



## Efficiency and Effectiveness in Teaching and Learning: Need For New Paradigm

K. C. Koutsopoulos<sup>1</sup>, Yannis Kotsanis<sup>2</sup>

### Abstract

*The examination of the educational system shows that the system needs to provide two fundamental conditions, namely: efficiency (equal opportunities and recourses to every school for an efficient system) and effectiveness (absence of common teaching and learning practices for an effective system). As a result, there is: a need for a new educational paradigm; a new methodological tool to support the new paradigm; and a learning environment where these are operating. The solutions presented in this paper are the following: the first is that the system is already in the era of the new Network centred education paradigm; the second is that Cloud computing is the main tool of the new paradigm; and the third one is the necessity of a new School, the School on the Cloud.*

### 1. Introduction

Education in order to successfully prepare students for the future, cannot continue addressing the education needs of the past [1]. In other words, a new educational approach is required to prepare students for the complex and challenging future [2] requiring changes in teaching and learning.

However, to grasp these changes it is necessary to understand the issues that underline the reality of the educational system. That is, there is a need to examine the existing education system in order to detect the important issues requiring attention and then proceed in formulating solutions, an approach that will be followed in this paper.

In examining the educational system the first issue is related to the basic concepts of efficiency and effectiveness in teaching and learning. Even a simple review of the innumerable papers, reports and policy decisions, including those by the European Commission, show that: on the one hand there is a need to find a way in designing a pedagogical approach, which should be the educational norm for all educational institutions, or provide the necessary educational efficiency, so that all schools will have equal opportunities and recourses. In other words, to design a system that has a norm of what should be available to all education institutions or create a pedagogic unity in order for the educational environment to be efficient.

On the other hand, there is a need for the existence of an educational system which can allow any school unit to develop the means to transform its own identity into an appropriate tool in designing its teaching and learning practices. An identity which is determined by the language, the culture, the particular conceptual structures of education and other factors which can be found among the diverse ethnic, cultural and regional groups and which express any educational institution's needs and expectations. In other words, there is a need to find the ways to design an institution's learning environment based on their identity and thus move away from homogenization and a non effective educational environment.

The second issue is related to the conceptual basis upon which the fundamental needs of efficiency and effectiveness can be attained. The solution to that issue can be found In the Networked Information society, which is unleashing two powerful forces on teaching and learning and as a result has been interposed in education in the form of the Network Centered Knowing paradigm [3]. More specifically, both of these forces are available to practically every educational institution and stakeholder and are related to their access to high-speed networks. The first force provides education stakeholders in any institution and location an easy access and use of ICT in the form of Cloud Computing. As a result, all education stakeholders have the same opportunities to discover, consume and produce educational resources and services and thus create an educational system which can provide the needed efficiency in teaching and learning. The second force provides ubiquitous access to subject contents, curriculums and techniques,

---

<sup>1</sup> National Technical University and Doukas School, Athens Greece

<sup>2</sup> Doukas School, Athens Greece



making it possible to facilitate education through identity related programs. In this way an education system is emerging where its stakeholders have at their disposal teaching techniques, learning practices and many educational related services which allow them to design their own programs in an effective way, negating the need for educational uniformity.

The third issue is related to the means required to achieve, within the network centered educational paradigm and the network information society, the needed concepts of educational efficiency and effectiveness. It is suggested that Cloud Computing, which is the basic tool in a cloud based educational environment, can fulfill all the earlier mentioned educational requirements. Indeed Cloud Computing represents a fundamental change in the way computing power is utilized by education. The literature [4, 5] indicates that this technology can be a powerful way to apply a new educational approach. That is, it can support an educational system providing a cloud based education with in turn is efficient and effective.

Finally, the last issue is related to the educational environment within which a school needs to work or how to practically apply to the classroom the concepts of efficiency and effectiveness. The results of several cloud based education projects [6, 7] indicate that the previously mentioned objectives can be achieved in a new school, the School on the Cloud (SoC). The School on the Cloud by providing digital and easy online access to educational stakeholders offers an educational system, which is not only efficient (provides norms and unity), but also an effective (evades uniformity) way to access, practice and administer education.

From this examination it should be evident that in order to achieve the major concepts of efficiency and effectiveness, there is: a need for a new educational paradigm; a new methodological tool to support the new paradigm; and a learning environment where these can operate. These are briefly examined next.

## 2. The Network Centered Paradigm

At the onset it should be declared that nowadays at the centre of the pedagogic approach towards teaching and learning should be the concepts of *efficiency and effectiveness*. But this notion forces us to accept [2] that both the traditional *Teacher Centred paradigm*, representing an instructing approach, as well as the presently used *Student Centered paradigm* focused on a constructivism based learning, are now absolute and education is in the period of the *Network Centered paradigm* where knowledge is achieved *through Cloud Computing*. More specifically, it is suggested that in the last few years education has gone through two paradigm shifts [8], that have been examined in detail elsewhere [2, 9].

## 3. The Cloud Computing Methodological Tool

The contribution of Cloud Computing towards efficiency and effectiveness in teaching and learning is of paramount importance to the future of education. As a result, a brief examination of that contribution follows:

### 3.1 Cloud computing Provides Efficiency

Some of the important characteristics of Cloud computing are: multitasking, flexibility, the ability to handle a large number of applications and to meet changing demands, as well as access to stored files, e-mails, databases and other applications from anywhere at request. As a result, on one hand it represents a very familiar tool for today's Z generation education participants. On the other hand and more importantly, it can support with equal opportunities and recourses all major education stakeholders (students, teachers and administrators) in any institution and in any location, thus qualifying as an *efficient* educational environment.

