age of **13 to 16** because this is the age when most of the teenagers form their ideas of future career.
- At the last two grades of upper secondary schools, they are already decided upon their future career.

Conclusions

- Many students consider chemistry difficult and not interesting for future career.
- The reasons of this lack are of different origin, from obsolete teaching methods and tools to general unpopularity of chemistry.
- This state can be improved by employment of new teaching methods and equipment; however this is limited by costs of new tools and time and effort necessary for change.
- There are many ICT-based teaching materials; available reviews of them can help the teacher to choose the proper one.
- Students` motivation can be also enhanced by various popularization events performed by universities and other scientific institutes.

References

1. Šmejkal P., Čtrnáctová H., Tintěrová M., Martínek V., Urválková E.: Motivační prvky ve výuce středoškolské chemie.
2. Chabičovská K., Galvasová I., Legátová J.: Attitude of the youth to natural sciences and to working in R&D.(in Czech)
3. Bílek M.: Zájem žáků o přírodní vědy jako předmět výzkumných studií a problémy aplikace jejich výsledků v pedagogické praxi. *Acta Didactica 2/2008* FPV UKF Nitra. (ISSN 1337-0073).
4. Janoušková S., Pumpr V., Maršák J.: Motivace žáků ve výuce chemie SOŠ pomocí úloh z běžného života.
5. Kekule M., Žák V.: Foreign standardized tools to assess feedback from science education. (in Czech) In T. Janík, P. Knecht, & S. Šebestová (Eds.), *Smíšený design v pedagogickém výzkumu: Sborník příspěvků z 19. výroční konference České asociace pedagogického výzkumu* (s. 149–156). Brno: Masarykova univerzita.

Thank you for your attention!