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Vyacheslav Osadchyi¹, Vladyslav Kruglyk²¹ Melitopol Bohdan Khmelnytskyi state pedagogical university, Melitopol, Ukraine² Kherson State University, Kherson, Ukraine

**PREPARATION OF FUTURE WEB DEVELOPERS TO KNOWLEDGE
CERTIFICATION AND EMPLOYMENT IN UNIVERSITIES OF UKRAINE**

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One of the main factors of successful employment is a choosing a profession, which would be demanded enough at the modern labour market.

According to the opinion of many experts, development of modern technologies is the main factor that stimulates growth of productivity and economy in general. This trend is characterized by the state of a labour market, when a significant amount of perspective professions is connected to IT field, which is a worldwide trend. Actually, a job of a programmer has become one of the most demanded specialties on a labour market.

As for today, web development is a mainstream in software development. This article describes the requirements for web developers, requirements to the frontend and backend developers. We consider skill levels and requirements. Considered programming languages to learn. These are HTML5, XML, ccs3, javascript+, PHP, sql. Considered particular certification level programmers. The content of the discipline "Web development" is alighted to obtain the necessary skills and knowledge in this area. It also considers the structure of a basic study guide of the discipline.

Keywords. *Education, programming, job, profession, certification, training textbook.*

Introduction. One of the main factors of successful employment is a choosing a profession, which would be demanded enough at the modern labour market. As a result, a majority of school and higher institution graduates analyse professions that will be on demand in several years in advance to ensure a high level of income and a stable job.

According to the opinion of many experts, development of modern technologies is the main factor that stimulates growth of productivity and economy in general. [1]. This trend is characterized by the state of a labour market, when a significant amount of perspective professions is connected to IT field, which is a worldwide trend. At the same time many graduates associate their future life with programming. Actually, a job of a programmer has become one of the most demanded specialities on a labour market [2].

As for today, web development is a mainstream in software development. Development of cloud computing, and business solutions based on a model of software as a service (SaaS - software as a service), Google services clearly show that modern web applications can compete with classic desktop applications, sometimes even surpassing their abilities. Internet has become not only a platform for creating systems and application, but introduced a lot of useful things like instant messenger clients, video calls, forums, social networks, online multiplayer games, distance learning systems, etc. due to having incomparable possibilities to communicate and organise a joint work in the network.

Certainly, it was impossible for such service growth not to influence needs of a labour market. Amount of workplaces for web developers increased several dozen times during the last few years. A profession of a web developer is prestigious and well-paid. For example, developers' salary varies from 100\$ to \$15000 a month depending on a position, language and location. A

successful junior developer will be able to qualify for a position of a team leader, project manager, IT-director. It is also possible to move within a specialty, perfecting professionalism.

Web development foresees not only development of web applications (software that ensure functioning of dynamic web sites of a World Wide Web), but also fulfilling functions, connecting to project management. As a result, primary responsibilities of a web developer include [3]:

- determining aims and goals of a project together with a direct manager as well as ensuring their timely and high quality implementation;
- choosing a development environment, programming languages, necessary software;
- developing a convenient interface of a web server in terms of navigation (well-thought hypertext representation of node pages);
- developing a concept of a web server development;
- administering a web server and an operating system running on a web server;
- laying out an HTML-document;
- configuring a web server, remote administration services;
- ensuring web server security;
- fulfilling a traffic analysis (statistics of visits);
- developing applications;
- communicating with employees of other departments to fulfill common tasks.

There is a need to admit that despite the fact of presence of specific responsibilities, requirements to web developers should be risen as follows. For example, we revealed that Ukrainian segment poses the following requirements to the candidates at interviews for a web developer position.

A web developer must know [3]:

- protocols and principles of Internet network functioning
- widespread web browsers;
- HTML language, CSS, JavaScript;
- an operating system running on a web server (*nix);
- basic web design;
- graphic applications (Adobe Photoshop);
- programming languages (PHP, SQL, JavaScript), HTTP standards, a DB server (PostgreSQL, MySQL);
- technique of programming a multitask highly loaded system;
- basic complex web server security;
- Russian grammar and stylistics;
- English at the level of reading a documentation.

A web development is divided into two large parts; front-end and back-end development.

Front-end developers are the specialists who know web development of a client part of a web site well. It is possible to say that their task is to create an attractive and convenient interface which are indicators of high quality software. Amount of users of the Internet resource depends on a web site design as well. Therefore it is important to be taken into account when developing a web application. The ability to use a web design correctly is a big plus for a web developer. A front-end developer must know HTML-layout well, CSS, a programming language JavaScript and frameworks for this language, such as JQuery. Moreover, he/she must know the rules of right convenient interface. A good front-end developer needs to know server languages as well. It is necessary to understand a correlation of a client part and a server side. It is impossible to avoid Ajax technologies in this issue [4].

