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CLOUD TECHNOLOGY AS A WAY OF UKRAINIAN EDUCATION DEVELOPMENT

This article is devoted to defining the forms and the required components cloud technology usage during studying of subject teachers. In order to improve the learning process it's necessary to use such powerful technology as 'cloud computing'. They support traditional forms of education and also are a new step in the development of education. Cloud technologies are-effective, efficient and flexible way to satisfy the needs of students during getting of new knowledge.

Nowadays a characteristic feature of our time is rapid growing of using cloud technology. That is why we are spectators of implementation of cloud technologies and services in the system of higher and secondary education, too.

A common information space in education using mostly cloud technologies that provide Microsoft and Google is creating now. Google Apps for Education containing free tools that allows teachers and students to communicate, teach and learn more effectively and efficiently.

Significant advantage of using cloud services is providing application development and storage of large amounts of data on servers in distributed information processing centers via the Internet. That is why cloud technology is a powerful tool to activate students' self-guidance work. Surely, growing demand for professionals who knows the technology of cloud computing will increase slowly.

Keywords*. Cloud computing, cloud technology, cloud services, forms of using cloud technology.*

1. General Formulation of the Problem and Its Currency

Because of integrating into the European educational space the need to work with the new methods based on the use of information technology in the educational process of higher schools was appeared. The Decree of the President of Ukraine № 926/2010 of 30.09.10 'On measures to ensure the priority development of education in Ukraine' [1] proves its necessity.

The main tasks of improving the education system include ability to provide every human being free and open access to knowledge paying attention to his/her needs, abilities and interests.

Today it is already impossible to imagine our life without information technology in the educational process. Purchase of computer equipment, software and their support during education process demands great finance costs and specialists of high training qualifications in large educational institutions. 'Cloud computing' can be a good for this because of ability to save material resources and transition to payments for services rendered by providers in a way that is similar to the implementation of regular utility bills. Moreover, this way will make education more efficient and accessible because of the opportunity to use many educational software.

As you know, the concept of Cloud Computing is the software and hardware available for users over the Internet or local network as a service that allows to use user-friendly interface for remote access to selected resources. Computers that provide cloud computing are called 'computer cloud'. Also assignment between computers that are in the 'cloud' is divided automatically.

'Cloud computing' work as follows. Instead of purchase, install and manage own servers to run the applications, there is a rental server from Microsoft, Amazon, Google or other companies.

Then the user manages his leased servers via the Internet while just paying for actual use for processing and storage.

Experts in information technology, analysts and scientists call cloud computing the most promising strategic technology of the future predicting the transfer of the information technology in the 'cloud'. That is why knowledge of these technologies is necessary for any expert who works in the sphere of information technology.

Every year demands concerning increase of information technologies use, their reliability with a constant increase in the data quantity get stringent. But the financing of the education system is not growing. We can say that the costs to development information technology infrastructure are reduced. One of the effective ways to solve this problem is the use of 'cloud computing' in the learning process, as mentioned above.
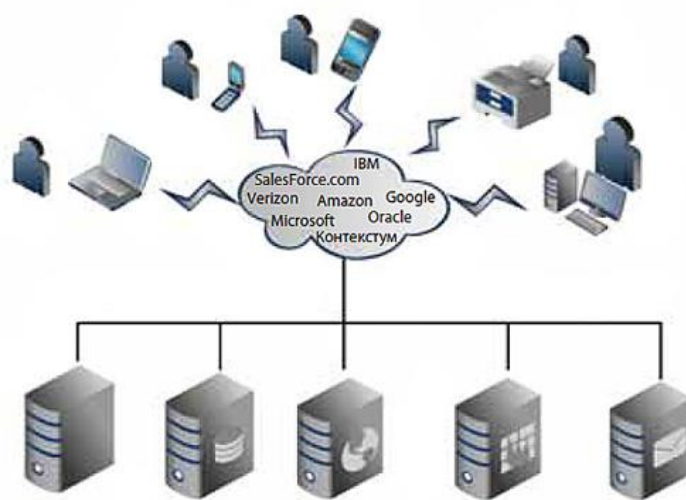

Fig. 1. The general scheme of cloud computing [11]

Analysis of recent studies have shown that the question of use of cloud computing for teaching mathematics and physics was considered by O.V. Merzlikin [4], N.M. Zaharchenko [4], S.O. Semerikov [4], I.O. Teplickij [4]. The problem of cloud means of information technologies studies was described in the works of Y.V. Trius [4], A.M. Stryuk [4], O.D. Trehub [4], organization of independent work using cloud services Yandex reflected in the works of G.A. Alexanian [5]. Cloud services provided by Google, Microsoft were described in the works of V.M. Franchuk [4], L.V. Breskina [4], A.V. Litvin [4].

