Virtual Technologies in the Educational Space: Pros and Cons

S. M. Kurbatova[1,2][a], L. Yu. Aisner[1][b] and S. D. Krasnousov[2][c]
[1]krasnoyarsk State Agrarian University, Krasnoyarsk, Russia
[2] Siberian Federal University, Krasnoyarsk, Russia

Keywords: Virtual Reality, Education System, Learning Technologies, VR / AR Technologies, VR Training, VR Formats.

Abstract: The global nature of the digitalization process, which is actively spreading across the planet, erases spatial boundaries and pushes the time frame, allowing its participants to "reach" the necessary information. And an increasing variety of technologies used in this process allows reaching great heights. Thus, the development of VR / AR technologies allows creating virtual reality, providing the full effect of immersion in it for maximum familiarization with the information field. Such opportunities, adjusted to specific mechanisms, have received a number of directions for their further development: scientific, applied, etc. One of these areas was the use of VR / AR technologies in the learning process in general, and in the educational system in particular.

1 INTRODUCTION

The evolution of society and the state determines the development of their individual industries and institutions. And, on the contrary, developing specific spheres of life affect the development of society and the state as a whole. The process of digitalization, which is happening everywhere at the present time, on the one hand, introduces humanity to it, and on the other - affects humanity itself, setting it a vector of development (Sosnilo and Ustyuzhanina, 2019). And this is nothing more than the essence of the learning process, since all these processes are associated with the acquisition of new knowledge and skills for their application. Nevertheless, the constant immersion of people in the world of gadgets prevents their involvement in activities that lead to the formation of personality (Koreneva., Lutoshkina, Maksimov, Yatsenko and Rakhinsky, 2020). Moreover, the training can be very diverse (Kurbatova and Naumkina, 2019):

- self-learning (Ivanko and Romanchuk E, 2019) (and primarily through applications-from simple and interactive forms (Sagimbayeva, Moldakhmetova, Kurmanayeva, Tazhitova, Kassymbekova, Smagulova, Tusselbayeva, Tussupova and Ustelimova, 2018), for example, applications for learning foreign languages LinuaLeo, Memrise, etc.
- training at the level of specific companies. For example, KFC created a 25-minute VR game, the purpose of which was to train employees in the process of cooking chicken according to special rules (KFC's New Virtual Reality Training Video), the example of which was followed by UPS, Farmers Insurance, and others;
- training in sectors. For example, the digital transformation of the banking sector, where today mobile and online banking are perceived by bank customers no longer as an additional service, but as an element of the usual activities of credit institutions.
- in the spheres. In particular, in the sphere of education (Kašparova, 2014), software developments are already used, which are based on virtual reality tools (device+software).

Modern education is a purposeful, orderly activity, primarily for the transfer of knowledge to students and the formation of their skills for their use and application (Kudashov, Chernykh, Yatsenko,

[a] https://orcid.org/0000-0001-8518-9233
[b] https://orcid.org/0000-0002-7093-4162
[c] https://orcid.org/0000-0003-0583-1770

Kurbatova, S., Aisner, L. and Krasnousov, S.
Virtual Technologies in the Educational Space: Pros and Cons.
DOI: 10.5220/0010671500003223
In *Proceedings of the 1st International Scientific Forum on Sustainable Development of Socio-economic Systems (WFSDS 2021)*, pages 536-542
ISBN: 978-989-758-597-5

Grigoreva, Pfanenshtil and Rakhinsky, 2017). The process of digitalization of education and the development of VR / AR technologies is of particular interest from the point of view of its immersion in virtual worlds, which can be observed already at the present time.

2 MATERIALS AND METHODS

The purpose of the study is to consider the specifics of virtual reality forms through the prism of the education system, where VR technologies are used as educational technologies.

The objectives of the study are to study this issue from two opposite points of view: pros and cons, since the process of introducing elements of virtual reality into the educational space has both positive and negative sides. Accordingly, their implementation in the educational process is impossible without studying all possible consequences (both positive and negative) on the physical and mental health of students, on the effectiveness of educational programs using VR technologies.

The purpose and objectives determined the research methodology. Taking into account the innovative nature of virtual technologies and their prevalence in different spheres of society (Zuckerberg, 2017; Trachuk, Linder, 2017), as well as their importance in the educational sphere for the formation of personality (Aisner and Trashkova, 2017), it is necessary to pay special attention to their application.

