

Educational Digital Technologies Development while Covid-19 pandemic*

Tatiana M. TATARNIKOVA

Russian State Hydrometeorological University, Saint Petersburg, Russia

Valery M. ABRAMOV*

Russian State Hydrometeorological University, Saint Petersburg, Russia

Eugene P. ISTOMIN

Russian State Hydrometeorological University, Saint Petersburg, Russia

Evgeniy A. BAIKOV

Russian State Hydrometeorological University, Saint Petersburg, Russia

Vladimir A. BOLSHAKOV

Russian State Hydrometeorological University, Saint Petersburg, Russia

Ekaterina M. KORINETS

Russian State Hydrometeorological University, Saint Petersburg, Russia

Tatiana V. VEKSHINA

Russian State Hydrometeorological University, Saint Petersburg, Russia

Ernest R. ESTRIN

Russian State Hydrometeorological University, Saint Petersburg, Russia

Correspondence should be addressed to: Valery M. ABRAMOV; val.abramov@mail.ru

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Abstract

In article, we describe the development results of educational digital technologies (EDT) adapted to Covid-19 pandemic conditions. In studies, we used methods of data bases constructing within digital educational platforms, web-technologies and virtual reality tools. While Covid-19 pandemic, we have to work on digital transformation of university education, including creation of new concepts for obtaining and presenting didactical materials. We propose to use digital educational platforms, which integrate heterogeneous hardware and software resources with the use of web-technologies in distributed networks and wide application of cloud services. We propose to use Google Classroom, as essential digital educational platform. Recently, we use remote sensing databases for educational purposes within geo-information management disciplines. We consider the issues of digital content creation within university education, essentially in practical training. We present the enlarged groups of didactical works in this area. For data exchange and preliminary discussion while research, was used platform https://www.researchgate.net/profile/Valery_Abramov2/.

Keywords: Educational Technologies, Digital Transformation, Covid-19 Pandemic, Environmental Economics

Introduction

Last year, the Covid-19 pandemic shocks the global economy, including education at university level (UL). Note, this pandemic shock matched the time with Industry 4.0 period, during which a lot of enterprises plan and implement wide spectrum of information technologies (Drabenko, 2019), (Grobitski, 2016), (Frolova, 2019), (Lukyanov, 2019), (Sikarev, 2020), (Trunin, 2019). Industry 4.0 leads to serious technological changes in natural risk management (Berboushi, 2014), (Ershova, 2018), (Garcia, 2018), (Isaev, 2015), (Istomin, 2018), (Shilin, 2019), which requires the development of new educational technologies, especially for UL (Averkiev, 2020), (Estrin, 2020), (Popov, 2019), (Tatarenko, 2020).

In the article, the authors describe the development results of educational digital technologies (EDT) at UL while Covid-19 pandemic in geo-information management area (Burlov, 2018), (Gomazov, 2018), (Fokicheva, 2016), (Lednova, 2014), (Malakhova, 2014), (Yaily 2019), (Zavgorodniy, 2020), in large environmental projects (Burlov, 2018), (Gomazov, 2018), (Fokicheva, 2016), (Lednova, 2014), (Malakhova, 2014), (Yaily 2019), (Zavgorodniy, 2020), within environmental economics (Bidenko, 2019), (Golosovskaya, 2014), (Karlin, 2014), (Karlin, 2009), (Kolbina, 2020), (Popov, 2016). Significant attention in the implementation of such industrial projects should be paid to geo-information support systems (GISS) of natural risk management (NRM) in the context of climate change (Bidenko, 2019), (Golosovskaya, 2014), (Karlin, 2014), (Karlin, 2009), (Kolbina, 2020), (Popov, 2016), including the issues of information collection and processing (Fokicheva, 2019), (Khaimina, 2014), (Popova, 2019), (Tatarnikova, 2019), (Ya, 2019). The educational technologies, discussed in this article, take all above mentioned factors into account.

Methods and Data

In research, we used Foresight technologies, theory of decision making under uncertainties, risk management approach, methods of data bases constructing, web-technologies and virtual reality tools. Also, we used big data technologies (Popova, 2019), (Yaily, 2019) From the point of view of geo-information management, geo-space is structured to allocate the interconnected components of the solution space (Bidenko, 2019). While study, we used data bases and tools of geo-information digital online platforms (GIDOPs) Earth (Sanina, 2020), (Vekshina, 2020) and EOS, including its Land Viewer (LV) product (Bolshakov, 2020), (Prostakevich, 2020).

