

## Efficient E-Learning Framework – Digital Reading and Green Utilities for Public Health and Sustainability

Tilemachos K. Koliopoulos<sup>1</sup>, Panagiotis Kouloumbis<sup>2</sup>, Slavoljub Hilcenko<sup>3</sup>

<sup>1</sup>Managing Director Telegeco Research Center, Collaborator University of West Attica, Athens, Greece.

<sup>3</sup>Telegeco Research Center, Athens, Greece.

<sup>3</sup> Akademiya Obrazovno-zdravstvenih strukovnih studija, Subotica, Vojvodina, Serbia, Academy of Vocational Studies for Educational and Health Professionals Autonomous, Subotica, Province of Vojvodina, Serbia.

---

### Abstract

The aim of this study is to better understand the role of e-learning related to digital reading materials for all, and associated training courses related to environmental health, landscape architecture, emotional, physical sports activities, educational hydraulics. The integrated waste management solutions, efficient landfill designs for public health protection and recreational sports, other sustainable educational health tourism activities, upgrade of landscapes next to landfill boundaries are presented. In this study is investigated the right operational project management of efficient monitoring design related to efficient constructions at community health facilities utilising properly geoinformation utilities. Also an educational e-learning framework is presented for sustainability using proper linguistics material, demonstration of green utilities associated associated with efficient constructions around recycling, renewable resources, sports and recreational facilities in green circular social economy.

**Keywords:** e-learning; digital reading; clean technologies; recycling; waste management; sustainable designs; renewable resources; circular green social economy; sustainable construction design materials; sustainable ecological health tourism; sustainable sports tourism; geoinformation utilities; digital image processing; public health protection; vocational education; fluid mechanics; rheology; green technologies; green utilities; COVID-19.

---

Contact Author: Tilemachos Koliopoulos, Managing Director Telegeco, collaborator University of West Attica, Egaleo, Athens, Greece, Telephone number: +30-210-7561914, e-mail: [t.kol@otenet.gr](mailto:t.kol@otenet.gr)

### 1. INTRODUCTION

The continual and rapid development in information and communications technologies (ICT), including improved wireless networking, and use web within ICTs, IoTs, virtual educational materials, proper

digital reading contents for all using PC's or mobile devices between all students, stakeholders with or without disabilities created a new learning environment, called "Electronic Learning" or "E-learning" for all as well as "Mobile learning" or "M-learning". Mobile phone was just a tool to

communicate with others by voice, but it is fast changed to multi-purpose tool in the light of the wireless modern network technology like personal computer with high-quality camera functions, however, most mobile phones had become small and light weight, providing useful applications like games, calendar, multimedia player, and enabled to browse the Internet to send and receive e-mails or to share multimedia experience as the text, audio and images in addition to voice calls [43, 44, 45].

In addition, the increasing of adoption and acceptance of E-Learning and M-learning in the world are not the same due to availability of mobile infrastructure technology, the level of awareness of E-learning, and the expertise in the field of M-learning, and the willingness of the students to implement and use E-learning and M-learning [52].

The M-learning is a recent e-learning

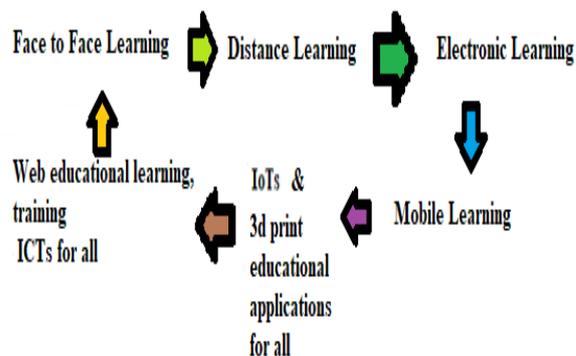
## 2. E-LEARNING, M-LEARNING APPLICATIONS WITH DIGITAL CONTENTS FOR USEFUL EDUCATION

