LEGO® SET AS A TOOL
ENHANCING CREATIVITY IN ARCHITECTURE, URBAN PLANNING AND DESIGN

Architecture as a discipline has the inherent potential of overlapping with areas that do not appear related to its own scope of functions at first sight. Along with town planning, the discipline is closely linked with mass evaluation, mutual relations of buildings' volumes impacting on the users' and inhabitants' everyday life. Contemporary IT technologies enable architecture to "materialise" in virtual space (to be performed *in silico*, i.e. on computer or via computer simulation, transl. note) but the creative design process calls for the direct connection between the hand and the mind – using a *"thinking hand"* whenever one is in need of inspiration, as Juhani Pallasmaa argues.[1] The idea is that, by suspending one's critical faculties and letting one's hand simply roam free, one's fingers might fashion something unexpected. Besides sketching or modelling there exist other tools which can be applied in the design process. The aim of this article is to explain the relation between the Lego® set and architecture, urban planning and design, to identify its potential for creation, creativity, and design innovation, and also to justify it as a teaching tool.

The Lego® Brick is a cultural phenomenon with its own history. It was designed in Denmark during the Cold War that followed WWII and has since swept the world off its feet. First patented on 28 January 1958, the use and popularity of the Lego® Group (hereinafter referred to as "the LEGO Group") has grown exponentially through the decades and most likely surpassed the expectations of Ole Kirk Christiansen, a bold carpenter of humble beginnings, based in Billund (Denmark). In 1932, Ole founded a factory that would later become the house of Lego and the LEGO Group, and be led by his grandsons in the years to come. Taking its name originally by a derivation from the Danish phrase *leg godt* (meaning "*play well*"), Lego® mainly produced wooden toys; remarkably, the 1950s famous duck may be the most emblematic toy in the company's early history. Following the trend of those years, the company's expansion into the plastic toys segment took place between 1940 and 1949. It was not before mid-1950s that the company's production consisted predominantly of plastic while wooden toys were discontinued in the 1960s. The generations raised in the 1970s, 1980s and 1990s lived in

Left to right
Pablo Sánchez Jiménez
(creator of the approved Lego® Ideas' *Pirate Bay*)
rendered in the software Stud.io;
The recreation of Erwin Govaerts'
Raf & Otje's playground in Turnhout (Belgium)
with 50 thousand bricks;
and the cyberpunk favela by Sebastien Bachorzewski.
Source: Courtesy of the creators who allowed
the reproduction of their work in this paper.

the memorable time of classic space, castle and pirate lines of sets, causing commotion and nostalgia while prompting the reissuance of many of the classics in later years.

Today, the LEGO Group has developed a worldwide community of enthusiasts from a diverse set of age groups and backgrounds. *AFOLs* (*Adult Fans of Lego®*) and youngsters organize fairs where they display their Lego® MOCs (*my own creation*)[2]. Some are accepted as ambassadors by the company and voluntarily promote the hobby via social media and events such as the Brick Universe Fan Convention and Brickfair Lego® Fan Expo (US), Festibriques (FR) or Lego® Fanwelt (DE). The brick experience is guaranteed in several thematic parks around the globe where exclusive sets are available for purchase. The AFOL romance was well depicted in the book *Lego®: a Love Story*.[3] Jeff Friesen narrates a tour of the U.S.A. overplaying the stereotypes of the visited locations in every state with brick built sceneries.[4]

After diversifying its portfolio in the late 1990s and early 2000s, the LEGO Group dealt with a setback in profits. In response, the company involved and encouraged users in the creation process with the Mindstorms 2.0 and Mindstorms NXT.[5] The very same could be said about the *Ideas* sets, where fans submit a creation that is reviewed by the company after gaining ten thousand votes from the community around the globe. The latest additions include the Treehouse, the Steamboat Willie, Dinosaur Fossils, the Pop-Up Book and the Ship in a Bottle. Over the course of writing this paper the authors encountered numerous astonishing original MOCs that could very well summarize the current state of brick-built inventions better than words

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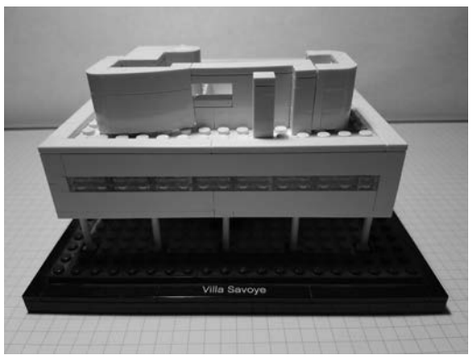
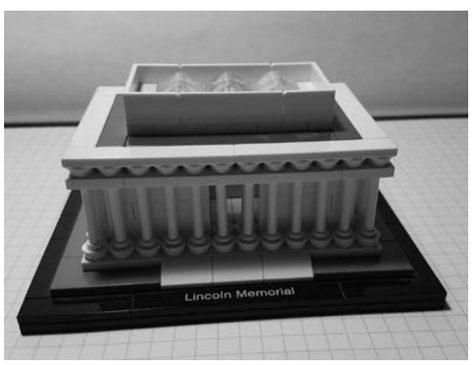
The LEGO Group hysteria did not go unnoticed in the mainstream media when Bloomberg dedicated an article entitled *The Hot New Asset Class Is Lego® Sets* and Newsweek released two special editions (Newsweek 2018 and 2019) celebrating 60 years of the Lego® brick as we know it and 40 years of Lego® minifigures (*"minifigs"* with their fixed scale of 1:48) in the following year, respectively.[6] By 2019, the LEGO Group announced there are more minifigures than actual human beings in the world. Another interesting fact is that as a widespread construction toy in the world it reaches the error rate in manufacturing of 5 pieces per 1 million bricks.

