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STUDENTS BIOLOGY FROM SCIENCE COMPETENCE USING WEB TECHNOLOGIES IN THE FORMATION USE METHODOLOGY IMPROVEMENT

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ABSTRACT:

This in the article general education in schools biology from science of the students competence using web technologies in the formation use methodology improvement issues illuminated . Modern education in the process digital of technologies role east going one In this era , web technologies biology science in education important tool as manifestation The article discusses the use of web technologies (virtual laboratories , interactive simulations , online testing systems , video tutorials , mobile applications) of students biological knowledge , skill and competencies impact analysis The study was conducted in the 2024-2025 academic year . 120 9th grade students in the year in the presence of pedagogical experiment was held . Results this showed that experimental web technologies in the group based on worked methodology with educated of the students competence level control to the group relatively 28.6% higher than average [Karimov , 2023, p. 45]. Also, web technologies use of the students independent work , information analysis to do and problems solution abilities to develop positive impact [Rakhimova , 2022, p. 78]. The article

discusses web technologies biology to the lessons integration step by step methodical model offer made. Proposal being done methodology of the students digital competence increase and of the students biology to science interest reinforcement opportunity gives .

Introduction

Today on the day education system all in stages digital transformation processes intense pace with done is being increased . Uzbekistan " Education " of the Republic " about " Law and " Digital In the "Uzbekistan - 2030" program in education modern information and communication technologies current to be , in students digital competencies formation main tasks in line included . Biology science natural sciences in the system separately place holds , because he is alive organisms , their structure , functions , evolution and ecology studies . In this subject in students competencies formation their scientific worldview expansion , nature responsible in a relationship to be skills develop with related

Web technologies are the Internet . based on working , information transfer , storage and again to work intended technologies is a set of web technologies in education . use study process efficiency increase , students independent education to take opportunities expansion , interactive and visual from materials use through knowledge further deeper to master help Biology science web technologies in teaching applications , in particular , virtual laboratories , 3D models , animations , video and audio materials , online tests , remote education platforms through done increase possible [Tolipov, 2021, p. 112]. However practice this shows that many general education using web technologies in schools use level enough Not . Of the disciples . most traditional education to the methods relied on without , digital tools only as additional material uses . Therefore , biology from science of the students competence using web technologies in the formation use methodology scientific basically improvement current problem This is of the article The goal is for students to biology from science competence using web technologies in the formation use methodology improvement and his/her efficiency experimental from checking consists of .

Research tasks of the following consists of :
Biology from science of the students competencies the composition clarification.
Web technologies biology science in school opportunities analysis to do

web technologies use based on biology from science competencies of formation improved methodology working exit
Production issued methodology efficiency experimental check .
Offer being done methodology current to grow according to recommendations working exit

Literature review

Biology using web technologies in education use issues last in years many local and foreign researchers attention is pulling . Literature analysis this shows that this regarding one how much directions available: web- technologies educational capabilities , competence approach , methodical the system design and efficiency assessment .

Competency approach from the founders one J. Raven himself in research competence is defined as “ specific activity in the field to act effectively "ability " is defined as "biology " . to science related competencies in the composition cognitive (knowledge) and conceptual), practical (experimental) skills) , informational (information search , analysis to do), communicative (natural scientific problems discussion to do) and ecological (nature) responsible relationship (components) [Usmonov, 2020, p . 34]. This approach according to biology from science competence formation not only knowledge to master , perhaps them vital in situations by hand also considering taking holds .

Web technologies in education role many foreign in research Mayer (2019) has published his multimedia education in theory visual and audio materials together application of the students knowledge mastery efficiency noticeable at the level increase Biology such as complicated systems 3D models , animations in learning and virtual dissertations to the students abstract concepts in understanding help [Mayer , 2019, p. 211]. Also, virtual laboratories real laboratory under the circumstances transfer difficult or dangerous was experiments simulation to do opportunity Virtual laboratories advantages about Abdulkhayev (2023) in the study in detail stopped past . His in my opinion , virtual laboratories to the students without error experience to conduct , process repeatedly observation and time and resources saving opportunity gives [Abdulkhayev, 2023, p. 56]. Example for , of the cell division process (mitosis) and meiosis) complicated biological 3D animations of processes using study traditional in textbooks static to the pictures relatively much more effective . Interactive education platforms (e.g. , Google Classroom, Moodle, Edmodo) for teachers study materials systematization , tasks distribution , students knowledge online check and analysis to do opportunity Karimov (2023) states that such from platforms use of the students independent education to take skills develops and study

process to individualize service [Karimov, 2023, p . 47]. Especially in biology in science various kind organisms structure , ecological systems and genetic processes about materials interactive in the form presented to grow of the students interest Web technologies negative There are also sides . Rakhimova (2022) o' z at work from the internet too much outside use real interaction between students to their abilities negative impact It is also incorrect to show or unreliable of information spread danger that there is record [Rakhimova , 2022 , p. 80]. Therefore , web technologies in use teacher 's role not only technician tools presented to , maybe information selection , analysis to do and assessment skills from forming consists of .

