



Towards Children Engagement in Urban Design Development for Sustainable Communities The case of Child's University at Alexandria University, Egypt

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Abstract

There is a growing interest worldwide to increase the community awareness about sustainable development goals by engaging different categories of a society to participate in the process of sustainable community development. This importance of the society perception towards the role of community development, leads to the idea of an experiment research to engage a number of school children aged between (10-13) years old in the process of sustainable urban design. This experiment research is the result of a cooperation project between the Child University at Alexandria University, Egypt and Smithsonian Science Education Centre at USA.

The research aims to document the experimental part of the project and how to engage children different in gender, abilities and education types in Alexandria into the design process for designing a sustainable open space in one of the informal neighbourhoods at Alexandria city, Egypt through applying principles of sustainable communities and sustainable development goals.

Keywords: public awareness, sustainable goals, urban design, community developments, informal settlements.

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1. Introduction

Governments are expecting to encourage developing cities to act more sustainable socially and environmentally [1]. By encouraging various societal groups to take part in the process of sustainable community development, especially those in informal settlements, this raises the need for community engagement awareness of sustainable development goals. In many countries nowadays one of the national planning strategies is aimed at encouraging urban childhood activity and guarantees specific involvement rights for children and youth in the planning process. Children's involvement is about giving children from different ages and abilities the chance to express their opinions, participate in decision-making, and effect change in their communities [2]. This participation of children is a fundamental principle that guides them to work in all spheres, from households to government, and from local to global levels [3].

1.1. Public awareness and children participation

In developing countries people specially children shows a lack of awareness about their communities planning rights and participation in the decision-making process. The seven Golden Rules for Participation developed by United Nations Committee (as shown in Figure 1) are a series of guidelines created to assist those who work with and for children and young people in supporting them as they comprehend, experience, and practise their rights to participate in sustainable communities' development [1], [4].

The United Nations Committee (2009), [3], [6] directly informs the Golden Rules to be:

1. Understand rights
2. A chance to be involved
3. Remember it is own choice
4. Giving Values
5. Supporting
6. Working together
7. Keep in touch



Fig. 1. The Golden Rules by United Nations Committee (2009) [3], [6]

These fundamental guidelines provide the framework for achieving of participation rights that is efficient, moral, and substantive. Instead, they serve as guiding ideas to use in routine work with kids and teens. Participating in the profession also helps make respectful connections with the children and teenagers they work with.

The General Comment No. 12 on the Rights of the Child, 2009 [3],[5],[6] was produced with the following goals in mind:

- Consultation with young people and children
- Mature professional research that reflects the skills and wisdom of those promoting involvement.

1.2. Community development and informal settlement

The first step in trying to control informality, a recessive characteristic feature of Egyptian urbanization, is to deal with it. According to the official data and indicators used to track this urban phenomenon, informality has become a well-established urbanism pattern that now effectively controls a significant section of the country's economy. This could be viewed from several angles. One of these crucial viewpoints is the capacity of these settlements to develop resilient traits that enable them to persist through time and deal with numerous challenges. Actually, this demonstrates their capacity to responsibly adjust to various situations and highlights their capabilities as strengths that any development process may successfully build on [7]. To put these communities on the correct path, nevertheless, will take significant work. One of those challenges is to involve children in the decision-making process and community sustainable development of these settlements.

2. Research Structure

The importance of the society perception towards the role of community development, leads to the idea of an experiment research to engage a number of school children aged between (10-13) years old in the process of urban sustainable design as a center of development in one of the informal neighbourhoods at Alexandria city.

2.1. Project Aim

The project is the result of a collaboration between the Smithsonian Science Education Center in the United States and the Child University at Alexandria University in Egypt. The initiative seeks to engage children ages between 10-13 years in experimental work of an urban planning project by working with kids from various educational backgrounds, ages, and abilities within the context of sustainable community projects.

