

**ANALYTICAL APPROACH IN DRAWING IN ARCHITECTURAL EDUCATION****<sup>1</sup>E.E. Belgorodskaya,**

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**Abstract.** Drawing is one of the vital tools of creative process for an architect. It helps to generate an idea. Work on image of a future building starts with it. Teaching drawing is one of the most important stages in comprehensive specialized training of architecture students. So the purpose of this article is the essence of analytical approach in drawing. And its tasks are to analyze basic types of drawing, to reveal the essence of shape making and analytical approach in drawing in architects; to uncover the meaning of basic methods of constructive drawing; to outline the place of constructive drawing in development of an architect's professional competencies. Techniques for creating a shape of an object on a plane largely depend on its structure. Therefore, when analyzing a shape of an object, one should start with an insight into the essence of its inner structure, disregarding small details, which prevent one from understanding geometric base of its construction. This will enable students to get more comprehensive information about the object and to create a drawing deliberately. Construction in fine arts means the essence, distinguishing feature of a structure of any shape, implying interrelation of parts in the whole and their correlation. When analyzing basic types of drawing in our research, we study linear constructive (linear) drawing, linear constructive drawing with conditional light-and-shadow, light-and-shadow drawing, tonal drawing. Teaching architecture students academic drawing should be based on structural constructive drawing, also known as linear constructive drawing. Key task in teaching drawing is to learn to see three-dimensional shape of an object correctly and to be able to depict it in a logical sequence on a plane of a sheet of paper. Shape of an object shall mean geometric essence of the surface of the object, characterizing its exterior. Hence, any object is a shape, and a shape means volume. Shape modelling suggested by A. P. Chistov is based on the following methods: modelling of a complex shape (Boolean modelling), polygonal modelling, curve modelling (spline modelling), tonal modelling, symmetrical shape modelling, and dynamic modelling.

**Keywords:** architects, institution of higher education, constructive drawing, architectural drawing, structure, shape, volume, modelling, shape making, constructive drawing methods.

**General Problem Statement and Connection thereof with Relevant Scientific and Practical Tasks.** In modern architectural science creative activity of an architect is deemed as a developing conceptual and creative process, including interlinks between verbal and visual layers of information as a result of the architect's design thinking culture. Communicative situation acquires a fundamentally new view on the outside world, where visual information media are brought to the forefront by the community. Comprehension of this new trend in presentation and interpretation of information requires development of creative process space mechanism at the new level of architectural design methods using creative and image language of visualization on the basis of professional communications. Drawing is one of the vital tools of creative process for an architect. It helps to generate an idea. Work on image of a future building starts with it. Teaching drawing is one of the most important stages in comprehensive specialized training of

architecture students. Vagueness in systematization and purpose of the types of drawing, unreliability of analysis of the shape of objects and their construction are often a cause of unconvincing and featureless drawings made by architecture students. One of the pressing issues in exercise drawing for architects-to-be is definition and application of constructive drawing methods as a methodological basis for drawing.