Accordingly, it is necessary to use an objective approach to the study of this issue. Within the framework of this work, based on the set goals and objectives, general scientific methods of cognition were used – the study of information sources, questioning, observation, logical analysis of the received information, deduction, induction, abstraction.

Issues related to various innovative and information-technological aspects of the education process have repeatedly become the subject of study and research (Ageenko and Dorofeeva, 2017). However, due to the fact that virtual reality is a young direction in the field of scientific and technical technologies (Chalmers, Howard and Moir, 2009; Lanier, 2007; Song, Borton, Park, Patterson, Bull, Laiwalla, Mislow, Simeral, Donoghue and Nurmikko, 2009; Robles-De-La-Torre G, 2006), and in the educational sphere its implementation is still at the stage of formation, this topic is only beginning to become the subject of relevant scientific research (Monaha, 2006; Thakral, Manhas and Kumar, 2010; Selivanov and Selivanova, 2014; Erokhin, 2015; Uvarov, 2018; Golokhvast, Dokuchaev, Sergievich, Smirnov, Tumyalis and Good, 2019).

3 RESULTS

Virtual reality (VR) is a well – defined, albeit artificial world created by specialists using technical means, information technology and computing power, in which, in 3d mode, from the first person, you can both observe what is happening around you, and take a direct virtual part in it, interacting with the results of your activities. This world allows you to create a variety of situations, phenomena and places; it can simulate any process and immerse any person in it. This requires appropriate technical equipment – systems of image, sound, simulation of tactile sensations, control, direct connection to the nervous system, but at least virtual reality glasses (or helmet) and controllers (Sdelnikova, Shkiranda and Bagaeva, 2015).

At the same time, we can talk about different formats of VR education (Postoyev, 2020):

Table 1: Formats of VR education.

VR education format	VR education Technologies
full-time education, when VR technologies are added to the traditional forms of the educational process, immersing students for 5-7-10 ... minutes in the virtual space	virtual reality (VR), based on the technology of full immersion in a three-dimensional virtual space
distance education, which is most open to the wide use of VR technologies, given the fact that it is already initially based on the remote mode of interaction through various information technologies	augmented reality (AR), which adds virtual objects to reality
self-education	mixed reality(MR), when the learning process is based on the use of VR and AR technologies

Of course, an important preparatory stage for the introduction of VR technologies into the educational process was the transition of educational institutions to the technologies of the electronic educational environment (although 10 years ago many of them

were little used, or even completely inaccessible), solving the issues of the information component of the problem of personality formation (Trashkova, 2018, Zinina, Dalisova and Olentsova, 2020, Sultanova and Nigmatova, 2020).

The authors of the study conducted a survey among 50 teachers of humanities working in universities in Siberia, Khakassia and the Far East and concluded that the currently widely used technologies of the electronic educational environment included: electronic and interactive whiteboards; multimedia classrooms / computer classes; distance learning technologies; the information system of the university and the electronic information security of specific disciplines; an electronic journal; information and technological means of collaboration (e-mail, personal accounts on the university portal, mobile phones, messengers, programs for remote communication-Skype, Zoom, etc.); cloud services; web conferences, etc. With interest and willingness to use VR technologies in teaching their disciplines, 28% of respondents are ready (despite the fact that most of them belonged to the age group under 35 years); 46 % - generally positive, but subject to a number of conditions (that there will be appropriate methodological support, the safety of these technologies will be guaranteed, etc.); 12 % - against (mainly due to the risk of impact on the psyche and health in general); 14 % found it difficult to answer (do not see such technical possibilities at the moment and in the near future; they have a poor understanding of the essence of virtual reality in general and how it could be used in teaching their particular disciplines).

The presence of doubts when using VR technologies in the educational process indicates the lack of information support for this issue and sets the task of conducting appropriate research in this direction. As for the general analysis of the factors influencing the possibility of using VR technologies as educational technologies, they can be grouped into two components: "pros" and "cons".

