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GLOBALIZATION'S CHALLENGES IN THE 21ST CENTURY – USING THE ICEBERG STRATEGY, THE BUTTERFLY EFFECT AND MULTIPLE INTELLIGENCES TO CREATE A NEW LEARNING MODEL

Abstract. Haller-Hayon Orit, *Globalization's Challenges in the 21st Century – Using the Iceberg Strategy, the Butterfly Effect and Multiple Intelligences to Create a New Learning Model* [Wyzwania globalizacji w XXI w. – wykorzystanie strategii wierzchołka góry lodowej, efektu motyla i inteligencji wielorakiej w tworzeniu nowego modelu uczenia się]. Studia Edukacyjne nr 51, 2018, Poznań 2018, pp. 479-490. Adam Mickiewicz University Press. ISSN 1233-6688. DOI: 10.14746/se.2018.51.29

Each student has their own individuality and special interests. One of the greatest challenges facing contemporary teachers is how to fascinate and link the students to the learning, to cause them to get excited and feel satisfaction. However, is it possible to attach different students with a diversity of abilities, dissimilar knowledge and different interests, to the same subject? Or is it a dream that cannot be fulfilled? The current article will introduce a new learning model, by using the 'iceberg learning model', understanding the influence of the 'butterfly effect' and the connection to the special 'multiple intelligences' of each student. Instead of seeing the subject of learning as a collection of facts, the concept of the iceberg sees the subject as a vast world full of information connected to endless forms related to the students' areas of life. Therefore, the Iceberg learning method allows each student to be linked to the learning topic according to their own abilities, interests and desires; by using their unique strengths and utilizing their individual substantial intelligences.

Key words: learning model, underwater knowledge, iceberg model, butterfly effect, multiple intelligences

Introduction

Every student in the classroom has their own individuality, special interests, needs, abilities and qualifications.[1] Some of the students are fascinated

[1] N. BarOn, *When Homer Simpson met Pythagoras: the method which adapt the materials to each student*. In: http://www.edunow.org.il/edunow-media-story-254248?utm_content=buffer2b011&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer, 2018.

with History, others, do not understand why they have to learn about events happened a long time ago, often in other parts of the world. There are students who like Mathematics; others are terrified by the need to cope with numbers. In the same class, students can be found who like satirical TV series, while others like action movies.

In the current era of globalization, one of the greatest challenges facing contemporary teachers, perhaps more than ever, is how to fascinate and link students to learning, how to cause the students to get excited and feel satisfaction from it.[2] However, is it possible to attach different students with a diversity of abilities, dissimilar knowledge and different aspirations and interests, to the same subject? Or is it a dream that cannot be fulfilled?

The current article will introduce a potential new learning model; *'The 2 Dimensions Iceberg Learning Model'* by using 'underwater knowledge' and the 'Iceberg method', which instead of seeing the subject of learning as a collection of facts, students must memorize, sees it as a vast world full of information, connected to endless forms related to the students' areas of life. Additionally, the article presents the 'butterfly effect's influence on the learning model and the link to the special intelligences of each student. Hence, the article will introduce how the 'Iceberg learning model' can allow each student to be linked to the learning topic, according to their own abilities, interests and desires, by using their unique strengths, utilizing their individual strong intelligences and by exposure the student to the whole range of phenomena that characterize a particular event, in our 'flat world'.

Globalization and learning

What is globalization? Friedman[3] relates to it as the era that gives individuals the power to compete and collaborate globally, as a result of the advanced technologies and telecommunications systems that have shrunk the world and flattened the playing field, at the same time. Zhao[4] describes globalization as the increasing integration of the world's 21st century's economies through trade and financial transactions that involve the movement of goods, people and money across national and geographical borders. According to Jerald,[5] globalization is breaking down the economic, social and intellectual borders between the world's nations.

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[2] M.M. King, *Twenty-First Century Teaching and Learning*, New Jersey 2012.

