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Integration of interdisciplinary links of core disciplines in the curriculum content “Modeling with artistic embroidery”

Abstract. The article substantiates the necessity of integration of interdisciplinary links of core disciplines in the curriculum content “Modeling with artistic embroidery”. It examines the theoretical and methodological aspects of synthesizing subjects such as “Color science and color theory”, “Technology of artistic embroidery”, “Clothing modeling with artistic embroidery”, “Design in artistic embroidery”, “Garment construction with artistic embroidery”, “Mastery of artistic embroidery”. The aim of the research is to provide a theoretical justification and develop a model for integrating interdisciplinary links of core disciplines within the “Modeling with artistic embroidery” curriculum. Based on an analysis of syllabi and pedagogical experience, an author’s model for integrating interdisciplinary links is proposed. This model includes interdisciplinary modules, implementation methods and external fashion factors.

Keywords: interdisciplinary links, interdisciplinary integration, clothing modeling, artistic embroidery, professional education, modern fashion.

Modern higher education in the field of traditional art crafts is oriented towards training specialists capable of combining creative activity with deep technical and technological knowledge. The fashion industry is in a state of dynamic transformation, characterized by the blurring of boundaries between traditional forms of artistic creation, design and technological innovation [2]. Under these conditions, the training of specialists who are able not only to possess individual professional competencies but also to integrate knowledge from various fields to create original, technologically complex and aesthetically refined products acquires particular significance. For example, in the art of embroidery – one of the key types of traditional art crafts and a vital resource for the formation of cultural identity – this is especially important.

In the context of globalization and the unification of fashion, the need for the preservation and actualization of national traditions is growing. This is directly connected to the training of highly qualified artists in the art of embroidery, which is carried out within the framework of the educational program 54.03.02 Decorative and applied arts and folk crafts, with the specialization “Modeling with artistic embroidery” at the Russian university of traditional art crafts.

The educational program “Modeling with artistic embroidery” is comprised of the following core disciplines: “Color science and color theory”, “Technologies of artistic embroidery”, “Materials science”, “Design in artistic embroidery”,

“Clothing modeling with artistic embroidery”, “Garment construction with artistic embroidery” and “Mastery of artistic embroidery”, which form its foundation.

The traditional, linear structure of the educational process, in which disciplines are taught in isolation, leads to a fragmentation of knowledge and hinders the formation of a holistic professional worldview. Furthermore, the issues of integrating interdisciplinary connections between core disciplines, taking into account the development of modern fashion, remain insufficiently developed, which determines the relevance of this research.

The solution to this problem lies in the integration of interdisciplinary connections between core disciplines – a process of establishing substantive, methodological and technological links between academic subjects, which allows for the formation of a unified system of knowledge and ensures continuity in education.

According to the definition by O.A. Chebotayeva, integration is a complex characteristic of educational goals, a combination of pedagogical tools applied in academic activities and wholeness in achieving planned results [12, p. 24]. S.N. Sirenko defines interdisciplinary integration (the integration of interdisciplinary connections) in the content of professional education as “the process and result of establishing links between various academic disciplines, aimed at forming in students a holistic understanding of the object being studied and the methods of working with it” [10, p. 223].

In contrast to interdisciplinary connections – as a didactic condition that ensures the consistent reflection in the content of academic disciplines of the objective interconnections operating in nature and society, and aimed at forming in students a holistic system of knowledge and a scientific worldview [6, p. 140], which are of a local nature (for example, the connection between the topics “color wheel” and “composition of an ornament”), integration implies a deeper unification of the content, forms and methods of teaching. The correlation of these concepts is presented in the table 1.

