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ACCORDANCE SYSTEM OF DISTANCE LEARNING "FOUNDATIONS OF ALGORITHMIZATION AND PROGRAMMING" TO INTERNATIONAL STANDARDS OF QUALITY

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In the article is examined accordance of the integrated environment of study course «Foundations of algoritmization and programming» with the requirements of international standards of quality IMS and SCORM for distance learning systems.

Keywords: *environment, system, module, integration, computer-integrated.*

Raising of problem

Programming facilities are inalienable part of information technologies and traditional systems, such as cargo-carrying, military, health protection and financial. Strengthening of role of standards, procedures, methods, facilities and external terms, is thus determined for development and realization of software. Quality Assurance, or QA, is a process of verification and confession of products and services which must satisfy or exceed the hope of client. Thus, QA sent to the planned and systematic production processes, which provide a confidence in that a product will be useful at the use of him after the direct setting. It certainly can not guarantee the production of absolutely high-quality goods, but does this process more feasible.

Similar approach creates considerable difficulties during a management programming facilities and in technologies of programming, especially during integration of products and services. Organization with modern amenities of questions of creation of software products is therefore needed in transition to the general structure, which can be utilized professionals for a «talk a common language» at creation and management programming facilities. Exactly a standard sets such general structure.

This structure wrap-round the life cycle of programming facilities from conception of projects through determination and association of processes for an order and supply of software products and services. In addition, it is intended for control and modernization of these processes.

Processes which are certain in a standard create the plural of the general setting. Concrete organization, depending on an own purpose, can choose proper subset of processes for realization of the concrete tasks. Therefore it follows to adapt any standard for a concrete project or application. Standards are used both for separately workable and for programming facilities which will be built-in or computer-integrated to the general system.

Quality assurance and standardization in industry of the system and programming engineering

Quality assurance unlike control of quality, is activity which is directed on providing of business aims. Both control of quality is production activity and quality assurance is active activity which comes forward person supervision of leader. If the process of activity does not execute the concerted steps, then QA will report about it for the sake of guarantee of correct implementation of work. Activity from quality assurance is carried out on all of development processes in an order to help to support the level of efficiency.

Control of quality is used to all of forms of products and services as testing of activity. Two is here pursued governed: «accordance's with the put purpose» (a product must correspond to purpose) and to «do them correct in the first turn» (errors must be corrected). He includes adjusting of quality of raw material, wares and components, services, related to the production, and also managements, issue and inspection of processes.

An expert estimation appear inalienable part of quality's control activity. It is a major and most effective mean for diminishing of errors during design time.

Checking for a refuse an useful process which is conducted above all of types of consumer products. Maintenance of product until a refuse will not pass more frequent all takes a place as a result of intensive vibration, temperature or humidity. Often sufficiently simple changes can substantially prolong the term of service of product.

A lot of organizations utilize the statistical process of control, which allows to take it to such level of quality, what is acknowledged in the world. Points which are controlled include office tasks, and also usual production tasks often. Traditional statistical process of control in production operations – to pass to the casual sampling and testing part of production.

Deep control of quality of rules of maintenance and pre-conditions, what are use for them, are the most important inspections of control in all of cases, when, regardless of implementation statistical methods of control and quality's improvement, volume a sale was abbreviated. A serious problem which results in such consequences is specifications to the products do not include for itself one is important factor: what descriptions do take a place in accordance with the customer's requirements?

If specifications do not correspond to the real requirements of quality, it can not be assured. The general understanding questions of quality in all of organization increases probability of that quality of products will be taken into account on each of the stages of production process.

The process of standardization and certification for a long time entered in the programming engineering, where he makes basis of industrial production of software products. Standardization has a not less value here, because it provides quality of products and moving of them to the market. If some organization gives services and produces commodities and here applies some technology of production, then it must correspond to standards on these types of commodities and services. In addition, technology which is used organization passes a certification on accordance with these standards.