This article describes the problem of specialist studying that can easily and skillfully adapt to changing conditions and requirements in contemporary globalization of the information society using the latest achievements in information technologies.

2. Main Problem Solution

In Ukraine the technology of 'cloud' computing just start their development. Online seminars discussed the subject of using cloud technology appeared recently. We took part in some of them and learnt with the work in this area and we concluded episodic use of this technology. The demand for cloud services in Ukraine is still small, but it is growing rapidly. So we indicate the future revolution in information infrastructure. For example, many higher education institutions in Russia implementing new courses like 'Cloud computing' for training IT- professionals. If we make an analysis of such course, the purpose of formation of the discipline is to develop the required theoretical and practical knowledge of cloud computing technology and skills of practical implementation of the benefits of cloud technologies in students [12].

But after reading the work programs of these disciplines we can concluded that the focus of the courses is still made on the theoretical material, analysis of the prospects, opportunities and benefits of the cloud infrastructure. Only in some cases we can see the use of cloud technologies in

practice. For example, in the Moscow Higher School of Economics for masters in 'Business Informatics' there are workshops aimed to development of their Web-based applications in a cloud environment, installation of transactional Web-based applications, virtual servers for their support [10].

Today there is a problem of developing concrete courses or introducing topics related to cloud technology to existing courses. Every high education institution solves this problem differently.

There is no separate discipline that gives basic information about the appearance, development and use of technologies of cloud computing in Kherson State University. But during teaching of the work program material of different program courses technologies of virtualization, security, scalability, development, backup in the context of cloud infrastructure, skills system administration of applications in the cloud are learnt.

It's necessary to start from the use the services of Google Apps created for educational institutions, which can be accessed in any browser (Mozilla Firefox, Google Chrome, Opera, Internet Explorer , etc.) using Internet connection .

The most often used Google services in education are Google ArtProject - interactive museums popular in the world, Google Calendar - online calendar, Google Docs - online office , Gmail - a free email, Google Knol - a wiki encyclopedia, Google Maps - set of cards, Google Sites - free Web Hosting that uses wiki technology, Google Translate - translate , YouTube - broadcasts.

Google Apps are special service from Google. This service is provided by Google to work with web services from Google. Domain name registration is possible via the registrator authorized by Google. Google Apps have free base and Premier. Google Apps Education Edition is a free package for schools includes all the features of Professional package. Google Apps Education Edition is Web- based application of cloud computing, providing students and teachers of schools the tools necessary for effective communication and collaboration.

Google Apps for Education, according to developers, 'containing free and ad-free set of tools that allows teachers and students to communicate, teach and learn more effectively and efficiently'.

The main benefits of Google Apps Education Edition using in education from the user's point of view are following:
  – The minimum hardware requirements (obligatory access to the Internet);
  – Cloud technology does not require the costs of purchase and maintenance of special software (Access to applications can be got through a web browser window)
  – Google Apps support all operating systems and client applications used by students and educational institutions;
  – Work with documents available via any mobile device that with Internet access;
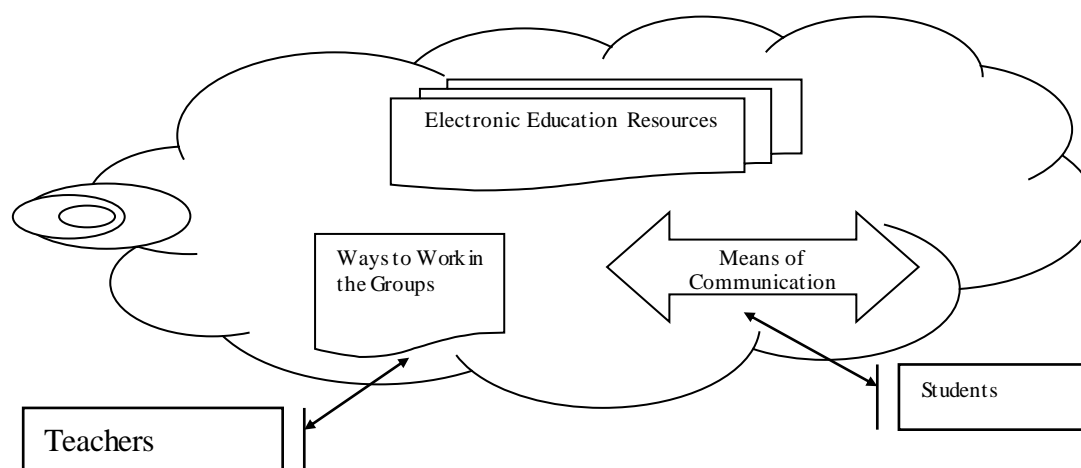 – All the tools of Google Apps Education Edition are free.