Analysis of Sources of Research and Latest Publications. Issues of drawing as a method of artistic thinking were studied by Leonardo da Vinci, F. Brunelleschi, G. Holtz, F. Wright, P. Hill, R. Arnheim, M. Posokhin, B. Barkhin, I. Zholtovsky, A. Burov, G. Paksenov, V. Zhabinsky, Bob McKean, I. Azizyan; three-dimensional compositions as conceptual semantic schemes of modern architectural thinking – in works by L. Lisitsky, V. Kandinsky, K. Malevich, O. Niemeyer; drawing creativity – by A. Gaudi, Simpson, J. Guilford, Torrance, S. Mednik, Abraham Maslow, J. Mendelssohn, Ya. Ponomarev; drawing as an expression of emotional meaningfulness – by G. Paksenov, G. Minervin, S. Hesselgren, A. Ikonnikov, J. Simonds, P. Kapustin, B. Decharne (symbol); issues of drawing teaching methodology were studied by such authors as A. Deineka, S. Lomov, A. Solovyev and others [10]. Outstanding scientist, painter and teacher N. Rostovtsev, when analyzing methods of teaching drawing in the last quarter of the 19th century, states that drawing teaching methodology at that time was represented by two key methods: natural and geometric, which gave rise to basics of constructive drawing [9;10]. A number of authors studied construction in drawing as applied to objects of design and artistic design – design activity of a designer and an architect. One could name, inter alia, K. Alexander, G. Arnheim, J. Bossard, E. Volkov, C. Siegel, J. Itten, J. Collier, A. Piontkovsky, A. Hoffman [1-3,7-8]. On the whole, the analysis showed that publications on methodology of teaching constructive drawing were not sufficient. Today drawing has turned from universal tool of creativity into a local tool required in a limited range of activities and only during a certain period. Now drawing has an applied nature and features of its methodological basics, aesthetic and graphic principles are determined by peculiarities of a specific occupation: for a typographer drawing is planar, for a clothes designer balance of colour spots and expressiveness of silhouette lines is more important, for an animated cartoon artist it is an image and exaggerated expressiveness of movement, and for an architect drawing is constructive. «Drawing constructiveness (depiction of an object as if right through revealing conformity between exterior shape and inner structure) is determined by an architect's thinking nature, need to see construction and technological structure of an object. Another feature of the architect's drawing is connected with deep knowledge of geometry, since fundamental principle of architectural drawing «from geometry to architecture» remains constant, despite all novelties in design technology», concludes O. Osmolovskaya [13, p.343-353]. Another feature is accuracy of depiction driven by responsibility of drawing, which comes before further development in yet more accurate graphics – in a technical drawing. That is why purpose of the article is the essence of the analytical approach in drawing. Tasks:

- to analyze basic types of drawing;
- to reveal the essence of shape making and analytical approach in drawing in architects;
- to uncover the meaning of basic methods of constructive drawing;
- to outline the place of constructive drawing in development of an architect's professional competencies.

Presentation of the Main Material of the Research with Complete Substantiation of Scientific Results. Academic exercise drawing by architects differs from drawings by painters and graphic designers, where drawing at the final stage is a completed work, whereas drawing by architects is a set of orthogonal and perspective drawing diagrams. Architectural artist «speaks» visual language of his/her buildings, which contributes greatly to the style of architectural graphics. Architect-to-be must learn to see a shape in space, to be able to connect simple shapes into a complex body, grasping governing laws of shape making of an object and its interrelations

with other elements of material and spatial medium [8]. For these purposes certain skills are required:

- primary professional technical skills on the basis of drawing and technical drawing course;
- creative fantasy, originality, creativity of thinking;
- three-dimensional spatial thinking skills (ability to imagine any three-dimensional and spatial shapes from any angle; ability to depict the shapes imagined in accordance with the laws of linear perspective; ability to think in terms of projections, i.e. based on planar images to imagine and to depict a three-dimensional shape and, vice versa, based on exterior of a three-dimensional object to draw its projections);
- project thinking skills (ability to lead and control creative process of search for an idea, ability to find solution for a task set, to build a sequence of activities). Improvement of student training process in drawing is aimed at creation of an optimal system for teaching impact, management of perception and image, which could help to solve the problem of conveying volume and space when depicting shapes on a plane. Unlike planar shapes, three-dimensional shapes have a third dimension – depth. It occupies a certain place in space, characterized by volume, and a certain position in space in relation to other shapes [7]. For truthful conveyance of these qualities on a plane a drawing artist needs to be able to orient freely both in real space and in space of a representational plane. The cornerstone task of drawing is to learn to depict a three-dimensional shape living in free space, to enable movement in any direction. «Key task of teaching drawing, - emphasizes N. Lee in his work «Drawing. Basics of Academic Exercise Drawing», - is to learn to see three-dimensional shape of an object correctly and to be able to depict it in a logical sequence on a plane of a sheet of paper» [5, p.5].