Nowadays, mobile devices such as cellular phones, tablet PCs, smartphones and netbooks (ultra-mobile laptop PCs) are recognized as essential tools for our daily lives, at the same time these devices are the main tools for E-learning. As well as the fact that the distance learning, D-Learning set up foundation for E-Learning and E-Learning has been the foundation for M-Learning and the relationship between M-learning, e-learning, distance learning and face to face have to follow a proper educational learning for all in a hierarchy of learning, e-learning methodologies, relative ICTs, IoTs, useful 3d printing applications, digital reading materials, around sustainability, emotional, pshysical activity sports and associated multidisciplinary fields for pubic health protection based on time and learning environments in post pandemic COVID-19 era [1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 17, 19, 20, 21, 39, 42, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 59, 62, 79, 80, 81, 82].

environment, it has been introduced as a new learning technology lead to new learning form, through the availability of use mobile devices, such as PDAs, smart phones, and handheld computers by anyone to access information and learning materials from anywhere and at any time.

However, M-learning allows students to learn from since they can learn whenever and wherever they want on their existing mobile devices. Simply, the flexibility of use mobile devices at all times in the day and the night is it the most important characteristics of M-learning to achieve the idea of learning at anytime and anywhere [53, 54].

Moreover, IoTs could be combined with interactive e-learning, visual reading material as seen in Figure 1. The latter could be enriched by relative educational digital linguistic material could be used for better reading and training results.



**Figure 1.** Hierarchical learning methodologies, from face to face learning to web educational ICTs e-learning virtual environments.

Also according to literature the differentiates between the particular delivery learning methodologies is the way in which learning content are delivered, applying proper e-learning - m-learning,

ICTs – IoTs for all, since learning content can be delivered through each model, but the transmission channel usually differs [18, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 40, 41, 43, 51, 52, 53, 54, 55, 56, 57, 58, 60, 61, 66, 67, 68].

However, M-learning has risen in educational field to express learning using these portable mobile devices, however, M-learning is one of the e-learning system depends on wireless information communication technology and based on mobile devices in teaching, learning, training, and management homework of learners, it allows them to access educational materials at anytime, anywhere, outside the teaching classroom, it is not only an extension for distance learning, but is also a part of the e-learning and the future of it [14, 15].

### **3. RESEARCH METHODOLOGY**

According to the principle that efficient learning does not demand the educator and the student being present at the same time in the same place, E-Learning, Distance Learning contributes to the need for education or training through the rapid evolution of visual e-learning applications. The software tools that support distance learning are Learning Management Systems (LMSs). LMSs are met in the literature [63] as software tools that combine: computer and communication functionality, on-line methods of learning content provision and educational process management tools through an integrated web-based learning environment.

Additionally, the development of 3-dimensional Virtual World Learning Environments with relative interactive games, quiz, graphics, avatars plays a central role in distance learning [37, 69, 70, 71] gathering 3 main features: i) create the illusion of a 3- dimensional environment, ii) support the usage of avatars as virtual representations of human users, iii)

offer communication and interaction tools to their users. Also, e-learning emerging technologies present a supportive functionality to the educational procedure (i.e. through posting assignments and allowing for participation in synchronous or asynchronous chats or/and through bulletin boards) for efficient e-learning applications combined with proper demonstration of green utilities for environmental health protection and sustainable sports tourism [37, 47, 48, 49, 72, 73].

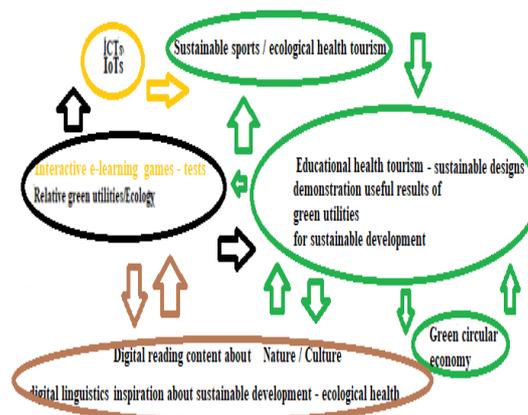
The evolution of Virtual Worlds to their current form has its roots in the rapidly evolving field of electronic games. The first effort of creating a Virtual World is dating back to the '80s where text-based single-player games were developed (Salt et al., 2008). Virtual worlds are designed to offer real-time communication tools, interaction capabilities and collaboration empowerment [49, 55, 57, 75]. Thus, students can gain experiences infeasible to live in the real world. An proper e-learning framework is necessary for effective interactive learning based on the characteristics of Virtual Learning Environments (VLEs) and identified several similarities with the characteristics of Virtual Worlds [71, 76]. This led to the belief that although Virtual Worlds were not intended for use as VLEs, they satisfy most of their relevant functionality offering the potential to be involved in the educational procedure. Nowadays, VLEs emerging technologies are presenting the relative educational materials for public health protection with case studies, quiz, questionnaires and learning games using avatars and proper graphics [49, 57, 71, 75].