2.2. Methodology

The project presents several interesting challenges related to how children perceive, assess, evaluate their knowledge, and develop their ideas. To engage kids in the analysis and development of one of the local and informal communities within the action plan of urban planning development project carried out by the Alexandria University Center of Excellence for Smart Urban Governance (ALEXU-COE-SUG). Three trained tutors introduce the principles of sustainable communities and sustainable development goals to a selected group of students enrolled in the Child University at Alexandria University. The objective is to create a sustainable open space in the informal settlement of Ezbet-Hegazy at Smouha

district, Alexandria as shown in the map of Figure 2. The project depends on a methodology consists of a theoretical base on sustainable development strategies, experimental and exploratory understanding ending with applicable action with a physical model

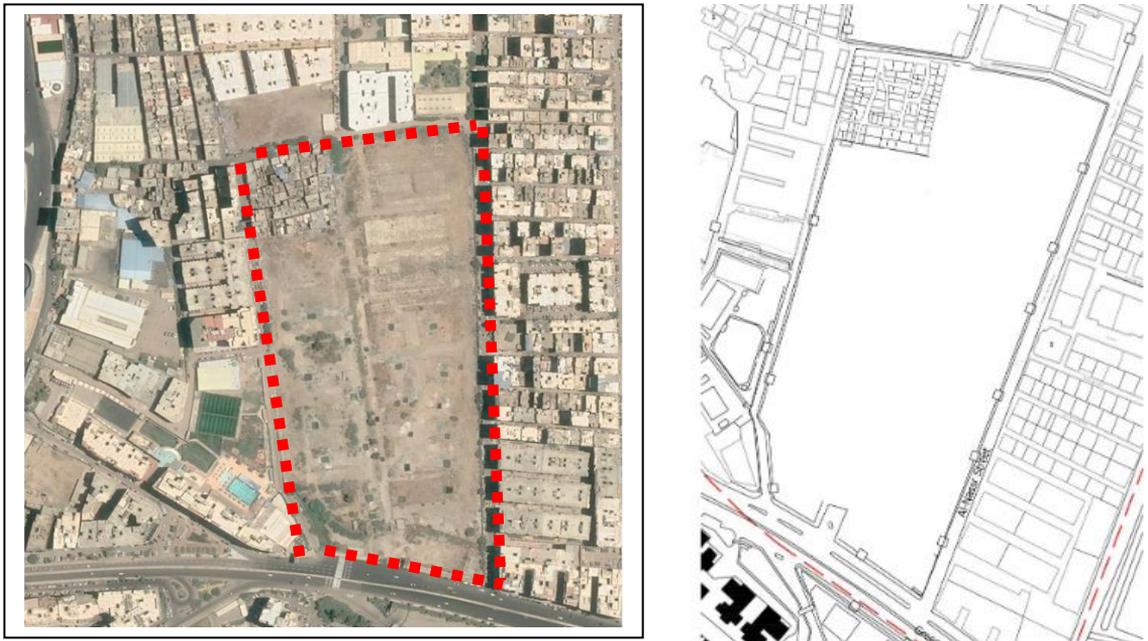


Fig. 2. Maps for the selected project area located in Ezbet-Hegazy at Smouha district scale (1:2000).

2.3. Children Selection

The experiment sample for the workshop selected 12 children both genders and from different school educational types (local, national, private, international) in Alexandria (as shown in Table 1)

Table 1. shows age grouping and distribution of experiment sample

Age grouping	Number of students	Educational back ground	Geographical distribution
10 years	5 students	Private/ public school sector	5 from Alexandria
11 years	4 students	Private/ public school sector	1 from suburbs Alexandria 3 from Alexandria
12 years	2 students	Private/ public school sector	1 from suburbs Alexandria
13 years	1 student	Private sector School	1 from Alexandria

2.4. Project Stages

The work has been divided through following stages as shown in Table 2:

- Tutors online training with Smithsonian Science educational center through 10 hours of professional development on Sustainable Communities.
- Preparation and literature reviews included brain storming sessions, lectures and a workshop handled through five weeks started from 7/7/2022 to 18/8/2022 at the Architectural Engineering Department, Faculty of Engineering, Alexandria University.
- Project first stage with brief introduction, aim and objectives clarification, methodology and interests' observations from students.
- Project pre and final stage with sketches, mind map works, try and error details and a 3d model pilot project.

Table 2: activities workflow

Dates	Event
5/7/2022 – 6/7/2022	Tutors online training with Smithsonian Science educational center
6/7/2022 -18/8/2022	Preparation and literature reviews
18/8/2022 - 8/9/2022	The project (2 weeks)
18/9/2022	Project submission

The experimental part is based on the Sustainable Development Goals (SDG's) and the module developed by Smithsonian Science Education Center manual handout [8] in collaboration with IAP (Inter Academy Partnership) science health policy. The experiment is constructed on a framework based on the Global Goals **Action** Progression; Discover, Understand, and Act as shown in Figure 3. Since children are social agents in their own right, the experiment privilege acknowledges that they have the right to participate in decision-making [8]. Their early involvement in urban planning makes their participation in the urban development cycle more relevant [9], [10].



