

Article

# Supporting Theoretical Courses through Application

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**Abstract:** Ecological crises have affected the architecture discipline, and different techniques, technologies, and design approaches have flourished. A theory about the effect of ecology on architectural design, formulated as ecological design, and its education has started in institutes. However, it is important that the practice of architecture is reflected through theoretical knowledge in its outputs, and the discipline is conscious about its theoretical knowledge when designing a building, including how much can be understood in the concrete project. This study tries to discern the role of theoretical knowledge in practice and in final projects in the context of ecological design by estimating masters students' experiences, perceptions, and attitudes. The research method of this study is a qualitative approach, and in-depth interviews have been done with masters-level students. The results of this study showed that the theoretical knowledge given in the lectures could change the opinions of a designer regarding ecological design. Based on the results, ecological design courses can increase the popularity of ecological building design strategies, which offers potential for more sustainable living environments and more environmentally friendly buildings, and their spread into human environments.

**Keywords:** sustainability; ecological design; architecture; design education; theoretical courses

## 1. Introduction

Architecture is a discipline that combines theoretical knowledge with practical output. Architecture is an epistemologically different field in that it has two aspects, both theory and practice [1]. Another interesting point is that theory in architecture cannot be determined as theory in the natural sciences; it is more subjective and a more institutional knowledge, compared to in the natural sciences [2]. Because of this, its estimation can be sometimes hard, and many debates on society can occur in a discussion of a product of architectural design [3]. It can have broad meanings, and each one of them can be read differently by different people, according to their perceptions [2]. This is one of the hardest aspects of architecture and architectural knowledge. The same situation is observed in the fine arts because both have an aesthetic dimension. However, architecture has a more primary position: its products and output of architectural design are related to spatial design and have more necessary functions when compared with outcomes of the fine arts. Accommodation is a basic living need for humankind and it is based upon other needs, with a need for feeding at the bottom of the hierarchy-of-need pyramid [4]. This function was accepted for humans only recently, but with the increasing ecological disturbances of the past century, designers have started to express its meaning by taking care of other living creatures, and accordingly they have started to design with nature and environmental cycles in mind [5].

The effects of climate change can be observed by the naked eye, and environmental pollution around the globe has increased. Many institutions have warned of environmental destruction and

mass extinctions. Carbon emissions into the atmosphere have increased day by day. The concept of sustainability has been formulated to solve these problems.

Sustainability has caused the development of ecological architectural design theory, in terms of sustainable development. Ecological design is an approach to architecture that conveys the use of green technologies, use of recycled material, the design and building of buildings with minimum carbon emissions, and other innovative techniques to integrate the building in nature. Similarly, there is an increasing trend in the building sector to estimate the effect of building on nature, from construction to decomposing phase, and BIM (Building Information Modelling) techniques have been integrated into all phases of the construction sector. Sustainable building design can be identified as designing and building of buildings without harm to the resources of future generations. This paper sought to find the importance of the theory in architectural practice of ecological design by assessing perceptions of architects. Theoretical knowledge regarding ecological design can be defined as shared wisdom between architects and environmental scientists about relationships between nature and buildings, which considers minimizing the effects of the building on the environment and the implementation of this knowledge in the design of the architectural products. Many studies have showed that the understanding of architects and laypersons is different [6], and many debates can be observed in terms of the value of an architectural product [7]. In ecological design, outcomes can be perceived differently, and different functions can be ignored by users [8]. This causes debate between experts and ordinary users causes, and there is a need to find balance between them, with shared wisdom and knowledge. To achieve this, theory is critical in terms of bringing them together. Both design and the context of the design in architecture have vital roles in building a sustainable community [9], and theory is a crucial factor in paving the way to creating it [10]. However, teaching theory is difficult in architectural education because of the unique nature of the architecture discipline. In theoretical lectures, some theoretical knowledge is taught to the students, and it is expected that students will be able to answer questions within this field. Students who memorize theoretical knowledge and answer questions will probably pass the exam, but if they do not use this information later, they will probably forget it. This situation means that useful information cannot reflect the final output, and in terms of architecture and ecological design, this output would be expressed by a more sustainable living environment, such as green buildings. Some different strategies have been formalized to increase the role of the theory in practice [11]. These strategies can help improve sustainable environments in terms of both ecological resilience and quality of life [12].