Moreover, most e-learning systems consist of several modules and functionality (e.g. content and participants' management, communication, operational environment, etc.). Moreover, within such a distant learning environment, the students should have full control of where, when and how the necessary knowledge can be obtained. Also, a fundamental feature of such a system is to guide course development and direct relevant didactic plans implementation that have to be followed by the learners. The tradeoff involved in user guidance is between posing burdens in aimless and navigation wandering within the educational proper use ICTs utilities and interactive effectiveness for stakeholders [74, 75]. Although there are no learning theories, specific applied techniques or models exclusively designed for e-learning the “electronic” enhancements of them with proper digital reading material from digital linguistics setting up successful interactive educational games – reading materials, ICTs, related to sustainability, landscape upgrade, reclamation works, sustainable tourism, emotional – sports physical activities for all ages, project management and public health protection in multilingual systems [8, 9, 37, 42, 43, 55, 71, 72, 73, 76, 77, 78].

Furthermore, virtual worlds offer the opportunity to the learners to be engaged in activities that continuously measure their performance and assess their apprehension. It is clear that although teachers and students are innovative regarding ICT in education, many efforts have not been widely accepted due to deficient design and implementation outcomes. The latter problem becomes more complicated as technology evolves and Virtual Worlds are more and more applied as educational tools. However, should be taken into account that real learning should be based on experiences, interactive games and in order to gain new knowledge continuous testing and assessment are necessary for participants in an e-learning course. Based on the results of an e-learning course an

improvement may be necessary based on updates and useful digital reading material for students, people with – without disabilities and stakeholders. Based on the above proper combination of new virtual environments, digital reading contents from linguistics, technical books, ICTs, IoTs with the traditional learning theories are omnipresent and should not be ignored [31, 32, 33, 42, 43, 71, 72, 73, 78].

In figure 2, below is presented the framework to use results from green utilities that can be adopted properly to Open Sim as educational content or other similar e-learning software, moodle, sloodle and other associated educational applications for stakeholders, working staff students, graduates from vocational education or other kinds of education to learn about useful green utilities and emerging environmental technologies that promote sustainability and protect public health.



**Figure 2.** Ontologies and associated e-learning utilities for efficient learning methodologies.

According to figure 2 are presented the main ontologies for the relative educational content in order to be effective for educational and training purposes. It should be enriched with proper digital reading contents, interactive virtual e-learning environments, from the digital linguistics about landscape that inspires emotional, physical sports activities. Moreover, based on figure 2 will be useful proper demonstration of results from useful green utilities around particular ontologies related to environmental health protection. The use of proper interactive ICTs, digital comprehension tests, e-learning games will be useful for students, graduates about relative associated constructions associated to sustainable tourism, associated interactive games related to educational

health tourism, reclamation works, project management for sustainable development and public health protection at post COVID-19 era [9, 48, 49, 55, 67, 69, 78].

The relative educational thematic contents, ontologies should be presented properly to stakeholders, students, graduates, working staff that could be enriched with useful case studies. The additional educational material that could be uploaded should adopt relative content related to digital linguistics, sustainable cultural emotional activities, recreational sports, emotional, physical activities, agricultural activities related to particular alternative types of tourism supporting the relative e-learning presentation to graduates, pre-schoolers, students, vocational education, people with disabilities, elderly people, stakeholders. A useful e-learning case study based on digital linguistics reading content providing an inspiration about the importance of heritage protection, landscapes, ecological protection, cultural activities, beauties of goods of natural spaces in particular motivations of emotional, physical activities could be the proper e-learning ICTs reading visual content presentation to preschoolers or students,

Moreover, web links for educational material in environmental management and sanitary engineering, environmental, civil engineering should be provided for students, graduates, stakeholders in applications for visual e-learning and reading using the Open Sim software, moodle, sloodle in combination with relative digital reading content materials and demonstration of results from useful green utilities around sustainable environmental health protection in particular educational utilities for students, graduates, vocational educational training and stakeholders.