For correct depiction of an object visual perception thereof alone is not enough. It is necessary to know its objectively existing shape. We cannot see this holistic shape of an object, but we can comprehend it as a structure, as an interrelation of elements located in a certain system. Detailed and attentive study of a shape of an object helps to create a holistic image of the object in the head of a drawing person. When teaching students academic exercise drawing each practical lesson connected with depiction of a three-dimensional shape on a plane implies operating and manipulating spatial images. Drawing in teaching process is connected with issues of proportions, movement, plastics, construction, tone, point and level of view, composition. Drawing teaching system should be based on these provisions enabling to develop professional worldview and professional craftsmanship. Let's discuss constructive types of drawing. The term «construction» originates from the Latin construction, which in translation means: con (Lat.) – together (or jointly) and structio (Lat.) – to compile or build. As applied to art objects and aesthetic notions, the term «construction» means a full set of internal interrelations between separate parts and elements of the artistic whole in direct dependence on its common and local function (or purpose). The most constructive of all arts (due to its utilitarian nature) is architecture. Construction in painting, graphics or sculpture is a set of internal links, through which visual integrity is achieved, as well as a certain «visible strength» (unity) of an object or an image. Construction in visual arts ensures connection and balance of the subject matter in the first place. Teaching architecture students academic drawing should be based on *structural constructive drawing* [9, p. 5], also known as *linear constructive drawing* [10, p.82]. Very similar names, and yet they differ. *Structural constructive drawing* is based on pass-through drawing of a shape. It enables to teach architects-to-be not only to convey physical resemblance of a subject matter and a real object in drawing, but to see and depict its internal structure on a plane. Work on study and conveyance of a constructive basis of real objects starts with abstract geometric shapes. It creates a basis for understanding structure of complex objects (human head and figure, architecture and its surroundings) as a combination of simple geometric shapes. *Linear constructive* depiction of objects is feasible to complete by application of sections. It should be taught in the beginning using abstract geometric shapes. When building a cube, cylinder, prism

and other simple shapes on a linear perspective basis, students make some sections enabling to uncover constructive basis of the subject matter. Key depiction tool in these types of drawing is a line, which can have varying thickness, filling, tone and texture. Line in drawing is a result of complex work on a shape. As to *linear constructive drawing with conditional light-and-shadow*, we should note that it enables to depict lighting of details of a model and their position in relation to the light source. The drawing student shows degree of lighting of elements of the shape and their position in space in relation to the main source of light. At drawing classes we apply constructive arrangement with conditional light-and-shadow when depicting objects of complex shape or architectural elements. This drawing method helps not to get lost in lines of arrangement and to put together a complex construction. *Light-and-shadow drawing* helps to model a shape of an object with a tone, to reveal volume of objects and their general tonality using half-shadow and light-and-shadow (dark is depicted dark, and light is depicted light). This type of drawing is good for conveyance of planned, arranged lighting of an object when drawing from life and helps to achieve a realistic image using strokes and spots. *Tonal drawing* takes time to complete. Tonal drawing conveys materiality of objects, their position in space. Tonal drawing shows, which object occupies a dominating position in arrangement, and which objects are secondary, enables to highlight key points and to convey all shades of the tone of objects. Tonal drawing conveys not only shape, volume, colour, materiality of objects, but their position in space in view of the light and air medium. Key task of teaching drawing is to learn to see three-dimensional shape of an object correctly and to be able to depict it in a logical sequence on a plane of a sheet of paper. Shape of an object shall mean geometric essence of the surface of the object, characterizing its exterior. Hence, any object is a shape, and a shape means volume. These two notions – shape and volume – are interconnected and constitute a whole. Construction of an object usually determines nature of its shape. In exercise drawing the term «construction of a shape» acquires a special meaning in terms of its spatial arrangement, geometric structure, external plastic structure, material and functional purpose [5-7,10,12]. It enables students to apply a more conscious approach to work on a drawing. Techniques for creating a shape of an object on a plane largely depend on its structure. Therefore, when analyzing a shape of an object, one should start with an insight into the essence of its inner structure, disregarding small details, which prevent one from understanding geometric base of its construction. This will enable students to get more comprehensive information about the object and to create a drawing deliberately. Construction in fine arts means the essence, distinguishing feature of a structure of any shape, implying interrelation of parts in the whole and their correlation. When analyzing construction of a complex shape one needs to see smaller and simpler shapes in it. They are all closely interconnected and subordinate to a central, larger shape-making part. Three-dimensional image is conveyed on a plane using such drawing tools as a line and a point. When moving away a line becomes less active and thinner. Forefront lines are strengthened at the approach with a pencil, and secondary lines are weakened with an eraser when moving away. An emphasis is made in a drawing at the place of touch or transition of one component into another: a line becomes thicker. Lines in constructive drawing can be of two types: contour line (key line), which locks a shape or a variety of shapes and separates them from space, and line of shape boundaries or margins communicating position of sides of a shape in space. Line of shape margins has a wide graphic range. Construction of an object usually begins with a centreline. Proportional relations of parts of an object are located within the centreline [11,14,15].