Fig. 2. Organization of educational process with the use of cloud computing

Modern computer technology allows students and teachers to more devices use to communicate and work, i.e. laptops , PCs, smartphones, cell phones, etc. Google Apps Tools worked with a variety of devices. So it's public and universal IT-technology to work in an educational environment.

Organization of educational process in the KSY with the help of cloud is shown in figure 2.

In our opinion, the theme 'Using of Cloud Computing in Education' must be in the discipline 'Methods of Informatics Teaching'. The aim of it is to prepare students of physics and mathematics faculty to use modern technologies in cloud computing in teaching practice.

So the structure of the discipline can be so.

Table 1.

Discipline Structure

Names of Modules and Topics	Number of Hours											
	Full-time Education						Part-time Education					
	Total	Including					Total	Including				
		lect	pr	lab	ind	s.w		lect	pr	lab	ind	s.w
7 Semester												
Module. Cloud Computing												
Theme 1. Theoretical Basis of Computing in the cloud	12	4		2		6	12	2				10
Theme 2. Technology Classification (Platform as a Service, Infra-structure as a Service, Software as a Service, Data as a Service)	14	4		6		4	14	2		2		10
Theme 3. Selecting of a Cloud Service and the Risks in it	12	4		4		4	12			2		10
Theme 4. Features of Practical Work in Cloud Services	16	4		8		4	16	2		6		8
Hours Total	**54**	**16**		**20**		**18**	**54**	**6**		**10**		**38**

As we can see in Table 1, 54 hours is necessary for this course. It includes organizing of lectures, laboratory work and self-guided work of students.

The topics may include:

1. The history of cloud computing. Basic concepts and terms. Classification of cloud technologies. Distinguishing features of cloud computing technologies from Web 2.0.

2. Provider of cloud services choice. Here are recommendations for the use of calculations in cloud involved in the learning process. Their advantages and disadvantages, issues related to organizational and legal field that may result after implementation of cloud technology in the learning process.

3. Features of cloud services. Active overview of the most popular cloud services technologies. Considered an example of work with Microsoft Live @ Edu, Google Apps For Education, as well as popular services to save large amounts of data in the cloud.

4. Students get knowledge of four main components of Cloud Computing:

– 'Infrastructure as a Service' (IaaS) is providing client different computer infrastructure, such as servers, storage systems, network equipment and software for the management of these resources. As a rule, virtualization technologies are applied, i.e. particular equipment can be used by several clients. One major advantage of it is getting rid of the need to purchase expensive equipment. Examples of this kind of applications is online MS Office, '1C: Enterprise', antivirus solutions.

– 'Software as a Service' (SaaS) is a model of using the software when the supplier develops a web application and independently manages it giving customers access to software over the Internet. Moreover, all the costs of application work are paid by the provider. The user (if the service fee) pays only for the use of 'cloud' software. Examples are management of customer relationship (CRM), video conference, Human Resources (HR), projects, email.

– While providing service 'Data as a Service' (DaaS) the user get standardized virtual workplace that each user can further customize to solve and fulfill the tasks. So, the access is given not for the separate program, but for complete work required of program complex [12].

– Platform as a Service (PaaS).

PaaS is giving access of broad-minded and flexible choice for tasks that have integrated platforms as a service of virtual computing resources and programs. [9].

As a first task for laboratory work students can do an analytical overview of several new services of cloud appeared in the last year. They will compare the proposed classification with the offered one during the lectures and give their own recommendations on the use of these services during learning.