4 DISCUSSION

4.1 Virtual Reality in Education: PROS

The positive aspects of the widespread introduction of VR technologies in the educational process include the following:

- Inclusiveness. A distinctive feature of virtual reality is that it can affect all five human senses, reacting to their actions and movements. Thus, a three-dimensional image is recreated by the operation of a special helmet that reacts to the movements of the user's head. Special displays and virtual reality rooms activate stereoscopic vision, immersing the participant in the process inside a three-dimensional object, which also changes depending on the position of the body and the movement of the user's eyes. All this leads to the fact that all types of memory begin to work, and, as a result, to the best memorization of perceived information, which is also facilitated by the emotions received from all this, which the person experiences (Nadyseva, 2019). At the same time, it should be recognized that in our time of high technology, the use of such outdated "teaching methods as information stands, slates and interactive whiteboards, layouts, signs, etc., in our modern world are boring, uninteresting and beloved manuals" (Smirnova,1998).
- Visual quality. Virtual reality allows you to visually perceive what a limited amount of descriptive texts in textbooks and book illustrations can provide. While through VR immersion, students can travel to the past, go to the Moon or Mars, find themselves in the middle of a desert or on top of a mountain, including in places that did not exist and do not exist at all.
- Interactivity. VR-space allows not only to observe actions, but also to take a direct part in them, from the first person in 3D mode, which also contributes to the memorization of information and determines the specifics of perception by students (Nurtdinova, Gureev and Krutskaya, 2018).
- Cost-effectiveness. Virtual reality allows saving time and money for the implementation of certain virtual projects in reality, despite the fact that once created an interactive model of virtual reality can be used many times in the future.
- Safety. Virtual reality is irreplaceable from the point of view of physical safety and labor protection requirements of its participants. Flights, dives, battles and other simulation situations do not pose a threat of harm to the life and health of students (at least in the present and foreseeable future: it is possible that in the future virtual technologies will reach a level where the harm caused in virtual space will be projected on the body of a person immersed in it in real reality) (Fedorova, 2018).

Thus, the use of virtual reality as educational technologies allows us to bring the educational

process to a new, higher-quality level (Mamedova, 2016), activating the cognitive activity of students, increasing its stimulating component (Surmenko, 2003).

4.2 Virtual Reality in Education: CONS

The unreality of virtual reality. Virtual reality, no matter how real it may be, is still an illusion. The illusory nature of what is happening can introduce disorientation into the spatial and temporal–orientation characteristics of the student, which in the future may make it difficult to return to reality, to become an "ordinary" person again in an ordinary society (Aisner and Naumov, 2020).

There is concern about the possible risks to the psyche of the participant of VR technologies.

Due to the lack of knowledge about the experience and consequences of immersion in VR worlds, there is not enough information about the possible effects on the physical and physiological processes and the state of the body of the participants. So, there are complaints of users of VR technologies about malaise, nausea and headache after a certain time spent in virtual reality, the reason for which is usually the difference in image quality and in time between turning the head and displaying a new picture of virtual reality. To eliminate this problem, it is important to use high-quality technical means (Elesin and Feshchenko, 2016).

Relationship with the real world. First, the materials of the virtual world that are used in the educational process, this is the essence of the perception of models of the real world. Accordingly, before diving into VR, students must gain a certain level of knowledge within the real educational process. Secondly, it is necessary to understand that the use of VR technologies in the study of disciplines should be balanced and reasonable, for example, it is one thing to use them in the study of such sciences as geography, biology, chemistry, history, medicine, physics, but another thing is mathematics and law.

Any model, even if it is a virtual reality model, has its own limitations and assumptions. And these technologies will not be able to replace real practice. They only help to prepare for it as much as possible.

Creating VR models is a complex technological and financially costly process. Specialists in the field of creating virtual reality projects are very much in demand in the labor market. Modern education is trying to meet the needs of the market: there are new specialties in universities; various training courses are being developed that allow mastering the relevant competencies.

New educational programs of a comprehensive nature are also being formed, which should promote the introduction of digitalization processes in different professions. For example, since 2019, the National Research University "Moscow Institute of Electronic Technology" has started recruiting for the specialty "Legal Support of National Security", which is focused on training specialists in the field of jurisprudence focused on combating cybercrime in various spheres and forms of its manifestation (Bertovsky, 2020).