Nowadays, the Lego® Architecture's Edition is very popular mainly among architects and architecture lovers. These minimalist sets aim to *"celebrate the past, present and future of architecture through the Lego® Brick"*.[7] The brand includes a series of Lego® sets designed by Adam Reed Tucker (*CEO of the Brickstructures, Inc.*), and each contains the pieces and instructions to build a model of a famous architectural building in micro-scale. The buildings are further categorised into three smaller series: The *Landmark Series*, the *Architect Series*, and the *Skyline Series*. From the beginning of 2009 until 2019, 45 sets with 10 special editions were released, including the Villa Savoye, Empire State Building, Sears Tower, Sydney Opera House, the Leaning Tower of Pisa, Guggenheim Museum and many others.

The latest edition – *Lego® Architecture Studio* – comprises white block sets, using primarily the smaller "plate" pieces rather than the larger "brick" pieces. „This allows creating very compact, yet highly detailed





Top to bottom
Model of Villa Savoye.
Author: Blipken; Available at: https://commons.wikimedia.org/wiki/File:Lego®_Architecture_21014_Villa_Savoye.jpg
Model of Guggenheim Museum.
Author: Blipken; Available at: https://commons.wikimedia.org/wiki/File:Lego®_Architecture_21035_Solomon_R._Guggenheim_Museum.jpg
Model of Lincoln Memorial.
Author: Blipken; Available at: https://commons.wikimedia.org/wiki/File:Lego®_Architecture_21022_Lincoln_Memorial.jpg

replicas of buildings designed to scale."The main aim of this edition is to get young and old bricksmiths across the world over to thinking about the core concepts of architectural design. Using the white colour actually creates natural lines and shadows that can represent architectural shapes and forms more accurately. This edition has another advantage, too. *"With every Lego® Architecture Studio, Lego® has included a vividly designed 268-page book that illustrates real-world case studies of six different professional forms* (REX Architecture, Sou Fujimoto, SOM, MAD Architects, Tham & Videgård, and Safdie Architects) *trying to seriously explain the principles of the original architectural design by showing how you can do it all in Lego®."*[8] It includes theories on architecture and construction, where authors get their inspirations from or how their design process works.

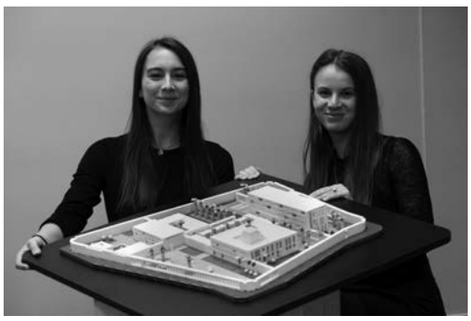
The Lego® Company also supports many other projects and competitions, such as the *Inspireli Awards*, the world's biggest global student contest in architecture, urban design, landscape and interior design, involving 136 countries around the world. This year was a very special one for the Faculty of Architecture of the Slovak University of Technology (FA SUT), Bratislava, Slovakia, after two students won the special section – *"Design a real project"* in October 2019. Their design of the Czech Embassy in Addis Ababa was transformed into a unique Lego® model in a special Powered by Lego® Architecture box. This limited Lego® set edition – only three sets were produced – has mainly collector's value.

The consideration of plastic bricks as objects beyond mere children toys has made a relatively recent debut within the academic realm, and we would like to briefly discuss it before moving towards the main topic of this paper. The building blocks seem to have encountered a critical standpoint according to two recent studies, where the number and diversification of bricks was the focus.[9] It is plausible to argue that if there were limitations concerning the possibility of creation within the LEGO Group products with regard to the shift from simple bricks to complex, more structured sets, the process of creation can be seen as limiting.[10] The increase in the variability of shapes, angles and the number of pieces does allow for an expansion in the possibility of creation with the parts included in a set. After all, even sets that follow strict guidelines on how to build or play with them can be seen as boxes packed with interesting/useful pieces for one's MOC *(My Own Creation)*.

