UDC 378.147

DYNAMIC CURRICULUM FOR THE EXTRAPOLATION OF INNOVATIVE TEXHNOLOGIES IN FASHION

©Ryabchykova K.
Ukrainian Engineering Pedagogics Academy

Інформація про автора:
Рябчикова Катерина Миколаївна: ORCID 0000-0002-3086-5975; ryabchikova.ekaterina@gmail.com; бакалавр за спеціальністю професійна освіта, дизайн, магістр кафедри технологій та дизайну, Українська інженерно-Педагогічна Академія, вул. Університетська, 16, м. Харків, 61003, Україна

The work is devoted to the problem of curricula development for the students of fashion design in the higher educational institutions. Industry constantly faces rapid developments in technologies and implementation of new approaches, what in response distinguishes the necessity of educational system upgrade in order to prepare competent professionals at the end of studies. In close scope was analyzed process of competences' formation on the example of fashion education in the higher educational institutions. In particular, were discussed expeditious changes and recent innovations, which have introduced 3D technologies and their expanded use in fashion industry, what, as a result, have created necessity to the development of new competences in fashion education. Consequently theory was developed, based on the assumption that competences can be static and dynamic, where dynamic are presented by flexible and steadily reformed disciplines. As the practical implementation, example of 3D technologies usage by students of Ukrainian Engineering Pedagogics Academy was examined. On the basics of analyzed material, were proposed methods of curriculums' creation, which will allow extrapolation and adoption of continual changes in the industry.

Keywords: competences, fashion education, dynamic curriculum, 3D technologies

Рябчикова К.М. «Динамічний навчальний план для екстраполяції інноваційних технологій в моді»

Робота присвячена проблемі розроблення навчального плану для студентів, що вивчають дизайн одягу в вищих навчальних закладах. Індустрія постійно стикається з швидким розвитком технологій і впровадженням нових підходів, що у відповідь визначає необхідність освітньої модернізації системи з метою підготовки компетентних фахівців на момент закінчення навчання. Більше детально був проаналізований процес формування компетенції на прикладі навчання дизайну одягу в вищих навчальних закладах. Зокрема, були обговорені швидкі зміни та останні інновації, які запровадили 3D технології та їх широке використання в сфері моди, що визначило необхідність створення нових компетенцій в освіті за сферою моди. Як наслідок, було розроблено теорію, виходячи з припущення, що компетенції можуть бути статичними та динамічними, де динамічні представлені гнучкими дисциплінами, що постійно реформуються. В якості практичної реалізації, було досліджено приклад використання 3D технології студентами Української Інженерно-Педагогічної Академії. Базуючись на проаналізованому матеріалі, були запропоновані методи для створення навчального плану,що дозволять екстраполювати та пристосовувати постійні зміни в індустрії.

Ключевые слова: компетенції, освіта в сфері моди, динамічний навчальний план, 3D технології

Рябчикова Е.Н. «Динамический учебный план для экстраполяции инновационных технологий в моде»

Работа посвящена проблеме разработки учебного плана для студентов, изучающих дизайн одежды в высших учебных заведениях. Индустрия постоянно сталкивается с быстрым развитием технологий и внедрением новых подходов, что в ответ определяет необходимостью образовательной модернизации системы с целью подготовки компетентных специалистов на момент окончания обучения. Более подробно был проанализирован процесс формирования компетенций на примере обучения в сфере моды. В частности, были обсуждены быстрые изменения и последние инновации, которые ввели 3D технологии и их широкое использование в сфере моды, что определило необходимость создания новых компетенций в образовании по сфере моды. В результате была разработана теория, исходя из предположения, что компетенции могут быть статическими и динамическими где динамические представлены гибкими дисциплинами, которые постоянно реформируются. В качестве практической реализации, был исследован пример использования 3D технологий студентами Украинской Инженерно-Педагогической Академии. Базируясь на проанализированных материалах, были предложены методы для создания учебного плана, который позволит экстраполировать и приспосабливать постоянные изменения в индустрии.