Fig. 3 Global Goals Action Progression [8].

The experiment work passed through three main phases; theoretical phase (Discovery), the practical and explanatory phase (Understanding) and application phase (Action), as shown in Table 3

Table 3: experiment main phases

Phase	Dates	Topics	Sequence	Outcome	
Theoretical	Discovery phase	Meeting 1 - Day 1 21/8/2022	Introduction	sustainable community concept perfect community concept	Discover ideas about perfect community.
		Meeting 2 - Day 2 23/8/2022	Sustainability pillar	The pillars of environmental, economic and social aspects in order to achieve the sustainability concept	Discover the problems in our community to the social, environmental and economic aspects.
		Meeting 3 - Day 3 25/8/2022	Sustainable spaces	Introduction about spaces in the community and the difference between urban and rural areas and shared and personal spaces	Discover ideas about the open, shared and, public spaces.
		Meeting 4 - Day 4 28/8/2022	Sustainable transportation	introduce the children to the part 5 which is concerned with transportation	Discover ideas about sustainable transportation.
		Meeting 5 - Day 5 30/8/2022	Sustainable community	generating some ideas about sustainable open spaces	Starting to approach the major problem.
Practical And Explanatory	Understanding phase	Meeting 4 - Day 4 28/8/2022	Introduction to the project	Site visit, collecting data about Ezbet Hegazi, Smouha , Alexandria Introduce the children to know the area and its surrounding community and starting to analyses the needs of the community	Understand problems related to the site.
		Meeting 5 - Day 5 30/8/2022	Collecting solutions	generating some ideas about sustainable open spaces	Starting to approach the major problem.
Application	Action phase	Meeting 6 - Day 6 4/9/2022	Project development	show and modify the prototypes the children developed	Examined and development of prototypes and ideas
		Meeting 6 - Day 6 18/9/2022	Final project submission	Video and final project preparation	Final submission.

2.4.1. Discovery phase:

This is the first phase of the project work that took 5 Days, introduced the children to the main principles and concept of sustainability related to the urban development. This phase focused on children’s thoughts, excitement, and energy to advance the cause of a better world. They participated in the planning and construction of the society they desire based on lectures from the Smithsonian institutions’ manuals of sustainable communities, spaces and transportation [8]. as shown in Figure 4.



Fig. 4. Smithsonian Manuals for Sustainable Communities, Space and Transportation [8].

Activities in this phase has been concentrated on conveying the concept of a sustainable community, together with its resources, infrastructure, and private and public spaces. Learn the differences between public and private zones in our immediate environment. The children make significant decisions about what and how they will learn throughout the exercises and lectures in this stage. The phase's goals are for the participants to comprehend neighborhood concerns and act responsibly to enhance their communities.

From their perspectives (as shown in figures 5 & 6), children design one identity map and own vision for a proposed sustainable community.

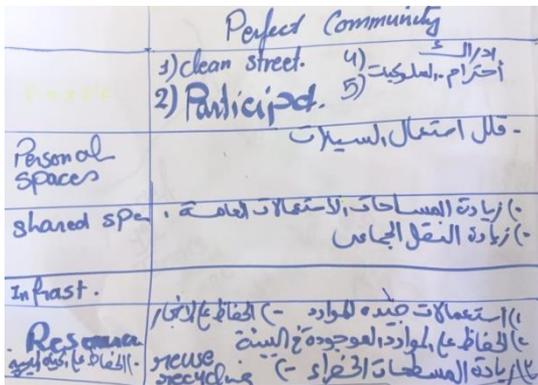


Fig. 5. Example of children’s ideas about perfect community.

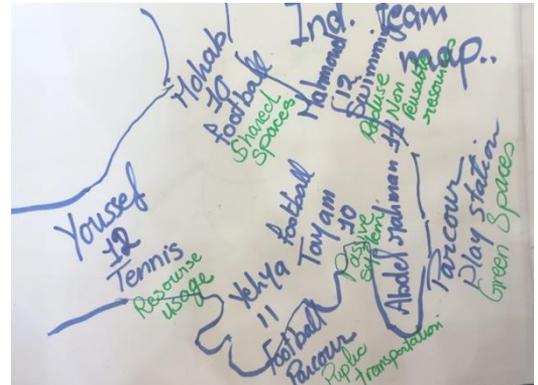


Fig.6: Example of team identity map.