In 2014, Mark J.P. Wolf as an editor analysed, with other authors, the media phenomenon of the LEGO brand and its potential for media studies within the volume of historic studies of the bricks.[11] In his study, Mr. Giddings highlights a gap in the actual playing with Lego®, where a distinction needs to be drawn between a world of narrative in unthemed sets, meaning the proto-architectural bricks, before the themed Lego® Space was released in the 1970s, and the newer sets where the imaginative aspect may be hindered by strict guidelines, and a prefabricated phantasmagorical world such as in the Star Wars, Harry Potter or Marvel themed sets.[12] However, in the same book, there is a detailed account of the LEGO Group's timeless success through different epochs from a national to a global product. From this perspective, Koncazk describes this development as influenced by the 19th century National Romantic Movement and the Biedermeier culture – respect for family, church values and close ties to the local community – from national to romantic and transmedial.[13]

Furthermore, it is important to highlight that although there was a clear shift from unthemed sets to story-driven ones e.g. *Ninjago*, the increase of space and pirate-related sets such as *Nasa Apollo Saturn V*, *Nasa Apollo 11 Lunar Lander*, *Ship in a Bottle* and the upcoming *Pirate Bay* may indicate a potential return to the classics.[14]

When speaking of the advantages of the Lego® set, its use in medical treatment must also be mentioned. Although it is not primarily linked with architectural education, the Lego® set is also applied to treat communication disorders of autistic children. The *Lego®-based therapy* (also known as Lego® therapy) was originally developed by US psychologist Daniel LeGoff[15] followed by Professor Simon Baron-Cohen, and Dr. Gina Gómez de la Cuesta from the University of Cambridge



Left to right
Students Jana Hájková and Kristína Boháčová from the Faculty of Architecture STU in Bratislava won the Inspireli Awards special section – "Design the real project". Their design of the Czech Embassy in Addis Ababa was transformed into a unique Lego® model in a special Powered by Lego® Architecture box.
Photo: ČVUT Prague.
Design of the embassy. Photo: Kristína Boháčová.

Comparison of potentials and limitations of the Lego® set in architectural and design education.

Pros (+)

Item	**Description**
Time	modular bricks enable users to create design very quickly and easily
Variability	2,350 elements in approx. 50 colours
Availability	bricks & pieces can be acquired based on demand via PAB (Pick a Brick) online, PAB wall at stores or marketplaces e.g. Bricklink
Modularity	assemble and disassemble

Cons (-)

Item	**Description**
Price	the kit is quite expensive, especially some specific bricks *(the Architecture Studio set costs approx. £150)*
Instructions	the LEGO Group moves further away from proto-architectural bricks to specific constructs which, due to their complexity, include colourful bricks to ease the process for a variety of builders while emphasizing the building experience by following the instructions
Commodity	the commodification of the bricks turning into an economic asset

Autism Research Centre. Nowadays, it is an increasingly popular social skills programme for children and young people with social communication problems such as autism spectrum disorders (ASD). The recipients of this therapy work together to build Lego® models, allowing them to develop social skills such as turn taking, collaboration and social communication. The key to this approach lies in its engaging and enjoyable form of education. Participants/children mostly take on different roles which need to be fulfilled – including the role of an *Engineer,* who has the instructions and uses plans to describe the construction needed and bricks, a *Supplier* who finds the correct bricks as described by the Engineer and gives them to the Builder, and the *Builder* who uses the verbal instructions given by the Engineer to put the bricks / model together. Within this therapy, all

The bricks have the same number of studs as are used for individual letters and numbers in the Braille alphabet.
Available at: https://www.dezeen.com/2019/04/26/Lego®-braille-bricks-blind-children/

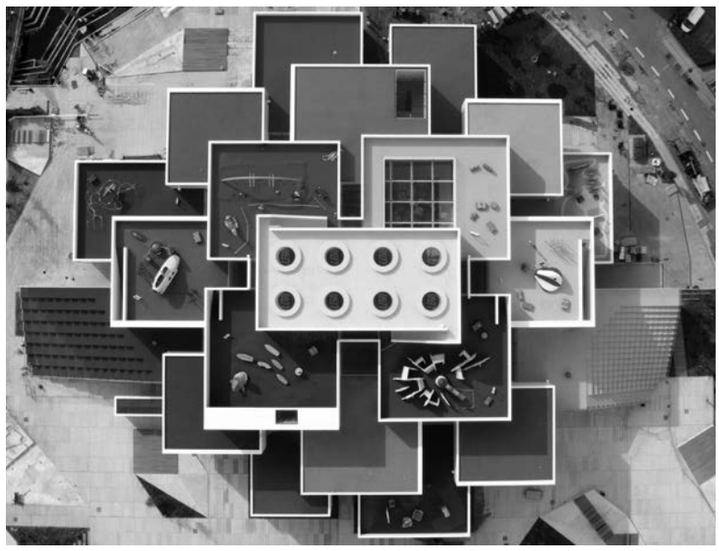
persons involved take turns to play these different roles and immediately have a joint focus on the same thing. As a result, children work together, interact one with another and can learn without fear or anxiety. This access to stress-free social opportunities provides guidelines for parents and supports vital research in the field of autism, too.