Therefore, let us mark out employers' main requirements to a front-end developer:

- In-depth knowledge of HTML, CSS, JavaScript, JQuery, HTML5 and CSS3;
- Basic knowledge of server development languages;
- Cross-browser layout;
- Understanding of Agile-methodologies in development;
- Experience of teamwork according to SCRUM methodology;

- Free technical English (intermediate and upper-intermediate / B2-C1 levels);
- Work experience with version control systems.

Back-end developer is a web-development specialist, who develops and creates a server part of a web site. He/she provides displaying a necessary content from a database in necessary parts of a web site, automates a process of user data collection, protects a web site from cracking and various DoS and DDoS attacks [5].

Respectively, main requirements of employers to a back-end developer are the following:

- Basic knowledge of HTML, CSS, JavaScript, JQuery;
- In-depth knowledge of a server programming language;
- Work experience with a DB server (PostgreSQL, MySQL, etc..)
- Free technical English (intermediate and upper-intermediate / B2-C1 levels);
- Understanding of Agile-methodologies in development;
- Experience of teamwork according to SCRUM methodology;
- Work experience with version control systems.

It is possible to classify a professional activity of a programmer according to the following criteria [6] (table 1):

- qualification level – Junior, Middle, Senior;
- technological areas – PHP, Python, Java, .Net, C++...;
- roles in projects – an intern, a beginner developer, a developer, a lead developer, a technical leader, an analyst, an architect, a quality engineer, a quality manager, a customer relationship specialist, a project manager.

Table 1.

Professional competencies in a personality structure of an engineer developer

| Level | Experience (knowledge, skills) | Qualities | Orientation |
|-------------------------------------|--|---|---|
| 1 | 2 | 3 | 4 |
| <i>An intern, beginner / Junior</i> | Knowledge and work experience in certain programming technology. | Perception of new information. Persistence. Attentiveness. Responsibility. Ability to search new information. Ability to work in a team. Ability to understand programs (code lines, algorithm and data structures, programs of general purpose). | Professional activities; Mastering new technologies; Searching professional information and self-education. |
| <i>Developer / Middle</i> | Ability to see further than one program that is being developed at the moment Ability to use and combine well-known development techniques and typical algorithms. Ability to generalize typical situations. Ability to modify a program. | Critical thinking. Efficient thinking; Rapid mastering a particular subject area. Ability to adjust programs | Further professional development. Increasing knowledge and skills through participation in various projects. |

| 1 | 2 | 3 | 4 |
|---|--|--|---|
| <i>Lead developer / Senior</i> | Ability to see a project in general. Ability to make a decision independently. Ability to define stages in advance. | Wide outlook.. High capacity for work and diligence. Ability to modify programs. Ability to make decisions within a limited timeframe. Ability to create an own workplace that enhances productivity. Attention to details and readiness to check and take into account every detail. | Fulfilling difficult tasks. High motivation to achieve a defined aim. |
| <i>Team leader Team Leader.</i> | Basic knowledge in project management (project management models and software specification), team work organization, methods of control and estimation the results, quality management. | Communication skills Leadership Ability to work under stress Ability to create friendly style of relations. | Result-oriented. Increased prestige of a speciality programmer/developer. |
| <i>customer relationship specialist (introduction, support)</i> | Understanding business processes and setting tasks that can be automated. Knowledge of quality standards of documentation support Understanding a user's needs Ability to assess convenience of certain interface forms | Friendliness. Tolerance. No neglect | |
| <i>Architect</i> | Knowledge of different models and an experience in software development. Ability to determine software architecture. Ability to see a task on different detailing levels simultaneously. Ability to imagine the process that is designed dynamically. | Ability to abstract from an issue and solutions | |
| <i>Analyst</i> | Ability to formalize, knowledge in a system analysis, ability to form requirements and estimate possibilities | Flexible and strategic thinking; Creative thinking | |

| 1 | 2 | 3 | 4 |
|------------------------|---|--|---|
| <i>Project Manager</i> | Knowledge of risk management, work with subordinates and clients. | Flexible and strategic thinking; Ability to work under stress | |

1. Choosing a Web Programming Language for Learning

There are a lot of programming languages used in a web development.

Client languages are executed in a user's (client's) computer. Usually client languages are built into an HTML code of a web page [7].

The most widespread client languages are JavaScript and VisualBasicScript (VBS). To make a browser able to read and execute them, it has a special built-in instrument - interpreter. JavaScript, was developed by Netscape company and was originally used only for Netscape Navigator browser. Currently this language is extremely popular. VisualBasicScript (VBS) is an analogue client language from Microsoft.

Server languages are executed by a specific program directly on a server. This means their work does not depend on a user's browser because all calculations will take place on a remote computer (a server) [7].