Table 1

Comparative characteristics of interdisciplinary links
and interdisciplinary integration

Criterion	Interdisciplinary links	Interdisciplinary integration
Level of Interaction	Local, between specific topics or sections within a subject	Systemic, on a larger scale, involves the integration of disciplines
Goal	Systematization of knowledge, formation of a holistic worldview	Formation of holistic professional thinking
Result	Deepening the understanding of individual phenomena	Formation of new knowledge and competencies, a holistic picture of the world
Forms of Implementation	Seminars, Practical classes, Field trips, Independent study	Integrated modules, Courses, Projects, Modular programs

Thus, integration is not merely a connection, but a synthesis that creates a new quality of professional training. The integration of interdisciplinary connections is a more fundamental process aimed at uniting disciplines to solve complex problems and form a holistic worldview.

The core disciplines of the “Modeling with artistic embroidery” program can be conditionally divided into three cycles: artistic cycle (Color science and Color theory; Mastery of artistic embroidery); Technological cycle (Technologies of artistic embroidery; Materials science); Project cycle (Design in artistic embroidery; Garment construction with artistic embroidery; Clothing modeling with artistic embroidery). Each discipline contributes to the formation of professional competence, but only their integration allows reaching the level of creating a complete fashion product.

Using the example of the educational program “Modeling with artistic embroidery”, the characteristics of the levels of integration of interdisciplinary connections between core disciplines are presented (Table 2).

Table 2

Characteristics of the levels of interdisciplinary integration in the educational program “Modeling with artistic embroidery”

Levels of integration	Characteristics	Sample
Intradisciplinary	Deepening knowledge within a single discipline through the connection of theory and practice	Color science and Color theory + Materials science (the influence of thread luster on color perception). In the “Embroidery technology” course, students first study the history of goldwork embroidery and then master the technique in practice by creating a modern accessory or product
Interdisciplinary	Integration of the content of related disciplines	The “Color and texture” project integrates the content of the “Color science and Color theory” discipline (palette selection) and the “Materials science” discipline (selection of threads and fabrics)
Transdisciplinary	Transcending the boundaries of academic disciplines, working with real-world fashion industry cases	Creating a collection for a local brand with consideration of sustainable development trends and digital technologies

In the process of training artists in the art of embroidery, both intradisciplinary and interdisciplinary integration acquire fundamental importance. For the educational program “Modeling with artistic embroidery”, interdisciplinary integration of core disciplines is the most significant. This integration is aimed at combining artistic, technological and design knowledge, abilities and skills with the purpose of forming various aspects of professional competence.

Among the aspects of integrating interdisciplinary connections into the educational program “Modeling with artistic embroidery”, it is necessary to note:

- *the connection with other disciplines*: the educational program is based on knowledge from such fields as garment construction, technology and materials science, color science and color theory, design, with the aim of forming professional competencies [11];
- *the use of modern technologies*: disciplines aimed at mastering computer-aided design (CAD) software for creating products with artistic embroidery are integrated into the educational process;
- a key condition for training competitive artists in traditional arts and crafts is the *combination of studying traditional techniques of artistic embroidery with the analysis of modern fashion trends*, new materials and technological solutions. This allows for a harmonious fusion of cultural heritage and innovation [10];
- *the development of project-based thinking*: the incorporation of artistic embroidery into the garment’s construction, which contributes to establishing an interconnection between the traditional and innovative components of the educational content [8];
- *research activities*: the program may include elements of research work, which contributes to developing students’ skills in analysis, synthesis, generalization, comparison and data interpretation [11].

According to I.S. Pleshkova, modern fashion demonstrates a tendency towards conceptualization, when clothing becomes not so much an object of utilitarian purpose as a means of expressing the designer's worldview, a “special philosophy” [9]. Under these conditions, artistic embroidery is experiencing a revival, but on a new technological and artistic level. It ceases to be merely a decorative element and becomes a crucial means of shaping, a method for creating the three-dimensional spatial structure of a garment and a carrier of conceptual intent.

To visualize the degree of interconnection between the disciplines of the educational program “Modeling with artistic embroidery”, an integration matrix (Table 3) was developed, where “+” denotes the presence of a connection, “++” denotes a strong connection and “+++” denotes the maximum degree of integration.

