



The usage of virtual reality as a teaching tool in the field of chemistry

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Goals and short description

The project will include the preparation of a program using virtual reality as an innovative approach to the educational process. The research will be concentrated on possible benefits of virtual reality usage in the field of chemistry and work in a laboratory. Virtual reality will serve as a tool to present the effects of chemical reactions. It will allow conduction of dangerous experiments in a virtual manner.



Research plan

- 1) Discussion with the research's supervisor Dr. J. Lebień and the consultant from the Faculty of Chemistry, Dr. K. Januszewicz.
- 2) Systematic literature review.
- 3) Writing the research scenario.
- 4) Specifying the application's requirements.
- 5) Design of the learning application.
- 6) Development of a demo version of the application, deployment in the environment of the Immersive 3D Visualization Laboratory at Gdansk University of Technology.
- 7) Creation of questionnaires.
- 8) Pilot study conduction.
- 9) Analysis of the pilot study results.
- 10) Improving the application and questionnaires to the final version.
- 11) Final study.



Research tools

Experiment:

- 3 groups of people
- 1st group reads a short article
- 2nd learns playing game on a regular computer
- 3rd group - same game but with the use of VR devices

Questionnaire



Expected results

- The usage of virtual reality as a teaching tool is at least 20% more effective than traditional learning from books.
- The usage of virtual reality as a teaching tool is at least 10% more effective in comparison with the usage of the same application on a regular computer, without VR devices.
- The learning process with the use of virtual reality is 50% more interesting and motivating than the traditional learning.
- The learning process with the use of virtual reality is 20% more interesting and motivating in comparison with the usage of the same application on a regular computer, without VR devices.



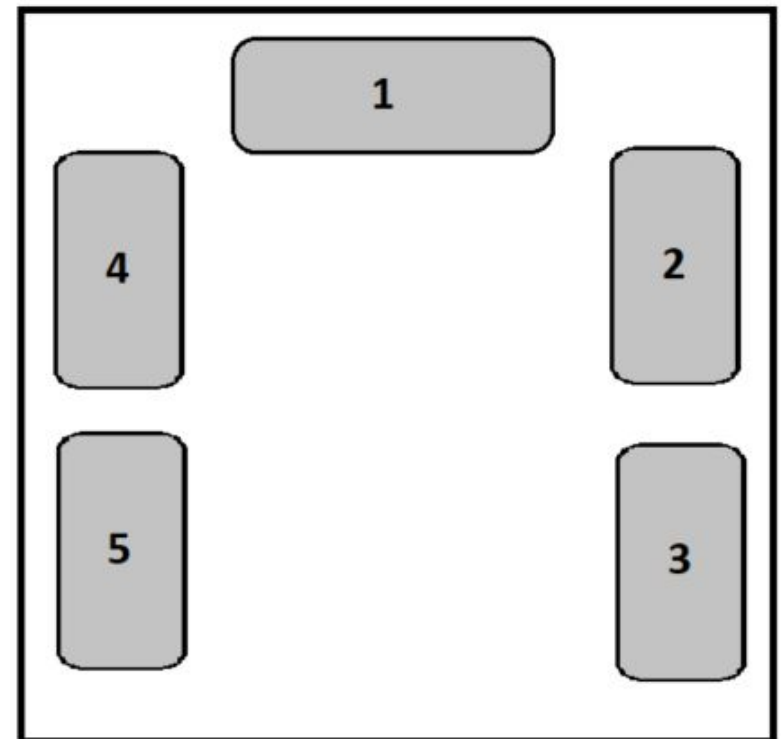
Validity threats

- Improper selection of the research participants (e.g. level of chemistry knowledge).
- Misinterpreting of questionnaire questions.
- Irresponsible, negligent students' attitude to the research process.
- Discrepancy in questionnaire results, incorrectly analyzed results.
- Usage of VR tools can be too entertaining and can distract students from the actual studying and memorizing of the lesson's subject.



Application Scenario

Experiment room





Application Scenario

Experimental tables

- **Two modes - learning mode and assessment mode.**
- **Learning mode:**
 - presence of hints
 - absence of a scoring system
 - availability of help materials
- **Assessment mode:**
 - absence of hints
 - presence of control tasks
 - presence of scoring system



Application Scenario

Available experiments:

- 1. Neutralization**
- 2. Reaction of acid and metal oxide**
- 3. Reaction of acid and metal**
- 4. Reaction of acid oxide and hydroxide**
- 5. Reaction of acid oxide and metal oxide**



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