Brynjar Karl Birgisson, a 15-year old Icelandic boy with autism, built a Titanic replica with sixty-five thousand Lego® bricks. The LEGO Group subsidized his work, affording him a discount when acquiring the pieces needed for his project. The model, which now resides at the Titanic Museum in Tennessee (USA), was previously displayed in Iceland, Sweden, Norway and Germany. Brynjar, who would like to become a captain one day, has now turned his interests towards exploring the history of ships in general and recognizes that Lego® played an essential role in building his confidence.[16]

The fact that in 2019 the LEGO Group developed a brick version with printed letters and numbers from the Braille alphabet and with standard symbols – numbers and letters which are compatible with Lego®'s wider collection – is very inspiring from the medical aspect. Therefore, blind and partially sighted children can learn to read while playing with the Lego® set. There are 250 bricks in total in this unique set covering the full alphabet, the numbers between zero and nine and a selection of mathematical symbols. It is expected that the interactive nature of the design will give the children with visual impairment an opportunity to develop new skills, enhance their abilities and give them a fighting chance in the labour market.

The basics of structural engineering and the forethought required in architecture in general, whether one talks about town planning or design, are an essential element of building with Lego®. Numerous examples the authors presented in the pictures above – built with bricks or other materials – requires deliberate thinking about space and physics and finally, creativity and innovation in producing these works or replicas. In other words, there exists a great conceptual tool at one's disposal, which perhaps may be downplayed due to its simplicity and straightforwardness. Needless to say, one does not need to hold a degree in architecture, urbanism or design to plan and craft a brick built structure that may – more or less – check the boxes of what a professional in the area would regard as quintessential features of an architectural creation. Notwithstanding, the intrinsic potentiality and practicality of deploying bricks in the service of architecture should not be overlooked. The aspect of playfulness in the process breaks away from stringency and seriousness by intertwining the act of bringing a new idea into existence with the sound of bricks clicking, alluding to childhood memories, while prompting joyfulness, fun and humour from the outset. It also welcomes any novice to the process of creation.

The *Superkilen* public park in Nørrebro, Copenhagen is an example of playful interaction with the landscape. By integrating components of diverse social and cultural backgrounds, the project aims to represent, acknowledge and celebrate the diversity of the neighbourhood. Other examples are the *Dortheavej* low-income affordable housing and the three-dimensional perimeter block of *8 House* also located in Copenhagen. Instead of simply standing for architectural objects, they in fact explore new ways of co-existing. Both of these constructions carry the name of the Bjarke Ingels Group, or *BIG*. The group also developed projects such as the dazzling



The Lego® House in Billund
Available at: https://www.Lego®.com/cs-cz/aboutus/news/2019/september/Lego®-house-images

Vancouver House in Canada and a ski slope atop of a heat and waste-to-power plant in Copenhagen. It should come as no surprise that when commissioning the Lego® House in Billund to (proportionately) epitomise the ultimate Lego® experience, the LEGO Group closed a deal with *BIG*.

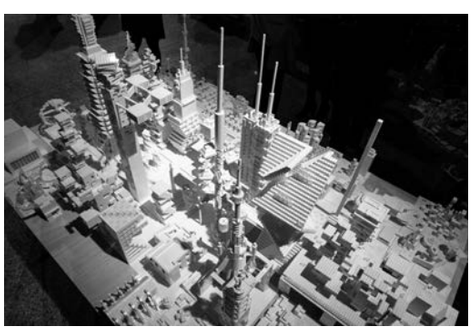
The Lego® House is an open museum unlike any other where visitors are invited and encouraged to interact with the artefacts. The architectural object celebrates the culture of the brick, displaying the adaptability (a crucial factor in architecture) of the toy in a real-life model. The designers paid attention to every little detail: the interior is decorated with pixelated objects that are or can be made out of Lego®, the skylights imitate the studs on a brick and the façades are made out of ceramic tiles based on the 2×4 measurement of basic bricks, giving the look of a smooth, flat finish tile-plated facade. The variety of installations underline the fluidity and organic shapes that can be achieved by combining a number of very little bricks in different and unusual forms. Moreover, the roofscape is comprised of playgrounds resembling interconnected colourful bricks. The object as a whole invites the public to inhabit the world of bricks, play, coexist and co-create, transforming reality with new shapes and forms.

Lego® and the works of Bjarke Ingels evidently have the element of playfulness in common. The architect lucidly points out that the aforementioned Dortheavej project was inspired by the flexibility discovered while placing bricks in slightly different orientations. A similar approach is to be found in the recent Lego® Campus building in Billund designed by C.F. Møller Architects. In brief, innovative thinking, creative and playful experience are the brand's key characteristics speaking about its impact on architecture.[17]

Handling Lego® is appealing to many people of all age groups and educational or social backgrounds. Therefore, the sets are very suitable for teaching and explaining basic architectural principles in a simple way. Advantages and disadvantages in this matter were presented in Table 1. It is common knowledge that clicking bricks together to form more complex objects requires just a little of artistic talent and not much of technical knowledge. Using simple 3D blocks (8-pin brick-like blocks), children/students can explore architecture and creation, and it can help them to develop a sense of spatial relations and shapes.[18]