Children learn about the environmental, economic, and social pillars of sustainability in this stage to assist them understand that all three pillars must be addressed in order to achieve the sustainability concept. Following is some of the kids' opinions on each topic as shown in figure 7:

- Environmental: air pollution – forest fires – deforestation – water related issues - overexploitation of natural resources
- Social: Spread of illiterate – unemployment – bullying – overpopulation and accidents – high prices of food that lead to poverty – negative behaviors from the people in the community - respect others
- Economic: High prices

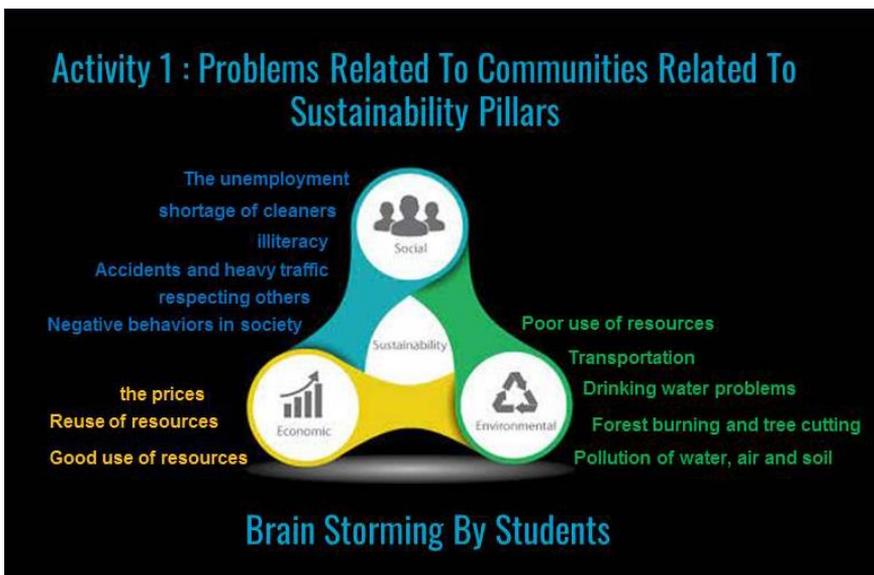


Fig. 7. The Three Pillars of Sustainable communities made by students.

Children came to the deduction that all of the issues, such as climate change, are interconnected on a global basis [9]. People founded the United Nations and the Sustainable Development Goals for this reason. Several of the answers suggested by students' ideas include:

- Lightening with sensors to reduce electricity consumption
- Isolation ideas and using of photovoltaic cells
- Collection of wastes in a system from each building
- Reduce consumption of local products as to reduces the prices
- Robots for cleaning the roads and streets
- Sustainable transportation through using bicycles and electrical cars
- Reduces water consumption and use it in a more sustainable way
- Sensors to detect water pollution
- Special roads for handicapped persons

In addition, students have discovered their insights from reading and watching some of the videos about sustainable communities. To list some ideas as follow and shown in Figure 8:

- Increase green areas
- Sustainable transportation by using cycles and electrical trains and buses
- Special areas for handicap people
- Rewarding system for plastic collection
- Using sustainable energy sources
- Create a sense of belonging
- Make community more resilient to disasters
- Reduce, reuse, recycle
- Revalue the culture and heritage
- Filters for emissions control
- Increase equality between community members.

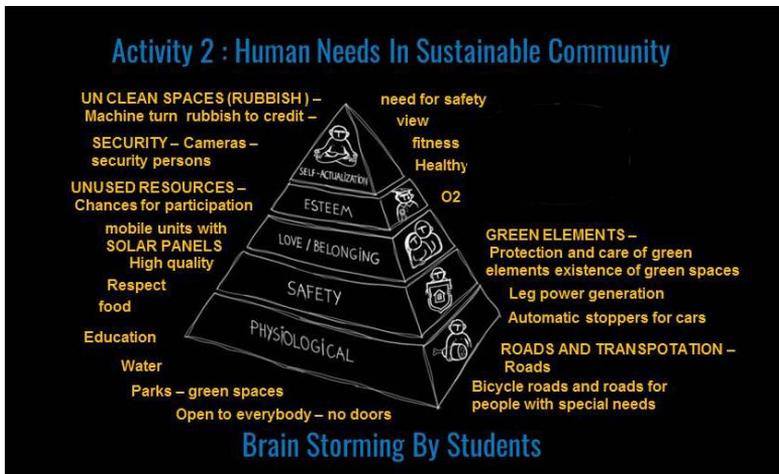


fig 8: The Three Pillars of Sustainable communities made by students.