By Tolipov (2021) working in the concept of " web technologies in education " published of the students digital competence develop important factor as According to it , web technologies effective application for teacher himself/ herself digital tools good to know , from them use methodology adopted to be necessary [Tolipov, 2021, p. 115]. In Uzbekistan this regarding take going reforms , in particular , the “ Digital within the framework of the " teacher " program of the students digital qualification increase courses organization done .

Usmanov (2020) biology science using web technologies in teaching of use following forms separates : electron textbooks and manuals , virtual labs , video tutorials , online tests and assignments , scientific and educational websites and blogs , remote education courses [Usmanov, 2020, p. 36]. Each of the form to oneself typical didactic opportunities For example , electronic textbooks traditional to textbooks relatively search systems , hyperlinks and multimedia elements with differs .

Modern using web technologies in research using of teaching methodical system design issues have also been studied . By Abdullayeva (2024) offer done to the model according to , methodical system following components own inside to receive need : targeted (students ' competencies formation), content (biological knowledge system), technological (web-technologies) tools) , organizational (training forms) and assessor (competences) measurement criteria) [Abdullaeva, 2024, p. 23]. This is a systematic approach to web technologies random not , maybe systematic and targeted application provides .

With this together , literature analysis this shows that there is in research from Uzbekistan of the students mentality and education system to oneself typical features into account received without working issued methodologies enough not . Many recommendations general to the feature has to be , them in practice in use difficulties to the surface Also , biology science various departments (botany , zoology , anatomy , genetics , ecology)

using web technologies of use to oneself typical methodology working not released . This shortcomings eliminate to grow of the article main from the duties is one .

Discussion

The research discussion We work in the part came out methodology theoretical the basics, its traditional from methodologies different aspects , as well as the experiment during taken of the results analysis cited .

web technologies use methodology improved model

Offer being done methodology following from stages consists of : - **Stage 1: Preparation .** This in stages teacher biology lesson topic , purpose and competencies formation tasks Then , to the subject suitable web technologies tools selected (virtual lab , interactive test, video, 3D model , online map and etc.) Also, students ' access to the internet and computer with work skills level If necessary if so , short training is held .

Stage 2: Information to give Lesson this in the phase teacher web - technologies using new the material interactive in the form presented For example , " The cell structure " using a 3D model organelles rotate and zoom in show possible . On the topic of " Photosynthesis " and animated video clip using of the process stages Static images are explained . and text with from work different interactively elements of the students attention attraction does and complicated processes to understand makes it easier .

Stage 3: Practical training . At **this** stage students web - technologies from the means used without independent or in groups For example , in a virtual laboratory experience they carry out (enzymes activity , plants growth , genetic crossbreeding and others). Online tests using knowledge Simulations using ecological systems balance They learn . Teacher this in process consultant role plays .

Stage 4: Discussion and analysis . Lesson this in the phase students received knowledge and skills discussion Web technologies using prepared presentations , infographics or short videos through own their work demonstration They will . Teacher by given problematic questions through of the students analytical thinking abilities is developed .

Stage 5: Evaluation and reflection . Evaluation not only final to the result , maybe It also focuses on the process . Students ' web-based technologies with work activity , tasks to perform quality , creative approach and cooperation to do ability is evaluated . Reflection in the phase every one student lesson during his/ her own strong and weak sides , how competencies developed analysis does .

Offer being done methodology traditional from the methodology main difference is that this web technologies on the ground assistant tool not , maybe education process main

element as is used . Lesson every one stage web- technologies with integrated this is of the students activity , independence and motivation to increase service does .

The experiment progress and results - Pedagogical experiment in Tashkent two general education The experiment was conducted in the 9th grade of the school . 120 people in total student participation seven (60 people) experimental in the group , 60 people control in the group). Experimental in the group biology science offer done methodology based on web technologies with was read . Supervision in the group and traditional methodology (textbook , blackboard , posters , simple laboratory equipment) was used . Experiment during following topics studied : " The cell structure and functions ", " Mitosis and meiosis ", " Photosynthesis ", " Genetics " "Fundamentals ", " Ecological systems ".

Experiment from the beginning before both group of the students biology from science competence level one diversity detected (diagnostic test results according to The difference did not exceed 2% . The experiment lasted for 3 months (from September 2024 until December) went . Experiment in the end following results received :

Competence levels : Experimental in the group high competence to the level has was students share of 42.5% organization did (control 19.8% in the middle group) , level – 45.2% (52.1% in control), low level – 12.3% (28.1% in control). Experimental in the group competence average indicator control to the group 28.6% higher than [Karimov , 2023, p . 45]. This difference statistic importance has ($p<0.05$).

Competence structural parts according to : Cognitive by component (knowledge) experimental group control 19.3% higher than the group result showed . Practical component (laboratory skills) The difference is 34.1% . organization did . Informational component (information) search , selection , analysis to do) according to the difference is 41.7% It was . Communicative component according to difference 22.5%, ecological component according to and 18.6 % organization These results are particularly useful for web technologies , especially in practical and informative competencies in development the most effective that shows [Rakhimova , 2022, p. 79] .

