

Architecture of the yurt and its impact on teaching young architects

Zhandarbek Malibekuly†, Olga Semenyuk†, Ulkairbek Dyisebayev† & Sabina Kuc‡

L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan†
Cracow University of Technology, Kraków, Poland‡

ABSTRACT: The yurt is an harmonious idea in architecture. In the Eurasian Steppe or Great Steppe, it is a symbol of warmth and comfort. The yurt can be seen as a *teacher* of the Kazakh people and a source of tradition and custom. The traditional Kazakh yurt is a founding principle of Kazakhstan architecture. It has its basis in the design of a dome. The innovative architecture of a yurt is, at heart, a new architectural form. At the Department of Architecture in the *L.N. Gumilyov* Eurasian National University (ENU) in Kazakhstan, students study the traditions of national housing and town-planning in practical architectural design classes. The yurt can be considered the basis for buildings and constructions.

INTRODUCTION

In the present era - the era of rapid globalisation - the preservation of national and regional identity is a problem, which comes to the fore for states that have just embarked on the path of independence. One such is the Republic of Kazakhstan, where this problem exists and needs to be addressed. Architecture and town planning since gaining independence reflects the conservatism of Soviet architecture (usually, in regional cities) or a blend of numerous styles (mainly in the major cities).

There are good examples of architecture by world-renowned architects in Kazakhstan, such as Kisho Kurokawa, Norman Foster and Manfredi Nicoletti, in the city of Nur-Sultan (the capital, formerly named Astana). But, their works cannot be considered examples of local, national architecture reflecting the Steppe culture (Kazakhstan is in the centre of the great Eurasian Steppe).

The architectural heritage of the steppe remains insufficiently studied. The Kazakhs settled in different places, from the foothills to the high mountains. The nations that lived in the territory of modern Kazakhstan for thousands of years have developed common artistic traditions, passed down from generation to generation.

Studies until the mid-twentieth Century concluded that the Steppe peoples did not have their own culture, art and architecture but were wanderers. In fact, the Steppe culture has existed since ancient times, and many cultural traditions in art and architecture, handed down from generation to generation, have survived to the present day.

An example is the Pazyryk culture from the Iron Age in Kazakhstan, the Altai Mountains and Mongolia. Botai culture existed in the 3rd and 4th Centuries BC. In the north-west of Kazakhstan there are culture monuments.

Although the main materials of the Stone Age were stones, wood and clay, Botai dwellings made of these materials have a round shape. The smoke hole in the ceiling resembles a Kazakh yurt in shape. Botai culture has importance for the study of ancient history of the steppe region of Eurasia from the 5th and 6th Centuries BC.

YURT: THE FOUNDATION OF THE STEPPE CULTURE

The Kazakh yurt with decoration (Figure 1) is called *kıyz ui* and is a collapsible lattice-felt construction. The space-planning features of the yurt took shape over history. They have developed a certain size of elements and volume, which are dictated by the system of the *konystanu*, which characterises the lifestyle of the ancient tribes.

Ancient tribes in Sak (the Sak were nomadic Iranian peoples) and during Hun-Sarmatian times (the Sarmatians were a large Iranian confederation), in the 6th Century BC to 13th Century AD, used felt as insulation for yurt frames.

The *kerege* structure in the yurt is a half-timbered lattice of wicker rods where, at the intersections of the rods, they are firmly tied into a bundle. The yurt has a round layout. The roof is dome-shaped; at the top is a light/smoke hole called a *tundik*, of which there are varieties, named *tunuk-alt*, *tonoo-mong* and *erke-kalm*.