The high cost of the product for many potential buyers. In the complete set of a modern complex for the use of VR technologies, at least the following are required:: Software with a virtual workspace, a powerful system unit, an LCD monitor, a keyboard, a mouse manipulator, a virtual reality helmet (for example, Oculus Rift CV1), controllers that determine the position and actions of hands (for example, Oculus Touch) (Petkova and Ehrsson, 2009). And although there are budget options (for example, virtual reality glasses (Shevchenko and Kochkin, 2018), their use will significantly reduce the opportunities that give value to VR technologies (Suvorov, 2013).

The unwillingness of educational institutions (potential clients) to use the new opportunities provided by VR technologies (Ivanova, 2018) in the educational process: conservative views and unwillingness / unwillingness to change; lack of understanding of how and where these technologies could be used; resistance of the teaching staff, who may have to retrain, undergo various types of advanced training, etc. training, and other reasons.

Legal problems: issues of the use of intellectual property and its protection (Shtyrov and Bertovsky, 2007), ensuring information security (Bertovsky and Sembekova, 2019), introduction of information technologies in the education system (Trashkova and Aisner, 2017), etc.

Currently, against the background of modern global changes, the need for its own development path is recognized, which fully reflects the national model of modernization of education, taking into account local socio-cultural traditions (Pfanenshtil, Yatsenko, Kudashov, Mongush and Rakhinsky, 2019).

4.3 Survey Results

The authors of this article, having many years of experience in the education system, actively

participating in scientific and educational activities, regularly exchange experience among themselves and with their colleagues. Being open to innovative processes, including understanding the possibilities of virtual technologies, the authors are supporters of the use of scientific achievements that increase the effectiveness of educational activities, in this case – virtual technologies. Having interest in the opinion of colleagues on this issue, the authors conducted a survey among the representatives of the teaching staff of their universities regarding the readiness and openness of their teachers to use virtual technologies in educational activities.. The following results were obtained.

The analysis of the received answers allowed us to identify the following 4 groups of teaching staff regarding the introduction of virtual technologies in the process of teaching disciplines:

- open and ready for innovative processes for the use of virtual technologies;
- ready for innovative processes on the use of virtual technologies;
- allowing innovative processes for the use of virtual technologies;
- wary of innovative processes for the use of virtual technologies.

At the same time, the relationship between the belonging of a person of a certain age group to the corresponding category is obvious.

5 CONCLUSION

Despite the fact that there are more factors in the "cons" group, this does not mean that the answer to the question: "Virtual technologies in education: pros or cons" will be negative. It is necessary to proceed from reality, and it is such that the process of introducing VR technologies into the educational process has begun (Zadoya, 2007).

At the present time, when the requirements for the quality of graduate training are constantly increasing, due to the increasing requirements for employees in the labor market (Agapova, Aisner and Naumov, 2019) there is a further development of the process of global informatization and the development of information technologies, which include VR technologies. The different formats of their application in education, as well as the fact that the use of virtual reality allows you to use in educational activities such opportunities that in reality would be either unrealizable or very expensive in various indicators, makes their use more and more promising.

REFERENCES

Agapova, T.V., Aisner, L.Yu., Naumov, O.D. (2019). Training of modern personnel: anthropological foundations of education. *Advances in economics, business and management research. Proccedings of the "New Silk Road: Business Cooperation and Prospective of Economic Development" (NSRBCPED 2019), pages* 301-303.

Aisner, L. Yu., Trashkova, S. M. (2017). The role of education in the formation of personality. *Kazan science*, 10, pages 126-128.

Aisner, L. Yu., Naumov, O. D. (2020). Digital environment as a social space. *Science and education: experience, problems, prospects of development. Proceedings of the international scientific and practical conferenc.*, pages 319-321.

Ageenko, N. V., Dorofeeva, D. D., (2017). Innovative technologies in the educational process: trends, prospects of development. *Bulletin of the Samara State Technical University. Series: Psychological and pedagogical sciences,* 2 (34). - p. 6-15.

Bertovsky, L. V. (2020). The investigator must understand what high technologies are. https://news.myseldon.com/ru/news/index/212807532

Bertovsky, L. V., Sembekova, B. R. (2019). Criminal use of high technologies as a threat to national security. *Bulletin of the Academy of the Investigative Committee of the Russian Federation,*. 4 (22)., pages 60-65.

Chalmers, A.G., Howard, D., Moir, C. (2009). Real Virtuality: A Step Change from Virtual Reality. *Proc. Spring Conference on Computer Graphics SCCG'09.* New York: ACM SIGGRAPH Press., pages 15—22.