As a second laboratory work students can be taught to work with cloud service for storing large amounts of data. Students learn to create accounts, delete and add files in the cloud group work and study the rules and methods of confidentiality providing.

Then students get skills of creation and placement of ordinary courses using Moodle platform in the cloud during the next laboratory works.

For example, students study the structural elements, principles, types of documents for the creation and subsequent operation of 'virtual office for Computer Science (Mathematics)' ' virtual laboratory in Physics (Computer Science)', 'virtual teachers' on the basis of the forms and required components using cloud technology subject teachers and heads of schools and activities supported in the cloud.

The work of students according to the teacher guidance on making a list of organizational and legal changes that would be required in the schools that use cloud computing finishes the student's work. To complete this document they should base it on a license agreement to provide services in the cloud in education sphere.

Besides laboratory work, students may be offered a job where they can use received knowledge and skills to work with cloud technologies in practice as an individual task. Tasks should reflect the theme of the faculty they study at the university. As part of the work students develop business plan for the transfer to use cloud services as an example of a single cloud technology. The aim of this work is to display completely all kinds of costs associated with the use of cloud computing to obtain adequate to realities of life evaluation of economic efficiency cloud technologies discussed in the article.

Certification of a student is as follows:

– Testing of the topics discussed in lectures;

– Fulfillment and answering questions of laboratory work;

– Fulfillment and answering questions of individual tasks.

Set of electronic presentations / slides to the lecture topics is necessary to maintain the lecture.

To maintain the laboratory work the following is necessary:

– Computers with UNIX- like operating systems (for example, Linux) or Microsoft operating system (Windows 7 , Windows 8);

- Availability of one of the browsers on the computer: Internet Explorer 7 , Firefox 3.0.1, Chrome 3.0.195.27, Safari 3.1 (this version of the browser is the minimum necessary, so you can use more modern versions of these programs).

Thus, the following statistics of the most important characteristics is to support the use in the educational process of 'cloud technology' (fig. 3) [6].
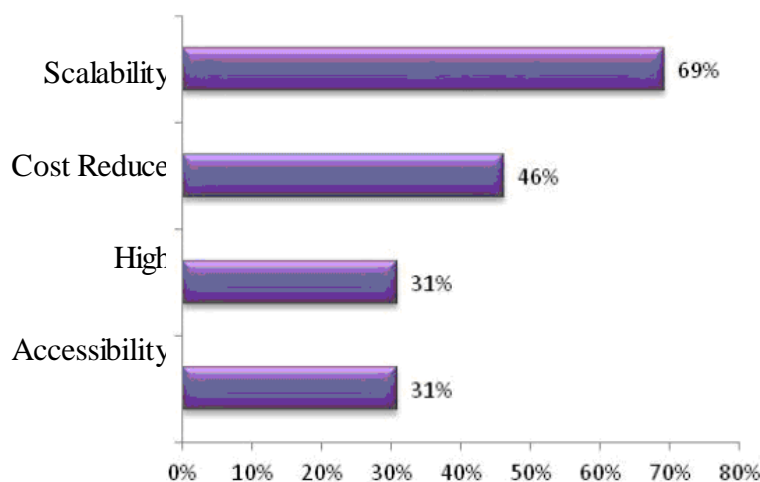

Fig. 3. Diagram of the characteristics of educational technologies

Today, 'clouds' help during the workshops of Computer Science where the software that does not require licensing and upgrade versions is used.

It's necessary to emphasize that use of technology of 'cloud computing' avoid the need for software technical support, as well as control and supervise its operation, including data storage, copy , protection against computer viruses and Internet attacks etc. Everything is carried by provider.

On teaching in this way the student does not need a powerful computer with lots of memory, CD and DVD-devices, as well as all information is stored in the 'cloud'. It's enough to have, for example, an ordinary laptop or small netbook, the main thing is connection to the Internet.

3. The Conclusion and Ways of Further Researches

Nowadays a characteristic feature of our time is rapid growing of using cloud technology. That is why we are spectators of implementation of cloud technologies and services in the system of higher and secondary education, too.

A common information space in education using mostly cloud technologies that provide Microsoft and Google is creating now.

The uses of powerful technologies like 'cloud computing' gives advantages to improve the learning process along with traditional forms of education. New technologies appear. They are the next step in the development of education and cost-effective, efficient and flexible technology.