### 3.2 Cloud computing Provides Effectiveness

In addition, Cloud Computing offers also a unimaginable, just a few years ago, capacity to connect people across any distance allowing them to store, access and share information from anywhere [6]. As a result, the ubiquitous abilities of Cloud computing, resulting in a Cloud based education, which is amenable to identity adaptations related to educational units needs and desires, negate the necessity for educational uniformity and homogenization and an effective educational environment.

## 4. The School on the Cloud (SoC)

It has been shown [2, 6] that ICT changes, in the form of Cloud-based technologies, provide the means to change how education should be approached and practiced, substantiating the effort to institute efficiency

and effectiveness in education. The School on the Cloud approach not only brings benefits to education, but also facilitates trends and developments at the interface of Cloud computing and education [10], which both in turn provide stakeholders with the ability to adjust or alter its educational objectives. More specifically, the benefits to education substantiate the existence and need for *efficiency* and the trends emerging from developments in society, in technology and mainly in education support the necessity for *effectiveness* in education.

#### 4.1 SoC Characteristics Supporting an Efficient Education System

The School on the Cloud, as a cloud based approach, provides to every educational institution conditions such as: infrastructure, services, solutions, the introduction of new processes etc. [5]. As a result, it can offer them equal opportunities, recourses and possibilities as norms in education, which provide the much sought *efficiency*.

#### 4.2 SoC Characteristics Supporting an Effective Education System

The School on the Cloud by been based on Cloud computing technology provides to the teaching and learning system, as it was mentioned previously, the ability to be adjusted, altered or revised using identity factors. That is, to design the way in which education institutions, students and teachers are able to use equipment, applications and subjects' content to satisfy their needs and desires, operating in an effective education system.

It is imperative, in closing, to be noted that the School on the Cloud is not a novel utilization of Cloud Computing to education, from which many exciting things are expected. It is an existing reality with many successful applications [6, 7]. The School on the Cloud is a new school, is operating in many areas of the world, but most importantly is going to be part of the education system at least in the foreseeable future, for it is characterized by *efficiency and effectiveness*

### 5. Conclusions

The way teaching and learning have been changing in terms of the paradigm they have to adhere to, the methodological practices they must apply and the learning environment that needs to be created in the schools, clearly indicate that today's education and its projections in the future do not correspond to future needs and the very nature of the future education stakeholders. To the contrary the paradigms, the methodology and the learning environment in use can only create confusion and difficulties and require to change as outlined previously.

### Acknowledgement

This work was supported by the *European Commission: Lifelong Learning Program - ICT Key Action 3 European Project* under Grant 543221-LLP-1-2013-1-GR-KA3- KA3NW.

### References

- [1] Fullan, M., & Langworthy, M. "A Rich Seam - How New Pedagogies Find Deep Learning", 2014. Available at: [http://www.michaelfullan.ca/wp-content/uploads/2014/01/3897.Rich\\_Seam\\_web.pdf](http://www.michaelfullan.ca/wp-content/uploads/2014/01/3897.Rich_Seam_web.pdf) (accessed 4/4/2016).
- [2] Koutsopoulos, C. K. & Kotsanis Y. School on Cloud: Towards a paradigm shift. *Themes in Science and Technology Education*, 2014, 7(1), 47-62. Available at: <http://earthlab.uoi.gr/theste/index.php/theste/article/view/147> (accessed 4/4/2016).
- [3] Koutsopoulos, C. K. A review of cloud based futures and methodologies. Report, Deliverable 5.1 for the School on Cloud: Connecting education to the Cloud for digital citizenship network (SoC), 2015 Available at: <http://schoolonthecloud.eu/> (accessed 4/4/2016).
- [4] Johnson, L., Adams, S., Cummins, M The NMC Horizon Report: 2012 Higher education edition. Austin, TX, 2012.
- [5] Bradsaw, D. et. al., "Quantitative Estimates of the Demand for Cloud Computing in Europe and the Likely Barriers to Up-take". Final Report, IDC Analyze the Future 2012. Available at: <http://cordis.europa.eu/fp7/ict/ssai/docs/study45-d2-interim-report.pdf> (accessed 4/4/2016).
- [6] Donert, K., & Bonanou, H. (eds.) "Education on the Cloud 2014: State of the Art Case studies" Report, Deliverable 6. 4 for The School on Cloud: Connecting education to the Cloud for digital citizenship network (SoC), 2014. Available at: <http://www.schoolonthecloud.net/#!blank/crxj> (accessed 4/4/2016).



- [7] Malmierca, R. M. et. al. "Teaching and Learning in the Cloud". Report, Deliverable for Rural School Cloud: Cloud Computing for School Networking, 2015. Available at: <http://rsc-project.eu/index.php/products/> (accessed 4/4/2016).
- [8] Kuhn, S. T. The structure of scientific revolutions. Chicago. University of Chicago Press, 1962.
- [9] Koutsopoulos, C. K. *A review of cloud based futures and methodologies*. Report, Deliverable 5. 1 for The School on Cloud: Connecting education to the Cloud for digital citizenship network(SoC), 2015. Available at: <http://schoolonthecloud.eu/> (accessed 4/4/2016).
- [10] Armbrust, M., et. al. A View of Cloud Computing communications. Association for Computing Machinery, Johnson, L., Adams, S., Cummins, M. The NMC Horizon Report: 2012 Higher education edition. Austin, TX, 2012,53,(4),50-58.