A standard can be developed on:

- Material and technical objects (products, standards, model of raw material);
- Norms, governed, requirements of organizationally methodical and in-technical character.
- Among all of variety of standards it is accepted to select followings a few types:
- Corporate standards are developed large firms (by corporations) with the purpose of upgrading the products. They are developed on the basis of own experience and taking into account the requirements of international standards. They are not certified, but are obligatory for the use into a corporation. In the conditions of market competition can have the reserved character. In IT-sphere a sphere are known standards, developed Microsoft, Intel, IBM.
- Industry standards operate within the limits of organizations of certain industry (ministries). For example, BNIP is build standard and governed. Developed recognition requirements of world experience and specific of industry. It is, as a rule, obligatory for industry. Certifications are subject.
- State standards are accepted public organs, valid law. Developed recognition world experience or on the basis of industry standards. Can have both recommendation and obligatory, character (standards of safety). For a certification the public or licensed organs of certification are created.
- International standards are developed, as a rule, by the special international organizations on the basis of world experience and the best corporate standards. Organizations (state and private) which passed licensing in international organizations take a title for a certification.

The international standards of quality can be use somebody in a direct appearance or adapted to the own circumstances. Creation of equivalents to the international standards, to adjusted by the own products, is national standards. They, as a rule, differ from an etalon after technical maintenance, but can contain editorial differences, such as appearance, use of characters and metages, replacement of point a comma, as a separator, and also those, which are the results of

«conflicts» in state positions or requirements of enterprises, caused climatic, geographical, technological or production factors, or requirements of rules of safety.

International standards are one of ways of overcoming of technical barriers in international industry, which are caused the difference of technical positions and standards, developed independent and separated nationality, by national features by organizations or companies. Technical barriers appear result of that various groups are at connection, each of which has the own base, the separate do very much good, but incompatible, things. Development of international standards is by a distraction or victory of this problem.

Controlled from distance learning: state and prospects of development

The controlled from distance technologies wrap-round practically all of spectrum of educational necessities. One its role there are quick studies of plenty of people to base professional skills, that almost all of most producers of the programming and vehicle providing practice. Not for nothing a coefficient of returning of investments from introduction of the system of the controlled from distance studies of employees and partners in Cisco is 900%! On other pole is making of more difficult professional skills, teaching of the detailed co-operation, with the concrete systems, in-plant of leading specialists training.

The world market of the controlled from distance education grows stably. After the estimations of firm Cortona Consulting, to the end of decade in the whole world he will make 50 milliards of dollars, and in opinion of the National institute of standards and technologies of the USA, this sum is attained America already today. In Europe the particle of on-line decisions, concordantly IDC, arrives at already the third at the market of studies. The half of all of the Turkish students gets education remotely, a border in million students attained the Indian university the name of Indira Gundy, and advice from the controlled from distance studies at Department of education of RF unites ten of institutes of higher already. Thus the Russian educational structure does not need the special permission of this ministry on organization of the controlled from distance form of studies, although quality and plenitude of courses is however subject state verification. In a prospect possible and handing over of state examinations in the controlled from distance mode over the Internet – teachers during examination only will control correctness of authorizing of schoolboys on workplaces. With development of dustings of passing to information to DL all more frequent will be utilized not only on enterprises and in organizations but also by the students of institutes of higher, private individuals.

By providers to DL practically all of spheres of activity of man are today overcame. All more frequent there are announcements of the social programs. In schools the controlled from distance studies of children are inculcated with physical defects. For example, in the Russian oncologic scientific center the name of Blokhin the special educational program “Internet school for children with onko-haematological diseases was started”. In many areas of our country works go on forming of informative environment of trade education on the base of the controlled from distance technologies.

Reason of growth of popularity of the controlled from distance education is active state support. New technologies allow for short period and at in relation to small charges, preparing is enough shots are skilled, thus quite often without tearing away from a production. The modern controlled from distance teaching take advantage before traditional forms and at price: it is very effective, saves time, charges absent on financial educational materials and maintenances of class rooms and others like that. Such systems of education bring an especially high effect at the studies of large audiences listeners, as scaled easily, and running expenses at the increase of number of users grow slowly enough. The controlled from distance learning allowed a minimum on 30% to shorten preparation time specialists, an economy on transport charges on the average made not less than 80%, but the listeners of on-line courses on 56% better mastered material as compared to those, who studied on traditional courses.