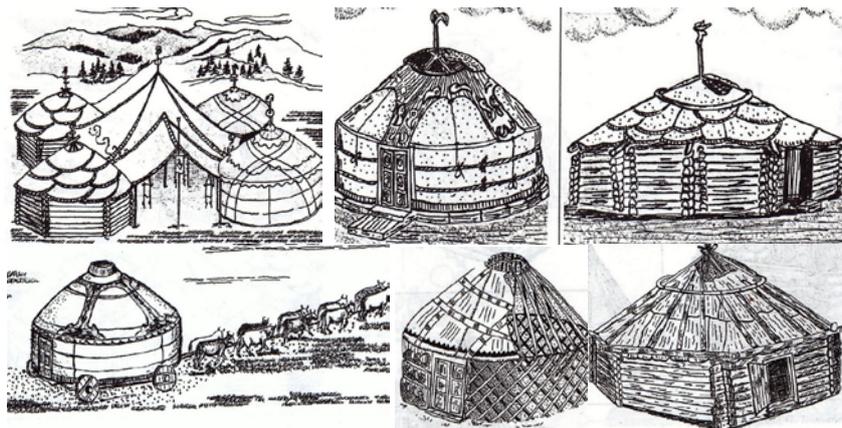


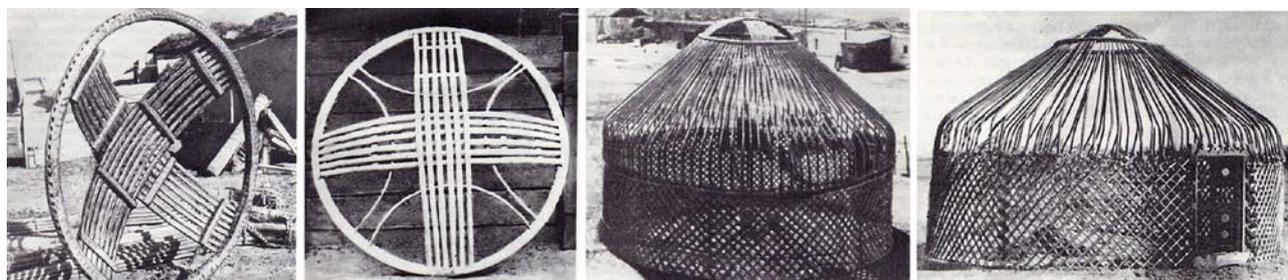
Figure 1: Types of yurt.

The type of felt applied historically in the Uisk steppes on the territory of the modern Altai Mountains has survived to the present day. The interior decoration of the yurt of the previous era testifies to the interrelation of cultural traditions with state entities, such as Babylon, Assyria, Media and Persia. Among the items purchased in eastern countries were carpets that were used as decoration. Carpets found in the Pazyryk region are the oldest known, with an age of more than 2500 years. Thus, from ancient times to the present day, the evolution of the home and its three-dimensional form contributed to the development of a mobile type of home and decorative art [1].

The art critic, Olga Ilina, describes Altai culture [2]; there were three types of dwelling among the Altai: the felt collapsible yurt; the conical hut *kaaza ail*; and the polygonal log *ail*. These are all ancestors of the yurt. Thus, the nomadic type of dwelling of the *ail* yurt was formed over several millennia. The term, *kaaza ail*, denotes a Kazakh yurt. The type of modern yurt, *kazakh kiiz ui*, has been formed for several millennia by evolutionary development.

Until now, scientists have held differing opinions about the origin of the word, Kazakh. It is associated with the *Saki* word: *kass-sak*, *kai-sak*, *naz-sak*. It was mentioned by P. Butkov, A. Levshin in 1832; E. Bernshtam in 1949; M.B. Akhyntanov in 1957; Margulan in 1984; as well as K. Salgara, K. Sartkozhauly, K. Kydyrbaev and other researchers [3]. When that type of yurt dwelling appeared, it was called *kaaza ail* – Kazakh yurt. This term appeared several thousands of years ago.

In the 3rd and 6th Centuries BC in Altai, where many forests are located, and taking into account the local climatic conditions, the types of dwellings were a hut, a log cabin with quadrangular outlines. Later, a type of dwelling called the log *ail* appeared in settled locations. Instead of having four edges, the structure was hexagonal or octagonal. As a result, a polyhedron type of dwelling evolved (see Figure 2). Then, in the Kosh-Agach district, on the Altai plateau, lightweight wooden dwellings appeared, named the *Kaaza ail* yurt.



a)

b)

c)

d)

Figure 2: The yurt; a) to c) upper part of the yurt, the *Shanyrak* (wooden crown); and d) double door entrance; the *Yergenek*.