[3] T.L. Friedman, *The world is flat: A brief history of the twenty-first century*, New York 2005.

[4] Y. Zhao, *Education in the flat world: Implications of globalization on education*, Edge: The Latest Information for the Education Practitioner 2007, 4, p. 2-19.

[5] C.D. Jerald, *Defining a 21st century education*, Alexandria, Retrieved from http://www.centerforpubliceducation.org 2009.

Globalization and global awareness are significant for 21st century education. As nations join the global marketplace and add workers with increasing skills, many educators recognize the importance of preparing students to be productive workers,[6] with critical thinking and problem solving skills, along with technological and information literacy abilities.[7]

The out-of-date transmission model of education, through which teachers transmit factual knowledge to students via lectures and textbooks, remains the dominant approach to essential education in much of the world.[8] Through the transmission model, students can learn information, but typically do not have much practice applying the knowledge to new contexts, communicating it in complex ways, using it to solve problems, or using it as a platform to develop creativity.[9] Hence, transmission is not effective way to teach 21st century skills. Students are not developing themselves, because they are not being taught explicitly[10] and because 21st century skills are more difficult to assess than factual retention.[11] Despite the challenges, it is possible to educate students differently,[12] for example, by using nine points related to teaching 21st century skills: Make it relevant; Teach through the disciplines; Develop thinking skills; Encourage learning transfer; Teach students how to learn; Address misunderstandings directly; Treat teamwork like an outcome; Exploit technology to support learning and Foster creativity.

Today's students are 'digital natives', born and raised in a digital world and are fluent with digital technologies. The technology those young students are using in their everyday lives provides them with direct access to information and resources.[13] In the global economy, 21st century students will need to make meaningful contributions at work, in their communities and personal lives. The ability to communicate, collaborate, analyze, create, innovate, and solve problems are skills students will need to compete in the workplace and the global economy.

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[6] M.M. King, *Twenty-First Century Teaching and Learning*.

[7] Partnership for 21st Century Skills, *Learning for the 21st century: A report and mile guide for 21st century skills*, Retrieved from http://www.p21.org/downloads/P21_Report.pdf, 2002.

[8] Organization of Economic Cooperation and Development, *Creating effective teaching and learning environments: First results from TALIS*, Paris, France 2009: Author. In: http://journals.sagepub.com/doi/abs/10.1177/003172171209400203?journalCode=pdka.

[9] A.R. Saavedra, V.D. Opfer, *Learning 21st-century skills requires 21st-century teaching*, Kappan, 2012, 94, 2, p. 8-13.

[10] A. Schleicher, *Preparing teachers and developing school leaders for the 21st century: Lessons from around the world*, Paris, France 2012.

[11] P. Griffin, B. McGaw, E. Care (Eds.), *Assessment and Teaching of 21st Century Skills*, Melbourn, Australia 2012.

[12] A.R. Saavedra, V.D. Opfer, *Learning 21st-century skills requires 21st-century teaching*, p. 8-13.

[13] M.M. King, *Twenty-First Century Teaching and Learning*.

Creating a 21st century education system is about assuring all students are prepared to succeed in a competitive world.[14] However, since the current educational system is not adequately preparing our students for the kinds of jobs and lives they are likely to encounter in their lifetime,[15] a new learning model must be established, for replacing rather than updating the current models.

The Iceberg Method of learning

The iceberg model of learning, suggests that the part of the iceberg above the water line represents the understanding typically assessed during classroom instruction. Although the tip of the iceberg is easily visible, the majority of the iceberg is below the water line. Hence, the knowledge, understanding and skills a student needs for mastery of a concept are the mass below the surface.[16] It also teaches what is under the surface**.** It changes the way we look at topics and thus permits each student to be connected to the content field according to his own interests, abilities, goals and desires. Instead of seeing the learning subject as a collection of facts that students must memorize, the concept of the iceberg sees the subject as a vast world full of information connected to endless forms related to the students' areas of life.[17] Since the iceberg method facilitates linking the students to the subject, it allows the students to enjoy the studies and remember the knowledge they acquired for a long time. Being enthusiastic about the learning experiences, which relate to the students' interests and real lives, will make the knowledge become unforgettable.[18]