The environment of study of course of «Foundations of algorithmization and programming is computer-integrated»

The environment of course studying «Foundations of algoritmization and programming» is computer-integrated it is realized as Web-application, intended for the use on lecture and laboratory employments from this course, for self work of students of high educational establishments which have an access to the network of Internet. Exactly these aspects are advantages of this product. Also an environment gives possibility well enough to learn the course of foundations of algorithmization and programming and students, and teachers which work with him.

A product is given realized on the basis of train aid of «Foundations of programming». An environment is computer-integrated it is developed in Laboratory of the integrated environments of learning of the Research institute of information technologies of the Kherson state university the students of 5th and 4th courses of this high educational establishment. Realization passes in a few stages, on each of which reports are conducted and certain work is conducted from filling of the modules and correction inaccuracies.

The feature of environment is that the specifics of subject domain are taken into account in him. A programming mean is given realized on the unique methodology, with co-operation of all of facilities there are studies which are included in its composition: electronic textbook, book of problems, magazine, current and final checking and environment of demonstration of the software. The interface of this product was developed thus, that a course was intuitional clear even for those students which first work with the software of the controlled from distance learning (fig. 1).

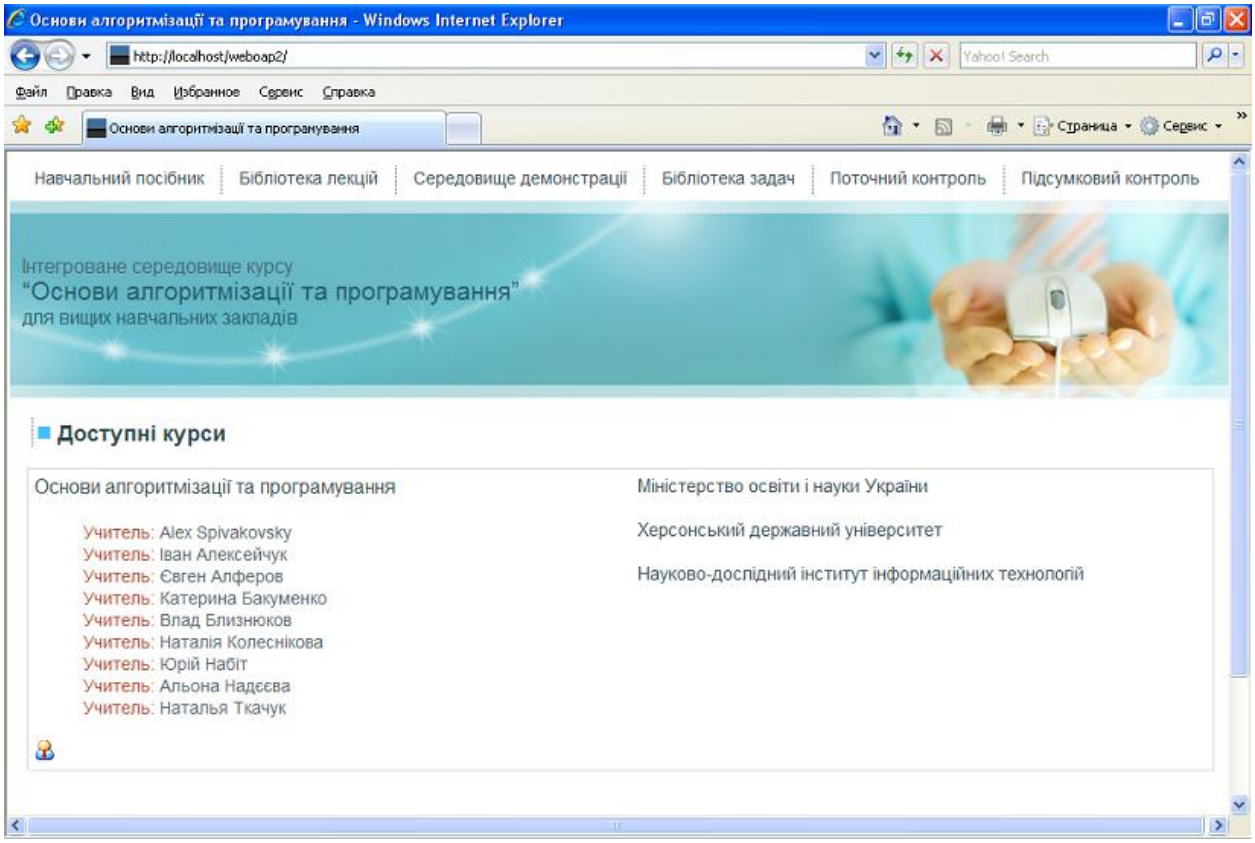


Fig. 1. Interface of the controlled from distance system of learning «Foundations of algorithmization and programming»