#### **4. CONCLUSIONS**

The specific flows of goods or waste-management stream characteristics over time in a given geographical area could be studied using proper e-learning, ICTs related to signal processing theory and input-output theory to determine useful socioeconomic parameters for useful environmental resources protection, recycling topics, clean technologies and public health protection.

Proper Learning Materials and Interactive Methodologies should be focused on the aims of

graduates, stakeholders about indicative books authored by Italian Deledda, G. who got in 1927 the Nobel Price in linguistics "for her idealistically inspired writings which with plastic clarity picture the life on her native island and with depth and sympathy deal with human problems in general", or other authors with similar contents [42, 43]

Moreover, useful digital engineering technical drawings could be included at that e-learning content about environmental resources protection, renewable resources, recycling and public health protection.

The relative e-learning, digital reading content could be useful for stakeholders in digital linguistics relative to travels in nature, sustainable health tourism, sports tourism, public health inspectors as well as in associated engineering fields like in industrial ecology, sanitary engineering, environmental engineering and associated civil engineering projects, recycling waste management technologies, leachate waste water treatment, landfill emissions, waste water units, composting units, noise protection, solid waste management, project management etc. in Greek, Serbian language and English.

learning material utilising properly digital reading materials for students, working staff, people with disabilities and stakeholders. Also Learning Management Systems should be focused in interactive educational materials between proper e-learning platforms, students and teachers. Virtual e-learning world environments should present the main procedures in relative numerical simulation solution problems in geoinformation for public health protection.

The presented outcomes of this study could be applied properly in e-learning material combining relative thematic contents about nature. The presented e-learning framework will be useful for future training of graduate students, stakeholders in particular smart engineering applications related to environmental protection, public health protection and knowledge about digital sanitary environmental engineering designs applying proper geoinformation utilities, I.C.T's in decision making for taking measures in time for sustainable development within integrated associated sports tourism facilities; sports facilities; efficient construction designs; nursing infrastructures and associated ecological health infrastructures at clean environments on mountainous topographies next to forests, lakes, rivers, coastal environments within clean environmental healthy ecosystems.

Future proper e-learning, training content will be

useful for graduates, working staff, stakeholders about efficient construction designs; recycling units; process biotechnology management; monitoring bio-sensors; geoinformation utilities; smart engineering applications; life cycle analysis of landfill chemical emissions within efficient interactive educational ICTs for interesting users. In this way future e-learning utilities will be useful to graduate, students, stakeholders so as to provide them the right knowledge at vocational education to learn about useful sustainable solutions and associated environmental

health protection at post COVID-19 era that promote social cohesion and green circular social economy.

## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest between them.