If one speaks about the positive effects of Lego® related to teaching architecture design, some specific learning approaches have to be mentioned. Many pioneers of this unusual teaching procedure are of the opinion that through Lego® sets students are able to:

Compare the difference between towers by differing heights and base sizes and discuss other ideas to improve building stability. Hence, they are learning the basics of architecture and engineering;
Construct one or more Lego® models that can mimic a real-world software process that consists of many interrelated activities. Throughout this process, it can be said that the pixelation of the environment occurs



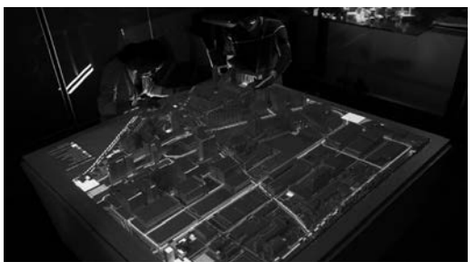
High-rise buildings built of Lego® sets at the Inspireli Awards workshop in Prague, October 2019. Photos: ČVUT Prague

in a fashion similar to software programming but with actual plastic bricks;
Focus on the trade-offs of choosing different architectural styles (patterns) to design and develop a complex system. The baseplate is a blank canvas, the pieces one has at his or her disposal delineate the possibilities and limitations of implementing the idea. Within the brick world, let's say e.g. I am working with *Modified 1 × 2 × 1 ⅔ with Studs on 1 Side* bricks. I can choose to create a flat plate finish on the outside, use the studs on the material for ornaments, greenery, or invert the pieces indoors to reinforce curtains, furniture, or to simultaneously support a wall and be part of the exterior façade;
Learn about the need for flexible design to accommodate stakeholder changes and needs. Just as in a real-life architectural project, adaptability to the surroundings and landscape as well as flexibility for change, if needed, are intrinsically related to and an integral part of the creating with the bricks.

The concept of modular building comprised predominantly in the Creator Expert line sees a new set release annually. Among the classics are the Pet Shop, Town Hall and the Grocery Shop. Matt Snelling from ASLA (*The American Society of Landscape Architecture*) along with the HOK team developed an innovative drainage solution called Freno in order to tackle stormwater runoffs.[19] Inspired by the architect's childhood passion for Lego®, the three-type concrete panels are combined in a structure that can be shaped in a variety of combinations, creating rain gardens while cutting costs; they can also be easily replaced or rotated if damaged.

The overlapping between architecture and construction toys that foster the keenness to build and create has been known for decades. During 1970s, Frank Lloyd Wright, who

Using the Lego® set during Building Construction I. at the Faculty of Architecture, STU in Bratislava. Photos: Tomáš Hubinský



GIS data is used to create "Lego®-tized," 3-dimensional representations of existing urban areas. The model is augmented with layers of information via projection mapping. Layers: Left: mobility system; Right: Google satellite image Photo from MIT Media Lab (https://www.media.mit.edu/people/jiw/overview/)

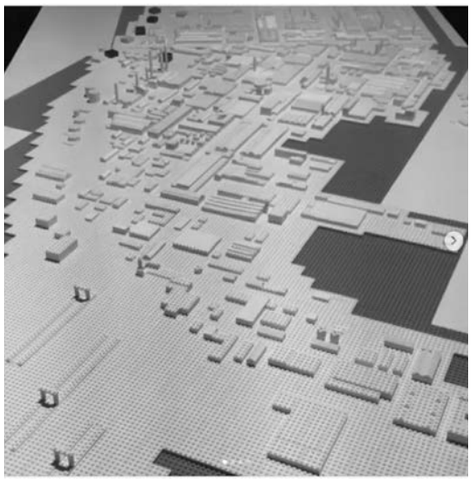
GIS data is used to create "Lego®-tized," 3-dimensional representations of existing urban areas. The model is augmented with layers of information via projection mapping. Layers: Left: solar insolation; Right: Twitter user activity Photo from MIT Media Lab (https://www.media.mit.edu/people/jiw/overview/)