What is the connection between icebergs and school learning? Similarly, to the iceberg, tiny part above the sea and most of it deep below the surface, when a subject is taught in the classroom, teachers and students touch only a small part of a huge area. The history, usability and accessibility of the field in life and other domains, its representations of culture and art, are often forgotten, since they are perceived as not essential for learning.[19]

While using the Iceberg Model, after selecting a topic or event, the teacher guides the students to focus on 2 significant issues:[20] *The 'Tip' of the Iceberg*: the

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[14] Partnership for 21st Century Skills. *Learning for the 21st century: A report and mile guide for 21st century skills*. Retrieved from http://www.p21.org/downloads/P21_Report.pdf, 2002.

[15] T.L. Friedman. *The world is flat*.

[16] A. Westenskow, P. Moyer-Packenham, *Using an Iceberg Intervention Model to Understand Equivalent Fraction Learning when Students with Mathematical Learning Difficulties use Different Manipulatives*, International Journal of Technology in Mathematics Education, 2015, 23, 2, p. 45-62.

[17] N. Bar On, *When Homer Simpson met Pythagoras*.

[18] Ibidem.

[19] Ibidem.

[20] https://www.facinghistory.org/resource-library/teaching-strategies/iceberg-diagrams.

students are asked to list what they know about the facts of a selected event in the 'Tip' area of the iceberg. While questioning: What happened? What decisions were made in this situation? Who did it? Etc. *Under the Surface* – the students are asked to think about what caused this event. The events might be from the past or present, a war, an economic collapse, a natural disaster, etc. Chart 1 introduces the model.

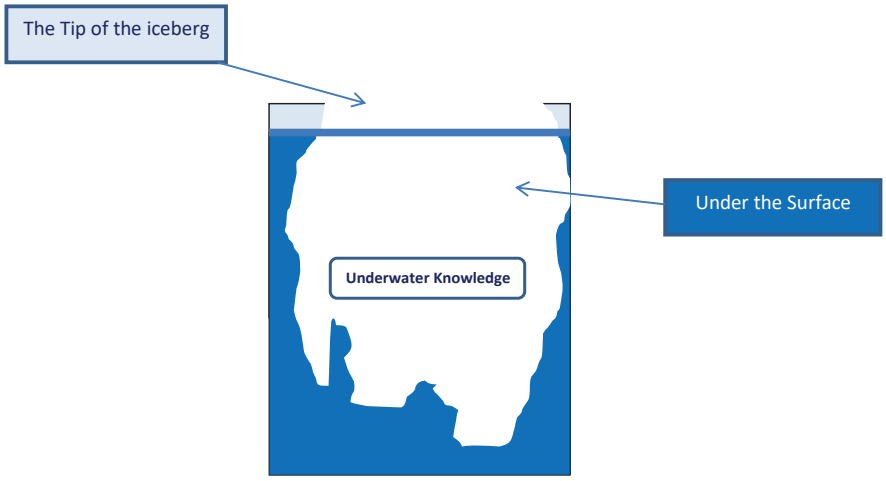

Chart 1. The Iceberg Learning Model

Previous researches have approved the iceberg model's contribution in different domains; like improving Mathematics learning,[21] support the Mathematics' teachers for better teaching[22] and by teaching minority students languages.[23] It can also contribute in business and workforce.[24]

To conclude, the iceberg model suggests replacing the current system. By using 'underwater knowledge' the iceberg learning method allows each student to connect to the learning topic according to their own abilities, interests and desires, using their specific, strong multiple intelligences.