## REFERENCES

- [1] Aldrich, T., Griffith, J. (1993). Environmental Epidemiology and Risk Assessment, (Ed. Cooke, C.), Van Nostrand Reinhold, New York, U.S.A.
- [2] Ayioutantis, Z. G. (2002). Elements of Geomechanics, Rock mechanics, ION Pubs, Athens, Greece.
- [3] Arvanitidou Vagiona, M., (2009). Hygiene, University Studio Press.
- [4] Ibanez, J.G., Hernandez-Esparza, M., Doria-Serrano, C., Fregoso-Infante, A., Mohan Singh, M. (2007). Environmental Chemistry Fundamentals, Springer.
- [5] Anderson, D., Sweeney, D., Williams, T. (2011) Statistics for Business and Economics, South Western – Sengage Learning Publications, U.S.A.
- [6] Argirakis, P., Neural Networks and Applications, Patra (Greece): Open University, 2001.
- [7] Ali, U., Kidd, C., (2014), Barriers to effective configuration management application in a project context: An empirical investigation, International Journal of Project Management, Vol. 32(3): 508-518. Armstrong M., (2012), Armstrong's Handbook of Human Resource Management Practice (12<sup>th</sup> ed.), London: Kogan Page Limited.
- [8] Yodiansyah, H., Yuzalmi, N. Koliopoulos, T. (2019) Consultation Comparative Study: Communicative Language Teaching (CLT) Principles in the difficulty is that among a wide range of textbooks in the MMCs, vol. 2, pp. 45-53, Journal of Emerging Environmental Technologies and Health Protection, ISSN 2623-4874, e-ISSN 2623-4882  
[https://www.telegeco.gr/2\\_4.pdf](https://www.telegeco.gr/2_4.pdf)
- [9] Koliopoulos, T., Kouloumbis, P., Hilcenko, S. (2019) Community Health Infrastructures and Medical Sports Facilities to Prevent AD Disease for Elderly People, vol. 2, pp. 83-94, Journal of Emerging Environmental Technologies and Health Protection, ISSN 2623-4874, e-ISSN 2623-
- [10] American National Standards Institute (2002) American National Standard Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Acoustical Society of America.
- [11] Ali, U., Kidd, C., (2014), Barriers to effective configuration management application in a project context: An empirical investigation, International Journal of Project Management, Vol. 32(3): 508-518. Armstrong M., (2012), Armstrong's Handbook of Human Resource Management Practice (12<sup>th</sup> ed.), London: Kogan Page Limited.
- [12] Autodesk (2013) AutoCAD 2013 users guide, Autodesk.
- [13] Anderson, M., Jackson, D., (2001) Computer systems for distributed and distance learning. Journal of Computer Assisted Learning 16, 213–228.
- [14] Ally, M., Lin F., McGreal, R. and Woo, B. (2005). An Intelligent Agent for Adapting and Delivering Electronic Course Materials to Mobile Learners.
- [15] Attewell, J. (2005). From Research and Development to Mobile Learning: Tools for Education and Training Providers and their Learners. Proceedings of mLearn.
- [16] Attewell, J. and Webster, T. (2004). Engaging and Supporting Mobile Learners. In Attewell, J. and Savill-Smith, C. (Eds.), Mobile learning anytime everywhere: A book of papers from MLEARN 2004.

- pp. 15-20, London, UK: Learning and Skills Development Agency.
- [17] Babatsikou, F., Koliopoulos, T., Koutis, C., (2017) Efficient Design of a Community Health Infrastructure and Public Health Protection in Emergencies, Review Clinical Pharmacology and Pharmacokinetics, International Edition, 31: pp. 79-84, Pharmakon Press.
- [18] Barab, S.A., Hay, K.E., Squire, K., Addison, M. (2011). m-Learning: a cautionary tale. Training Journal.
- [19] Bates, R.A., Holton, E.F., (1995) Computerized performance monitoring: A review of human resource issues. Human Resource Management Review, Winter95, 15(4): pp. 267-288.
- [20] Barnett, M., Schmidt, R., Karrigan, K., Yamagata-Lynch, L., Johnson, C., (2000) Virtual solar system project: Learning through a technology-rich, inquiry-based, participatory learning environment. Journal of Science Education and Technology 9, 7–25.
- [21] Barfield, W., Zeltzer, D., Sheridan, T., Slater, M., (1995) Presence and performance within virtual environments. Oxford University Press, Inc., New York, NY, USA, pp. 473–513.
- Bartle, R., (2003) Designing Virtual Worlds. New Riders Games.
- [22] Bronack, S., Riedl, R., Tashner, J., (2006) Learning in the zone: A social constructivist framework for distance education in a 3-dimensional virtual world. Interactive Learning Environments 14, 219–232.
- [23] Brooks, F.P., (1988) Grasping Reality Through Illusion - Interactive Graphics Serving Science. Proc ACM CHI88 Human Factors in Computing Systems Conference 1–11.
- [24] Bugeja, M., (2007) Second Thoughts About Second Life. The Chronicle of Higher Education 54, C2. Clark, R., Mayer, R., 2008. e-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning, 2nd ed. Pfeiffer.
- [25] Chanchary, F. H, Islam, S. (2009) Mobile learning in Saudi Arabia - Prospects and Challenge. Proceedings of 5th international conference on e-learning. Penang, Malaysia.
- [26] Charmonman, S., and Chorpothong, N. (2005). Digital Lifestyle and the Road Ahead. Proceedings of the 4th International Conference on eBusiness. December 5-9. Beijing, China.
- [27] Cherian, E. and Williams, P. (2008). Mobile Learning: The Beginning of the End of Classroom Learning. Proceedings of the World Congress on Engineering and Computer Science 2008. WCECS 2008, October 22 - 24, 2008, San Francisco, USA.
- [28] Cobcroft, R. S., Towers, S., Smith, J. and Bruns, A. (2006). Mobile learning in review: Opportunities and challenges for learners, teachers, and institutions. ProceedingsOnline Learning and Teaching (OLT) Conference 2006. Pp. 21-30, Queensland University of Technology, Brisbane. Retrieved March 16, 2014
- [29] De Freitas, S., 2006. Learning in immersive worlds: A review of game- based learning, Joint information systems committee, Bristol.
- [30] De Freitas, S., 2008. Serious Virtual Worlds report. Bristol, England: JISC [WWW Document]. URL <http://www.jisc.ac.uk/publications/reports/2008/seriousvirtualworldsreport.aspx>
- [31] Dickey, M.D., 2005a. Three-dimensional virtual worlds and distance learning: two case studies of Active Worlds as a medium for distance education. British Journal of Educational Technology 36, 439–451.
- [32] Dickey, M.D., 2005b. Brave new (interactive) worlds: A review of the design affordances and constraints of two 3D virtual worlds as interactive learning environments. Interactive Learning Environments 13, 121–137.
- [33] Dietinger, T., Maurer, H., 1997. GENTLE-(GEneral Networked Training and Learning Environment), in: Proceedings of EDMEDIA & ED-TELECOM. pp. 274–280.
- [34] Dillenbourg, P., Baker, M., Blaye, A., O'Malley, C., 1996. The