The environment of «Foundations of algorithmization and programming» is computer-integrated it is projected on the object-oriented technology. It consists of the followings modules:

- System of personification – use for registration users, gives them the proper rights for access, provides a protection fetch;

- Train aid – contains theoretical material which answers the program from bases of algorithmization and programming for high educational establishments; shows by itself the structured collection of themes and algorithms, realized as hypertext application;
- Library of tasks – answers the structure of train aid, contains tasks, up-diffused after the proper themes and sections; shows by itself the system of tasks;
- Environment of demonstration – provides subject demonstration of work algorithms and programs, used for implementation of practical and laboratory works;
- Current and final checking of knowledge system – provides work of the traditional system of testing, and also testing of programming code;
- Library of lectures – contains electronic presentations in a format .ppt, provides support of theoretical course in accordance with the sections of train aid;
- Electronic journal – will realize monitoring of mastering of knowledge and abilities of drafting students algorithms.

Standardization of the controlled from distance education (specifications SCORM and IMS)

Unlike other most IT-spheres, where a great number of incompatible specifications is, two basic standards are mass used in the modern controlled from distance education actually – Sharable Content Object Reference Model (SCORM) and Instructional Management Systems (IMS), developed in 1990th in the USA for presentation of educational material in an electronic kind. Other specifications use considerably less popularity.

Standards which are developed Consortium of global formation of IMS (IMS Global Learning Consortium) help to avoid these difficulties and instrumental in introduction technology of education, based on compatible functionality. Some of them got world confession and grew into standards for educational products and services. Basic directions of development of specification IMS are metadata, compatibility of questions and tests, packing of maintenance and management.

Standards for metadata determine the set of attributes, necessary for organization, determination of location and estimation of educational objects. By them is a type of objects, name of author and proprietor, terms of distribution and format. If necessary these standards can also include description attribute of pedagogical character – such, as style of teaching or co-operation of teacher with a student, level of the got knowledge and previous preparation.

The informative model of packing of maintenance, which is created IMS, describes the structures of data which provide compatibility of materials with the tools of development of content, by the systems of organization learning(learning management systems – LMS) and, by the workings environments or operative facilities of management implementation of the programs so-called (run-time environments – RTE). It determines the standard set of structures which can be utilized for exchange of educational materials.

The specification of compatibility questions and testing IMS describes the data structures, created on the basis of the use of the Internet. It a primary objective is a grant the users of possibility of import and export of materials with questions and tests, and also providing of compatibility of maintenance of on-line tutorials with the systems of estimation. Also it sets standard line control procedure between the components of maintenance of on-line tutorials and workings environments.

Recommendations of IMS from the choice of technology for realization services and construction of the proper attachments foresee the use:

- XML as a base format of presentation of information;
- WSDL for description of functionality of services;
- SOAP with Attachments as a general mechanism of exchange messages;
- HTTP and HTTPS as base transport protocols.

Presently specifications of IMS are supported and by most initiative of standardization which develops actively, in the area of e-Learning. Among organizations-participants of IMS it is possible to find the corporations of Oracle, Microsoft, Cisco, Blackboard, WEBCT; governments of

Great Britain, Canada, Australia, USA; universities of MIT, Carnegie Mellon, Berkeley, Stanford and a lot of other.

SCORM – presumably, most developed and widespread standard for the systems of the controlled from distance studies. He sets the method of distribution of educational information in the format XML, meaning presentation of any educational materials as components – alienable from an initial theme "pieces" of knowledge which can be built in different courses, and also determines the features of functioning of environment of support and receptions of navigation and managements of content.

Today it is opened a specification is so popular, that, for example, in 2004 The department of defense of the USA decided to prepare all the educational materials only on this standard. And all because it not limits a teacher in the choice of methods of electronic studies, as it is oriented not on description of great number of methods, but on introduction of common language which would answer for description of different methods and technologies of education.