Ключевые слова: компетенции, образование в сфере моды, динамический учебный план, 3D технологии

Problem justification. The creation of new tools and techniques means advancement of old or formation of new technologic processes. In educational sphere, it determines necessity of special competence's formation, which didn't exist before. Evolution of 3D texnologies' manufacture is designated at the present time. With regards to implementation in fashion sphere, it includes 3D scanning, 3D prototyping by 3D printer, 3D visualization with the help of holographic pyramid. In some fields tools of 3D technology are used even more widely, for instance automobile manufacturing [1]. Nevertheless, process of adoption to the education is still requires a lot of time, what distinguish lack of contemporary required skills to the point of graduation.

Literature analysis. Recent studies suggest that knowledge in 3D technologies is important and newborn alumni should consider pursuing those skills for future job prospects [2]. Additionally was examined necessity of 3D tools introduction in the educational process [3], however 3D competence as a separate outcome was not discussed. Nevertheless, we consider that in fashion sphere, with its' rapid and constant development, such technologies as 3D should be considered as flexible and dynamic substance, rather than static implementation of tools. Currently, competences in fashion education cover traditionally known skills and knowledge [4], what do not exactly reflect reality of modern fashion industry.

Aim of the research. The main scope of the research identifies the necessity to create methods, which will allow to adopt and extrapolate innovations in industry to the curriculum. Particular attention is devoted to innovations in fashion sphere.

Main contributions. The stepped model of competences' level increasing according to time is described in the work [4]. We will receive a three dimensional diorama of requirements' increasing according to the competence, if divide competences into directions. The biggest weight is demonstrated of 3D technologies' sphere in the present time. Therewith, the transition from stepped dependence to the infinity change of the competences' demands is observed. The sphere of fashion education is not completely filled with recent innovations in industry and 3D competences pursuing in particular. Currently, there is three level model for the preparation of the specialists in the design sphere.

1. Competences, which are mutual for modern specialists in different fields of design (general, social, personal, etc.)
2. Basic competences for all specialists in fashion (generally professional)
3. Special competences, which are limited of definite field of fashion (special academic, subjective etc.)

Competence as enlistment of knowledge, skills and experiments is not a constant value for execution of work. The complex of competences is changing constantly, according to the time, weight of technologies and methods (Fig.1).

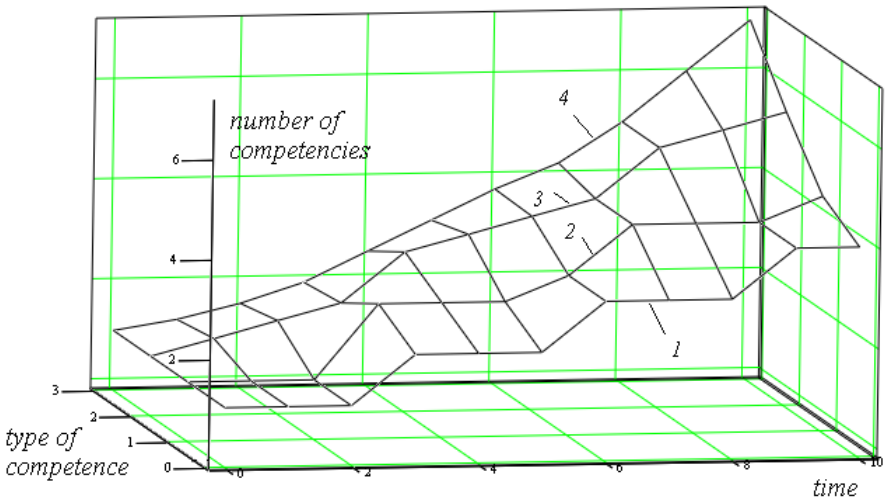

Fig.1 Change of competences in the time

Relying upon proposed figure, it is appropriate to separate several groups of competences:

- Quasi-static competences with a few step-changes;
- Quasi-static competences with vast changes of informative part (this model requires a periodical but ground breathe remarking of approaches to the specialists' training.);
- Stepped competences with the infinity weight between steps;
- Dynamic competences. (Requires incessant change in the training process. According to the fact, that the preparation of specialist is consist of at least three years, it's necessary to take into account not just present achievements in the industry, but also future technologies, thus predict in advance. This task must be considered in the education and in the formation of competences.