At the end of the Saki period in the 3rd and 4th Centuries BC, and in the 2nd Century AD, a grand migration began. There was a type of housing on carts. These mobile homes were covered with waterproof felt. The nomadic types of housing were used in military campaigns, and in nomadic areas on pastures and other types of land. Carts were pulled by several pairs of oxen. The traditions of nomadic dwellings are spread throughout the steppes.

During this time the wooden yurts became lightweight, without metal elements. The outlines of the yurt, instead of being hexagonal or octagonal in shape, became round. Hexagons became six-rope yurts, octagons became eight-rope

yurts. In subsequent periods, only round 4- to 12-rope yurts functioned in the Kazakh valleys. They were called *ak orda*, *kok orda*, *khan's orda*. Large-span, 18- to 24 rope yurts, were moved on special carriages.

The felt yurts were used by the leaders of the Saki tribes. The interiors and exteriors were decorated by decorative and applied products. Later, this tradition was observed in the territories of the eastern and western *khaganates* (territories) of Kazakhstan. Thus, the design of the yurt became an art; new types of dwellings appeared - the yurt-shaped palaces. Yurt-shaped palaces and mobile yurts on carts testify that the ancient steppe nations were a highly developed society.

The exterior and interior design tradition, laid down in Saki and in Gunno-Sarmatian times, has survived to the present day. The rich decoration of the interiors of the felt yurt of the Turkic-Kazakh time is described in folk *epos* (viz epic poetry). The aristocrats and the ruling segments of the steppe nations decorated their yurts with an ornament and coloured felt. The colour blue symbolised an eternity and loyalty; the colour yellow was a symbol of wealth and well-being. The door blanket was decorated with pink signs i.e. the *tamga* ornament (viz *stamp or seal*) [4].

CONSTRUCTION: ANCIENT AND MODERN YURTS

In the sixth- to-third centuries BC, according to archaeological data in the Pazyryk Valley, the types of dwelling were wooden houses, huts, conical huts and log dugouts made without metal materials. The term, *germe*, in translation means to *hack a notch* which, for the Altaians, means a constructive method of joining logs at a corner. This was typical for what is known as the log *ayur*-type yurt. Another type of yurt construction is called *kanat ail*, the name probably formed from the name of the light structural element of the felt yurt of steppe peoples. The Mongols had lattice yurts, which are called *khan*. The different types of yurt that have reached modern times have different outlines.

The Mongolian type of yurt differs in height from the Kyrgyz yurt. In the Mongolian steppe, climatic conditions vary with sultry, strong winds whereas mountainous areas with rocky slopes are characteristic of Kyrgyzstan. Residential settlements are located mainly between the mountain ranges. The characteristic shape of the configuration of the Kyrgyz yurt is elongated and pointed. The yurts of the mountainous Altai retained the type of a classical hut or polygonal log ail.

Forests and mountains cover the area from Altai to the Caspian Sea between about 45° and 50° north latitude. In addition, in the vast expanses of the Kazakh steppe, the yurts differ, but the overall proportions of the Kazakh yurts differ from others in the neighbouring states of Russia, Kyrgyzstan, Mongolia and others.

In Kazakhstan, the bearing structure of the yurt - the *kerege* - is distinguished by its strict rectangular outline. In the west, *kerege* can be oval and straight, and in the middle and southern regions of Kazakhstan, the middle *kerege* slightly protrudes outside; it is called *kerege karyny*. This type of construction ensures the stability of the horizontal elements of the *beldeu* (rope) and *baskur* (tape). There are two types of *kerege*: the tor *koz kerege* and the *zhel koz kerege*. They differ from each other, depending on the number of ropes; there are six, eight, nine, 12 or 18 rope yurts [5].

Basically, the yurt is divided into three structural parts: the *kerege*, *uyk* and *shanyrak*. The *kerege* is a bearing structural element on which is placed heat insulation material (felt). Felt is also placed inside the yurt, and is called the *tyrlyk*. The *uyk* is a constructive element that rests on a *kerege* base under an incline, and is fixed at the end to support the *shanyrak*. The insulation of what is called *uzik* felt, rests on the *uyk* and provides heat inside the yurt; at the same time as protecting it from precipitation, e.g. snow and rain.