An initial purpose of development of standard model of SCORM is development of strategy of the use of educational and informative technologies for modernization of education and providing of co-operation between a government and business in standardization of interactive studies. In SCORM drawn on the results of developments of a number of projects and organizations, including IMS. Rich in content part of initiative of SCORM are metadata of educational object (Learning Object Metadata – LOM). The purpose of this standard is a facilitation of search, revision, estimation and use of materials, for students, teachers or automatic programming processes. Thus clearly, that SCORM provides connection between educational objects. And so as metadata have high degree of semantic interoperability, transformations of these connections will pass without complications.

In SCORM seven basic services are selected in composition control the system by an educational process:

- administration educational activity (Course Administration);
- management of content (Content Management);
- delivery of content (Delivery);
- a management a navigation is after content (Sequencing);
- testing and evaluation of student (Testing/Assessment);
- control is after motion and job of student performances (Tracking);
- conduct of type of student (Learner Profile).

In the process of work above SCORM were formulated a few requirements to all of the systems, which will be developed in accordance with this standard. They are known as "ilities" of ADL («possibilities» or «capabilities» of ADL), and they form basis for changes and additions of SCORM. These requirements followings:

1. *Accessibility*: to determine ability location and to get access to the educational components from the point of access and to put them to many to other such points.

2. *Adaptability*: ability on-line tutorial concordantly to individual and necessities of organizations.

3. *Affordability*: to increase ability efficiency and productivity, abbreviating time and charges on delivery instruction.

4. *Durability*: ability to answer new technologies without additional and expense revision.

5. *Interoperability*: to utilize ability educational materials regardless of platform which they are created on.

6. *Reusability*: to utilize ability materials in different applications and contexts.

All of these principles successfully can be observed in case that at first oriented on the use of educational content in web-environment.

In addition, it is possible to name the followings requirements of international standards of quality of IMS and SCORM birth-certificates and make examples from the system of the controlled from distance studies of WebFAP:

- Hierarchical construction of educational materials structured (dividing by sections, themes and others like that)