- evolution of research on collaborative learning, in: Spada, E., Reiman, P. (Eds.), *Learning in Humans and Machine Towards an Interdisciplinary Learning Science*. Elsevier, pp. 189–211.
- [35] Dillenbourg, P., Schneider, D., Synteta, P., 2002. Virtual Learning Environments. *Communication* 8, 3–18.
- [36] Dillenbourg, P., Traum, D., 1999. The long road from a shared screen to a shared understanding, in: C., I., Hoadley, & J.R. (Eds.), *Proceedings of the 3rd Conference on Computer Supported Collaborative Learning*, Stanford, 12–15 December 1999.
- [37] Kahiigi, E.K., Ekenberg, L., Hansson, H., Tusubira, F.F., Danielson, M., (2008) Exploring the e-Learning State of Art. *The Electronic Journal of e-Learning* 6, pp. 77 – 88.
- [38] Hew, K.F., Cheung, W.S., 2010. Use of three-dimensional (3-D) immersive virtual worlds in K-12 and higher education settings: A review of the research. *British Journal of Educational Technology* 41, 33–55.
- [39] Koliopoulos, T., Koliopoulou, G. (2007) Evaluating Landfill Chemical Emissions- Mid Auchencarroch Experimental Design, *Asian Journal of Chemistry*, vol. 19(5), pp. 3911-3917.
- [40] Holmes, B., Gardner, J.R., 2006. *E-Learning: Concepts and Practice*. Sage Publications Ltd.
- [41] Hughes, P., 2001. *Developing Independent Learning Skills*, in: *Implementing Skills Development in HE: Reviewing the Territory*. University of Hertfordshire, 11-12 July 2001. Illinois Online Network, 2010. *Instructional Strategies for Online Courses*.
- [42] Deledda, G. (1913) *Canne al vento, Reeds in the Wind*.
- [43] Deledda, G. (1931) *Il libro della terza classe: lettura, religione, storia, aritmetica.*
- [44] Lehmann, K., Chamberlin, L. (2009) *Making the Move to eLearning Putting Your Course Online*, Rowman & Littlefields Education.
- [45] Mason, R., Rennie, F. (2006) *ELEARNING, The Key Concepts*, Routledge.
- [46] Hwang, B., Zhao, X., Toh Ping Li, (2014) Risk management in small construction projects in Singapore: Status, barriers and impact, *International Journal of Project Management*, V. 32(1): 116-124.
- [47] Hartnell-Young, E. and Heym, N. (2008). *How mobile phones help learning in secondary schools. A report to Becta*, University of Nottingham. <http://www.ifap.ru/library/book330.pdf>
- [48] Hourdequin, P. (2014). Edmodo: A Simple Tool for Blended Learning. *The Language Teacher* 38 (1). <http://jalt-publications.org/lt/departments/lt-wired/articles/3547-edmodo-simple-toolblended-learning>
- [49] Hung M.L., Chou C., Chen C.H. & Own Z.Y. (2010). Learner readiness for online learning: scale development and student perceptions. *Computers & Education*. Vol. 55, Issue 3, 1080–1090.
- [50] Williams, G.M., Ward, R.S., Noy, D.J. (1999): Dynamics of landfill gas in unconsolidated sands, *ISWA, Waste Management and Research Journal*, vol. 17, No.5, pp. 327-342.