Table 3
Matrix of interdisciplinary integration of core disciplines in the curriculum of the “Modeling with artistic embroidery” program
(Specialty 54.03.02 Decorative and applied arts and folk crafts)

Discipline	Materials science	Color science and Color theory	Technologies of artistic embroidery	Design in artistic embroidery	Garment construction with artistic embroidery	Clothing modeling with artistic embroidery	Mastery of artistic embroidery
Materials science	–	+	++	+	++	+	++
Color science and Color theory	+	–	++	++	+	++	++
Technologies of artistic embroidery	++	++	–	++	++	+	+++
Design in artistic embroidery	+	++	++	–	++	++	++
Garment construction with artistic embroidery	++	+	++	++	–	++	++
Clothing modeling with artistic embroidery	+	++	+	++	++	–	++
Mastery of artistic embroidery	++	++	+++	++	++	++	–

“+” – The integration of disciplines and their interrelation,
“–” – The absence of interdisciplinary integration and interconnection of disciplines

The matrix data revealed that the central element of the system is the discipline “Technologies of artistic embroidery”, which is characterized by maximum integration and its interconnection with all other disciplines. A particularly high degree of integration of this discipline is observed with the discipline “Mastery of artistic embroidery”, since technological processes serve as the instrumental basis for the formation of performing skills. Similarly, the discipline “Mastery of artistic embroidery” integrates all prior knowledge, acting as a synthesizing discipline.

Based on the analysis of the curricula of core disciplines, which are key components of the educational program “Modeling with artistic embroidery”, the integration of interdisciplinary connections of core disciplines within the higher education curricula in the field of artistic embroidery has been established.

For example, color science and color theory, as the science of color, occupies a fundamental position in the training structure of an artist in the field of artistic embroidery. Color in clothing performs multiple functions: informational, psycho-emotional, form-building and symbolic. In the context of artistic embroidery, color acquires particular significance, since embroidery, unlike a printed pattern on fabric (print), allows for the creation of complex color effects through the interweaving of threads of different colors, textures and luster [3].

Interdisciplinary integration of color science and color theory can manifest in the following areas:

- with the technologies of artistic embroidery – the specifics of color perception of embroidered surfaces depending on the embroidery technique (satin stitch, cross-stitch, beadwork, etc.);
- with design – the development of color solutions for collections taking into account fashion trends, seasonality and the garment’s purpose at the sketch stage, which determines the overall emotional impact of the product;
- with the mastery of artistic embroidery – when creating embroidery, the artist realizes the color palette by selecting threads and regulating stitch density to achieve the desired color nuances and light-and-shadow transitions.

The discipline “Materials science” as a fundamental basis for training studies the structure and properties of textile fibers, threads, fabrics and other materials used in embroidery and garment manufacturing [4].

Knowledge of the fiber composition and the physical-mechanical and hygienic properties of materials allows for a well-founded selection of the embroidery base, threads and findings. The connection with embroidery technologies is traced in the questions of material selection and its main characteristics (density, fraying, elasticity), which determine the permissible embroidery techniques. For example, for loosely woven fabrics, openwork embroidery techniques with numerous cuts are unsuitable; for slippery silk fabrics, special stabilization with hoops is required [7].

The connection between materials science and color science and theory is determined by the process of color rendition of threads and the base fabric, which depend on their texture (shiny or matte), thickness and twisting method. The same thread color looks different on cotton and viscose [5].

Materials science is directly linked to garment construction, as the drape, rigidity and shrinkage of a material influence the choice of construction solutions (shape, volume, placement of seams and darts).

Interdisciplinary integration is characteristic of the discipline “Technologies of artistic embroidery”, as it directly connects the artistic concept with its material realization. Modern embroidery technologies include both traditional hand techniques (satin stitch, cross-stitch, Richelieu lace, goldwork) and innovative machine methods, including computerized embroidery, laser engraving and heat transfer.

In the context of modern fashion development, experiments with non-traditional materials and technologies are of particular significance: special surface treatments of materials, such as latex coating, needle punching, laser engraving, as well as pleating, dyeing and heat treatment [12].