The most popular server languages are Ruby, Perl, C#, Java, Python and PHP.

Since programming languages constantly evolve, there are certain systems of their estimation. Dutch company TIOBE Software BV [8] – is a famous author of language popularity rating, which is calculated on a regular basis. When creating a popularity rating, TIOBE takes into account amount of language experts, language courses, a number of providers supporting a language, and amount of code indexed by search engines.

Table 2.

TIOBE Rating for January, 2015

| | Place in Rating |
|------------|-----------------|
| Java | 2 |
| C# | 5 |
| PHP | 6 |
| JavaScript | 7 |
| Python | 8 |
| Perl | 9 |
| Ruby | 15 |
| VisulBasic | 17 |

The second column of the table (table 2) says that PHP is one of the most popular web programming languages. PHP has a C-like syntax, is used in web development and has low barriers of entry. Therefore it is possible to state that PHP is actively used in the industry and hence is the best suitable to study web programming.

2. Studying “Web Programming” in Universities of Ukraine

A lot of universities of Ukraine have several disciplines connected to web development: «Basic Internet Technologies», «Internet Programming», «Web Programming», which are different in a depth of studying and amount of hours allotted by work programs. As an example we examined disciplines «Web Programming» in two universities: Kherson State University and Bohdan Khmelnytsky Melitopol State Pedagogical University. For instance, a faculty of physics, mathematics and informatics of Kherson State University assigns 108 hours for a classroom work, including 32 hours for lectures and 76 hours for laboratory classes as well as a significant amount of

hours for independent work (54 hours). At the same time a faculty of mathematics, informatics and economics of Bohdan Khmelnytsky Melitopol State Pedagogical University assigns 81 hours for classroom work, including 16 hours for lectures and 26 hours for laboratory classes as well as a significant amount of hours for independent work (39 hours).

On the basis of conducted comparative analysis, learning materials of a discipline is offered to be brought in correspondence with a unified work program and structured into two main parts: client programming and server programming.

Lectures completely cover all material necessary to learn a discipline. Learning starts from learning Internet basics: history of the Internet development, client-server interaction, browser, cookie. Concepts of client and server programming are examined. The following step in learning web programming is getting acquainted to Hypertext Markup Language HTML, its development history, basic tags, necessary for work, attribute values. HTML-code structure is examined. The following section in learning web programming is CSS language and its use in creating of html-pages. Students listen to lectures on advantages of CSS styles, ways of adding styles to a page, examine a basic CSS syntax, rules of stylesheet, style properties and their values. Then, according to a work program, lectures on JavaScript language are read as well as on its use in creating html-pages. Particularly, basic JavaScript is regarded: data structures, functions, JavaScript objects and methods, events and interaction with a web site visitor.

Lectures on server programming start from the basics: configuration tools on a server and on a client are examined. Later lectures are devoted to PHP programming language. Basic PHP is examined: variables, constants, management structures, functions, arrays, work with strings, forms, databases. A separate topic of a lecture course is an object-oriented programming. OOP basics are considered, such as: a class declaration, creating an instance of a class, inheritance, methods and properties of a class, constructors, destructors, interfaces, exceptions, and a library SPL. It is necessary to study security when designing web applications: main types of vulnerabilities, protection against hacking. The final topic of the course is considering PHP frameworks: CMF-system architecture, Model-View-Controller, Code Igniter, Zend Framework, Yii Framework, Cakephp.

Laboratory works have a typical structure: name, purpose, literature, brief theoretical information, step by step instruction, supplemented with a graphic material if needed, questions for self-testing. Instructions are built in such way that the tasks of the following lab are based on fulfilling a previous one. In the process of fulfilling labs. students create projects in groups or individually. While working on the projects, they get acquainted to the basic work with jQuery library and validation methods of data entered in an html form, create a server logic, using PHP and MySQL, study SPL Framework. Laboratory works, particularly student's projects, are included into his/her personal portfolio.

Tasks for independent work contain theoretical materials, which were not regarded at lectures as well as practical tasks that allow a student to improve skills, developed at labs.

In our research, we focus on the specialty 6.040302 Informatics. According to it, students receive a qualification of Information Technology Specialist and can work as developers, information technology specialists, specialists in software development and testing, teacher trainees.

According to educational qualification characteristics of this area of training, a student of a web programming field must be able to:

- develop model and structure of an Internet server, using technologies of distributed applications;
- design informational web resources with external data integration and software using technologies of Java, Perl, PHP, etc.;
- know widespread Internet protocols;
- know basic web design;
- know and use methods of information protection in Internet resources;
- know basic Internet technologies and methods of administering Internet servers, developing and supporting an Internet informational portal, web interfaces;

- develop software for local computer networks, Internet-servers, informational Internet portals, web interfaces;
- configure and service software for Internet servers, informational Internet portals, web interfaces [9].