Golokhvast, K. S., Dokuchaev, I. I., Sergievich, A. A., Smirnov, A. S., Tumyalis, A.V., Good, P. P. (2019). Virtual reality as a component of the virtual learning environment. *Proceedings Russian State Pedagogical University*, 191., pages 32-44.

Elesin, S. S., Feshchenko, A.V. (2016). Virtual reality in education: doubts and hopes. *Humanities Informatics*, Issue 10, pages 109-114.

Erokhin, S. V., (2015). Technologies of Virtual Reality as a Tool for Efficiency Increasing of Decision-Makers' Activity in the System of Professional Education and Sciences. *Electronic Scientific Edition Almanac Space and Time: Space, Time and Decision Making 9.2. Web. 2227-9490eaprovr_e-ast9-2.2015.45*

Fedorova, E.A. (2020). Virtual reality as an innovative method of teaching university students. https://scienceforum.ru/2018/article/2018001226

Ivanko, A. F., Ivanko, M. A., Romanchuk, E. E., (2019). Virtual reality in education. *Pedagogical sciences* 3 (part 1)., pages 20-25.

Kašparová, I. (2014). How to educate Czech children: social network as a space of parental ethno theories negotiation. *International multidisciplinary scientific conferences on social sciences and arts.* SGEM. Sofia, pages 85-92.

Koreneva, V.V., Lutoshkina, V.N., Maksimov, S.V., Yatsenko, M.P., Rakhinsky, D.V. (2020).Influence of

electronic gadgets on the formation of school adulthood in older preschoolers. *International journal of psychosocial rehabilitation,* Vol. 24, 3. pages 2875-2882.

Kudashov, V.I., Chernykh, S.I., Yatsenko, M.P., Grigoreva, L.I., Pfanenshtil, I.A., Rakhinsky, D.V. (2017). Historical reflection in the educational process: an axiological approach. *Analele Universitatii din Craiova - Seria Istorie*. - T. 22. - № 1., pages 139-147.

Kurbatova, S.M., Aisner, L.Yu., Naumkina, V.V. (2019). Some aspects of the essence and legal regulation of agriculture digitalization as one of the priorities of modern state policy of agriculture development. *IOP Conference Series: Earth and Environmental Science. Krasnoyarsk Science and Technology City Hall of the Russian Union of Scientific and Engineering Associations*. P. 32021

Lanier, J., 2007. *Jaron's World: Virtual Horizon. Discover: Science for the Curious.* Kalmbach Publishing Co.

Mamedova, K. A., 2016. IT-technologies as a necessary component of the education system. *Universum: psychology and education: electron. scientific. Journal*, 9 (27). https://7universum.com/ru/psy/archive/item/3526

Monaha, T., McArdle, G., Bertolotto, M. (2006). Virtual Reality for Collaborative E-learning. *Computers and Education*.

Nadyseva, V. M. (2019). Introduction of virtual reality in teaching students. *Education and Science in Russia and abroad,* Vol. 63, 15, pages 86-93.

Natalia, K., Julia, O. (2018). New use of Moodle tools for distance English language learning (Experience of Krasnoyarsk state agrarian university). *International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management*, SGEM, 18(5.4), pages 225–232.

Nurtdinova, L. R., Gureev, M. V. Krutskaya, S. V. (2018). Principles of designing virtual environments in the educational space and psychological features of their perception. *Bulletin of the Samara State Technical University. Series: Psychological and pedagogical sciences*, Vol. 1 (37), pages 123-130.

Petkova, V.I., Ehrsson, H, (2009). *When Right Feels Left: Referral of Touch and Ownership between the Hands.* - PLoS One 4.9 e6933

Pfanenshtil, I.A., Yatsenko, M.P., Kudashov, V.I., Mongush, A.L., Rakhinsky, D.V. (2018). Multiculturalism and educational practice: problems of socio-cultural identity preservation In *The European Proceedings of Social & Behavioural Sciences EpSBS Conference: SCTCGM 2018 - Social and Cultural Transformations in the Context of Modern Globalism.*– pages 1493-1502

Postoyev, T. (2020). Virtual reality technologies in training. https://academy.webinar.ru/journal/tehnologii-virtualnoj-realnosti-v-obuchenii/