The connection between the discipline “Technologies of artistic embroidery” and materials science is traced through knowledge of the properties of threads and fabrics, which allows for the selection of an optimal needle, thread tension and stitch density. Its connection with the discipline “Garment construction with artistic embroidery” is evident through the placement of embroidered fragments, taking into account the technological properties of the material (shrinkage, stretch) and the garment’s construction lines.

The knowledge and skills acquired by students while studying all preceding disciplines within the educational program “Modeling with artistic embroidery” find their embodiment in the final, synthesizing disciplines: ‘Design in artistic embroidery’ and “Clothing modeling with artistic embroidery”. The design process includes several stages: situation analysis and concept formulation, searching for an artistic solution, developing a range of sketches, selecting materials and technologies, engineering development and manufacturing a sample. In this process, artistic embroidery should not disrupt the garment’s structure; on the contrary, it can emphasize or disguise construction lines. For example, embroidery along the edge of a lapel, at the waistline, or on a yoke requires precise alignment of the pattern with the garment's pattern pieces.

A special place in the system of professional training for embroidery artists is occupied by the discipline “Mastery of artistic embroidery”, which acts as a continuous process of interdisciplinary integration. Focused on the development of a specialist’s professional competencies, this discipline, in the context of interdisciplinary integration, contributes to students’ awareness of the connections between various fields of knowledge, the formation of an individual style of professional activity and the development of the ability to innovate.

Mastery is perfected not only within the framework of formal education, but also through practical project activities, participation in competitions, exhibitions and internships. At the initial stages of training, a “fragmented artistic perception” is formed, which over time evolves into a “holistic artistic perception”. The latter is characterized by the embroidery artist’s ability to identify and objectively evaluate the concept of a work of art, as well as the skill to justify their understanding of it [1].

Each of the disciplines listed above contributes to the formation of professional knowledge and skills of students in the “Modeling with artistic embroidery” program. The core disciplines of the artistic cycle (color science and theory, mastery of artistic embroidery) lay the foundation for visual literacy: the ability to see form, color, light and shadow, rhythm and proportion. The disciplines of the technological cycle (technologies of artistic embroidery, materials science) form practical skills in working with materials, tools and equipment. The disciplines of the design cycle (design in artistic embroidery, garment construction with artistic embroidery, fashion modeling with artistic embroidery) develop the ability to conceptualize and visualize ideas and to create sketches and technical drawings of a future product.

However, the mere set of disciplines does not guarantee the integration of interdisciplinary connections within the educational program’s content. Full-fledged integration requires purposeful methodological work to establish and implement connections between disciplines.

Based on the theoretical analysis and synthesis of practical experience, a model for the integration of interdisciplinary links of core disciplines in the curriculum of the “Modeling with artistic embroidery” educational program has been proposed (Fig. 1).

The model is presented in the form of a centered circular diagram consisting of several components:

- the central component – the core of the model – is the student’s final qualifying work as an indicator of mastering professional knowledge and skills;
- the sectors of the model’s first circle contain the core disciplines of the “Modeling with artistic embroidery” educational program. The interconnections between them are visualized using solid arrows indicating the bilateral nature of these connections. A circular arrow inside the ring indicates the integrity of the system;
- the second, outermost circle represents the forms of integration of interdisciplinary connections in the form of seven interdisciplinary modules, the content of which is presented in Table 4;
- the third, outermost circle represents fashion development factors, which are connected not only to the professional activities of graduates but also to the integration of interdisciplinary connections of core disciplines, or rather, to the integrated interdisciplinary modules. These modules allow for structuring the educational content in the field of artistic embroidery while taking into account fashion trends.

The fashion development factor in the context of training an artist in artistic embroidery is an objectively existing or purposefully formed set of conditions, means and demands (technological, artistic, social) that are integrated into the curriculum of the “Modeling with artistic embroidery” educational program. This integration ensures the formation of professional competencies (knowledge, abilities, skills) in graduates for creating a relevant, aesthetically expressive and socially demanded fashion product featuring artistic embroidery.