At the same time, a persistent trend to decrease classroom time becomes a serious issue for a higher education because it is connected to insufficient professional preparation of students after graduation from a university. Besides, a programmer has to increase his/her qualification through practice. It is well-known that one of the main factors of preparation of a high-quality professional is gaining a practical experience no less than 10000 hours in a chosen field [2]. Only in this case he/she will get enough practical skills to solve assigned tasks.

One possible way to solve this issue is to increase students' motivation when learning web programming. A motivation should be considered on a par with a material interest. Moreover, content of a discipline «Web Programming», which is learnt by students of this specialty, must be oriented at a knowledge certification and correspond to a basic level of knowledge and skills when working with modern technologies in the field of web programming with distinct practical approach as well as correspond to the requirements of a labour market.

As a result of taking a course «Web Programming» a student should get a experience of work with basic web technologies, necessary knowledge and skills to prepare for the certification examination. In addition a student must prepare his/her own project for portfolio.

3. Knowledge and Skills Certification for Future Programmers

Today having a higher education does not guarantee a successful employment, especially for IT professionals. Additional certificates, which confirm qualification in the certain field of knowledge, increase chances to be demanded by employers [10].

Knowledge offered by a classic higher education less and less correspond to actual needs of the labour market of information technology industry. Such situation is primarily related to the speed of IT development.

In the field of web development there are several indicators of competencies, skills and knowledge. One of such indicators is a certificate in a certain field, which can be obtained in corresponding certification centres.

Certification of programmers is a confirmation that their qualification corresponds to the requirements, connected to executing certain tasks in the field of computer and network technologies. Certification confirming a qualification of an IT professional is issued by an authority or organization that performed certification. Now programmers should obtain sufficiently big amount of knowledge to be as versatile as possible and be able to solve any assigned tasks. Certification of programmers is a standard used to assess the level and quality of professional knowledge of IT specialist. Certainly, having a particular certificate does not 100% guarantees getting a job in corresponding field. However, having this document can be very helpful in employment and further work, more specifically [10]:

1. A process of preparation for the exams helps to focus on learning particular areas of programming and development of corresponding skills on the basis of systematic approach.
 2. Tasks, offered by certification exams, suggest the presence of relevant knowledge and skills. In this aspect, a certification applicant will increase his/her qualification and will become more competitive.
 3. Having a certificate has certain advantages, when it comes to employment relative to other candidates for a position, who have not passed the certification. At the same time, there is a need to admit that work experience still has a more significant value.
 4. Some serious companies require their employees to pass a certification. In this case a presence of a specific certificate depends on preferences and requirements of the employer.
 5. In some cases having a certificate in a specific field helps to receive a bigger salary or a higher position.
 6. Having a high level certificate often brings a respect from colleagues.
- There are several types of certification of programmers, for example:

1. ITIL library certification (a library that describes the best practical ways of organization of work of departments or companies that provide services in the area of information technologies [11]). It is a highly demanded form of certification of programmers, which confirms not only professional knowledge and skills, but also managerial skills. ITIL certification confirms programmers' qualification, gives an estimation to their abilities to solve the tasks that appear in the process of providing and supporting information systems at companies.
2. ITSM certification for programmers (IT Service Management – is an approach to management and organization of IT-services, aimed at fulfilling business needs [2]). It is a recognized standard used to assess the knowledge and skills of programmers in the field of management of IT-departments of a company. High levels of certification for programmers are IT Service Manager, ITIL Expert and ITIL Master. Specialists with such certification level are highly valued in all organizations.

Within informatisation of a society and development of the Internet network, online certification centres creation becomes widespread. Creating an Online certification centre suggests free (seven days a week, twenty four hours a day) presence of the centre in the Internet and taking knowledge control to receive a certificate in any field. Online certification centre has the same significance as a regional one, precisely [13]:

- 1) it allows to obtain a documented evidence of professionalism;
- 2) it reflect a real amount of knowledge and skills;
- 3) it allows to perform a self-check;
- 4) it enables an employer to choose more high-qualified specialists of a narrow qualification;
- 5) it gives certain bonuses during employment;
- 6) it creates favorable conditions for career growth;
- 7) it helps to ensure high salary;
- 8) it increases prestige;
- 9) it facilitates a psychological impact: attracts attention, inspires trust and respect;
- 10) it is an evidence of a specialist's purposefulness.

Besides, the following advantages are well-known:

- 1) learning and certification speed – a respondent can pass learning and certification shortly (depending on his/her possibilities, free time, access to the Internet, purposefulness and wish) on a certain course. Then, after earning certain score, he/she can order a certificate;
- 2) independence from time and period of education - a client have a possibility to take a long or short course and certification anytime;
- 3) territorial independence - a client does not have to travel to the certification centre in person to pass education and certification to obtain a certificate;
- 4) comfortable learning conditions - a client has a possibility to fulfill learning and testing to obtain a certificate or just check his/her knowledge in certain professional field in comfort of his/her own home;
- 5) interactive connection via email and other means of communication.