- [51] Wolf, P.R., Defitt, B.A. (2000) Elements of Photogrammetry with Applications in GIS, McGraw-Hill, Pubs.
- [52] World Health Organization (2006). Neurological Disorders: Public Health Challenges. World Health Organization, [http://www.who.int/mental\\_health/neurology/neurological\\_disorders\\_report\\_web.pdf](http://www.who.int/mental_health/neurology/neurological_disorders_report_web.pdf).
- [53] Vygotsky, L., 1962. Thought and Language. The M.I.T. Press.
- Westera, W., 2005. Beyond functionality and technocracy: creating human involvement with educational technology. Educational Technology & Society 8, 28–37.
- [54] Weiss, D. (2004) Using mobile phones and pocket PCs for creating, delivering and retrieving content on the fly, based on mobile web browsers. In Attewell, J. and Savill-Smith, C. (Eds.), Mobile learning anytime everywhere: A book of papers from MLEARN 2004. pp. 213-216, London, UK: Learning and Skills Development Agency.
- [55] Slavoljub Hilcenko, S. (2019). Preschool Institution: Methods and Approaches to Learning – More Important Than Information Communication Technologies, J. Informatologia, vol. 52, 1-2, pp. 90-98.
- [56] Osang, F.B., Ngole, J., Tsuma, C (2013), 'Prospects and Challenges of Mobile Learning Implementation in Nigeria. Case Study National Open University of Nigeria NOUN' International Conference on ICT for Africa 2013, February 20-23, Harare Zimbabwe.
- [57] Pisey, S., Ramteke, P.L. and Burghate, B.R. (2012) Mobile learning exploring the challenges and opportunities of distance education. Proceedings of "National Conference on Emerging Trends in Computer Technology (NCETCT-2012)". Held at R.C.Patel Institute of Technology, Shirpur, Dist. Dhule, Maharashtra, India. 2012, 2 (3):19-23.
- <http://worldjournalofscience.com/index.php/wjst/article/viewFile/13152/6648>
- [58] Cherian, E.J., Paul Williams, P. (2008) Mobile Learning: The Beginning of the End of Classroom. Proceedings of the World Congress on Engineering and Computer Science 2008WCECS 2008, October 22 - 24, San Francisco, USA.
- [59] Secondlife (2020) Secondlife for Vitrual Educational Applications and Training <https://marketplace.secondlife.com/>
- [60] Opensim (2020) Opensim for Vitrual Educational Applications and Training <http://opensim.stanford.edu/>
- [61] Edmodo (2020) Edmodo Educational Applications and Training for all <https://support.edmodo.com/home#teacher>
- [62] Moodle (2020) Moodle for educational e-learning applications <https://moodle.org/>
- [63] Hobo (2020) Hobo Design website for blinds <https://www.hobo-web.co.uk/design-website-for-blind/>
- [64] Autocad map 3d (2018) Autodesk utility for digital drawing <https://www.autodesk.com/education/free-software/autocad-map-3d>
- [65] Ford, S. and Minshall, T. (2017) 3D printing in teaching and education: A review of where and how it is used , 1 Institute for Manufacturing, University of Cambridge, Cambridge, United