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[21] A. Westenskow, P. Moyer-Packenham, *Using an iceberg intervention model to understand equivalent fraction learning*, p. 45-63; A. Westenskow, P. Moyer-Packenham, B. Child, An Iceberg Model for Improving Mathematical Understanding and Mindset or Disposition: *An Individualized Summer Intervention Program, Journal of Education*, 2017, 197, 1, p. 1-9.

[22] D.C. Webb, N. Boswinkel, T. Dekker, *Beneath the tip of the iceberg: Using representations to support student understanding*, Mathematics Teaching in the Middle School, 2008, 14, 2, p. 110-113.

[23] V. Fueyo, *Below the tip of the iceberg: Teaching Language-minority students*, Teaching Exceptional Children, 1997, Sep/Oct, 30(1), p. 61.

[24] S.S. Adkins, *Beneath the Tip of the Iceberg: Technology Plumbs the Affective Learning Domain*, TD, 2004, Feb, 58, 2, p. 28-33.

Multiple Intelligences

The theory of Multiple Intelligences, developed by Gardner, assumed that human beings have eight or more relatively differentiated intelligences. People use these intelligences individually or in collaboration with other intelligences, to create products and solve problems in the society in which they are living.[25] Belief in a multiple intelligences theory led to the certainty that everybody is intelligent.[26] The eight intelligences are:[27] Linguistic, Logical/mathematical, Visual/spatial, Musical, Bodily/kinesthetic, Interpersonal, Intrapersonal and Naturalist.

Multiple intelligences theory promotes the idea that every individual is capable of learning through the range of different intelligences. Teachers should consider the various multiple intelligences of the students during their teaching; and should persuade the students to use their different intelligences in their learning. Improving the quality of teaching and learning, the teacher and learner should take into account different multiple intelligences.[28] Gardner argued that each person has a unique profile of intelligences of varying strengths; all intelligences are required for an individual, in order to participate, act purposefully and creatively in the society.[29] However, in schools, generally, logical and linguistic intelligences are emphasized in teaching. Students who are more developed in other intelligence dimensions are often ignored. Identifying and knowing students' intelligences profiles is important for success. For example, if a student has limited success with verbal and mathematical intelligences, more success may be achieved by using some of the other intelligences.[30]

The multiple intelligences approach has very useful suggestions for providing a more reasonable and practical approach to schooling. Furthermore, since strengths and weaknesses in intelligences are not static, they may be improved with different educational experiences. For this reason, the multiple intelligences approach supports continuous assessment of intelligences, starting at an early age.[31]

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[25] K. Davis et al., *The Theory of Multiple Intelligences*, [In:] *Cambridge Handbook of Intelligence*, Eds. R.J. Sternberg, S.B. Kaufman, New York 2011, p. 485-503.

[26] N.I. Al-Wadi, *Teachers' Perceptions toward Enhancing Learning through Multiple Intelligences Theory in Elementary School: A Mixed Methods Study*, Indiana 2012, URI: http://hdl.handle.net/10484/3733,.

[27] H. Gardner, *Intelligence reframed: Multiple intelligences for the 21st century*, New York 1999.

[28] G. Shahzada et al., *Interrelation of Multiple Intelligences and their Correlation with Students' Academic Achievements: A Case Study of Southern Region, Khyber Pakhtunkhwa*, FWU Journal of Social Sciences, 2014, Winter, 8, 2, p. 59-64.

[29] K. Davis et al., *The Theory of Multiple Intelligences*, p. 485-503.

[30] G. Shahzada et al., *Interrelation of Multiple Intelligences and their Correlation*, p. 59-64.

[31] Ibidem.

The iceberg method represents a teaching and learning model which allows the students to learn each topic by using their strongest intelligences, facilities which do not exist in the current learning models. However, the iceberg method relates to a single event/topic each time, with all the complexity of the subject, but, does not provide the answer of how to link one topic/event to other events/topics and why it is significant to do this for improving the students' understanding and learning. It is claimed here that with all the fast and parallel changes occurring nowadays, students must develop a broader perspective, to be exposed to the dynamics of various events which are taking place in different parts of the world, at the same period of time, understanding the complicated influences of one event on the other.