Children were also introduced to sustainable transportation principles during the discovery phase, and their main finding was understanding the various forms of transportation available in the community, the components of the transportation system, and the issue of greenhouse gas emissions from the transportation system shown in Figure 9.

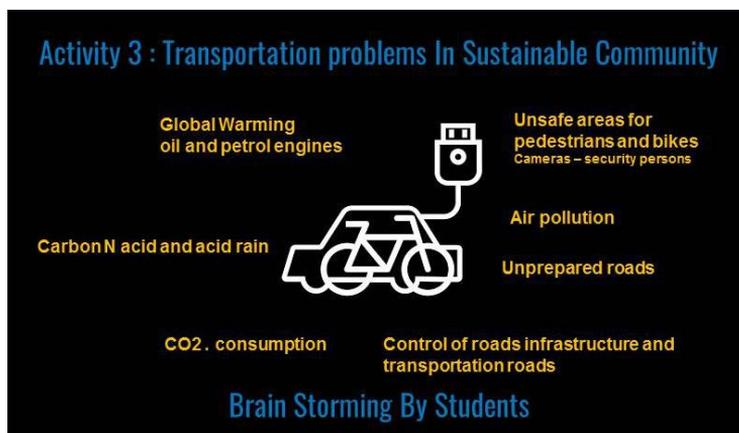


fig 9: The discussion board on sustainable transportation problems made by students.

2.4.2. Understanding phase:

Children worked on how to create action research plans throughout this phase and acquired data on components of sustainable communities. They used a scientific investigation and experimentation method to learn more about the community problems as well as how society works and deals with it to reach sustainable solutions when social science and other sciences are merged together as shown in Figures 10, 11.

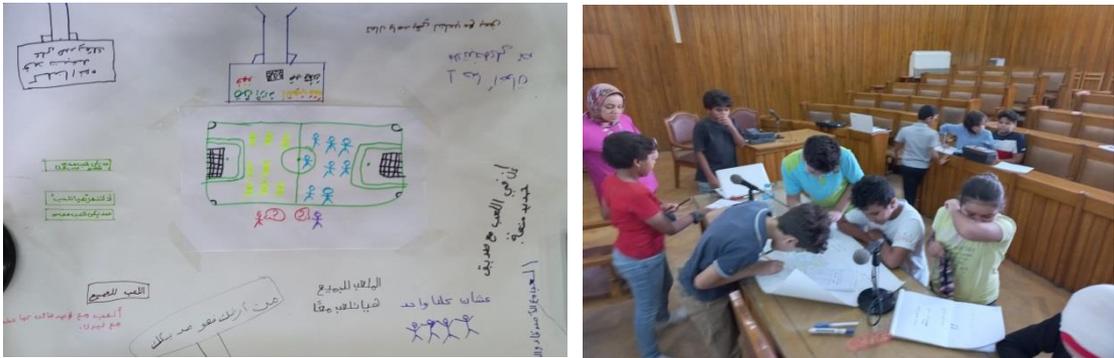


fig.10: Example of children work on one of the community problems (participation in sustainable space)



fig.11: Example of children participation to solve community problems (participation in sustainable space)

The action phase's objective was to support children learning and acting in their communities for better sustainable design choices. Children were undertaken research during this stage, then utilize the findings to decide design elements for the selected proposed area. Finally, they summarized decision choices into action and monitor the outcomes supported by a site visit to the selected area. A huge board that depicts the planned design for the sustainable open space in Ezbet Hegazi, Smouha, Alexandria, have been used to develop their ideas into a prototype and design solutions for the challenges that come from those ideas. The proposal was designed using the MineCraft software [11], by one of the team students to design the base map. Each student tried to solve one or more of the problems regarding the issues of: transportation, recycling system and units, lighting system, sustainable setting areas, services, sports activities, recreational activities and green areas as shown in Figure 12



fig.12: Example of children results ideas for sustainable solutions

3. Discussion

Children created a model of public space that will serve sustainably for Ezbet Higazy neighborhood at Smouha district. The proposed project, as well as the Center of Excellence concept and initiatives targeted at resolving issues with urban governance for informal settlements, would increase the area's effectiveness and quality of life. The proposed design was based on a site visit and problems observation that have been translated into sustainable design solutions on the final proposal documented in levels as shown in Table 4 bellow.