When studying approaches and types of drawing, one should analyze methods of drawing as wells. Basic method in teaching drawing is three-dimensional constructive method, because it has a marked analytical component, enabling to learn anatomy, laws of perspective, theory of shadows and construction. Constructive three-dimensional drawing is applied both in exercise drawing and in specialities connected with design planning, design, modelling, that is areas, where developed practical thinking in combination with visualization of the idea is a must.

Creation of a constructive drawing is connected with transformation of a shape into a constructive (generalized) model, thus giving rise to difficulties for beginners. Once a student learns and acquires skills and abilities in basics of constructive transformation of a shape, he/she adds a certain degree of conditionality into a drawing – constructive stylization. Constructive three-dimensional method is often matched against tonal pictorial method. Construction in terms of exercise drawing means a meaningful shape, i.e. a shape that has been analyzed and is clear.

Drawing teacher P. D. Chistov has suggested that analysis of a shape, shape modelling may occur on various bases connected with properties of the shape, i.e. in constructive drawing there are a number of separate methods applied depending on specific properties of the depicted object. Some methods are universal. Methods of symmetrical shape modelling and dynamic modelling need to be combined with universal methods. Shape modelling is based on the following methods suggested by P.D. Chistov: *modelling a complex shape (Boolean modelling)* through simpler shapes read as geometric shapes (prism, parallelepiped, pyramid, cone, sphere, cylinder, etc.). This method is used for analysis of nature of a shape, interaction between parts of a large shape, explanation of connection between various constituent elements. *Polygonal modelling* is shape-based determination of a number of surface points connected with segments, thus creating polygons accompanied by certain faceting of the surface. *Curve modelling (spline modelling)* is determined on a shape of nearby surface points connected and blended with lines. Points are placed in sites of changes in plastic movement of the shape. The researcher states that curve modelling may be represented by depiction of a surface with one continuous line encircling the entire shape as a thread on the principle of a helical spiral or stretching over it on the principle of spinning into a ball [14,15]. *Tonal modelling* is connected with application of knowledge in optics and theory of shadows and reflections. This knowledge serves as a systemic basis for tonal modelling and ensures connection of perceived tonal method with construction and other visual properties of a shape. When discussing *symmetrical shape modelling*, he suggests indentifying a repeating element, its movement (nature of repetition) and change (scaling and transformation) are a basis of this method. *Dynamic modelling* is viewed as operating in three-dimensional modelling. Moving parts of a shape are modelled using universal methods. It includes determination of points or surfaces, on which elements of the shape are set in relative motion, nature and trajectory of movement, system of limitations, i.e. conditions for changes in the object are described. For instance, study of dynamics of human body movement is built on principles of dynamic modelling. Making sketches of human figure during change of positions is in fact dynamic modelling [5,14]. Solutions by P. D. Chistov are very up-to-date, but due to decrease in academic hours for teaching Drawing we cannot apply them to the full extent. These methods may exist in isolation, but in combination with one another they also show their worth very well. Our position is closer to conclusions made by V. Mamugina suggesting to use linear constructive (structural constructive) method of drawing, which we discussed above, for architecture students. Architecture students continue to learn spatial phenomena in drawing through study of building three-dimensional shapes on a representational plane. At the first stage simple shapes are taken as an object for depiction, and then they move to more complex shapes. On the basis of isolated abstract geometric shapes (cube, cylinder, cone, etc.) initial understanding of a shape of a three-dimensional object, its construction and perspective change of its shape is developed [7,8]. At this stage we solve the problem of creation of a three-dimensional image of a shape and its varying image in terms of perspective in an arranged space of the sheet plane. In the beginning geometric bodies are drawn from life and from image with constructive and tonal solution. For conveying the illusion of space depth, distance and three-dimensionality of an object, linear and aerial (tonal) perspectives are applied. Next stage in development of understanding of volume and space in drawing shapes will be creation of images for subtraction of volumes (making “clippings”). The above composition of shape drawing is used in various perspectives. Shapes that are complex construction-wise are created on the basis of combinatorial analysis and spatial