The Butterfly Effect

In chaos theory, the 'Butterfly Effect' is the sensitive dependence on initial conditions in which a small change in one state of a deterministic nonlinear system can result in large differences in a later state.[32] The term, coined by Edward Lorenz, is derived from the metaphorical example of the details of a tornado (the exact time of formation, the exact path taken) being influenced by minor perturbations, such as the flapping of the wings of a distant butterfly several weeks earlier.[33]

The butterfly does not power or directly create the tornado, but the term is intended to imply that the flap of the butterfly's wings can cause the tornado: in the sense that the flap of the wings is a part of the initial conditions; one set of conditions leads to a tornado, while the other set of conditions does not. The flapping wings represent a small change in the initial condition of the system, which flows to large-scale variations of events. Had the butterfly not flapped its wings, the route of the system might have been vastly different. However, it is also equally possible that the set of conditions without the butterfly flapping its wings is the set that leads to a tornado.[34] The butterfly effect presents an obvious challenge to prediction, since the initial conditions for a system such as the weather can never be known with complete precision.[35]

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[32] G. Boeing, *Visual Analysis of Nonlinear Dynamical Systems: Chaos, Fractals, Self-Similarity and the Limits of Prediction*, Systems, 2016, 4(4), p. 37, Archived from the original on 2016-12-03. Retrieved 2016-12-02. In: https://en.wikipedia.org/wiki/Butterfly_effect.

[33] E.N. Lorenz, *Deterministic Nonperiodic Flow*, Journal of the Atmospheric Sciences, 1963, March, 20, 2, p. 130-141. Bibcode:1963JAtS...20..130L. doi:10.1175/1520-0469(1963)020<0130:dnf>2.0.co;2.in: https://en.wikipedia.org/wiki/Butterfly_effect.

[34] https://en.wikipedia.org/wiki/Butterfly_effect.

[35] R.C. Hilborn, *Sea gulls, butterflies, and grasshoppers: A brief history of the butterfly effect in nonlinear dynamics*, American Journal of Physics, 2004, 72, p. 425-427; A. Woods, *Medium-range*

How do the 'butterfly effect', the 'iceberg model' and "multiple intelligences' link to each other?

The 2 Dimensions Iceberg Learning Model

Following globalization and the 21st century's changes, the educational system is not appropriate for teaching current students and has to be replaced and adapted. One of the learning models which were suggested by researchers for it is the iceberg learning model that can create links between several more relevant issues of the teaching topic, which were not learnt previously. However, the iceberg model can provides solutions to teaching and learning problems in a specific event, with all its relevant components, but it is only a 'deep learning', vertical learning of a particular topic, in depth. The model does not relate to 'horizontal learning', to additional events that occur at the same time, due to the butterfly effect. As the world is flat, at the same point of time, there are different events that affect each other. This means that the suggested learning model, 'the 2 dimensions iceberg learning model', has to include, simultaneously, not single one iceberg, but many icebergs, affecting one another, at the same period of time. The new learning model should relate simultaneously to the depth and to the breadth of the topic, it has to be a model of 2 dimensions, as can be seen in chart 2.