Level 1: Open Green Spaces and Playgrounds

- Providing green areas with planting a shade tree (Acacia), that considered a fast-growing tree. Reuse of waste water in the cultivation of shade trees. Use of tree Alzalkht insect repellent. Use of bougainvillea, lemon and jasmine trees.
- Providing smart seats with mobile charging options to attract more people.
- Providing play areas for children.
- Designing a football playground and studying its correct orientation, while providing suitable seating areas around it provided by shading areas and renewable lighting units.

Level 2: Transportation

- Determine a path for bicycles, scooters and strollers, specifying the appropriate width and design tracks conditions with "acrylic" paving material, smart stoppers and parking stations provided with the idea of bicycles generated energy.
- Determine pedestrian walkways and choose the appropriate paving pattern, seating areas and lighting features.
- Finding appropriate design solutions for people with special needs in terms of traffic corridors, how to use the various facilities, and the use of land inclinations in appropriate proportions.

Level 3: Systems

- Providing a variety of affordable services to be accessible for all with the consideration of using solar panels to have clean energy sources.
- Design lighting units in different shapes and technical systems using sensors to save energy and rely on solar energy.
- Design of covered seating areas with the use of solar panels on the roof.

Level 4: Sense of belonging

- Add elements that enhance the sense of belonging to the community and the surrounding environment by establishing a small library for the neighborhood, enhancing community activities and using the public service to participate among children and people with special needs.
- Encourage donations for public community services.

Level 5: Recycling

- Design waste recycling services in the proposed public space

Level 6: Social participating

- Campaigning against bullying and to encourage community participation.
- Making banners to raise awareness against bullying

Table 4: Observed problems and proposed solutions



Task	Activity	Number of students	Details	notes	solutions
Open / green spaces	Green spaces Kids playground	1	Allocating green spaces and determining the best type of trees to use so that they provides shades for most of the sunny days of the years	The slippery tree Jasmine tree The most suitable type of tree Acacia tree	<ul style="list-style-type: none"> • Providing green areas • Planting a shade tree (Acacia), a fast growing tree • Providing smart seats (for mobile charging) • Providing play areas for children • Providing circular seats for interaction and celebrations • Reuse of waste water in the cultivation of shade trees • Use of tree Alzalkht insect repellent • Use of bougainvillea, lemon tree and jasmine
	Football playground	1	Designing a football field and studying its correct orientation, while providing suitable seating areas around it	Playground design and orientation	<ul style="list-style-type: none"> • Orientation of stadiums • Making playground floors from grass and recycling water for irrigation • The work of lighting fixtures powered by renewable energy to illuminate the stadiums • Creating shaded areas around the stadiums with lighting units
	Basketball playground	1		28*15 Asphalt floors The type of flooring	
Transportation	Cycling track	1	Determine a path for the use of bicycles and the like (scooters and strollers), specifying the appropriate width and design conditions, if possible	Track 3.5 per bicycle Flooring Type "acrylic" stoppers parking stations "bicycles to generate energy"	ways for the bicycles and it is separate from the pedestrian movement