The *shanyrak* is the upper part of the yurt (Figure 2: a, b and c). Dome-shaped, the *shanyrak* protects the yurt from pressure in the form of snow and rain because of its shape. The *shanyrak* has four open, large segments that provide internal air exchange, for aeration and sunlight insolation, while serving as a chimney. The round, streamlined shape of a truncated cone provides protection from strong winds.

Numerous inclined structural elements evenly distribute pressure from permanent and temporary loads. At the junction of the rope, the *kerege* is tied with a specially made tape (*baskur* tape) to enhance durability. Outside, at the junction of the *kerege*, they are fastened with wooden anchors and for rigidity from four sides of the *shanyrak* the lariats - the *shylbyr* - are stretched. They are attached to the stakes, taking the rising wind into account. From the side of the prevailing wind inside the yurt, weights are hung on an element called a *zhelebau*. A *zhelbau* is a decorative and artistic element in the form of a metal ring attached to a wooden *shanyrak* bar.

The technological process of mounting the yurt begins with the lifting of the *shanyrak* to the desired height. Temporarily, this is done using a wooden support beam - the *bakan*. The *bakan* is installed on the axis of the *shanyrak* at the intersection of what is called the *kuldireuish*. After mounting the *kerege*, outside the entire structure is tied with a *beldeu* rope, to join the elements together. The strength and durability of the yurt depends on the connections of the wooden structures. From the top, the *shanyrak* is covered with a felt canvas - *tundik*. The *tundik*, if necessary, opens and closes by means of a rope. Generally, the yurt construction consists of a wooden frame and the felt of a sheep or camel [6]. Strength, stability and the spatial rigidity of the yurt are ensured by joint work and junctions of vertical diaphragms for rigidity.

The *shanyrak* is both for ventilation and a window. The size of the *shanyrak* depends on the size of the yurt. If there are many ropes in the *kerege*, then the *shanyrak* diameter is larger. The entrance to the yurt is through the door called the *yergenek*. The *yergenek* is an entrance double door (see Figure 2d), which consists of three parts: a jamb, the wooden panels (of the doors) and a felt cape with a sewn patterned mat.

The felt cover is made of sheep or camel wool. The felt cover can be of three types of canvas, different in size and shape: the *tuyrlyk* - base coating; the *uzyuk* - dome coating; the *tundik* - *shanyrak* coating. The felt is a quite durable material and, most importantly, it has high heat-shielding properties. The streamlined shape of the yurt allows it to withstand the pressures of strong winds and snow.

The yurt is practical, quickly disassembled and assembled. Its components are light, which makes transportation easy and gives the ability to deliver a yurt to the most remote areas of the country and over difficult terrain. The average weight of a portable yurt is 150 kg to 200 kg. A hole is made in the roof of the yurt through which it is insulated during the day.

TEACHING ENU STUDENTS MODERN ETHNIC KAZAKH ARCHITECTURE

The Department of Architecture at the ENU, which was named after the Soviet historian, ethnologist, anthropologist and translator, Lev Nikolayevich Gumilyov (L.N. Gumilyov), pays special attention to the study of ethnic architecture, so that students can apply their knowledge to future projects. The students study the following:

- *Ethno cultural bases of modern architecture of Kazakhstan.*
- *Artistic traditions and architecture of the future.*
- *Modern architecture of Kazakhstan.*
- *Architecture and art of Kazakhstan.*
- *Critical regionalism: modern architecture and cultural identity.*

Students participate in departmental scientific projects to restore historical architectural heritage structures. In practical classes in architectural design, students apply their knowledge to create works using the traditions of national architecture.

In teaching students of architecture, a question arises concerning the peculiarities of modern Kazakh architecture, *Oytegi* [7]. The right approach to developing original architecture, reflecting local building traditions, is by its historical development. The authors here are trying to find a pattern that will help solve the problem of finding the *local path* of the national architecture.

The first step to putting *the subject of yurt* into the educational process is to know how the traditional yurt was constructed. Students study the methods of constructing a yurt and its visual proportions; they also perform graphic works on the design of a yurt (Figure 3).