Analyze of necessary competences are realized to provide preparation of specialists in fashion. Separate articles [4] and also work experience in scientific and methodic commission of Ukrainian Engineering Pedagogics Academy were devoted to this process. To separate the competences and their component, structure and content were considered:

- Sight of academic staff on the problem of structure and content, demands of employers, demands of consumers of design production, opinion of graduators, opinion of industrial enterprises, art and creative studious;
- Modern tendencies and perspectives of theoretical and technological development in design production.

Indicated conditions allow to separate following groups of specialist's competences.

Informational competence: possibility to be familiarized in information flow, to use a rational technique for producing, transformation, systemization and possession of information; capability of its actualization in necessary situation of intellectual and cognitive process; capability to censure of receiving information; computer literacy; possession of new information and multimedia technologies (electronic educative resources); skills in using of rational search, selection, systematization and information using ways; using of methodic and scientific literature according to section of profession and complementary questions.

Communicative competence: Skills in converse, understanding of collaboration value, friendship, trust-based relationships between people, skills in listening and hearing each other, empathy, dialogue skills, team working.

Perfection competence is one of the key competences, which was formulated by the Europin Soviet in 1996 in Bern. It is determined like "capability to study during the life period in the base of ceaseless personal, professional and social studying". A content of competence can be determined in following order: requirements in self-development; skills in forming-up of personal life strategy, entwinement of intellectual developing with a formation of personality, capability of inquiring with contradictions and uncertainty of your life experience; capability of self-controlling in intellectual development and achieving a peak of professional skills; adequate score of achieving results in self-development and formation of new perspective tasks; professional mastery with theoretic understanding and creative searching [4].

Competence of activity is the base for all key competences, which includes the experience of cognitive, educative, researching and others; skills of problem's seeing and formation, finding solutions and choosing the best of them; readiness to take responsibility for your choice; skill of protecting and acknowledging own opinion; realistic appraising of self-possibilities.

Historic and cultural or cultural and educational competences are the internal base for solving of creative, researchable, organizational and methodical tasks. To this list weal so can add competences of esthetic field, art creation and art culture, competences of historical and cultural cycle (history of art, history of material culture and also history of separate arts' fields according to specialties, knowledge of sociology and psychology, which give an opportunity to show an art influence on the formation of esthetic field and art culture of citizens.

Art competences are competences in the academic drawing and painting, competences in the constructive and art cycle, competences of specificity in the complimentary art fields (drawing, painting and graphic, chromatics and sculpture) and in the problems of art synthesis.

Graphic competences are competences of the technological graphic, the perspective and shadow projections, the theories in perspective and projection building in current standards and technical instructions to the industrial production.

Technological or project and technical competences are competences in fabric knowledge, technology of industrial materials, foundations of pattern making, technological processes of manufacture and serial production, equipment and tooling, techniques of manufacture, modeling and mocking-up.

Economical competence is competence in organization and administration of project cycle, economic aspects, management and marketing of industrial enterprises in art sphere, projective and constructive organizations and issues of job safety, protective technique and esthetic technique.

Special attention is also required for professional competences. In each of them we can approximately singularize static and dynamic (discontinuous) parts.

According to our opinion, dynamic parts in different competences are connected with the modern computer, particularly three dimensional technologies. Proposal dividing into static (quasistatic) and dynamic parts we presented in the table.

Table 1

Professional competences dividing into static and dynamic parts

Competences	**Static parts**	**Dynamic parts**
Historic and cultural	History of arts, history of culture in professional field	History of three dimensional design
Informative competences	Subjects, which are connecting with the computer literacy	Special tools of 3D graphic
Graphic competence	Tools of picture formation	
Arts' competences	Subjects of construction and arts' cycle	Tools of 3D scanning, elaboration of scanning pictures, creation of three dimensional holographic contents.
Technological, projective and technical competences	Tools of mocking up and prototype creation	Quick prototyping with the help of 3D printer
Perfection competence	General tendency in design development	Future directions of 3D technologies development in design

Therefore, we can separate 3D competences as new for the preparation of the fashion specialists according to dynamic changes in the field. The three dimensional print, for instance, is inculcated into real manufactory after 3D scanning, holographic pyramids and foggy screens are created for the visualization.