Fig. 1. A model for integrating interdisciplinary links of core disciplines in the curriculum of the educational program “Modeling with artistic embroidery”

Table 4
Characteristics of interdisciplinary modules as an element of the model for integrating interdisciplinary links of core disciplines in the curriculum of the “Modeling with artistic embroidery” educational program

Interaction of interdisciplinary modules of core disciplines	Forms of interdisciplinary integration	Content
Clothing modeling – Garment construction	Embroidery design and layout	Scale, rhythm and placement zones of the pattern on the garment’s pattern pieces

Garment construction – Materials science	Design and technological solutions	Accounting for shrinkage, thread shifting and processing of embroidered components
Materials science – Color science	Color and texture of materials	The influence of the base material on thread color, luster and texture
Color science – Technologies of artistic embroidery	Embroidery colorwork	Gradient, watercolor transition, local color in stitches
Technologies of artistic embroidery – Design in artistic embroidery	Production feasibility	Justification for the choice of embroidery technique and equipment
Design in artistic embroidery – Mastery of artistic embroidery	From sketch to stitch	Transferring the pattern, quality control
Mastery of artistic embroidery – Clothing modeling	Artistic expression	Realization of the concept in material, stylistics

This definition has been updated to account for the type of traditional art craft and is introduced into scientific research for the first time.

The technological factor in fashion development within the educational program “Modeling with artistic embroidery” is understood as a combination of modern technological tools, materials and digital design methods integrated into the educational process. This integration ensures that future embroidery artists acquire the competencies necessary to create competitive embroidered products, taking into account current industry trends.

During the research, definitions of the social and artistic factors of fashion development were also updated, considering the integration of artistic embroidery into contemporary fashion trends.

The social factor of fashion development in the context of the educational program “Modeling with artistic embroidery” is a set of relevant societal demands (customization, upcycling, conscious consumption, cultural identity, prestige of manual labor) integrated into the educational process. This integration ensures the formation of competencies in the future embroidery artist aimed at creating works of artistic embroidery that are in demand by modern society and contribute to the preservation of cultural heritage. This is a holistic system and a set of interconnected components:

- the demand for customization (giving uniqueness to a mass-produced product through artistic embroidery);
- the demand for upcycling (transforming old items into new ones with the help of artistic embroidery);
- the demand for conscious consumption (durability, repairability, ethical production);
- the demand for cultural identity (transmitting traditions in everyday clothing);

- the demand for prestige of manual labor (the return of value to handmade work);
- the demand for “fashion for native” (support for local brands and traditional art crafts);
- the demand for self-expression (artistic embroidery as the voice of a community).

Through the purposeful mastery of the aforementioned interconnected components of interdisciplinary integration in the process of training a graduate in the field of artistic embroidery, students develop professional competencies that enable them to create a socially demanded fashion product with artistic embroidery. This product meets the challenges of modern society and contributes to the preservation and development of traditional art crafts.

The artistic factor of fashion development within the context of the educational program “Modeling with artistic embroidery” is an aggregate of traditional ornamental systems, compositional principles, coloristic canons and stylistic techniques from various types of artistic embroidery. Integrated into the curriculum, this ensures the formation of competencies in future embroidery artists necessary for creating aesthetically expressive embroidered items that preserve cultural identity and align with current artistic fashion trends.

The main components of the artistic factor in fashion development include:

- traditional ornamental systems (geometric, vegetal/floral, zoomorphic, anthropomorphic patterns);
- compositional principles (rhythm, symmetry/asymmetry, scale, relationship between background and pattern);
- coloristic canons (local color, contrast, nuance, a dominant color characteristic of a specific type of traditional artistic embroidery);
- stylistic techniques of various types of artistic embroidery;
- methods for stylizing and transforming traditional motifs into a modern fashion product.