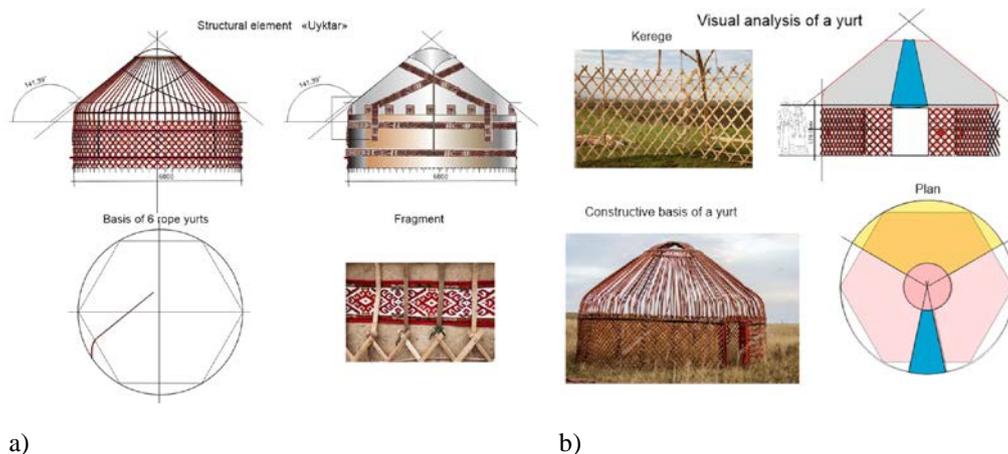


Figure 3: The yurt. Students' work at the ENU; a) structural elements of yurts; and b) design of a yurt.

The second step is to create architectural projects inspired by the yurt, which could be possible during regular classes and students' workshops. Students use the image, form and design of a yurt in the disciplines: Designing an Individual Residential Building in the second year; Designing Leisure Centres in the third year; and Energy-Efficient Design of Civil Buildings in the fourth year.

The shape of the yurt is optimal for creating an energy-efficient home in the climatic conditions of Northern Kazakhstan. Course projects for an energy-efficient residential building, completed by fourth-year students of ENU and using the form of a yurt with its design and functional features are under the leadership of O. Semenyuk (ENU)

(Figure 4). The environmental friendliness of the yurt is expressed through a rounded hemispherical shape, which reduces the negative effects of wind and retains heat to the maximum inside the house. The use of natural materials, i.e. wood and felt allows the creation of a favourable microclimate inside the house.

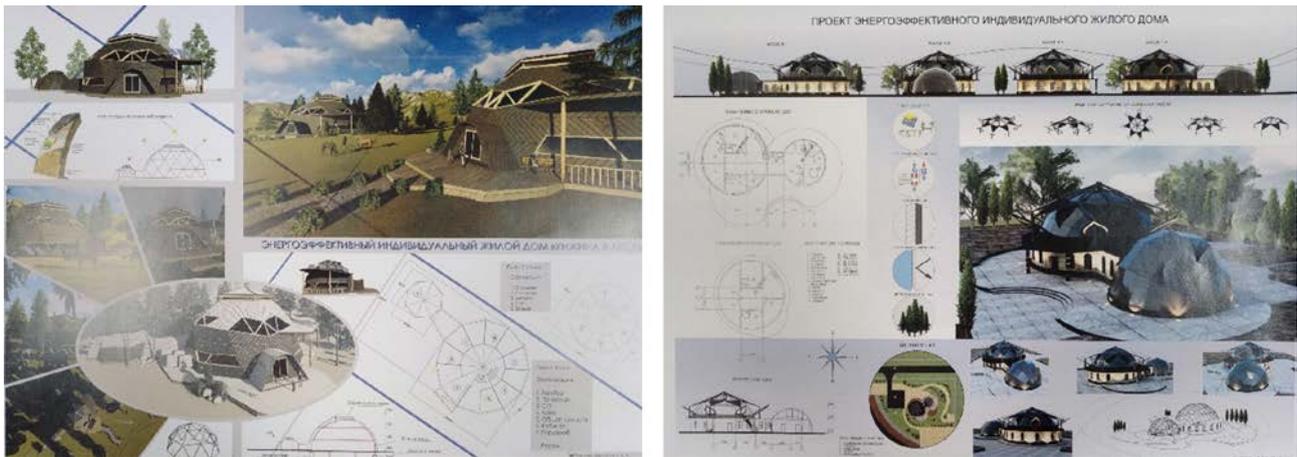


Figure 4: Course projects of an energy-efficient residential building, completed by ENU year 4 students using the form of a yurt with its design and functional features, under the leadership of O. Semenyuk (ENU), 2018.