structuring of abstract geometric bodies. Depiction of complex architectural shapes should be studied gradually. At first a combination of several simple volumes is created from image. This can be geometric bodies similar or varying in nature and size. Gradually number of shapes and their spatial arrangement becomes more complex creating a complex spatial three-dimensional composition [8]. Hence, skills and abilities acquired when drawing isolated geometric bodies, clippings in them, creating simple combinations for adding components to basic constructions will help to solve tasks for creation of spatial three-dimensional compositions, both at this stage and in future when drawing architectural shapes and architectural compositions of varying complexity.

**Conclusions and Practical Relevance of the Results.** The above methods include both commonly used constructive methods and tonal modelling, which is also a method for effective expression of construction. Tonal drawing smoothly integrates with other methods and may serve as a universal method. Architectural drawing has its special features arising out of its purpose and occupation. It is custom-designed and holds its own place in creative process of every maker. It is a product of an architect's creative and mental work, visual expression of his/her ideas, variants of architectural design solutions. On the other hand, such drawing may be final, included into design documentation and revealing constructive, artistic and plastic concept of a building being created. Such drawings are usually characterized by conditionality of image, succinctness, dimensions, their graphical tools are discreet, they must fairly reveal proportions, connection between architecture and environment. Rapid technological jump gave rise to dubious ideas about possibility to be a maker without being able to do anything with one's own hands – a computer will create everything. «As strange as it may be, this harmful delusion is created not by lazybones unable to do freehand drawing and sketching, but by those who know how to do all that, who came a difficult and interesting way mastering drawing skills, whose unique consciousness and perception of the outside world were shaped by drawing in many aspects. But all these complex competencies acquired throughout the years of studies in time become natural for an architect...», says famous drawing teacher O.V. Osmolovskaya [12, p.71]. Computer is only a tool in an architect's hands. In order to use it efficiently one must develop professional visual thinking. And a block of artistic subjects holds an important place in training of professional architects. One of cornerstone elements here is drawing. Constructive drawing, aspects of which are discussed in this article, is one of the basic components of drawing. Study of shape construction improves knowledge of perspective in architecture students, develops spatial thinking, helps to master not only drawing, but also painting, composition, design, design planning and other important major subjects. Solid knowledge of constructive drawing may become a key to all of the above.