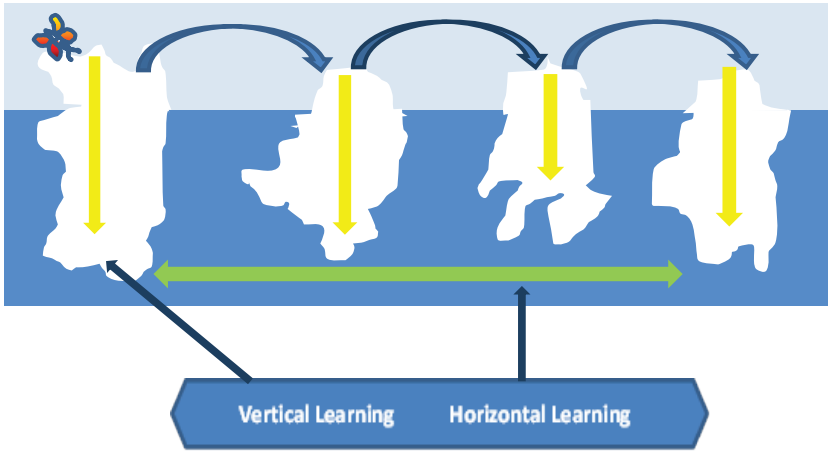

Chart 2. The 2 Dimensions Iceberg Learning Model

weather prediction: The European approach; The story of the European Centre for Medium-Range Weather Forecasts, New York 2005, p. 118. ISBN 978-0387269283.in: https://en.wikipedia.org/wiki/Butterfly_effect.

Several icebergs, in different places are floating in the ocean, while a thin thread connects them all, causing them to have influence; which probably would not happen, if the butterfly had not flapped his wings from the beginning.

For example, the world historical event, the meeting between Donald Trump the President of the United States and Kim Jong-un, the Supreme Leader of North Korea (12.6.18). The 2 dimensions iceberg learning model shows that it is not just "an event" between the 2 leaders, or countries, a single iceberg. There are several events; some icebergs, which are affected by this single one. Any contract, if signed, binding both parties, might affect other countries, like South Korea, China or Japan; it might affect world economic issues; the relationships of the US with the G7; Iran's nuclear agreement etc.

Another significant topic, which is becoming more serious nowadays, concerns African immigrants. It is possible to find in this example a couple of icebergs that have to be learnt simultaneously. One iceberg deals with the severe economic conditions in Africa, which can seem like the reason for the willingness of African people to find themselves another place to live. However, there is probably another iceberg which relates to the wars on this continent; between different countries and tribes. There might be additional iceberg concerns the EU – the European countries, which are ready or not ready to absorb the immigrants. So, looking at the immigrants' case demonstrates how one event in a specific place in the world influences and creates other events, connected to each other and cannot be separate while teaching and learning them.

A different type of example concerns Indonesia and its rain forest torching.[36] Palm oil is used in almost all kind of foods, most of our household products, cosmetics etc. Production of palm oil has surged as a cheap alternative to trans fats. But as the global demand grows, palm oil companies in Indonesia are pushing, illegally, farther and farther onto rainforest land, torching the forests in order to plant palm trees instead, for their production needs. It is an industry of something like 50 billion dollars a year. The mass--burning of Indonesian jungles poses a major threat to wildlife and indigenous populations, it produces huge amount of carbon dioxide, with terrifying consequences for our global climate, massive health problems for citizens, and so on. So, the need for palm oil, in one part of the world, causes enormous and irreversible results in another part of the world.

Conclusions

Educational systems need to adapt their learning models to the needs of the 21st century. They must teach the students how to deal with new skills, to

[36] https://valhallamind.com/personal-development/success-skills/the-iceberg-illusion-real-truth-success, 25.6.18.

develop creativity, problem solving and critical thinking; learning to utilize their multiple intelligences effectively, while strengthening their most successful ones.

The iceberg learning model is a significant solution to the current teaching problems. Nevertheless as was argued before, it is not enough. The educational system has to teach the students how to be more productive and efficient as adults, in the globalization era, in this flat world,[37] that following the butterfly effect idea, each event is affected by several different other events at the same time. Hence, the teaching model has to include some icebergs simultaneously, thus the students can recognize the relationships between the different events. The students must learn that in any case, there is not 'one iceberg', at the same time, there are several icebergs influencing and affecting each other. Consequently, the suggested new learning model should be, 'The 2 Dimensions Iceberg Learning Model', which relates to each topic/event, in an integrative way, comprehending the horizontal and vertical knowledges together. In this way, the students could enlarge their understanding about the different components of each topic, utilizing their preferred intelligences and receiving the whole global puzzle relating to the learning topic.

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