Education plays a central role in shaping individual and social change towards sustainability [13]. Professional education in universities provides not only the development and improvement of professional competence, but also an increase in the general cultural level [9]. In terms of architecture, universities departments and institutes are vital elements to transfer new technologies and approaches to the architectural design sector. This can be accomplished through the teaching of theory [14]. In terms of architectural teaching activity, theoretical knowledge learned from tutors in sectors where theoretical and applied courses are interpreted in practical design is expected. However, students are often unable to use this theoretical knowledge if it is not given when needed. In general, theoretical information not supported by application would be forgotten easily; however, the application of theoretical knowledge provides insight for individuals to improve their ability to design [15]. Therefore, more sustainable cities and living environments enrich daily life and ensure the future of human environments [16–18].

Some studies have reviewed sustainability issues in the construction sector [19,20]. Moreover, some studies have focused on traditional buildings [21], some of them consider the design phase of a green building [22], and others, the education phase [23], in terms of ecological design. This study focuses on the perception of architects regarding ecological design by estimating their description of it. There are some qualitative studies about sustainable design process [24], new architectural design methods such as co-housing [25] and communicative capability changes of architectural students [26]. They similarly use recordings of interviews as data and code their respondents' verbal expressions.

Theoretical lessons can always be applied in areas that require design skills such as architecture. In this context, this research is conducted with students in the Architecture Department during Ecological Architecture Research, where students are first given general theoretical knowledge, and then asked to design a small-scale ecological life capsule where they can apply this information. No exam is set, and a grade is given according to the success of the design project. In this context, students produce projects in which they can apply what they have learned in a theoretical way, in different environments, with different cultural and physical environments. Accordingly, the scope of this study is limited to a masters lecture, its students, and their perception of the lecture and its outcomes. A masters-level lecture was selected because its students are professional architects, practicing both architecture and its management in city municipality offices. They are very familiar with education, and some of them are future academic candidates. However, there are some limitations to this study. For example, the findings cannot be generalized because of its qualitative nature, finding clues about the perception of ecological design from the views of students and the effect of theory on practice and applications. Thus, the findings' limitations mean they should not be generalized to all architects; instead, its scope is limited to gaining insights about an ecological design lecture and its outcomes. It should not be forgotten that a qualitative approach was used as the methodology of the study.

The main aim of the study is to gain insights into the influence of theoretical knowledge on practice. The final projects of an ecological design masters lecture were used as research media in the interviews with research subjects. An ecological design lecture was selected as the research subject because ecological design is an essential part of the concept of sustainability. Our central assumption is that sustainability starts from a place where a responsible individual lives. The living environment is the primary medium that shapes life and lifestyles holistically. Thus, to build a more sustainable community in the future, architecture and ecological design will be critical elements. Because of the education of the designers who will shape future artificial spatial environments, more sustainably is essential for communities.

Based on this, the objectives of this study can be listed as follows:

- (I) To gain insight into the theoretical knowledge of practice
- (II) To find critical factors for educating designers to be more responsible towards sustainability
- (III) To investigate the architects' perceptions of ecological design
- (IV) To inform tutors of architectural lectures about knowledge-based design in ecology
- (V) To improve architectural education to build a more sustainable community.

From this point of view, it can be said that the overall aim of this study is to spread ecological design among designers as part of a sustainable community.

## 2. Materials and Methods

In this study, a qualitative research method has been used as the research methodology. It has implemented literature reviews and interviews and helps to find the insights into theoretical knowledge in lectures and its outputs. This insight should be gained more effectively by an understanding of individuals' perceptions about the lecture and its outputs. Despite quantitative methods having their own benefits, a qualitative research strategy allows for observing indicators, which cannot be gained and sorted by classical data collection tools such as questionnaires. Moreover, some other research questions, rather than "how much" or "how many", such as "how", "what", and "why", can be answered by data gained by qualitative research methods. Because the primary objective of the study is not to prove relationships by statistical analyses but rather to gain insights about relationships between theory and practice in terms of ecological design, a qualitative research method is best suited. Moreover, the research population was quite small, and the size did not allow for statistical analyses.