Implementation. There two main fields to examine implementation of 3D technologies in the educational process:

- The history of three dimensional fashion. However this clause is not necessarily devoted to the recent innovations. For instance one of the most significant 3D tool in Middle ages is Pandora doll which was used as the main trend ambassador for ages [5].
- Applied programs for three dimensional graphics to in the spheres of CAD/CAM/CAE, and also the sphere of art projecting [6].

Students of Ukrainian Engineering Pedagogics Academy practice methods of 3D scanning to compare anthropological sizes. After scanning process model can be edited in the special programs (Fig.2).

Fig.2 – Three dimensional scanning model

Received model can be used in the different construction or design systems of three dimensional projections. Construction systems as AutoCAD give an opportunity to define model's sizes in the necessary section.

Using of visualization programs as 3Dmax allows introduction of outfit directly on the consumer's body (Fig. 3).

Fig.3 – Costume model on the consumer

Described methods give an opportunity to the consumer not just choose an item but also try definite costume on him. Moreover, consumer can see himself in the costume before item would be sewed. Put in oversize, a possibility of virtual forms' application came true.

Students of Ukrainian Engineering Pedagogics also have an access to the 3D printer. And use it to materialize their 3D projects (Fig. 4).

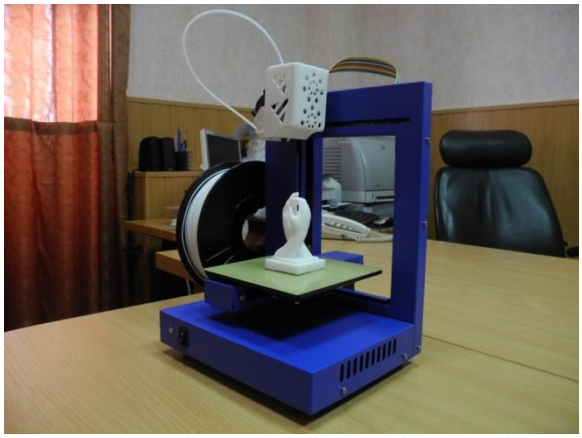

Fig.4 – Templates' creation on the 3D printer

We assume that using of quick prototyping can effectively raise an effectiveness of design technologies due to the production of templates for future item. We emphasize that models can be produced with accurate sizes so that template can be produced directly on the consumer.

Dynamic curriculum. In order to implement and extrapolate new technologies, curriculum of designers' preparation must be considered in the model of dynamic programming. It available like result of optimizing by the cooperation of static and dynamic blocks, which connected with 3D competence (Fig. 5).