Robles-De-La-Torre, G. (2006). *The Importance of the Sense of Touch in Virtual and Real Environments.* IEEE Multimedia: Special issue on Haptic User Interfaces for Multimedia Systems,13: 24—30

Sagimbayeva, J., Moldakhmetova, G., Kurmanayeva, D., Tazhitova, G., Kassymbekova, N., Smagulova, B., Tusselbayeva, Zh., Tussupova, G., Ustelimova, N. (2018). Self-learning process: understanding, positive attitudes and implementation. *Experience and Perspectives of Teaching Foreign Languages at the L. N. Gumilyov Eurasian National University.* Collective monograph. Vienna. pages 136-151.

Sdelnikova, A. A., Shkirando, V. S., Bagaeva, A. P. (2015). Virtual reality. *Actual problems of aviation and cosmonautic,* Vol. 1, pages 618-620

Selivanov, V. V., Selivanova, L. N. (2014). Virtual reality as a method and means of teaching. In E*ducational technologies and society*, Vol. 17, 3, pages 378-391.

Shevchenko, G.I., Kochkin, D.A (2018). The main characteristics of virtual reality glasses and the prospects for their use in the educational process. *Teacher XXI century*, 4, pages 160-168.

Shtyrov, V., Bertovsky, L. (2007). Copyright Protection. In *Legality*, 2 (868), pages 28-30.

Smirnova, T. V. (1998). Virtuality in creativity. *Virtual Realities. Proceedings of the Laboratory of Virtualistics,* Issue 4, pages 126-129.

Song, Y.-K., Borton, D.A., Park, S., Patterson,, W.R., Bull, C.W., Laiwalla, F., Mislow, J., Simeral, J.D., Donoghue, J.P., Nurmikko, A.V. (2009). Active Microelectronic Neurosensor Arrays for Implantable Brain Communication Interfaces. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*. - 17.1: 339—345.

Sosnilo, A. I., Ustyuzhanina, M. D. (2019). Virtual and Augmented reality technologies as factors of State economic policy and business competitiveness growth. *Bulletin of the Perm National Research Polytechnic University. Socio-economic sciences.* - 2019. - No. 2., pages 204-218

Sultanova, D., Nigmatova, D. (2020). The needs of implementing distance learning in higher education (the case of Uzbekistan as an example). *Bulletin of Science and Practice*, Vol 6. № 5, pages 466-470.

Suvorov, K. A. (2013). Virtual reality systems and their application. In *T-Comm-Telecommunications and Transport,* 9, pages 140-143.

Surmenko, S. L., Surmenko, O. M. (2003). The use of virtual technologies in professional training. *International Congress of conferences "Information Technologies in Education" ("ITO-2003")* http://ito.edu.ru/2003/III/2/III-2-1585.html

Thakral, S., Manhas, P., Kumar, C. (2010). Virtual Reality and M-Learning. *International Journal of Electronic Engineering Research*, Vol. 2, 5, pages 659–661.

Trachuk, A.V., Linder, N. V, (2017). Innovations and productivity of Russian industrial companies. *Innovations,* 4 (222), pages 53-65.

Trashkova, S.M., Eisner, L.Y. (2017). Complementation of information technologies and the education system through the prism of Russian legislation. *Scientific review: humanitarian research*, 8-9., pages 9-11.

Trashkova, S.M. (2018). Informational component of the problem of personality formation: socio-economic

aspects. In *Eurasian legal journal,* 8 (123), pages 435-437.

Uvarov, A.Yu. (2018). Virtual Reality Technologies in Education. *Science and School.* - № 4. - S. 108-117.

Zadoya, E. S., 2007. Virtual technologies in education. In *Fundamental Research*. - No. 6., pages 75-76.

Zinina, O.V., Dalisova, N. A., Olentsova, J. A. (2020). Distance Learning Technologies as the Main Mechanism for Increasing Efficiency Activities of the University. In Vision 2025: Education Excellence and Innovation Management to Sustain Economic Development during Global Challenges. Proceedings of the 35th International Business Information Management Association (IBIMA)

Zuckerberg, M. (2016). Virtual Reality - A New Social Platform. https://www.vedomosti.ru/technology/articles/2016/02/22/631047-mark-tsukerberg