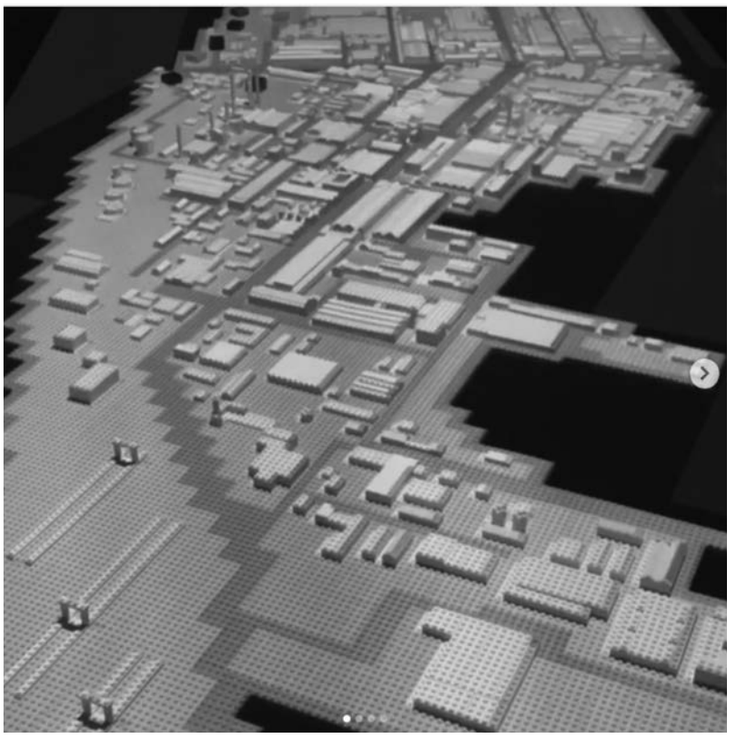
would later become a renowned 20th century architect and designed works such as the Fallingwater residence and the Solomon R. Guggenheim Museum, used to play with the *Fröbelgaben* (in English: Fröbel gifts) as a child. So did Walter Gropius who is considered to be one of the forerunners of modernist architecture, along with Alvar Aalto and Frank Lloyd Wright. The Fröbel gifts are named after their inventor Friedrich Fröbel, a German pedagogue considered to be the creator of the concept of *kindergarten*. His aim was to design an educational material that would focus on the individual child's aptitude while triggering their creative instincts. Mike Davies, the architect behind the Centre Georges Pompidou and the Lloyd's building, was inspired by Meccano sets.

In fact, these blocks and products present a hands-on opportunity to learn the basics of structural engineering, which involves understanding of *physics* and *creativity.* Experts in this field examine similar questions while crafting buildings, bridges, cars, dams, stadiums and other large structures. In September 2019, our colleague Ing. arch. Tomáš Hubinský from the *Institute of Structures in Architecture and Engineering Buildings,* started to use this Lego® set to teach basic structural principles in the *Building Construction I* course. By means of the Lego® bricks of various colours, he introduces essential methods of how to build a brick wall by applying different bricklaying and binding techniques.

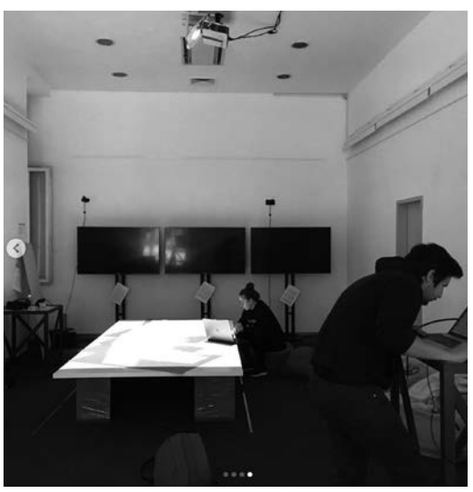
Urban design is a very complex process involving a lot of analyses (e. g. solar potential, shadow ratio, heat islands, intensity of transport, etc.) and inputs that urban planners have to consider. A specific feature of architectural design is the constant need for seeking, deciding on, displaying and evaluating alternative solutions. Model representation of architectural or urban concepts is the basis of an efficient and creative method that supports the decision-making process by interactive visual validation of the work model. Therefore, respecting the developments in IT tools, architects search for methods and instruments which are flexible, narrative, powerful and make this process as easy as possible.

In this regard, one can mention the *CityScope project* developed by MIT's *MediaLab,* which uses augmented reality (*Augmented Reality Decision Support Systems – ARDSS*) to quickly and simply model the effects of large-scale urban-planning decisions, allowing urban planning to be more accessible. The technology employs TIM (*Tangible-Interactive Mapping*), a tangible-interactive rapid prototyping environment for matrices of data. *"TIM uses an array of optically tagged Lego® bricks on the tabletop with overhead projectors that beam color-coded metrics onto each brick. Every Lego® piece has a special chip that communicates with overhead projectors, which beam metrics affected by each decision onto the new configuration. Chips of each brick are assigned user-determined variables such as walkability, access to jobs, housing or open space and can easily be evaluated in the following way: once assembled on the tabletop, the objects can represent an existing neighbourhood, city or region,*





Projections of layers on the plate with Lego® urban structure. Photo by Eszter Dávida, KÉK - Contemporary Architecture Centre in Budapest, June 2018.

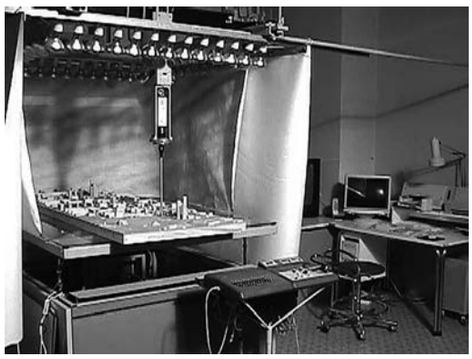


Technology of projection.
Photo by Eszter Dávida, KÉK - Contemporary Architecture Centre in Budapest, June 2018.