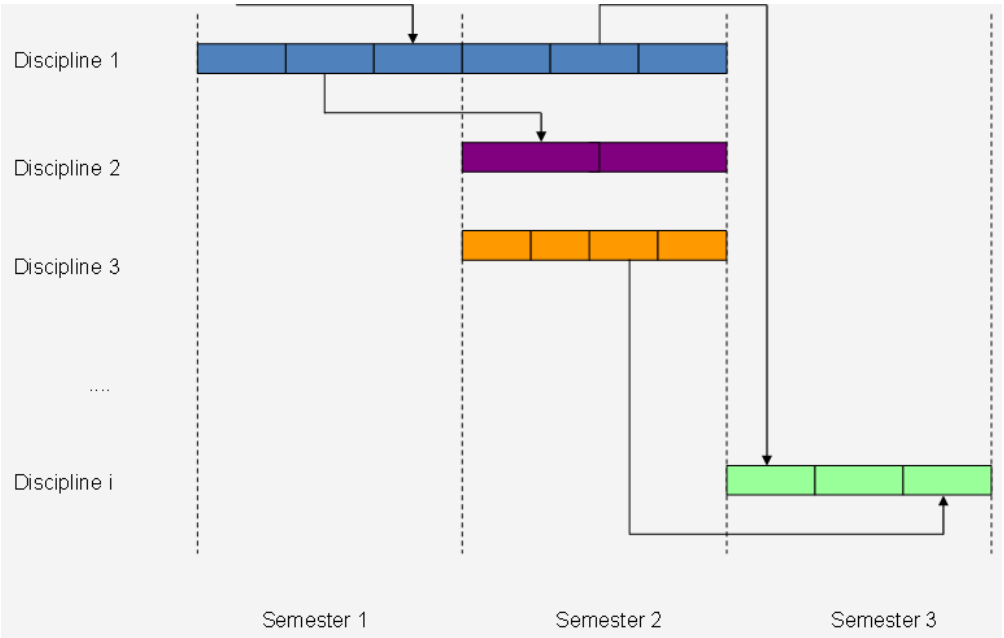

Fig.5 – Scheme of dynamic curriculum

Separated dynamic module of curriculum, which is connected with the formation of 3D competences, can be examined like presented on the scheme below (Fig.6).

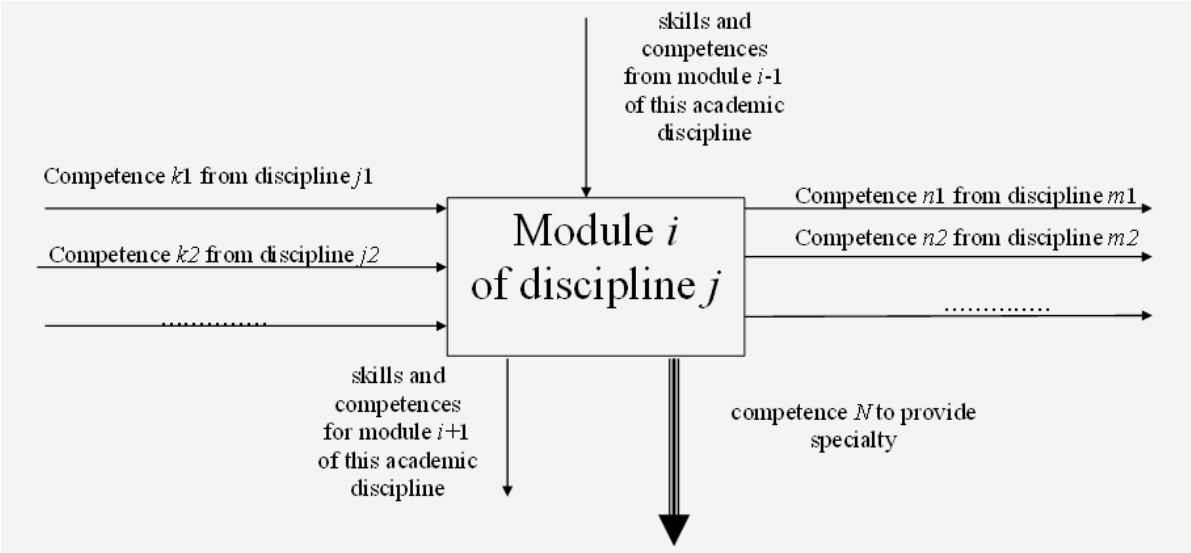

Fig.6 – Dynamic module of curriculum

Data in is gathered from the competences of previous discipline or of previous blocks of supplied discipline.

The data out are competences for the next block of disciplines or for the further disciplines. Competences are the main output characteristic, which is included to the qualification profile.

The well-made dynamic curriculum must consider the 3D competences and be changed in order to request on condition of further developing of 3D technologies.

Building of definitive educational program on the base of individual way of students training is undeveloped question up to now. In case of obvious competences' and subjects' formation this program can be introduced in the table with unknown credits allocations. If presume reception of "E" effect from adoption of define amount of educational information, this table can be introduced in following look.

Table 2 - Dynamic programming of educational process

Year of studying		Subject 1	Subject 2	…	Subject n	limitation
1	Credits	X_{11}	X_{12}		X_{1n}	$\sum X_{1i}=60$
	Effect	E_{11}	E_{12}		E_{1n}	
2	Credits	X_{21}	X_{22}		X_{2n}	$\sum X_{2i}=60$
	Effect	E_{21}	E_{22}		E_{2n}	
3	Credits	X_{31}	X_{32}		X_{3n}	$\sum X_{3i}=60$
	Effect	E_{31}	E_{32}		E_{3n}	
4	Credits	X_{41}	X_{42}		X_{4n}	$\sum X_{4i}=60$
	Effect	E_{41}	E_{42}		E_{4n}	

Condition of optimality can be introduced in such form $\sum_{j=1}^{4}\sum_{i=1}^{n}E_{ji} \rightarrow max$. To find the best credits' allocation between subjects methods of dynamic curriculum can be used.