Ecological design is selected as a topic because of its healthy relationship with the concept of sustainability. In addition, in terms of the dissemination of the sustainability concept, architects

who are in both practice and management in the city are seen as the main actors. In conclusion, the discipline of architecture is a crucial element of building sustainable spatial organizations in local and global spheres.

Because investigations of architects' experiences relate to the insight into the theoretical knowledge of practice in terms of ecological design, master students who have participated in a lecture about ecological design are the best subjects for this study. The ecological design lecture given at Akdeniz University's Architecture Department was selected as a case study, and students of the lecture were selected as the research population. No probability sample was used because it is small-scale pilot research. All the students who took this lecture (seven master students) were selected as the research sample. In interview phase, participation was voluntary, and all subjects gave their permission interview recordings to be used as research data. Seven interviews were done in March 2018.

Semi-structured interview questions had three different parts, and some additional questions were asked according to the responses of the subjects. Qualitative verbal data was collected through questions from semi-structured interview forms which were related to their professional background, perception of ecological design and of the ecological design lecture, and insights about projects that were conducted at the end of the lecture. Interviews were done by researchers with face-to-face verbal communication, and voice recording was done with the permission of the respondents. Four interviews took place at Akdeniz University campus, and the other three interviews took place in work environments such as municipalities or the design studio of the students. In Turkey, some of the students are going to study at graduate level and work as a professional at the same time because of institutes' funding restrictions. In this study, five of the subjects are both practicing architecture and studying at graduate level. The respondents' characteristics are given in Table 1.

**Table 1.** Definitions and role of the respondents.

	Position	Graduate	Expert	Audiotape
AZ	Practice in Sector	2014	Residential Projects/Commercial Projects	Yes
BY	Management	2014	Public Projects	Yes
CV	Education	2017	Urban Open Spaces	Yes
DU	Education	2017	Public Projects	Yes
ES	Management	2016	Public Project	Yes
FT	Practice in Sector	2016	Indoor Design	Yes
GS	Practice in Sector	2017	The innovation of Building Materials	Yes

The final projects of the masters students were used as practice outputs for evaluating their experiences from the lecture. Subjects were asked questions based on the semi-structured interview form about their perception of ecological design. They were also asked to evaluate all the projects that made up the final project of the lecture, including their own (Table 2).

**Table 2.** Stimuli used in interviews.

Stimuli						
						
AZ	BY	CV	DU	ES	FT	GS

Each interview began by asking about their educational and professional backgrounds and their expertise in different architectural positions. Then they were asked about their estimations and perceptions of ecological design, their definitions of it, and the effect of the lecture on their perception

of ecological design. It also tried to collect insights into the influence of theory on ecological design application. Finally, each project was shown to the respondents and they were asked for their thoughts.

The interviews lasted around 30 min, with some of them taking 40 min to one hour. All of them were done in the native language (Turkish) of the respondent. All recorded audiotape data was transcribed verbatim and typed into a word processor as raw data for content analysis and coding. Content analyses were done in the native language too; after investigations, translation of the cited conservations, codes and themes were made into English by the author. Some of the unique expressions peculiar to the native language have been lost in the translation phase, but the main content has been translated precisely. Despite the translation of the results causing loss of some comments, the essence of the conservation has been reflected in the paper. The data was analyzed with the help of a qualitative analysis program called Nvivo (ver. 10). The transcription of the sound data produced 14,842 words of data. All this data was analyzed using content analyses, coding, and thematic analysis.

### 3. Results

Students were asked how they define ecology and ecological design, why they define the terms like this, their perception of the terms and the effect of the lecture on their perceptions of ecological design. According to AZ, the most critical factor in ecology is not to interrupt the environment. She stated that “without interruption to the environment and by using opportunities of the local environment—being environmentally friendly is important—the design that sustains itself uses its own resources and productions without dependence on outer systems, and a holistic design uses its landscape of the endemic and natural vegetation of the area.” She stated that she has tried to apply this concept to her final project. For example, the choice of building aspects, the setting of the building, and the general settlement plan are all estimated in light of climate adaptation, and she tried to build a self-sustaining system for the energy needs of the building. She indicates that all these items and principles are essential for her to achieve an excellent ecological design. She highlighted the importance of the lecture they attended. She stated that they had been given a topic about building adaptations to local climate, and this topic was taught throughout the whole week. This topic was vital for her, and she was very impressed.