BrainBench - is a leader of online certification. Certificates are recognized by the majority of large companies of the world and are the evidence of one's classification. BrainBench is the only such company in the world that obtained a certificate ISO 9001 (ISO - is an international standardization organization). This certificate confirms that a testing process of BrainBench has a global quality.

BrainBench conducts testing in more than 600 categories. Tests are very different, but the vast majority regards computer programs and IT technologies (Windows, Word, Excel, Internet Explorer, Netscape, Photoshop, CorelDraw, 3D StudioMax, PowerPoint, FrontPage, HTML, Java, Oracle, Linux, TCP / IP, ASP, C / C +, Cisco, Internet Security ...) [10]. During an examination it is allowed to use reference information, but it is given three minutes only for each question. Therefore, if a question is unclear, it does not make sense to look for an answer in search engines.

Questions are mostly directed at solving practical tasks. A lot of BrainBench tests are devoted to web technologies and this allows to check quality of knowledge.

Also there are certificates that are taken in centres. Usually they get more respect than online certification centres.

Certificates that are earned in centres usually have more respect than online ones, because a process of passing the examination is controlled.

PHP:

Zend Technologies Ltd. – a company-developer of PHP language offers a certification for PHP-programmers. After a successful passing of a test, programmers get a status of a certified Zend professional, known as ZCE (Zend Certified Engineer) [14].

MySQL:

Oracle corporation conducts international certification of specialists in different fields, connected to Oracle technologies. Oracle renews certification examination when new versions of software appear. To maintain a constant level of one's certification, a professional should track appearance of new technologies and pass tests on these renewed technologies and software versions.

Certification programs include [15]:

Oracle Certified Associate (OCA) – Certified specialist of an entry level in any area of software and/or technologies Oracle.

Oracle Certified Professional (OCP) – Certified specialist of a high level in any area of software and/or technologies Oracle.

Oracle Certified Master (OCM) – The highest status for a Oracle technologies professional.

Oracle Certified Expert (OCE) – A professional in a specific Oracle technology. Usually it is necessary to pass one exam to get this status.

Java Script:

The Certified Internet Web Professional (CIW) – is an educational program, which was created by a community of web designers and developers in 1997 [16].

CIW courses and certificates are developed using leading technical standards.

There are several ways of CIW certification. The most popular one is Master CIW Designer, it is renewed the most frequently. This certification is given to those ones, who pass the following three separate examinations:

Site Designer;

E-Commerce Designer;

Associate Design Specialist.

It is due to the presence of certificates web developer can confirm his/her level of knowledge when a potential employer reads his/her CV. This saves time gives an idea of a developer's real level of knowledge and skills. Therefore the presence of certificated allows to adjust a level when studying, basing on an independent estimation and enhance own competitiveness at the labour market.

4. Description of a Textbook on a Discipline «Web Programming»

Based on the integration of a teaching expertise and web development experience, corresponding to technologies necessary for practical activities, a textbook «Basics of Web Applications Development» (authors: Osadchiy V.V., Kruglyk V.S. <http://books.uaconf.com/index.php/programmirovanie/152-osnovi-razrobki-veb-dodatki>) has been created [10].

The textbook is compiled on the basis of the analysis, systematization and generalization of a large number of documentation from various sources. The authors attempted to represent education material, specified by a curriculum in a concise and accessible form.

The textbook includes such basic concepts and sections of web programming: client programming, server programming, working with a database and publication on the web. A specific attention is devoted to configuration of both server and development software.

The textbook contains introduction, 16 sections, literature and a web developer's vocabulary.

Material is represented in the following sequence of sections:

1. Basic knowledge on HTML markup language is given. Basic information on HTML markup language are represented. It contains information on history of HTML development, its versions and main tags, necessary for work.
2. Material is devoted to work with CSS; inline, global, internal styles, basic CSS syntax, rules for applying styles, style properties and their values are considered.
3. A characteristics of JavaScript programming language is included. Expression language and forms processing on JavaScript are described.
4. The process of software configuration; php and php.ini configuration, as well as the configuration file .HTACCESS is regarded.
5. An overview of development environments, their use and features is provided.
6. Configuration tools on a server and on a client are considered.
7. Material is devoted to PHP programming language. The basics of PHP: variables, constants, management structures, functions, arrays, work with strings, forms and databases are discussed.
8. An individual section is devoted to object-oriented programming. In the section basic OOP is considered, particularly: class declaration, creating a class instance, inheritance, methods, and properties of the class, constructors, destructors, interfaces, exceptions, etc.
9. The section is devoted to the basics of relational databases using MySQL as an example..
10. Possibilities of publishing web sites in the Internet are considered.
11. An overview of content management systems such as Typo3, Drupal, Joomla and WordPress is provided.
12. Material is devoted to the concept of a framework. An architecture of a CMF system, Model-View-Controller, Code Igniter, Zend Framework, Yii Framework, Cakephp is examined..
13. A detailed description of the process of creating a technical specification is provided.
14. Methodologies of software project management are examined.
15. Project management tools, such as Trac, Redmine, Mantis, Google Docs, Bug Tracker are considered..
16. Issues of certification and employment of web developers are covered. Certification types and certification examinations are regarded. This section contains recommendations on designing CV and portfolio. There is a need to admit that this section allows to form practical interest in students and develop motivational component of the process of studying the discipline «Web Programming».