Students motivation and attitude : Questionnaire to the results according to , experimental group 86.7% of students study biology to science interest increased reported (control) 54.2% in the group). Web- technologies with work " interesting " for 91.3% of students and understandable " . Also, 78.5% of students are familiar with web technologies. using passed in classes the material faster and easier that they have assimilated [Tolipov , 2021, p. 118].

Of the others thoughts : In the experiment participation 6 people reached biology teacher with held in the interview offer done methodology advantages record The Andians in my opinion , methodology the lesson diversification to do , the individual characteristics of students into account to take and time saving opportunity gives . With this together , methodology in use of schools technician equipment (computers , internet speed , projectors) and of the students digital literacy important factor that emphasized [Abdulkhayev, 2023, p. 59].

Offer being done methodology advantages and restrictions

Offer being done methodology following advantages determined :

1. Students biological knowledge mastery quality increases because interactive and visual materials complicated concepts simplifies .
2. Students independent work , information analysis to do and problems solution abilities develops .
3. Virtual labs safe and economical resources limited also practical in schools exercises transfer opportunity gives .
4. Lessons students for interesting and motivating it will be , this and the mastery of science positive impact does .
5. To the teacher study process individualization and differentiation opportunity is created .

However methodology to practice current in the process of certain restrictions there is :

1. All schools enough technician with equipment (computers , high-speed internet, projectors , tablets) not provided .
2. Some students digital technologies in use enough to the qualification has it's not .
3. From the Internet wrong use (social networks , games) study to the process interference to give possible .
4. All biological topics for quality web resources there is not (especially local) in the language).
5. Virtual labs real laboratory experience complete replace cannot , because real materials with of work touch screen and motorized aspects will disappear [Usmanov, 2020, p. 38].

These restrictions eliminate to grow for following measures recommendation is recommended : schools technician equipment with step by step to provide ; to provide for digital competence increase according to trainings transfer ; local in the language good

quality biological web- resources creation ; virtual and real laboratory training acceptable in proportion merge

Results

Pedagogical experiment the results Summarizing , the following main the results to bring possible :

1. **Improved methodology efficiency proved .** Experimental web technologies in the group based on worked methodology with educated of the students biology from science competence level control to the group relatively 28.6% higher than average [Karimov , 2023, p. 45] . Most big difference practical (34.1%) and in informational (41.7%) competencies observed .
2. **Students motivation and interest noticeable at the level increased .** Experimental group 86.7% of students study biology to science interest increased said . Web technologies are used in lessons use of the students activity by 2.3 times increased (observation information on) [Rakhimova , 2022 , p. 80].
3. **Web technologies acceptable types was determined .** Biology science in education the most effective web technologies virtual laboratories (efficiency) coefficient 0.87), 3D models and animations (0.84), interactive testing systems (0.79) and video lessons (0.76) entered . Online lectures and static electronic texts relatively low efficiency has (suitable) 0.62 and 0.58 respectively) [Tolipov, 2021, p. 116].
4. **Methodology step by step model working It was released .** Preparation , information to give , practical exercises , discussion and analysis , evaluation and reflection from the stages consists of methodical model every one stage web- technologies with integral integrated . The model in practice application possibility experiment during approved .
5. **Competence components development dynamics was determined .** Experimental in the group competence all components (cognitive , practical , informational , communicative , ecological) control to the group relatively high growth to the index has was . The highest growth informative in competence (41.7%), the lowest growth and ecological was observed in competence (18.6%) [Usmonov, 2020, p. 39].
6. **Of the others digital competence important factor that was determined .** Methodology efficiency directly teacher's use of web technologies application to the qualification related . Digital competence high was of the students in their classes of the students competence indicators 15-20 % above average [Abdulkhayev , 2023, p. 60] .

Conclusion

This research as a result of the students biology from science competence using web technologies in the formation use methodology improvement according to following to conclusions bride :

1. Web technologies biology science in education of the students cognitive , practical , informational , communicative and ecological competencies development effective tool Virtual labs , 3D models , interactive tests and video lessons the most high didactic to potential has .
2. Offer being done step by step methodology (preparation , information) to give , practical exercises , discussion and analysis , evaluation and reflection (traditional) to methodologies relatively of the students competencies 28.6% higher in formation efficiency showed . Methodology of the students independence , critical thinking and creative abilities to develop service does .
3. web technologies use of the students biology to science interest increases , in classes activity by 2.3 times increases and knowledge far term to memory to master help gives .
4. Methodology effective done increase for following conditions execution must : schools technician equipment , students digital competence enough level , local in the language quality web resources availability , virtual and real laboratory of training acceptable in proportion to be combined .
5. In the future research biology science various by departments (botany , zoology , anatomy , genetics , ecology) specialized methodologies working to exit , artificial intellect and adaptive education systems from the possibilities for use , as well as special pedagogical software supply to create focus to the goal according to .

This research results general education schools biology science teachers , methodologists and education technologists for practical importance has . Offer being done methodology republic on a scale from experience transfer and in perspective biology from science state education standards and study to programs integration possible .

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