Results

In research, we developed educational digital technologies (EDT) adapted to Covid-19 pandemic conditions. We gave preference to the use of digital educational platforms (DEP) that integrate heterogeneous hardware and software resources with the use of web-technologies in distributed networks and wide application of cloud services (Popov, 2019). As DEP in our work, we used Google Classroom. Its main advantages are ease of use, universal access, flexible feedback system and its free of charge. This DEP usage eliminates a system administrator because

of Google servers implementing, and also a content Manager because each teacher is responsible for the content of his course (Popov, 2019).

While development of digital content, we used the decomposition as a technique in the preparation of the methodological basis. In figure 1, we present the enlarged groups of didactic works, oriented on practical purposes

- 1) problem statement;
 - 2) field works on data collection;
 - 3) processing and analysis of the data;
 - 4) preparation of geographical information system (GIS) layers and creating digital geo-information products within geo-information support and decision aids;
- decision-making.

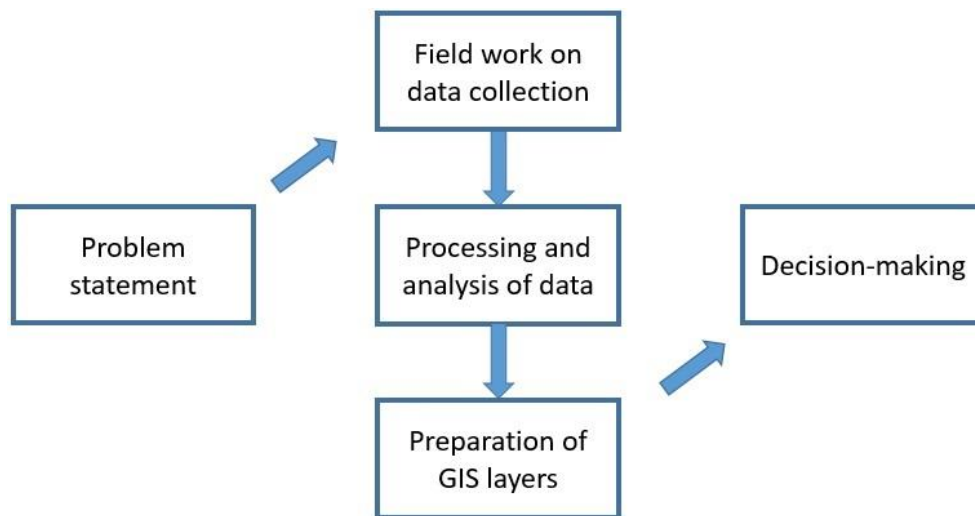


Figure1: Enlarged groups of didactic works, oriented on practical purposes

While our work, we developed digital content of practical works within UL in the field of geo-information management disciplines while Covid-19 pandemic for all above-mentioned groups (figure1), using freely distributed recording program CamStudio, a microphone and a camera to record the lecturer's explaining the individual sections.

As essential DEP in the field of geo-information management disciplines while Covid-19 pandemic, we propose to use DOP EOS eos.com, including its product LandViewer (LV) <https://eos.com/lv/>, that provides efficient tools for searching, processing, and analyzing large amounts of satellite data from the Landsat-8 and Sentinel-2 satellite systems. Usage of DOP EOS allows to find and use satellite images of chosen areas with for training purposes, to determine the location of these areas and to assess their main spatial characteristics (linear and area dimensions), which are the main initial parameters for creation decision aids while geo-information support for environmental economics.

Let's go to examples. In figures 2-4, we show the sequential training operations performed by student in online educational regime for the port of Pevek, the largest Russian port in East Siberian Sea. In figure 2, there is space image on 5th June 2020 (general view by DOP EOS LandViewer) visualized with Natural Colors Application of LandViewer. In figure 3, there is the same as in figure 1, space image, visualized with Atmospheric Removal Application of LandViewer.