Ecology is a general concept, and it should not be estimated by only the view of the architecture. According to her, ecology is a general science that concerns all living and non-living things in the world and the relationship between them. When she thinks about the concept in the context of the architecture, she stated that architects have generally perceived the building as a thing that is separate from nature. They are individual elements separate from nature and free from the effects of nature. She stated that the situation would be evaluated in detail and they can see that buildings are part of nature too, and as time passes nature’s invasion on buildings can be seen by the naked eye. According to her, the lecture about ecological design has improved her building knowledge more precisely. She stated that before she took the lecture, she had little knowledge about the carbon production of concrete and passive energy systems (like solar panels for water). After she had taken the lecture, she had an in-depth knowledge of ecological design. She stated that the lecture changed her perception. Before she took the lecture, she thought that ecological design depended on expensive systems and was not suitable for the everyday user, but when she saw the concepts and techniques used in the ecological design she understood that they can be applied even to simple public buildings.

According to GS, ecological design is an adaptation of the humankind and their need for nature. He stated that environment could be defined as the origin of humans. According to him, environment is divided into two sections: one is natural and other is artificial. According to CV, ecology is merely a system of nature, and she thinks that all the resources in nature are part of this system. DU has a lateral view with BY. She stated that ecology is knowledge of the environment that concerns the relationship between living and non-living things. FT has a similar perception about ecology but added that according to her, buildings are living things too, with a life cycle like living creatures. ES has estimated ecological design through the aspect of the sustainability. She indicates that ecological design

is sustainable, uses renewable energy and does not disrupt nature with its settlement, construction, and period of use (Table 3).

**Table 3.** Codes of respondents.

Codes	AZ	BY	CV	DU	ES	FT	GS
Ecology is not interpreting the nature	+	+				+	
Ecology is a science of interaction between living and non-living creatures		+		+		+	
Ecology is the system of nature			+				
Ecology is the adaptation of the Human to nature							+
An aspect of the Sustainability					+		
The courses have changed my mind about ecology		+					
Ecology courses help to improve my design	+						

AZ has estimated the projects on the success of the passive design strategies that help to energy saving of the building. In addition, she indicates that active systems for energy production of the building would help the system as a self-sustaining way. Moreover, she states that the vegetation around the building is very important and it would be suitable with the climate. She added that “the species planted around the buildings should be selected from endemic vegetation of the regions”. BY estimated the projects in term of the building integrity with landscape. She mostly highlights the importance of climate of the region and design techniques for buildings should be suitable with it. Moreover, she indicates that systems used in buildings should minimize the energy costs. CV mostly indicate that climate and protection of the building from energy loss is important. She states that “the view of the building should be optimum angle to collect natural light especially direct sunlight”. DU mostly highlighted the technology used in building design. She mostly estimates the technology of building according relation with ecological design. According to ES air circulation in indoor space of the building is important. From ecological view passive circulation systems should be used to save energy. According to FT use of local material is most important issue in term of the ecological design. She stated that ecological design should mimic the nature and traditional buildings and their design logic are good resources for achieving this aim. According to Gs general layouts of the projects is most important issue in term of the project estimation. Additionally, the material used in building should be selected with carefully and follow innovations in material science.

#### 4. Discussion

AZ, DU and FT have parallel definitions about ecology, and they have differed only in terms of their attitude towards design. AZ and BY indicate the importance of the theoretical lectures on the development and design of the final projects. BY has indicated the lecture led her to change her perception of ecological design, moving to a different position. She finds it more applicable than in the past when she considers the topics of the lecture. All the interviewers have a positive attitude towards all projects, including their own projects. They indicate that they estimate more consciously the projects when they are compared with the past. They are very sensitive to the context of the projects, and they estimate all the projects in their conditions. They highlighted the natural and ecological conditions that have been considered in the projects. Because of them, it can be said that ecological design lectures are essential to educating more sensitive designers about sustainability, and theoretical knowledge can cause a change in the attitudes of the architects.

In addition to these, lecture help to spread new technologies among the designers. They can use this technology in their design or they effectively read this technology from other projects. Moreover, the integration of the building with its context is important for students. With achieving this more ecologically sound designs can be established. Another important point that the students highlighted in self-sustaining in term of the energy production and energy saving in the whole building. Another point is that students looks traditional architecture in a different way. They seem it as a resource for

passive ecological design strategies and they willing to adapt them in modern building units with an innovative fusion.