Using 'cloud computing' capabilities, the teacher can not only observe the process of mastering academic material using interactive reception, office teacher pages with the materials for self-training and schedule of additional training and consultations, but also directly taking part in learning of academic material of the student to correct his erroneous actions and provide answers on questions on time. In addition, it is useful for students to communicate among themselves in chat rooms and forums in convenient time where those who are trained get the necessary information.

So the advantages of learning with using of 'computer cloud' technology include the following:

- The opportunity to illustrate the educational material by means of modern achievements in the field of information technologies;

- Separation of the components of educational material, allowing further combine new information with those that have already been learnt before;
- The possibility of training in a way that is most beneficial for every student based on his capabilities and abilities;
- Intervention and assistance by the teacher during the training process of student learning material in any of its stages;
- Selecting a student of teaching methods that are most interesting for him;
- Accustom of the students to the ability to control their actions;
- Ability of students to get new knowledge by themselves.

Significant advantage of using cloud services is providing application development and storage of large amounts of data on servers in distributed information processing centers via the Internet. That is why cloud technology is a powerful tool to activate students' self-guidance work. Surely, growing demand for professionals who knows the technology of cloud computing will increase slowly.

It's necessary to talk about the creation of a system of educational diagnostics and carry out its implementation in educational system based on existing experience in using cloud computing in the future.

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ХМАРНІ ТЕХНОЛОГІЇ ЯК ЗАСІБ РОЗБУДОВИ УКРАЇНСЬКОЇ ОСВІТИ

Матеріали даної статті присвячені визначенню форм та необхідних компонентів використання хмарних технологій при підготовці вчителів–предметників. Для удосконалення процесу навчання має сенс використовувати такі потужні технології як «хмарні обчислення», які, підтримуючи традиційні форми навчання, є новим етапом розвитку освіти та економічно вигідним, ефективним і гнучким способом задоволення потреб тих, хто навчається, у здобутті нових знань.

Останнім часом масштаби впровадження хмарних технологій нестримно зростають. Ми є свідками впровадження хмарних технологій і сервісів в систему вищої і середньої освіти. Будується єдиний інформаційний простір в освіті з використанням, в основному, хмарних технологій, які надають компанії Microsoft і Google. Служби Google для освіти містять безкоштовний набір інструментів, який дозволить викладачам і студентам успішно та ефективно взаємодіяти, вчити та вчитися.

Хмарні технології передбачають використання хмарних сервісів при розробці додатків та зберігання даних на серверах у розподілених центрах оброблення даних через Інтернет. Це робить хмарні технології сьогодні засобом активізації самостійної роботи студентів. Попит на фахівців, які володітимуть технологіями хмарних обчислень постійно зростатиме.

Ключові слова: Хмарні обчислення, хмарні технології, хмарні сервіси, форми використання хмарних технологій.

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ОБЛАЧНЫЕ ТЕХНОЛОГИИ КАК СПОСОБ РАЗВИТИЯ УКРАИНСКОЙ СИСТЕМЫ ОБРАЗОВАНИЯ

Материалы данной статьи посвящены определению форм и необходимых компонентов использования облачных технологий при подготовке учителей–предметников. Для усовершенствования процесса обучения имеет смысл использовать такие мощные технологии как «облачные вычисления». которые, поддерживая традиционные формы обучения, являются новым этапом развития образования и экономически выгодным, эффективным и гибким способом удовлетворения потребностей студентов во время получения новых знаний.

Последнее время масштабы внедрения облачных технологий стремительно растут. Мы являемся свидетелями внедрения облачных технологий и сервисов в систему высшего и среднего образования.

Строится единое информационное пространство в образовании с использованием, в основном, облачных технологий, которые предоставляют компании Microsoft и Google. Службы Google для образования содержат бесплатный набор инструментов, который позволит преподавателям и учащимся более успешно и эффективно взаимодействовать, обучать и обучаться.

Облачные технологии предусматривают использование облачных сервисов при разработке программ-приложений и хранения данных на серверах в распределенных центрах обработки данных через Интернет. Это делает облачные технологии сегодня средством активизации самостоятельной работы студентов. Спрос на специалистов, которые будут владеть технологиями облачных вычислений постоянно будет расти.

Ключевые слова: Облачные вычисления, облачные технологии, облачные сервисы, формы использования облачных технологий.