Kingdom

- [66] Ford, S. and Minshall, T. (2016) 3D printing in education: A literature review, 1 Institute for Manufacturing, University of Cambridge, Cambridge, United Kingdom.
- [67] Smiar, K., Mendez, J.D. (2016) Creating and Using Interactive, 3D-Printed Models to Improve Student Comprehension of the Bohr Model of the Atom, Bond Polarity, and Hybridization, *J. Chem. Educ.* 93, pp. 1591–1594. doi:10.1021/acs.jchemed.6b00297.
- [68] Britain, S., Liber, O., 1999. A Framework for Pedagogical Evaluation of Virtual Learning Environments. *Environments*.
- [69] de Freitas, S., Neumann, T. (2009) The use of ‘exploratory learning’ for supporting immersive learning in virtual environments. *Comput. Educ.* 52(2), 343–352.
- [70] de Freitas, S., Oliver, M. (2006) How can exploratory learning with games and simulations within the curriculum be most effectively evaluated? *Comput. Edu.* 46(3), 249–264.
- [71] Dickey, M. D. (2005) Engaging By Design: How Engagement Strategies in Popular Computer and Video Games can inform instructional design, *Educational Technology, Research and Development*; vol. 53(2), pp. 67-83.
- [72] Dillenbourg, P., Mendelsohn, P. & Jermann, P. (1999) Why spatial metaphors are relevant to virtual campuses. in Levonen, J. & Enkenberg, J. (Eds.) (1999). *Learning and instruction in multiple contexts and settings*. *Bulletins of the Faculty of Education*, 73. University of Joensuu, Finland, Faculty of Education.
- [73] Schuitema J, Ten Dam G., Veugelers W. (2008) Teaching strategies for moral education: a review. *Journal of Curriculum Studies* 40, pp. 69–89.
- [74] Maurer, H., Scherbakov, N. (1996) *Multimedia Authoring for Presentation and Education: The Official Guide to HM-Card*, Addison Wesley Pub. Co., Germany.
- [75] Maurer, H. (1997) *Necessary Ingredients of Integrated Network Based Learning Environments*, ED-MEDIA’97, Calgary, Canada , pp. 709-716.
- [76] Mayes, J.T. & Fowler, C.J.H. (1999) *Learning Technology and Usability: A Framework for Understanding Courseware*. *Interacting With Computers* 11, pp. 485-497.
- [77] Mayes, T. and de Freitas, S. (2004) *Review of e-learning theories, frameworks and models*. London: Joint Information Systems Committee. <http://www.jisc.ac.uk/whatwedo/programmes/elearningpedagogy/outcomes.aspx>
- [78] Radovic, M., Milosevic, D., Andjelija Mitrovic, A., Blagojević, M. (2015) Advantages and Drawbacks of Sloodle application for creating high-quality teaching materials with demanding graphics, in: *Proceedings of ICIST 2015 5th International Conference on Information Society and Technology*, pp. 375-379.
- [79] Mishra, L., Gupta, T., Shree, A. (2020) Online teaching-learning in higher education during lockdown period of COVID-19 pandemic, *International Journal of Educational Research Open* 1 (2020) 100012.

- [80] UNESCO. (2020). UNESCO Report, 'COVID-19 Educational Disruption and Response'.
- [81] OECD. (2020). 'A framework to guide an education response to the COVID-19 Pandemic of 2020'. Retrieved on 16 June 2020 from [https://read.oecd-ilibrary.org/view/?ref=126\\_126988-t63lxosohs&title=A-framework-to-guide-an-education-response-tothe-Covid-19-Pandemic-of-2020](https://read.oecd-ilibrary.org/view/?ref=126_126988-t63lxosohs&title=A-framework-to-guide-an-education-response-tothe-Covid-19-Pandemic-of-2020)
- [82] Radha, R., Mahalakshmi, K., Sathish Kumar, V., Saravanakumar, AR. (2020) E-Learning during Lockdown of Covid-19 Pandemic: A Global Perspective, International Journal of Control and Automation, Vol. 13, No. 4, (2020), pp. 1088-1099.