Task is modified in the occasion of competence dividing into static (Quasi-static) and dynamic parts. Scheme of terminal competences formation of specialists in design field can be introduced in the following look.

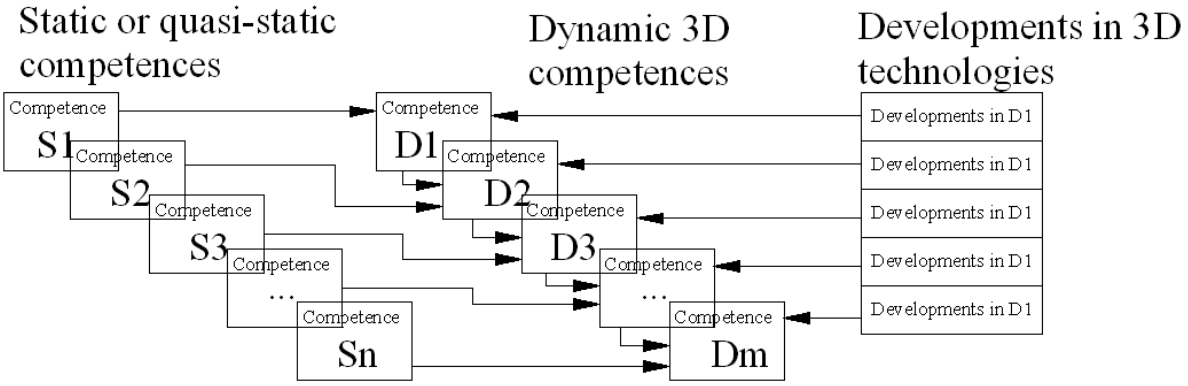

Fig.7 Scheme of static and dynamic competences' mutual interaction

Examined scheme can be a base to the formation of dynamic curriculum, which will consider both general demands of educational characteristics and vary demands to the modern 3D competences.

Conclusions. The recent appearance of innovative technologies, which found their firm incrustation in the fashion industry, has provoked researches and methodologies to adopt fashion education into new reality. However, as was demonstrated by currently adopted set of required competences, fashion education is still does not completely satisfy needs of industry. Thus, in this research current 3D tools were practically examined by the students of Ukrainian Engineering Pedagogics Academy and on the basics of their experience, as well as mathematical equations and previous experience, methods of innovations' extrapolation were proposed. In particular, competences were divided by static and dynamic, where last are adopted to meet rapidly changing demands of the industry and prepare graduators to highly competitive work market.

References

1. Ertu Unver1, "Atkinson Paul2 and Tancock Dave Applying 3D Scanning and Modeling in Transport Design Education Computer," Aided Design & Applications, vol. 3, nos. 1-4, 2006, pp 41-48

2. Dr. Jose L. Perdomo, Mohd.FairuzShiratuddin, Dr. Walid Thabet3, and AshwinAnanth (2005) Interactive 3D Visualization As A Tool For Construction Education ITHET 6th Annual International Conference/ July 7 – 9, 2005, Juan Dolio, Dominican Republic

3. 3D printers in schools: uses in the curriculum Enriching the teaching of STEM and design subjects October 2013 UK Department of education. 24 p

4. Kryshtal N.M.,"The structure and content of the most important designers competences", Education – Competence, 2010, pp. 4-10.

5. Ryabchikova K., "The advanced ways of advertisement of the new form of costume", The CrimeaInternational conference"Modern problems of development of light and nutritive iindustry", 2013, pp.117-119

6. UpadhyesudeepUse of 3D Hologram Technology in Engineering Education IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE). Second International Conference on Emerging Trends in Engineering (SICETE): Dr.J.J.Magdum College of Engineering, Jaysingpur. 2010. pp.63-67

7. Rapid prototyping in technology education. //The technology teacher.November. 2009. pp7-13

8. Nicola Tasic. Holograms and new technologies revealed. http://3d-holograms.blogspot.com., 2012 .

Article received 22 October 2016