Students are involved in national competitive projects that use the image of a yurt as a symbol of Kazakh national culture, under the leadership of Z. Malibekov (ENU). A competition project of East Turkistan was implemented to define an ethnic zone in the city of Nur-Sultan (Figure 5), in which students of years three and four took part. The area was divided into three functional areas: terraces lower, middle and upper:

- The lower terrace (*Dzhailau*) includes an area for holding national holidays and events; platforms for national games, *caravan routes* and shopping arcades.
- The middle terrace traditionally is surrounded by adobe fortified walls. It contains the main architectural objects: museums, theatres, hotel complexes, various recreation areas, places of worship, handicraft shopping arcades and fairs. Public buildings were made in the image of the yurt: ethnographic museum and museum of applied arts, museum of archaeology and artefacts.
- The upper terrace is surrounded by a burnt brick wall. The *aniyet-oba* mound dominates the whole complex, is a symbol of signal towers, completes the composition and urban planning of the *Eastern City* and gives a sacred image to the whole complex.



Figure 5: A competitive project of the *Eastern City* using the image of a yurt as a national symbol in the culture of Kazakhstan, made by students of year 3 and year 4, under the leadership of Z. Malibekov (ENU), 2018.

Projects Submitted to International Workshops

The ENU students participated in international workshops, where they applied the experience of designing architectural objects based on the yurt. One excellent example is the project (Figure 6) made by a group of students for the international students' workshops: Conceptual Landscape Project of the ENU Recreation Space in Astana in 2015 [8], under the leadership of S. Kuc (Cracow University of Technology (CUT)); S. Sadykova (ENU); P. Mika (CUT) and V. Revtova (ENU). The yurt has inspired students (Figure 6b) to project *yurta houses* as a part of ENU recreation space. These pavilions with glass walls gave a covered space (Figure 6c).

Another example is the international student workshop, *Architectural collage. Transformation of styles in the new architecture of Astana*, held at the ENU Department of Architecture, under the leadership of S. Kuc (CUT) and S. Sadykova (ENU), with the participation of: L. Sabyrbaeva; A. Seisekeeva and A. Toishieva (ENU) [9].