### *Implications*

These findings are significant in terms of the spread of the sustainability concept and ecological design education. Based on the results, it can be said that lectures can change the attitudes on the ecological design of the architects. To educate more sensitive architects, ecological design courses should be given more detail in the lectures of the undergraduate phase of the architecture. Another point is that the inform on the architects about new innovations in design and material science is important too. Ecological wisdom can gain more effectively with understanding of the natural cycles by designers. In addition, adaptation to these natural cycles is important. With understanding this process, it is possible for community to make more effectively design and to build more sustainable living units. Therefore, ecological design would become as essential part of the building sector and architects from any age would part to build more ecological buildings.

### **5. Conclusions**

Ecological design is the important step towards a sustainable community, because the building industry is most important field in terms of the negative effects on nature. An ecological design approach can help to minimize the negative effects of building on nature. Therefore, spreading the wisdom and philosophy of ecological design among architects is important for educators and researchers of the architectural design discipline, causing more rational use of natural resources, which will help protect nature. In addition, the logic behind nature should more precisely understood by architects, causing buildings to be more successfully adapted to natural conditions and self-sustaining. To achieve this, ecological wisdom in the design phase of a building is important. Results showed that architects have improved after being informed of different ecological design approaches. Each of them has different attitudes towards ecological design, but they expressed that they have gained the ability to design buildings in a more ecologic and sustainable paradigm. Architects in both practice and management are essential for building a sustainable community. In most developing countries in Asia, building designs and built processes still do not consider ecological aspects of buildings, and their current architectural education systems have problems regarding delivering knowledge about basic ecological cycles and natural systems; most of them remain more mechanical. However, with increasing integrity of ecological wisdom in architectural education, architects can be more conscious about ecology in the design phase of a building. The scope and aim of the ecological design course which is the subject of this study is to educate and inform designers with the concept of ecology and ecological design, and to offer theoretical knowledge about ecological architecture and ecological design principles. Giving this theoretical knowledge would help improve consciousness of the sustainability and ecology concepts and gain the ability to design buildings in terms of ecological design. Some students forget the theoretical knowledge in a very short period. However, as seen in the results, when theoretical knowledge is supported by application and practice, designers will resolve real design problems and to use their theoretical background in the design phase. With this treatment, the result of the course can be met with its proposed aim and scope. Experiences and expressions of the students show the importance of their theoretical knowledge on their designs. This study revealed the importance of the theoretical courses on the practice and application of ecological design, in terms of theoretical knowledge of practice. The research suggests that the perceptions of architects and designers can be changed in a positive way, with direct implementations of theory before and during the design phase. Knowledge about ecological design improves both the design technology and the perceptions of the designed projects.