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## АНАЛІТИЧНИЙ ПІДХІД У РИСУНКУ АРХІТЕКТУРНОЇ ОСВІТИ

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**Анотація.** Для архітектора одним із найважливіших інструментів творчого процесу є рисунок, за допомогою якого зароджується ідея, саме з нього починається робота над образом майбутньої споруди. Навчання рисунку є одним із найважливіших етапів комплексної спеціальної підготовки студентів архітектурної спеціальності. Тому метою статті є сутність аналітичного підходу у рисунку. Завдання – проаналізувати основні види рисунка; розкрити сутність формоутворення і аналітичного підходу в рисунку в архітекторів; розкрити значення основних методів конструктивного рисунка; позначити місце конструктивного рисунка у формуванні професійних якостей архітектора. Від структури будови предмета здебільшого залежать прийоми побудови його форми на площині. Тому, аналізуючи форму предмета, насамперед необхідно проникнути в суть його внутрішньої будови, не відволікаючись на дрібні деталі, які заважають зрозуміти геометричну основу його конструкції. Це дозволить студентам отримати більш повну інформацію про предмет і усвідомлено виконати рисунок. Конструкція – в образотворчому мистецтві сутність, характерна особливість побудови будь-якої форми, що припускає взаємозв'язок частин у цілому і їх співвідношенні. У нашому дослідженні, аналізуючи основні види рисунка, ми розглядаємо: лінійно-конструктивний (лінійний, лінеарний), лінійно-конструктивний рисунок з умовною світлотінню, світло-тіньовий рисунок, тональний рисунок. Основою навчання академічному рисунку у студентів-архітекторів повинен бути «структурно-конструктивний рисунок», або, як його інакше називають,

«лінійно-конструктивний рисунок». Головне завдання при навчанні рисунку – навчитися правильно бачити об'ємну форму предмета і вміти її логічно, послідовно зображати на площині аркуша паперу.

Форму предмета потрібно розуміти як геометричну сутність поверхні предмета, що характеризує його зовнішній вигляд. Отже, будь-який предмет є форма, а форма має на увазі об'єм. Моделювання форми ґрунтується на таких методах: моделювання складної форми (булево моделювання); полігональне моделювання; лекальне моделювання (сплайн-моделювання); тональне моделювання; моделювання симетричної форми, динамічне моделювання.

**Ключові слова:** архітектори, конструктивний рисунок, архітектурний рисунок, конструкція, форма, об'єм, моделювання, формоутворення, методи конструктивного малювання.

## АНАЛИТИЧЕСКИЙ ПОДХОД В РИСУНКЕ АРХИТЕКТУРНОГО ОБРАЗОВАНИЯ

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**Аннотация.** Для архитектора одним из важнейших инструментов творческого процесса является рисунок, с помощью которого зарождается идея, именно с него начинается работа над образом будущего сооружения. Обучение рисунку является одним из важнейших этапов комплексной специальной подготовки студентов архитектурной специальности. Поэтому целью статьи является – сущность аналитического подхода в рисунке. Задачи – проанализировать основные виды рисунка; раскрыть сущность формообразования и аналитического подхода в рисунке у архитекторов; раскрыть значение основных методов конструктивного рисунка; обозначить место конструктивного рисунка в формировании профессиональных качеств архитектора. От структуры строения предмета во многом зависят приемы построения его формы на плоскости. Поэтому, анализируя форму предмета, прежде всего, необходимо проникнуть в сущность его внутреннего строения, не отвлекаясь на мелкие детали, мешающие понять геометрическую основу его конструкции. Это позволит студентам получить более полную информацию о предмете и осознанно выполнить рисунок. Конструкция – в изобразительном искусстве сущность, характерная особенность строения любой формы, предполагающая взаимосвязь частей в целом и их соотношении. Анализируя основные виды рисунка, в нашем исследовании, мы рассматриваем: линейно-конструктивный (линейный, линейный), линейно-конструктивный рисунок с условной светотенью, свето-теневой рисунок, тональный рисунок. Основой обучения академическому рисунку у студентов-архитекторов должен быть «структурно-конструктивный рисунок» или, как его иначе называют, «линейно-конструктивный рисунок». Главная задача при обучении рисунку – научиться правильно, видеть объемную форму предмета и уметь ее логически последовательно изображать на плоскости листа бумаги. Под формой предмета следует понимать геометрическую сущность поверхности предмета, характеризующую его внешний вид. Следовательно, любой предмет есть форма, а форма подразумевает объем. Моделирование формы, основывается на следующих методах: моделирование сложной формы (булево моделирование); полигональное моделирование; лекальное моделирование



(сплайн-моделирование); тональное моделирование; моделирование симметричной формы динамическое моделирование.

**Ключевые слова:** архитекторы, конструктивный рисунок, архитектурный рисунок, конструкция, форма, объем; моделирование, формообразование, методы конструктивного рисования.