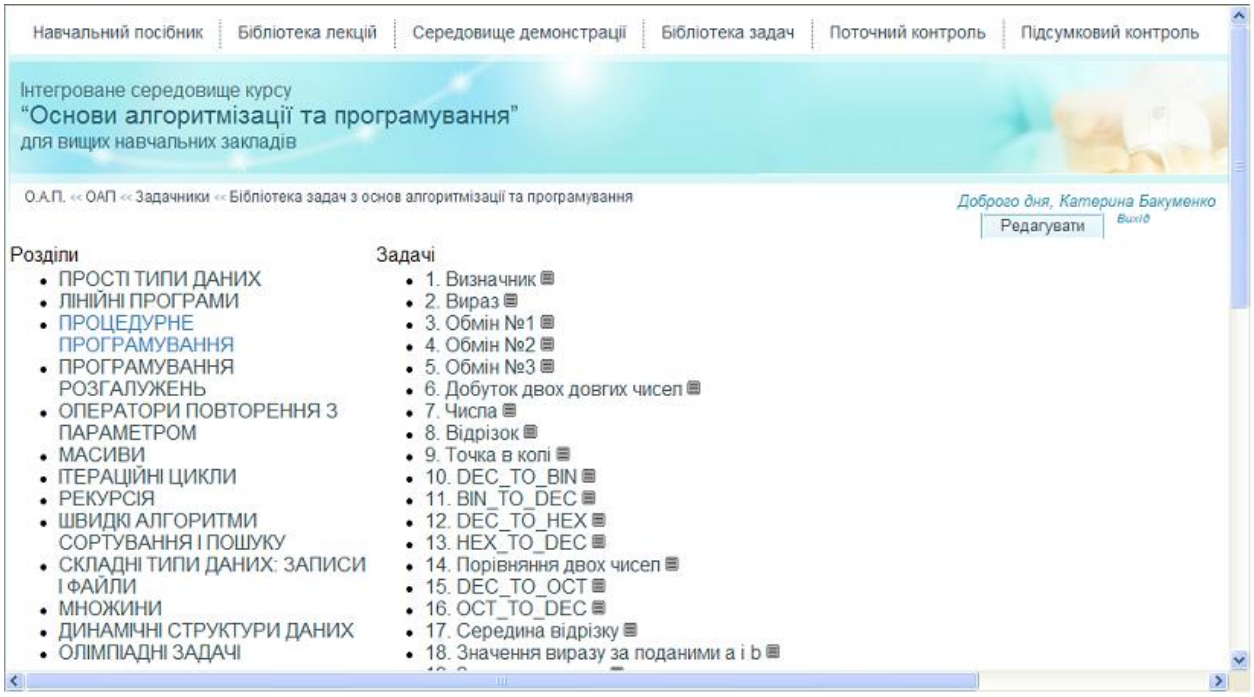


Fig. 2. Materials to the module «Library of lectures», structured after sections

- Scalability (expansibility) of educational materials (creation of the unique course is from any materials: to the phototypographic illustrations and others like that)

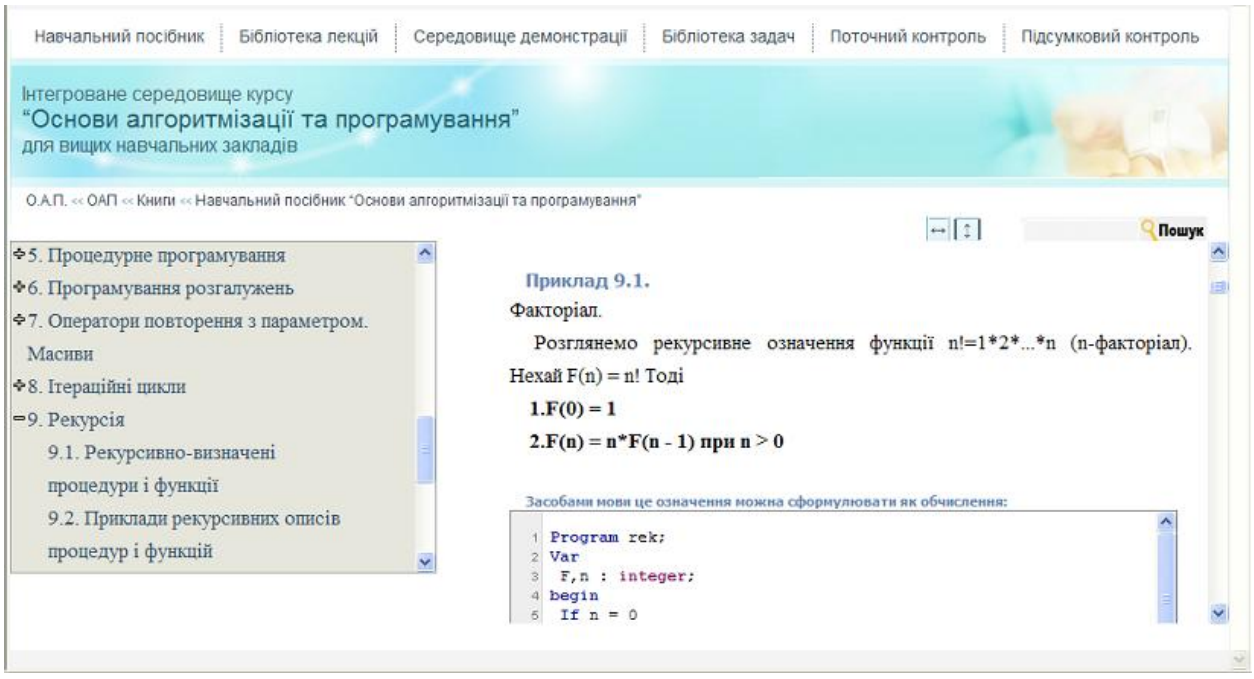


Fig. 3. Structure of educational textbook and him content

- Basis of internal (computer) format of storage of materials is a language of XML that possibility of translate of course in the format of HTML

