



DIDACTIC USE OF DIGITAL TECHNOLOGY IN CHEMISTRY LESSONS

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The meaningful use of digital technology in school leads to better:

- teaching and learning [1, 2, 3, 4, 8],
- more successful planning and implementation of individualization and differentiation [1,5,8],
- promotes creative thinking [1],
- improves motivation [3,4,8],
- stimulates students' curiosity [3,4,8],
- can reduce the teaching load [6,7,8],
- facilitates planning and working with students with special needs [6,7],
- teachers can contribute to a more successful learning [1,2,3,4,6,7,8],
- promote the development of a more sustainable knowledge of students in different subject areas [1, 2, 3].

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[6] Romeo, G. I. (2006). Engage, empower, enable: Developing a shared vision for technology in education. V: M. S. Khine (ur.), *Engaged Learning and Emerging Technologies*. The Netherlands: Springer Science.

[7] Shamatha, J. H., Peressini, D. in Meymaris, K. (2004). Technology-supported mathematics activities situated within an effective learning environment theoretical framework. *Contemporary Issues in Technology and Teacher Education*, 3 (4), 362-381.

[8] Logar, A. in Ferk Savec, V. (2019). *Razvijanje kompetenc bodočih učiteljev za didaktično uporabo IKT pri pouku kemije*. Izzivi in priložnosti uporabe informacijsko komunikacijske tehnologije v pedagoškem procesu na področju naravoslovja, tehnologije in matematike, 27-44.

The researchers also find that [1,2,3,4] :

- a supportive school environment is essential for the use of digital technology in teaching,
- which conditions the integration of digital technology in teaching through appropriate digital technology infrastructure and equipment,
- teachers' interest and belief that the integration of digital technology in teaching adds value in terms of improving the quality of the learning process.

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[2] Ferk Savec, V. (2017). The opportunities and challenges for ICT in science education. LUMAT, 5(1), 12–22.

[3] Logar, A. in Ferk Savec, V. (2019). **Razvijanje kompetenc bodočih učiteljev za didaktično uporabo IKT pri pouku kemije.** Izzivi in priložnosti uporabe informacijsko komunikacijske tehnologije v pedagoškem procesu na področju naravoslovja, tehnologije in matematike, 27-44.

[4] Gerlič, I., Veček, N., in Pungartnik, T. (2011). Stanje in trendi uporabe informacijsko-komunikacijske tehnologije (IKT) v slovenskih srednjih šolah. Univerza v Mariboru: Fakulteta za naravoslovje in tehnologijo.

PROBLEM DEFINITION

To study the possibilities of the potential of digital technology in achieving higher levels of knowledge and cognitive processes in chemistry teaching.



Production of interactive digital technology-supported learning materials.

THE COURSE OF THE RESEARCH

- Review of the possibilities of developing and implementing innovative digital technology in chemistry lessons,
- preparation of innovative digital technology for regular chemistry lessons.



- Recording of regular chemistry lessons in the eighth and ninth grade of primary school, innovative digital technology is planned and used in the lessons.



- Processing and preparation of recordings of regular chemistry lessons in primary school using innovative digital technology - 10 videos from 2 to 30 minutes long,
- analysis of the advantages / disadvantages of using digital technology in regular chemistry lessons from the teacher's point of view and from the student's point of view.

Use and creation of QR codes for connecting chemistry lessons with situations from everyday life and for visualization in chemistry

VIDEO: https://drive.google.com/file/d/1rcnXw_J1HZDIGJAYD2182EenRhwxOk2X/view?usp=sharing

From the teacher's point of view:

- by including QR codes in chemistry lessons, the teacher raises the interest of students,
- when planning lessons, the teacher follows modern trends in the use of innovative DT from everyday life,
- with the help of QR codes, the teacher directs students to a number of information on the internet, which they pre-examine, the information is high quality and verified,
- QR codes can be used by the teacher to direct students to additional optional content, for homework, or as links to knowledge testing,

Use and creation of QR codes for connecting chemistry lessons with situations from everyday life and for visualization in chemistry

From the teacher's point of view:

- with QR codes we can direct students to further research the processed content,
- by making QR codes, the teacher has a lot of work to do,
- the teacher must take care of the validity of QR codes or that the website does not expire,
- not all students have modern telephones or leased data transmission,
- students can use QR codes and the internet to download other online applications that students have downloaded on their phone (Facebook, Instagram,....).

Use and creation of QR codes for connecting chemistry lessons with situations from everyday life and for visualization in chemistry

From the student's point of view:

- high interest of students in work and learning,
- the student knows that the teacher directs him to the verified information via QR codes,
- the student sees that the teacher follows modern teaching trends and learns about innovative DT, and sees the useful value of modern technology - a modern telephone that allows him convenient access to a lot of information,
- students compete with each other to have a better phone,
- they do not have the ability to transfer mobile data at school, which can be bad for students and have the opposite effect.

Use and creation of e-comics for connecting chemistry lessons with situations from everyday life

VIDEO: https://drive.google.com/file/d/1DtyFcv_Q8ZX7zvCjw72jEwSdHdpeWC_y/view?usp=sharing

From the teacher's point of view:

- raises students' interest in learning by including e-comics in chemistry lessons and in connection with situations from everyday life,
- the student's attention increases as the lesson is interesting, the teacher uses a different approach,
- the teacher follows the modern trends of didactics of chemistry lessons,
- via e-comics it can capture several learning goals at the same time and connect them in a fun way with situations from everyday life,
- for more creative students, the teacher encourages interest in learning to make e-comics themselves.