Systems	Pedestrian rotes	1	Determine pedestrian walkways and choose the appropriate flooring pattern and seating areas	pedestrian walkways internal movements Lighting and landscaping are places for people to sit.	<ul style="list-style-type: none"> • Make pedestrian rotes • Make trees as shaded stations • Makes shaded area as rest stations • Put chairs and setting area under the trees • Make cycling rotes • Make pedestrian rotes by gross and stones • Emergency entrances
	Handicap (Special-needs)	1	Finding appropriate design solutions for people with special needs in terms of traffic corridors, how to use the various facilities, and the use of land inclinations in appropriate proportions		Paved paths for people with special needs
	Services (solar panels) (needs)	1	Finding places for services and choosing the types of services that must be provided, using solar panels to use clean energy sources		<ul style="list-style-type: none"> • Providing a variety of inexpensive services to be accessible to all
	Lighting (sensors)	2	Designing lighting units in the place and using sensors for the movement of individuals around them in order to optimize the consumption of electrical energy, using solar energy.	Sensors	<ul style="list-style-type: none"> • Design lighting units in different shapes and technical systems • Using sensors in lighting units to save energy and rely on solar energy
Systems	Shades (solar panels)	1	Design of covered seating areas and the use of solar panels on the roof	above the chairs Service seating units "	<ul style="list-style-type: none"> • Shaded areas with places to sit • And put seats with solar panels • Placing shaded areas at children's play areas • And place a shade tree at the games area • Put a fountain to cool the air and irrigate the flowers • Use of solar panels in all light installations in the park
Sense of belonging		1	How to add elements that enhance the sense of belonging to the community and the surrounding environment		<ul style="list-style-type: none"> • Establishing a small library for each person to teach others the experiences in which he is skilled • Doing community activities (drawing - sewing - calligraphy - playing ball) for free • Using the public service to participate among children and people with special needs • Putting machines for spinning girls manually for children • Exploitation of spaces under trees in sports that help generate electricity • Making shelves on trees to help with donations for the development of the area
Recycling system	Waste treatment	1	Design waste recycling services in the public space		Recycling in different way
Social participation	Advertising for social engagement	1	How to encourage the integration of all individuals using the place and encourage them not to bully Design advertisements urging and encouraging children, for example, to play together arenas for social participation		<ul style="list-style-type: none"> • Campaigning against bullying • Making banners to raise awareness against bullying • Making electric screens to raise awareness against bullying • Campaigns to encourage community participation

3.1. Proposed model

The model was designed by the software model “MINECRAFT” as shown in Figure 13. It is a kid-friendly computer game that combines exploration and survival abilities of problem-solving. It puts children's inventiveness and imagination to the test. MINECRAFT works like digital LEGO, allowing children to build their sustainable open space in an interactive way [11]. MINECRAFT is now being used in the classroom in some UK schools more than 7,000 classrooms worldwide now using Minecraft, according to a 2016 BBC News investigation [12].

A sustainable open space prototype for Ezbet Higazy area in Smouha district is the concept which children apply in the MINECRAFT version. Two lanes around the site; one for bicycles and the other for special needs' vehicles as well as two playground spaces, one for basketball and the other for football make up the children's model. Additionally, as viewed in figure 14, the developed model defines spaces for services, setting areas, and green spaces. One of the key elements of the model is the ability for children to physically navigate their digital version, which fosters more creative thinking about the sustainable open space solution they suggest.



Fig 13: MINECRAFT software [11].



Fig 14: MINECRAFT sustainable open space prototype designed by children

3.2. Proposed physical model

Children work on the design of a physical proposal using all their ideas and experiences. The final project created a composition of several ideas that would serve the surrounded area through levels of transportation, greenery, recycling system lighting system, sustainable setting areas, services, sports activities and recreational activities. Children built some parts physically as a maquette, printing out on paper the base map and stabilishing other suggested space components as shown in Figure 15.



Fig 15: The physical model on the printed base map designed by children on MINECRAFT software.

3.3. Final project model

The final project submitted to Smithsonian Science Education Center on a video recorded format; each child has been given 5 minutes speech illustrating his/her ideas on how to design each item to represent sustainable solutions for upgrading the selected site in Ezbet Hegazi, Smouha, Alexandria, as shown in figure 16.