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## References

- Marcus, L. The need for theoretical knowledge in architectural practice. *Nordic J. Arch. Res.* **2013**, *15*, 37–42.
- Dünder, Z. Mimarlık? Kuram? Mimarlık ve Kuram? Available online: <https://mimaritasarimvelestiri.wordpress.com/2012/02/27/mimarlik-kuram-mimarlik-ve-kuram/> (accessed on 27 June 2018). (In Turkish)
- Nasar, J.L. *The Evaluative Image of the City*, 1st ed.; Sage Publication Inc.: Thousand Oaks, CA, USA, 1998; pp. 17–30. ISBN 0-8039-5447-6.
- Maslow, A.H. The Instinctoid Nature of Basic Needs 1. *J. Pers.* **1954**, *22*, 326–347. Available online: <https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-6494.1954.tb01136.x> (accessed on 5 June 2018). [PubMed]
- Yang, B.; Li, S. Design with Nature: Ian McHarg’s ecological wisdom as actionable and practical knowledge. *Land. Urban Plan.* **2016**, *155*, 21–32. [CrossRef]
- Gifford, R.; Hine, D.W.; Muller-Clemm, W.; Shaw, K.T. Why Architects and Laypersons Judge Buildings Differently: Cognitive Properties and Physical Bases. *J. Archit. Plan. Res.* **2002**, *19*, 131–148.
- Gifford, R.; McCunn, L.J. Appraisals of built environment and approaches to building design that promote well-being and healthy behavior. In *Environmental Psychology: An Introduction*, 1st ed.; Steg, L., Van den Berg, A.E., de Groot, J.I.M., Eds.; BPS Backwell Publications: West Sussex, UK, 2013; pp. 87–96, ISBN 0479976381.
- Gou, Z.; Prasad, D.; Lau, S.S.Y. Are green buildings more satisfactory and comfortable? *Habitat Int.* **2013**, *39*, 156–161. [CrossRef]
- Asafova, E.V. Development of Ecological Culture of Students in the design and Creative Activity. *Proc. Soc. Behav. Sci.* **2015**, *191*, 2329–2333.
- Özen Yavuz, A.; Çelik, T. Proposing a Generative Model Developed by Ecologic Approaches in Architectural Design Education. *Proc. Soc. Behav. Sci.* **2014**, *143*, 330–333. [CrossRef]
- Gülgeç Özer, D.; Turan, B.O. Ecological Architectural Design Education Practices Via Case Studies. *Megaron* **2015**, *10*, 113–129. [CrossRef]
- Asilsoy, B.; Oktay, D. Exploring environmental Behaviour as the primary determinant of Ecological Citizenship. *Sustain. Cities Soc.* **2018**, *39*, 765–771. [CrossRef]
- Akinci, Z.; Yurcu, G.; Kasalak, M.A. The mediating role of perception in the relation between Expectation and satisfaction regarding Sustainability in tourism education. *Sustainability* **2018**, *10*, 2253. [CrossRef]
- Oktay, D. Mimarlık ve Sürdürülebilirlik, Güncel bir değerlendirme ve öneriler. *Güney Mimarlık* **2011**, *6*, 14–17.
- Todd, J.; Brown, E.J.G.; Wells, E. Ecological design Applied. *Ecol. Eng.* **2003**, *20*, 421–440. [CrossRef]
- Steiner, F. Frontiers in Urban ecological design and Planning Research. *Landsc. Urban Plan.* **2014**, *125*, 304–311. [CrossRef]
- Steiner, F. The Ecological wisdom of plan-making. *J. Urban Manag.* **2018**. [CrossRef]
- Romance, R.; Nielsen-Rodriguez, A.; Benitez-Porres, J.; Chinchilla-Minguet, J.L.; Morente-Oria, H. Cognitive Effects and educational possibilities of physical activity in sustainable cities. *Sustainability* **2018**, *10*, 2420. [CrossRef]
- Zavadskas, E.K.; Sapauskas, J.; Antucheviciene, J. Sustainability in construction Engineering. *Sustainability* **2018**, *10*, 2236. [CrossRef]
- Conte, E. Sustainable Use and Management of Natural Resources in Buildings and the Built Environment. *Sustainability* **2018**, *10*, 2472. [CrossRef]
- Baran, M.; Yıldırım, M.; Yılmaz, A. Evaluation of Ecological design strategies in traditional houses in Diyarbakır, Turkey. *J. Clean. Prod.* **2011**, *19*, 609–619. [CrossRef]
- Xiahou, X.; Tang, Y.; Yuan, J.; Chang, T.; Liu, P.; Li, Q. Evaluating Social Performance of Construction projects: An Empirical Study. *Sustainability* **2018**, *10*, 2329. [CrossRef]
- Pankina, M.; Zakharova, S. The Need for Ecologization of Design-Education. *Proc. Soc. Behav. Sci.* **2015**, *214*, 338–343. [CrossRef]
- Stipo, F.J.F. A Standart Design Process for Sustainable Design. *Proc. Comp. Sci.* **2015**, *52*, 746–753. [CrossRef]

25. Wang, J.; Pan, Y.; Hadjiri, K. Creative Housing Design: Promoting sustainable living in cohousing community in the UK. *Environ. Behav. Proc. J.* **2018**, *3*, 129–140. [[CrossRef](#)]
26. Mohammad, N.M.N.; Samah, S.A.A.; Muhammad, A.M. Exploring the Communicative Capability Challenges of Architectural Undergraduates. *Environ. Behav. Proc. J.* **2018**, *3*, 3–11. [[CrossRef](#)]



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