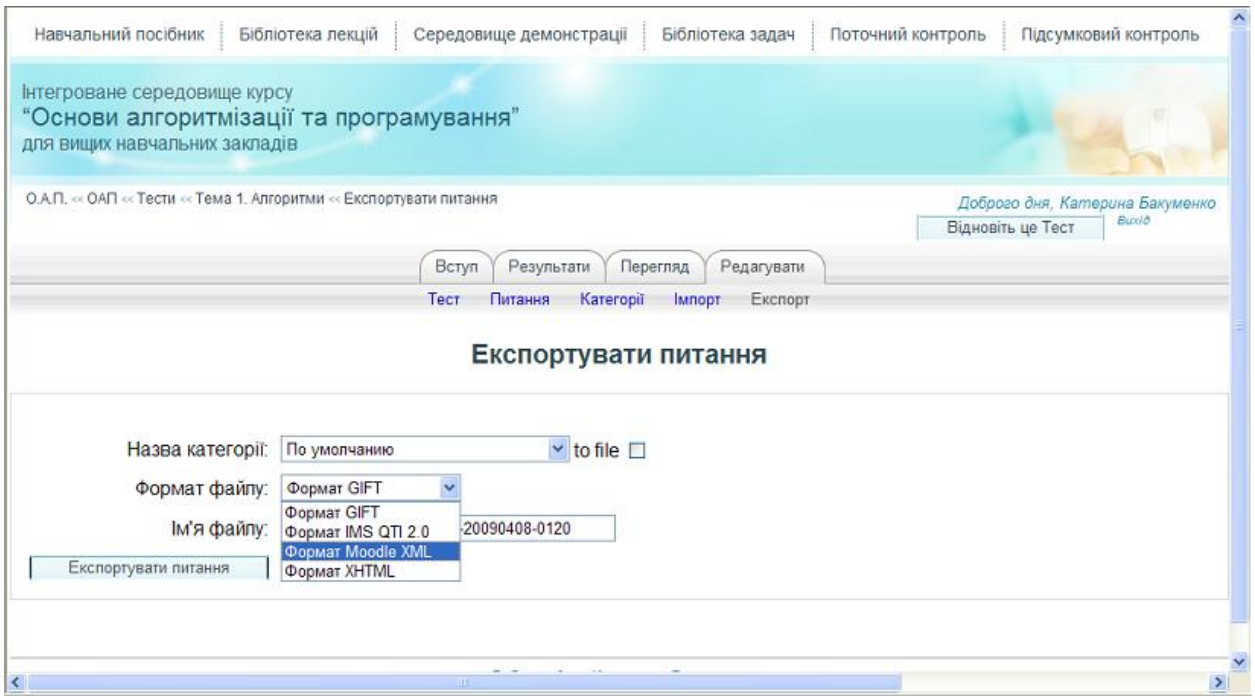
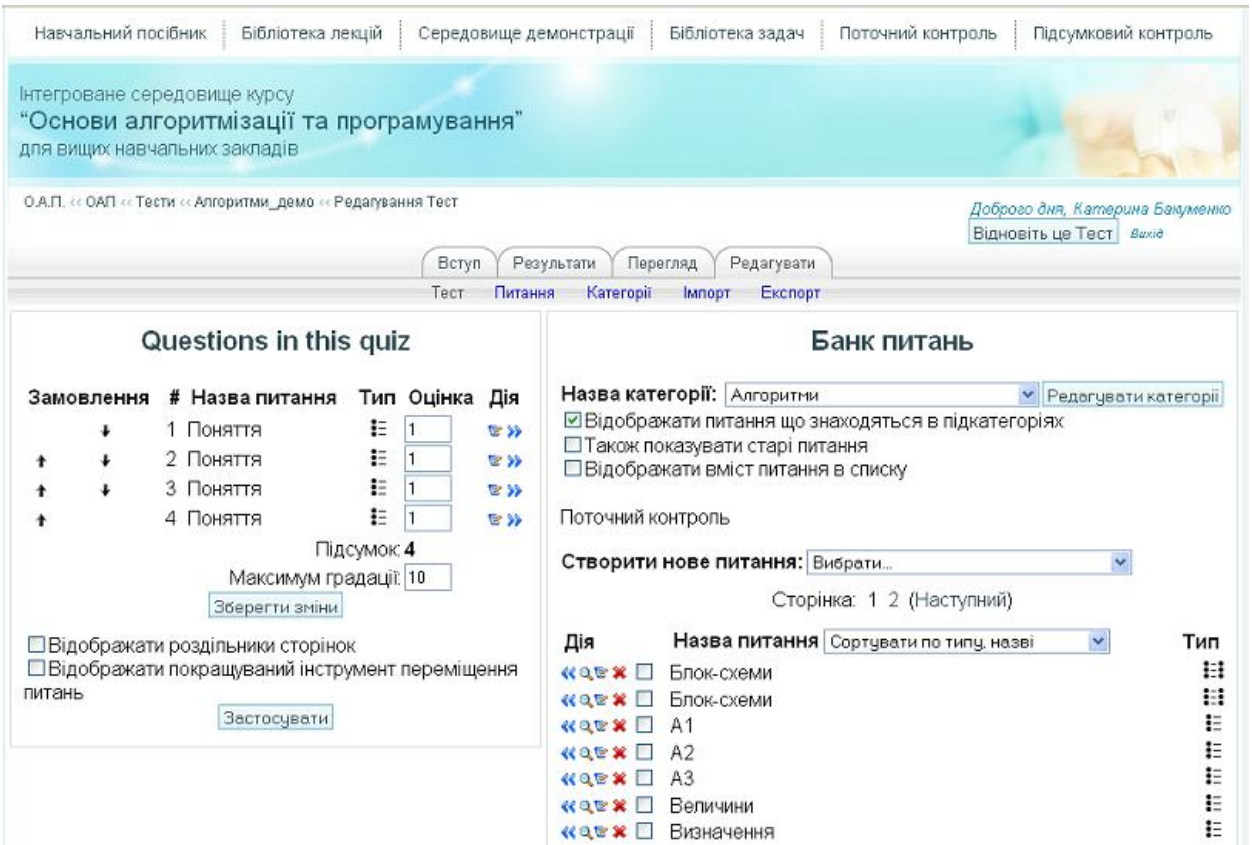