Use and creation of e-comics for connecting chemistry lessons with situations from everyday life

From the teacher's point of view:

- a lot of teacher preparation and homework,
- it is not easy to prepare and produce a good comic strip,
- since in addition to knowledge of chemistry and creativity, the teacher has yet to master the software, a lack of software for making e-comics from a chemistry point of view (mainly micro and symbolic level), better comic bookmaking programs are payable.

Use and creation of e-comics for connecting chemistry lessons with situations from everyday life

From the student's point of view:

- increased interest in learning,
- easier to memory,
- fun learning,
- learning material presented in a friendly and interesting way,
- students love to read comics,
- more creative can develop their creative skills and learn about DT for making e-comics,
- students can focus too much on comic rather than content,
- poor students do not understand the essence – chemical content,
- all students don't like comic books,
- pupils do not take comic learning seriously.

Use and creation of programs (H5P) for active teaching - interactive videos

VIDEO: https://drive.google.com/file/d/1Y2515HZhIkrzphnnn43FIG7BY5O4_Nrk/view?usp=sharing

From the teacher's point of view:

- independent active work of pupils,
- individual adjustment of video speed, task resolution, or video can be viewed several times,
- working with interactive video is different and interesting,
- increase interest in learning,
- the video can be viewed by students at home because it is loaded in online classroom,
- the teacher must pay attention when selecting the video clip,
- possibility of processing and translating foreign videos into Slovenian,
- the teacher can upgrade the video himself with tasks,
- can include all three chemical levels — macro, micro and symbolic,
- adding content,
- attention of pupils.

Use and creation of programs (H5P) for active teaching - interactive videos

From the student's point of view:

- working with interactive video is interesting,
- a new and different approach to working with video,
- pupils are increased in their interest in learning chemistry,
- students solve tasks individually and view video, adjust the speed of work to their skills,
- students can watch the video at home several times,
- pupils need an additional teacher's explanation,
- students are unaware of the software,
- the school does not have enough tablets and pupils have to work in pairs, which means that they cannot regulate their work rate individually,
- with an interactive video in English, students may have difficulty understanding.

Use and creation of digital games for active teaching

VIDEO: <https://drive.google.com/file/d/1otTtSpdLsNRljw0AOGZu7CdNi0jhhB6P/view?usp=sharing>

From the teacher's point of view:

- all students in the classroom are active,
- pupils have a very high interest in participating,
- the integration of games into chemistry lessons is a different teaching approach from normal,
- the teacher receives immediate feedback on the performance of the pupils,
- the teacher sees where the pupils are having problems and can provide them with an additional explanation,

Use and creation of digital games for active teaching

From the teacher's point of view:

- the teacher sees or participates all pupils,
- the selected activity can be used for introductory motivation or as a validation and consolidation of knowledge,
- the game must be professionally correct,
- there must be plenty of time in the game for answers,
- some game-making programs have limitations (task text length, number of images on assignment, use only specific videos - YouTube only).

Use and creation of digital games for active teaching

From the student's point of view:

- high interest in working and learning at the game, as everyone is active at all times,
- learning through the game,
- pupils can check their knowledge and receive immediate feedback,
- high attention in task resolution,
- learners want to demonstrate their knowledge and compete with each other,
- pupils are satisfied that they can use mobile phones during lessons,
- competition between pupils can also be negative, as the learning weaker pupils give up quickly,
- pupils do not have cell phones at school,
- students need to be quick responsive and good readers, because the time of solving tasks is limited and it may just happen that they are guessing the answers and resolving without thinking.

Individualization and differentiation by using digital technology

VIDEO: <https://drive.google.com/file/d/1OTPDblsYPott4udbhoCMc6RD9NdMX9ay/view?usp=sharing>

From the teacher's point of view:

- the teacher can prepare various QR codes or other DT activities to guide pupils on learning-assisting content,
- pupils are able to visualise different abilities,
- directing to additional content,
- increased interest in learning and working using DT as without the use of DT in differentiation,

Individualization and differentiation by using digital technology

From the teacher's point of view:

- a well-set lesson and tasks for the implementation of learning differentiation and adequate and appropriate DT support,
- problems may be when a teacher prepares a learning unit using DT to help pupils differentiate, not do the internet or there is no suitable DT equipment available,
- the teacher must pay attention so that pupils do not visit inappropriate websites.

Individualization and differentiation by using digital technology

From the student's point of view:

- students are satisfied when they can help themselves with DT equipment,
- pupils know that the information on the links is verified and relevant,
- easier access to different sources of visualisation,
- learningly weak pupils do not recognise the point,
- pupils do not understand the online link and are charged to DT,
- they do not have enough DT equipment for individual use.

Use and development of voting systems for the needs of individualization and differentiation

VIDEO: <https://drive.google.com/file/d/1su18GZPLRu2OZQnldDAUKI5zjjRB46hZ/view?usp=sharing>

From the teacher's point of view:

- the teacher, using voting systems, immediately receives feedback on pupils' knowledge and provides them with an additional explanation,
- priority of voting systems where they receive feedback on each pupil's knowledge over voting systems where they receive full-class feedback,
- easier planning of differentiation and individualisation,
- through voting systems, the teacher can obtain information on the content that pupils like and plans for further instruction according to their wishes and needs,
- a lot of work and teacher preparation at home,
- restrictions on different voting systems (e.g. number of questions, free use options, etc.).

Use and development of voting systems for the needs of individualization and differentiation

From the student's point of view:

- pupils are using voting systems to check knowledge like this,
- students get feedback on the correctly/misshaited task and see how they understand individual content,
- pupils' responses are anonymous.



THANK YOU FOR YOUR ATTENTION!



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