In the end of each section there is a list of recommended literature for extended learning of the section material and self-testing questions are provided.

When compiling the textbook the authors attempted to gather together the information that will be useful for students in learning the discipline «Web Programming». A represented above structure of the academic publication covers the majority of topics, necessary to prepare web programming professionals as well as pass corresponding certification examinations.

5. Conducting the Experiment

The efficiency of introduction of educational and methodological complex on the discipline «Web Programming» and the textbook «Basics of Web Applications Development» was decided to test on the basis of students' knowledge level dynamics. Experimental test was conducted on the basis of the faculty of informatics, mathematics and economics of Bohdan Khmelnytsky Melitopol State Pedagogical University while learning the discipline «Web Programming» by students of the 2-nd course of specialties «Informatics», «Informatics*» during 2012-2014 academic years..

According to the curriculum, a discipline «Web Programming» is taught to students of the 2-nd course of specialties «Informatics», «Informatics*» in the second academic semester.

A conducted experimental test consisted of two stages: ascertaining and forming. During the first step of the experiment knowledge level of students was studied according to the results of the first periodic control (table 3).

Table 3.

Knowledge level of students according to the results of ascertaining stage of the experiment

| | | 230 group. 2012-2013 academic year | 230 group. 2013-2014 academic year | 220 group 2013-2014 academic year |
|-----------------------------------|---------------|--|--|---|
| 1-st periodic control (before) | below average | 17,4% | 6,67% | 13% |
| | average | 52,2% | 60,03% | 60,9% |
| | above average | 21,7% | 20% | 17,4% |
| | high | 8,7% | 13,3% | 8,7% |

From the Table 3 we can conclude that a high level of knowledge in 230 group (2012-2013 academic year) is 8,7%, above average level had 21,7% students, average - 52,2%, below average – 17,4%. In 230 group (2013-2014 academic years): high level had 13,3% students, above average - 20%, average - 60,03%, below average – 6,67%. In 220 group (2013-2014 academic years.): high level of knowledge had 8,7% students, above average - 17,4%, average - 60,9%, below average – 13 %. Therefore to increase the level of students' academic performance it was decided to use educational methodological complex and the textbook «Basics of web application development».

After having conducted the ascertaining stage of the experiment, studying an educational material for students was organized using created educational and methodological complex. During the forming stage the next research hypothesis was offered: using the educational and methodological complex and the textbook facilitates increasing academic performance of students of a discipline «Web Programming». The aim of experimental work was to analyse the influence of using educational methodological complex and the textbook on the efficiency of students' work organisation on a discipline «Web Programming».

When studying the second educational module, a forming stage of the experiment was conducted. During it learning of a material on a discipline was handled using educational methodological complex and the textbook.

Each student should have reached some progress in the process of studying. The second periodic control was conducted to check efficiency of using educational methodological complex and the textbook (table 4).

According to the result of the second periodic control, a high level of knowledge had 21,73% students in 230 group (2012-2013 academic years), above average – 47,83 %, average – 30,44 %, below average – 0. A group 230 (2013-2014 academic years) had: high level - 26,65%, above average - 33,33%, average - 40,02%, below average – 0. A group 220 (2013-2014 academic years) had: high level of knowledge - 17,4% students, above average - 43,5%, average - 39,1%, below average – 0.

Table 4.

Knowledge level of students according to the results of forming stage of the experiment

| | | 230 group. 2012-2013 academic years | 230 group. 2013-2014 academic years | 220 group 2013-2014 academic years |
|---------------------------------|---------------|---|---|--|
| 2-nd periodic control(after) | below average | 0% | 0% | 0% |
| | average | 30,44% | 40,02% | 39,1% |
| | above average | 47,83% | 33,33% | 43,5% |
| | high | 21,73% | 26,65% | 17,4% |

Having compared the results of two stages of the experiment, it is possible to conclude that academic performance of the students increased because of effectively organized work on a discipline. This is shown below by the methods of mathematical statistics.