and users are able to pick up and insert, move or remove individual components while these changes to the city are visually revealed in real-time by changing color-codes projected onto the pieces. It is a combination of computer vision and 3D projection mapping. Such systems blend hardware, software, human interface design, cloud computation, and variants of so-called big data." [20]

Such methodology is currently being developed by the faculty's project partner KÉK - Contemporary Architecture Centre in Budapest, Hungary. Supported and sponsored by the U.S. Embassy in Budapest and elaborated within the Shared Cities Creative Momentum and Architectural Model Festival series projects, this research platform focuses on future development scenarios for the Csepel Plant area, the city's most significant industrial heritage, and one of its most important brownfield zones. By mobilizing the data collected on the area during a 2-year research project by KÉK while using the CityScope framework, stakeholders in urban development, computation, data analytics, and digital geography try to develop a tangible city simulator monitoring the potential changes of the building's functions and their resultant effects in this urban area. This contemporary device enhances teamwork and intervention design using data-based physical and digital tools.

At the Bratislava's Faculty of Architecture, we usually follow the traditional route of urban design, the staple of most architecture practices, meaning the use of cutters – a hot wire and polystyrene foam or laser cutters. Students cut out the building volumes and put them on a plate while simulating their various specific positions and relations. This process requires much more time than using Lego® bricks and, another disadvantage is the production of unpleasant and unhealthy vapours during the cutting process. Other more contemporary practices include digital software or a 3D printer, which are time-saving. Several years ago, the Faculty had the *Laboratory of model simulation*, which used

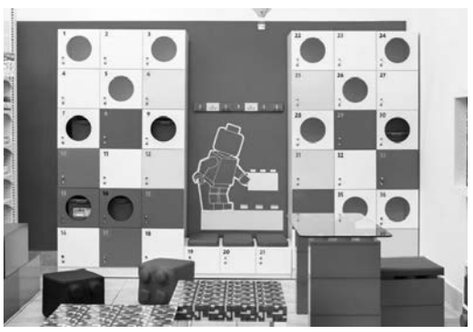


Opto-electronic simulation device with graphic output on a PC monitor or data projector; Recording of the testing of urban atmosphere in the (professional) design model of Bratislava Podhradie location; Endoscope interaction in model, scale M 1:200.
Photo: Assoc. Prof. Ing. arch. Peter Kardoš, PhD.
Available at: https://www.stuba.sk/sk/vyskume/dalsie-laboratoria-a-vyskumne-pracoviska-stu/laboratorium-modelovej-simulacie.html?page_id=7836

the analogue and analogue-digital model simulations based on architectural *endoscopy*. It was equipped with an opto-electronic simulation device, which allowed for the performance of an interactive situational survey in the environment of a physical (artificial) urban, architectural model or artefact with a graphic output displayed on the monitor. Unfortunately, the Faculty's lab no longer exists, and we do not currently have a substitute for it.

With the exception of architects, town-planners and researchers in medicine, this innovative and trendsetting company has had profound and unparalleled influence on designers and their inventiveness and creativity. The *toy design* in itself can manifest its potential as a final product, an element of interior design or as a conceptual tool in street art. The LEGO Group's most famous slogan *"It's A New Toy Every Day"* endorses this concept. In design, the Lego® bricks are mainly used for producing small artefacts such as tables and divider screens or in a few ambitious projects of fairly large dimensions. For instance, the Lego® team spent more than 13,000 hours working on a non-glued, fully-functional and self-propelled Lego® Technic model of the Bugatti Chiron which can hit the speeds of 20 mph. The LEGO Group's first ever large-scale mobile construction is packed with 2,304 motors and 4,032 technic gear wheels. One can also list many street art installations and artwork such as the Lego® bridge, a 250 square meters painting in Wuppertal, awarded by the *Deutscher Fassadenpreis Advancement Prize* in 2012 or one of the most recognizable Lego® sculptures, the *"Yellow"* by Nathan Sawaya which can be seen at *"The Art of the Brick"* at the Denver Museum of Nature & Science in June 2020.

In the era of climate change and the issue of how to mitigate the environmental impact of plastics, the LEGO Group as a partner of World Wildlife Fund (WWF) came up with a range of botanical elements made from



Top to bottom
Retail Interior Design – 26.25 square meters Lego® room in Silpo by Kassa, Kiyv, Ukraine
Available at: http://www.kassa.org.uk/en/Lego®-room-in-silpo/

Top to bottom
The Lego® Table by Yusong Zhang comprises of 10,480 bricks.
Available at: https://www.dezeen.com/2018/08/27/Lego®-coffee-table-yusong-zhang-comprises-10480-bricks/
EverBlock, a new modular building system of oversized bricks capable of forming fantastic life-sized creations.
Available at: https://mymodernmet.com/everblock-modular-plastic-blocks/
Fully functional, life-sized version of the Bugatti Chiron sports car made of Lego®.
Available at: https://upload.wikimedia.org/wikipedia/commons/5/51/Lego®_Bugatti_Chiron_-_Mondial_de_l%27Automobile_de_Paris_2018_-_004.jpg

soft, durable and flexible polyethylene plastic, manufactured using sugarcane ethanol in 2018, all this with the aim to reduce plastic waste i.e. its ecological footprint. At present, the plant-shaped pieces only account for a small percentage of its outputs and parts of set pieces but the LEGO Group's ultimate goal is to produce all of its bricks from sustainably sourced bio-based plastics which are biodegradable by 2030. Other measures taken by Lego® in order to reduce its CO_2 emissions include an investment in wind power facilities used in the brick manufacturing production. The reissuance of the Vestas Wind Turbine set also in 2018, underscores the company's attempt to move in the eco-friendly direction.[21] This approach will hopefully be very inspiring for designers and toy manufacturers in general.