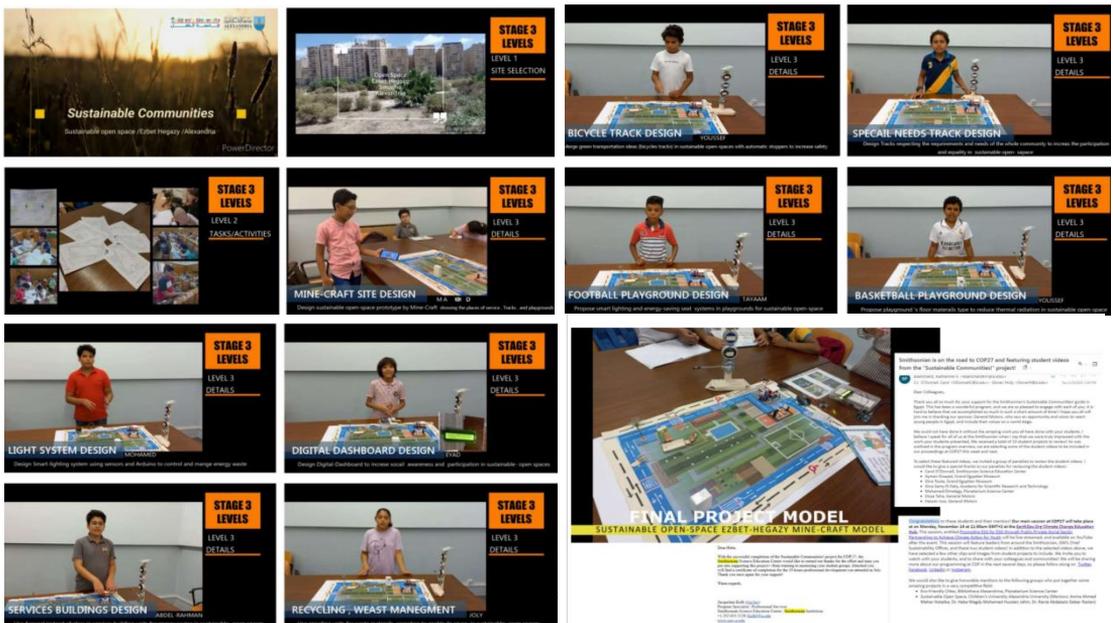


Fig. 16: Different shots from Final project video.

reviewed from specialist panelists from (Smithsonian Science Education Center, Grand Egyptian Museum, Academy for Scientific Research and Technology, Planetarium Science Center and General Motors). The final project proposal has been accepted and presented at COP 27 by November 2022. The children's project got the second honorable prize as an excellent project in a competitive field.

4. Conclusion

In conclusion, children participation in the urban planning process is a crucial element of the Sustainable Development Goals (SDGs) based on urban development trends of today. The study described an experiment work based on Smithsonian Science Education Center manuals that demonstrate how to use sustainable community principles and development goals to involve 12 selected students in the design process for developing a sustainable open space in one of Alexandria, Egypt's informal neighborhoods.

The experiment passes through three main phases; The Discovery phase, the Understanding phase, and the Action phase. In the Discovery phase: children identify and recognize their surrounding environment, and define the main problems and characteristics of urban space in the informal sector specially in the area of Ezbet Hegazi, Smouha, Alexandria. In the Understanding phase, children apply SWOT analysis to the selected urban space, in order to classify the problems related to each pillar of sustainable development, sustainable spaces, sustainable transportation, and sustainable communities. Relate those problems with solutions based on their study and data collected was one of the main objectives of this work. In the Action phase, children articulated their solutions into a prototype "software model, and physical model" and design a sustainable open space as a focus point in upgrading the informal district. Finally, the children's prototype was judged by an international specialties' panelist from (Smithsonian Science Education Center, Grand Egyptian Museum, Academy for Scientific Research and Technology, Planetarium Science Center, and General Motors).

This research raises the importance of community engagement and the applicability of children participation in urban planning process for upgrading informal areas based on inserting sustainable urban spaces to tackle the role of changing for better life quality.

5. Recommendations

The final project video was uploaded on Smithsonian Science Education Center website so that it can be shared and celebrated these students' amazing work as well. The investigation revealed that children and public participation in sustainable urban development based on the module developed by Smithsonian Science Education Center manual handout is a creative approach for upgrading informal areas. On this basis, future research should examine the developed module to expand participation to another aging groups, and approaches.



fig. 17: The participating team of Child University, Alexandria.

6. Acknowledgement

Special thank goes for every student from children's team at Alexandria University. A particular gratitude to the team of Smithsonian Science Education Center, Alexandria University Center of Excellence for Smart Urban Governance (ALEXU-COE-SUG) for support, and Dr. Amira A. Maher, a teaching assistant at Alexandria University's College of science.

The project was a collaborative experiment between children's University, Alexandria University, and Smithsonian Science Education Center. In order to involve children in the early stages of sustainable urban development for upgrading informal neighborhood, to obtain creative solutions based on an accurate understanding of users and their requirements in stage of development and the translation of their experiences into practical solutions.

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