Comparison of individual academic performance of the students is subject to a statistical analysis, namely: scores, received by an experimental group «before» (the first periodic control) and «after» (the second periodic control) a forming experiment. We need to determine whether there are sufficiently important changes and if it is possible to assert specific influence has a considerable importance.

Because the fact we have small groups under the test, we use T-Wilcoxon criterion to reach our goal. According to it, a zero-hypothesis has been formulated (H_0) about the intensiveness of the shift to the increasing knowledge level of students when using the developed educational methodological complex («Web Programming») and the textbook («Basics of web application development») does not exceed the intensiveness of the shift in knowledge level of students who studied the same material without the educational methodological complex and the textbook. Let us suppose as an alternative hypothesis H_1 that the intensiveness of the shift in increasing knowledge level of students when using educational methodological complex («Web programming») and the textbook («Basic web application development») exceeds intensiveness of the shift in knowledge level of students, who studied without using them.

According to the results of statistical data, we have found the absolute values of the deviations. According to the rules of ranking, we have found the ranks of these absolute values, as well as an empirical criterion T (table 5).

Table 5.

Summary results of the statistical processing

| Discipline name | Amount of respondents (n) | $T_{\Delta MN}$ | $\rho \leq 0,05$ | $\rho \leq 0,01$ |
|--|----------------------------------|-----------------|------------------|------------------|
| 230 group 2012- 2013 academic year | 23 | 13 | 43 | 60 |
| 230 group 2013- 2014 academic year | 15 | 7 | 9 | 17 |
| 220 group 2013- 2014 academic year | 23 | 20,5 | 55 | 75 |

According to the table of critical values of T-Wilcoxon criterion for levels of statistical value $\rho \leq 0,05$ and $\rho \leq 0,01$ we determined a critical value T.

In all cases empirical value of T-criterion gets to a zone of significance, which is at the left.

Because $T_{\text{эмп}} < T_{\text{кр}}(0,05)$, a main hypothesis H_0 is rejected, and an alternate H_1 is accepted, which means the intensiveness of the shift in increasing knowledge levels of students, with the use of educational methodological complex and the textbook on the discipline «Web Programming») increases the intensity of the shift in knowledge level of students, when they studied the disciplines without using educational methodological complex and the textbook.

Conclusion. Learning and analysis of web technologies showed a necessity to modify educational methodological complexes in universities and creation of specialized textbooks, corresponding to modern requirements of a labour market. On the basis of experimental data we can recommend using the textbook «Basics of web application development», which will be useful for future web developers in the process of a professional preparation and for the further employment.

We can conclude that a successful employment of future web developers depends on fulfilling a range of necessary conditions, precisely:

- basic knowledge and skills for working with web technologies should be provided in the educational qualification characteristics and in an educational professional program of a university graduate, who studies a specific specialty;
- presence of corresponding professionally oriented disciplines, educational publications and educational methodological complexes on the basis of a combination of professional and educational standards;
- presence of work experience, moreover, its quality and quantity will directly affect a level of graduate's competitiveness;
- presence of certifications, confirming knowledge.

A systematic analysis of the labour market and web development technologies can be a prognostic direction of the study as well as an adaptation of educational methodical materials and educational process in universities and creation of technological parks that will allow future professionals to form practical skills of web development directly in universities.

REFERENCES

1. Grishin V.N. Information technologies in professional activity: textbook/ V.N. Grishin, E.E. Panfilova – M.: PH «Forum»: INFRA-M, 2007. – 416 p.
2. Osadchiy V.V., Osadchaya K.P. Analysis of the issue of a programmer's professional training and ways of solution // International electronic journal "Educational Technology & Society". – 2014. - V.17. - №3. - C.378-392. - ISSN 1436-4522. URL: <http://ifets.ieee.org/russian/periodical/journal.html>.
3. Job description of a web developer, job descriptions of a web site developer, a sample of description of a job description of a web site developer [Electronic resource]. – Access mode: http://www.rabota.ru/guide/dolzностnye_instruksii/dolzностnaja_instruksija_razrabotchika_web_sajta_dolzностnye_objazannosti_razrabotchika_web_sajta_obrazets_dolzностnoj_instruksii_razrabotchika_web_sajta.htm
4. Front-end developer [Electronic resource]. – Access mode: <http://edu.cbsystematics.com/ru/education/speciality/frontenddeveloper>.
5. Back-end developer [Electronic resource]. – Access mode: <http://edu.cbsystematics.com/ru/education/speciality/backenddeveloper>.
6. Shchedrolosiev D.E. Competence approach to the training of software engineers [Electronic resource] // Information technologies and teaching aids. – 2011. – Issue 24. – №4. ISSN 2076-8184. Access mode: <http://www.journal.iitta.gov.ua>
7. How do client languages of web programming differ from server ones [Electronic resource]. – Access mode: http://www.luksweb.ru/view_post.php?id=330.
8. We Measure Your Quality [Electronic resource]. – Access mode: <http://www.tiobe.com>.
9. Educational qualification characteristics of a bachelor of a specialty 6.040302 «Informatics». Field of knowledge 0403 «System sciences and cybernetics». – K., 2010. – 32 p.