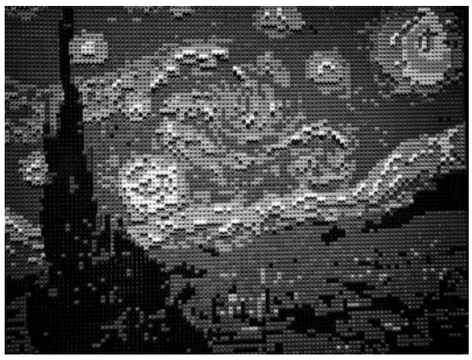
For the steadfast loyal AFOLs, there is an open-source IT tool entitled LeoCAD with an intuitive interface that allows users to start creating new virtual design models with Lego® bricks without having to spend too much time learning how to use the software. LeoCAD is fully compatible with LDraw Standard and related tools and reads and writes LDR and MPD files so that one can share and download models from the Internet. It uses the LDraw Parts Library which has nearly 10,000 different parts. This tool can be a stepping stone for aspiring designers and developers alike that have an avid interest in starting a career at the LEGO Group or simply would like to venture into a world of virtual brick possibilities.

Architects, like all human beings, sometimes have prejudice and tend to condemn simple concepts related to design education. As the authors have already stated, nowadays students are distracted mainly by the emerging information technologies (*information society, net-generation*).[22] Besides, Frank Weiner states the following about the old studio models of the modern and postmodern era: (*...) the monastic condition is* (due to distractions) *simply no longer possible (...) and which (...) would either question the model or cause new models to emerge*.[23] Due to this fact, perhaps the Lego® set should be enthusiastically embraced by some of us, and we can become the *AAFOLs* (*adult architect fans of Lego®*) to implement this kit along with contemporary information technologies into the early stages of the architectural and town-planning education process at the SUT's Faculty of Architecture. After all, Lego® bricks, together with other similar blocks and building brands such as *Meccano*, the *Spanish Tente* blocks or the slightly older *Exin Castillos* (castle building blocks), have helped children (and not only children) from all over the world to develop spatial vision and a love for building, development and engineering, which represent crucial elements of our everyday life.

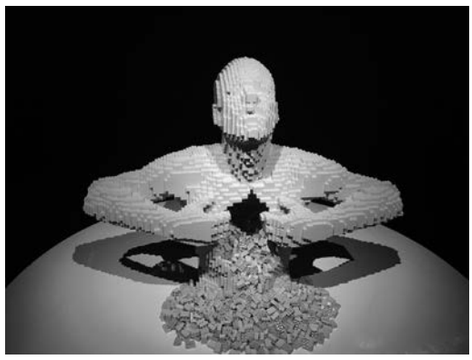
Left to right
The Lego® bridge in Wuppertal by the street artist Megx (Martin Heuwold) revitalized in 2011.
Available at: https://upload.wikimedia.org/wikipedia/commons/7/75/Lego®br%C3%BCcke_Wuppertal_1.jpg

The Cherry blossom tree made from over 800,000 Lego® bricks originally designed in the Czech Republic and created by the LEGOLAND in Japan, 2018.
Available at: https://mymodernmet.com/cherry-blossom-tree-legoland-japan/

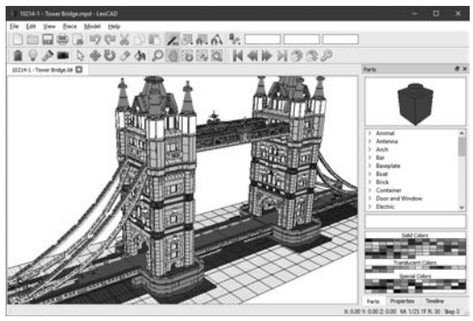
Street art intervention using Lego® bricks to repair a wall breakdown.
Available at: https://www.isupportstreetart.com/Lego®-street-art/



Left to right
The Van Gogh's "Starry Night" in Lego® bricks.
Available at: https://www.flickr.com/photos/mharrsch/35163396956
Nathan Sawaya's "Yellow", one of his most recognizable Lego® sculptures.



Available at: https://www.needpix.com/photo/download/702594/Lego®-yellow-statue-human-open-soul-art-installation-free-pictures-free-photos



Screenshot taken from the LeoCAD IT tool which is optimized for large models. Picture of the Tower Bridge, an official set with over 4,000 pieces.
Available at: https://www.leocad.org/