Figure 2: Port of Pevek space image (Natural Colors Application) on 5th June 2020 (general view by DOP EOS LandViewer)

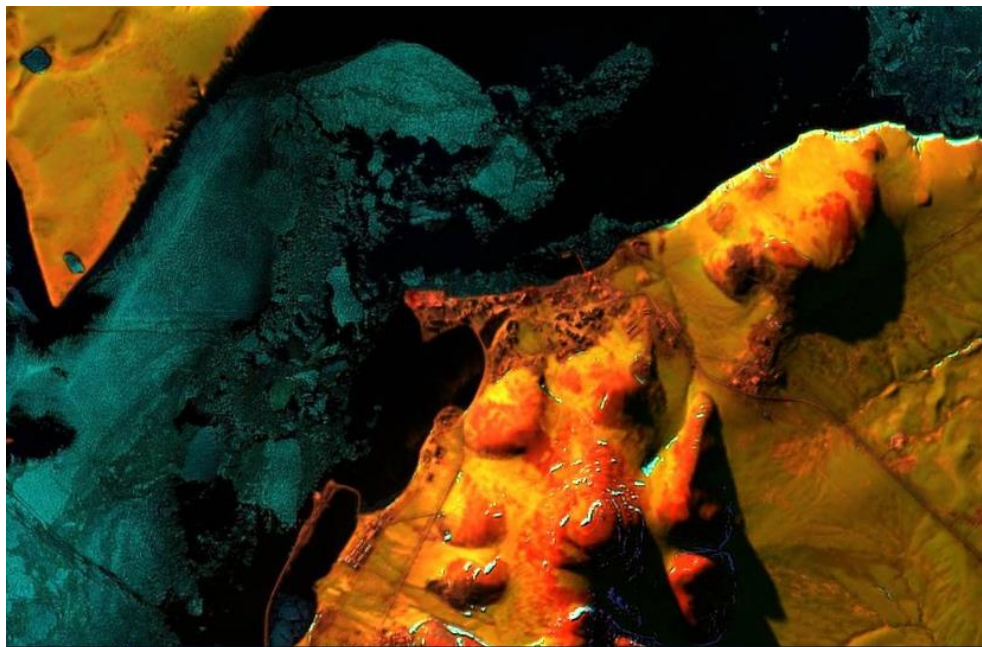


Figure 3: Port of Pevek space image (Atmospheric Removal Application) on 5th June 2020

In figure 4 and 5 are Port of Pevek space images on 16th August 2020.



Figure 4. Port of Pevek space image (Natural Colors Application) on 16th August 2020



Figure 5: Port of Pevek space image (Scene Classification Application) on 16th August 2020

Figure 4 and 5 can be used for town Pevek and surrounding territory space characterization for geo-information management purposes. Note, that decoding of above mentioned images was not goal of this article. As essential result, we propose the usage of DOP EOS tools as EDT at UL for geo-information management disciplines while Covid-19 pandemic.

Discussion

The essential task of EDT at UL for geo-information management disciplines while Covid-19 pandemic is to teach students the practical aspects of work with DOP EOS tools, which requires a developed learning base in special geo-information systems (GIS). In Covid-19 pandemic conditions, real practical work in special GIS laboratory can be undergoes with virtual reality (VR) technologies (Popov, 2019), that can reduce total cost of learning process. Results of study can be useful for goals of geo-information management to large space-distributed projects, including emergency management, within the environmental economy while climate change.

Conclusion

In article, we describe the development results of educational digital technologies (EDT) adapted to Covid-19 pandemic conditions. In studies, we used methods of data bases constructing within digital educational platforms, web-technologies and virtual reality tools. While Covid-19 pandemic, we have to work on digital transformation of university education, including creation of new concepts for obtaining and presenting didactical materials. We propose to use digital educational platforms (DEPs), which integrate heterogeneous hardware and software resources with the use of web-technologies in distributed networks and wide application of cloud services. We propose to use Google Classroom, as essential DEP. We consider the issues of digital content creation within university education, essentially in practical training. We present the enlarged groups of didactical works in this area. As essential result, we propose the usage of DOP EOS tools as EDT at UL for geo-information management disciplines while Covid-19 pandemic. The research results presented in this article has significant scientific novelty and can be useful for private investors, public environmental organizations of the civil sector and state environmental control bodies.

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