10. Osadchiy V.V., Kruglyk V.S. Basics of web application development: teaching aid / V.V. Osadchiy, V.S. Kruglyk. – М.: ИД ММД, 2012. – 540.
11. ITIL [Electronic resource]. – <https://ru.wikipedia.org/wiki/ITIL>.
12. ITSM [Electronic resource]. – <https://ru.wikipedia.org/wiki/ITSM>.
13. Installing Trac as a project management system for configuration storage 1C 7.7 [Electronic resource]. – Access mode: <http://infostart.ru/public/16992/>.
14. Zend Technologies [Electronic resource]. – Access mode: http://ru.wikipedia.org/wiki/Zend_Technologies.
15. Oracle Database 11g [Electronic resource]. – Access mode: http://education.oracle.com/pls/web_prod-plq-dad/ou_product_category.getPage?p_cat_id=163#tabs-3.
16. Explore Our Certifications [Electronic resource]. – Access mode: <http://www.ciwcertified.com/>

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Осадчий В. В.¹, Круглик В.С.²

¹Мелітопольський державний педагогічний університет імені Богдана Хмельницького, Мелітополь, Україна

²Херсонський державний університет, Херсон, Україна

ПІДГОТОВКА МАЙБУТНІХ ВЕБ-РОЗРОБНИКІВ У ВНЗ УКРАЇНИ ДО СЕРТИФІКАЦІЇ ЗНАТЬ ТА ПРАЦЕВЛАШТУВАННЯ

Одним з основних факторів успішного працевлаштування є вибір професії, що користується попитом на сучасному ринку праці. Для цього потрібно проаналізувати професії, які будуть користуватися попитом в майбутньому, щоб забезпечити високий рівень доходів і стабільну роботу.

На думку багатьох експертів, розвиток сучасних технологій є основним фактором, який стимулює зростання продуктивності та економіки в цілому. Ця тенденція характеризується станом ринку праці, коли значна кількість перспективних професій пов'язані з ІТ-сферою. Професія програміста є однією з найбільш затребуваних спеціальностей на ринку праці.

На сьогоднішній день, веб-розробка є одним з основних завдань у галузі розробки програмного забезпечення.

У даній статті розглянуті вимоги до веб-розробників. Розглянуто вимоги до фронтенд і бекенд розробників. Розглянуто рівні кваліфікації та вимоги до них. Розглянуто мови програмування для навчання. Це HTML5, XML, css3, javascript, PHP, sql. Розглянуто особливості сертифікації рівнів програмістів.

Розглянуто зміст дисципліни "веб-розробка", щоб отримати необхідні навички і знання в цій галузі. Розглянуто структуру навчального посібника з дисципліни.

Ключові слова: Освіта, програмування, робота, професія, сертифікація, навчання підручник.

Осадчий В. В.¹, Круглик В.С.²

¹Мелітопольський государственный педагогический университет имени Богдана Хмельницкого, Мелітополь, Украина

²Херсонський государственный университет, Херсон, Украина

ПОДГОТОВКА БУДУЩИХ ВЕБ-РАЗРАБОТЧИКОВ В ВУЗАХ УКРАИНЫ К СЕРТИФИКАЦИИ ЗНАНИЙ И ТРУДОУСТРОЙСТВУ

Одним из основных факторов успешного трудоустройства является выбор профессии, которая бы была востребована на современном рынке труда. Для этого нужно проанализировать профессии, которые будут востребованы на несколько лет вперед, чтобы обеспечить высокий уровень доходов и стабильную работу.

По мнению многих экспертов, развитие современных технологий является основным фактором, который стимулирует рост производительности и экономики в целом. Эта тенденция характеризуется состоянием рынка труда, когда значительное количество

перспективных профессий связаны с ИТ-сферой. Профессия программиста стала одной из самых востребованных специальностей на рынке труда.

На сегодняшний день, веб-разработка одна из основных задач в разработке программного обеспечения.

В данной статье рассмотрены требования к веб-разработчикам. Рассмотрены требования к фронтенд и бекенд разработчикам. Рассмотрены уровни квалификации и требования к ним. Рассмотрены языки программирования для обучения. Это HTML5, XML, css3, javascript, PHP, sql. Рассмотрены особенности сертификации уровней программистов. Рассмотрено содержание дисциплины "веб-разработка", чтобы получить необходимые навыки и знания в этой области. Рассмотрена структура учебного пособия по дисциплине.

Ключевые слова: Образование, программирование, работа, профессия, сертификация, обучение учебник.