Fig. 4. Possibility of export of information to the module of «Current control» in different formats

- Possibility of the repeated use of scenarios of educational process



It is needed also to do an accent on that the platform of Moodle, on which was directly developed a course is given, supports the standards of quality of the controlled from distance formation of SCORM and IMS.

Conclusions

Presently the market of services of the controlled from distance studies develops actively, there is every year on 25-30%. At the same time, at the market of educational services not enough the controlled from distance programs which would answer the domestic and world standards of

quality and guaranteed a listener approach of the systems to the studies. Also corporate customers, as a rule, utilize technologies of the controlled from distance education for the decision of specific tasks of project character, such as creation of courses for the studies of employees on a that or other subject, but not for creation of the full-scale educational systems, for example portals of corporate university. Such and similar to them decisions have most demand, and all of them have a few general lines – they need to be inculcated in the the earliest possible date with the minimum expenses of budget. But basic advantage of this system is in that it is easily built to other electronic systems of company and allows to watch history of studies of employees from a hire for job to liberation.

High-quality education by the controlled from distance mechanisms becomes accessible in any point of country, and if a classic extra-mural form has natural limitations on expressiveness and interactiveness of educational materials and scope of audience, the modern systems of studies are deprived similar failings. In addition, a positive factor is the controlled from distance access to the resources of leading institutes of higher, which are concentrated in large cities, and them scientific base from a «depth».

The system of the controlled from distance formation of «Foundations of algorithmization and programming» answers the requirements of international standards of quality of IMS and SCORM fully, that touch these software products. To a certain extent it is related to the choice of platform of Moodle, which it was developed on. But also ponderable payment was done by programmers and testers which provided high quality of this product.

BIBLIOGRAPHIC REFERENCES

1. Благодатских В.А. Стандартизация разработки программных средств: Учеб. пособие. – М., 2005. – 288 с.
2. Богомолов В.А. Обзор бесплатных систем управления обучением / Educational Technology and Society. – 2007 – № 10(3). – С. 439 – 459.
3. Крупский А.Ю. Разработка и стандартизация программных средств / Крупский А.Ю., Феоктистова Л.А. – СП., 2008. – 100 с.
4. Матвєєва Л.Є. Процес розробки програмного забезпечення. Від теорії до практики / Матвєєва Л.Є., Волков В.А. – К., 2008. – 11 с.