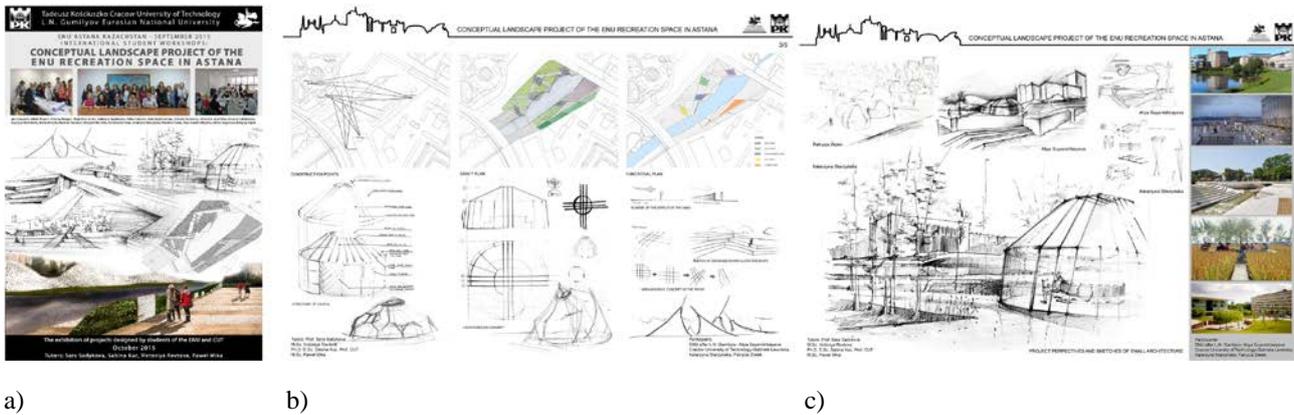


Figure 6: International students' workshops: *Conceptual Landscape Project of the ENU Recreation Space in Astana*; a) poster of the exhibition; b) and c) students' work (team: A. Suyenishbayeva (ENU), G. Lewińska (CUT), K. Starzyńska (CUT) and P. Ziętek (CUT); leaders: S. Kuc (CUT), S. Sadykova (ENU), P. Mika (CUT), V. Revtova (ENU), Eurasian National University, Nur-Sultan, Kazakhstan, September 2015).

The workshops and students' exhibition were part of the celebration of the 20th Anniversary of Astana (now Nur-Sultan) [10][11]. Students were inspired by the architecture of Nur-Sultan. Examples of the yurt in the architecture of the city of Nur-Sultan were the Shabyt Palace of Arts, Independence Palace, Schoolchildren's Palace, Khan Shatyr Shopping and Entertainment Centre, Hotel St Regis Astana, Millennium Park Residential Complex and a number of residential complexes.

The aim was to create an architectural collage as a powerful method of presenting artistic expression of form and composition. The main theme of the architectural students' work was to use the yurt in the new architecture of Nur-Sultan.

CONCLUSIONS

The yurt is a traditional Kazakhstan structure and an inspirational design of a dome structure. In the design of architectural objects of the city of Nur-Sultan, great attention was paid to ethnic architecture, to give a unique look to the capital of Kazakhstan, and to emphasise the uniqueness of local culture. The Kazakhs' yurt is a main object of national culture; therefore, its image, form and structural elements are applied by architects to create modern residential and public buildings.

The architecture and construction of the yurt have an important role in teaching young architects. Students study yurts and their construction and create architectural projects inspired by the yurt. It is important to create Kazakhstan architecture inspired by the Kazakhstani yurt.

The ability to apply knowledge is in demand in the architectural and construction industry in Kazakhstan. The national architecture could adorn many cities of the Republic of Kazakhstan and make their appearance unique.

REFERENCES

1. Malibekuly, Z., *Coat of Arms of Kazakhstan*. Astana: Sardar, 348 (2017).
2. Пыина, О., *Sources of Architecture*. Mountain Altai: Gorno-Altaysk Printing House, 110 (2012).
3. Salgaryula, K., *Kazakhs*. Almaty (1995).
4. Argynbayev, K., *Craft of the Kazakh People*. Almaty: Oner, 126 (1987).
5. Sartkozhaula, K., *Ethnic Problems of the Third Turkic Khaganate*. Astana (2014).
6. Mukanov, K., *Woolen Products*. Almaty: Kaynar, 144 (1990).
7. Malibekuly, Z., Semenyuk, O., Sadykova, S., Dyisebayev, U. and Amirkhanov, M., A new style of architecture for Kazakhstan - *Oitegi. World Trans. on Engng. and Technol. Educ.*, 16, 3, 301-306 (2018).
8. Отчетная международная выставка работ по живописи студентов специальности «Архитектура», <http://www.enu.kz/ru/info/novosti-enu/38735/> (in Russian).
9. Международный студенческий воркшоп студентов архитектурно-строительного факультета ЕНУ им. Л.Н. Гумилева и архитектурного факультета Краковского технического университета им. Т. Костюшко, <http://www.enu.kz/ru/info/novosti-enu/53114/> (in Russian).
10. International Creative Exhibition of Students of the Architecture Department of *L.N. Gumilyov* Eurasian National University and the Faculty of Architecture of Cracow University of Technology, <https://www.enu.kz/en/info/news/53151/> (in Russian).
11. Wystawa Prac Studentek Wydziału Architektury w Astanie, https://www.pk.edu.pl/index.php?option=com_content&view=article&id=2559:wystawa-prac-studentek-architektury-w-astanie&catid=49&lang=pl&Itemid=944 (in Polish).