When implementing the presented model, it is assumed that disciplines will be structured around a single semantic center. The educational material is organized so that every topic within any of the core disciplines is explored with consideration of its connections to other subjects.

The main mechanisms for implementing the curriculum of the educational program “Modeling with artistic embroidery” are:

- cross-cutting thematic modules – the integration of content from several disciplines around a common theme. For example, the module “Historical costume in a modern interpretation” integrates knowledge about costume history (composition), historical embroidery techniques (technology), the color palette of an era (color theory) and contemporary design (design);
- complex practical assignments that require the application of knowledge from different disciplines to create a single product. Example: “Develop a series of sketches for festive clothing using embroidery as the primary form-generating element, justify the color solution, select embroidery technologies, perform

engineering development and manufacture a sample”. Practice shows that the use of such assignments promotes the activation of students’ cognitive activity and the systematization of their knowledge, abilities and skills;

- project seminars and workshops – an intensive form of organizing educational activities where students work on an interdisciplinary project under the guidance of instructors from various disciplines.

The main teaching methods used in this model implementation are:

- the method of associative search – a technique for creating a new form by transferring or reinterpreting forms and lines from other types of art (nature, architecture, painting) into embroidered compositions;

- the case-study method – solving professional tasks that simulate real-world situations in the fashion industry (for example, developing a capsule collection for a hypothetical client);

- the brainstorming method – applied at the idea generation stage for embroidered compositions, color solutions and construction findings.

- the moderation method – group discussion and expert evaluation of projects involving faculty members from various departments.

The leading form of educational organization for implementing the integration of interdisciplinary connections between core disciplines in the curriculum of the “Modeling with artistic embroidery” program is project-based activity. This is because the entire educational process is structured around the creation of a comprehensive project (a coursework or final qualifying work), which goes through all stages: from the initial idea to the finished product. In this process, not an individual discipline is assessed, but rather the student’s final integrated project, taking into account the integrity of the artistic image, the structural correctness of the solution, technological complexity, quality of embroidery execution and novelty of the approach.

The integration of interdisciplinary connections between core disciplines in the curriculum of the “Modeling with artistic embroidery» program shapes a new type of specialist, capable of:

- thinking systematically, establishing interconnections between artistic, technological and engineering aspects of design;

- generating original ideas at the intersection of various fields of knowledge;

- materializing these ideas by mastering both traditional and innovative embroidery technologies;

- working in a team with designers of other specializations, construction engineers, technologists and marketers;

- contributing to fashion development through the combination of art, technology and modern approaches.

The integration of interdisciplinary connections opens up new possibilities for using artistic embroidery in contemporary fashion:

- a form-giving factor – the use of rigid and voluminous embroideries to create frame-based and sculptural forms in a garment;

- means of transformation – embroidered elements that change the configuration of a garment, creating transformable constructions;
- hybrid technologies – combining embroidery with laser cutting, 3D printing, heat transfer and the creation of hybrid textures.

The integration of interdisciplinary connections between core disciplines in the curriculum of the “Modeling with artistic embroidery” program also contributes to the preservation and development of national embroidery traditions, as well as their rethinking in the context of contemporary fashion. The synthesis of traditional embroidery techniques with modern materials, forms and technologies creates unique products that possess both cultural value and commercial appeal.

The conducted research allows us to formulate the following conclusions:

- the integration of interdisciplinary connections between core disciplines in the curriculum of the “Modeling with artistic embroidery” program is a necessary condition for training competitive specialists in the modern fashion industry, which is characterized by trends towards conceptualization, technologization and the synthesis of arts;
- the proposed model for integrating interdisciplinary connections of core disciplines is multi-component. The implementation of the curriculum content for “Modeling with artistic embroidery” is carried out through cross-cutting thematic modules, complex practical assignments and active/interactive teaching methods. This fosters the formation of a new type of specialist capable of innovative activity, which, in turn, stimulates the development of contemporary fashion through the emergence of original, technologically complex and aesthetically designed products.

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