The Impact of Funded Research Projects on Architectural Education Development

Delta-TU Partnership between Mansoura University and TU-Berlin

Mahmoud Ramadan, Ahmed El-Tantawy, Alaa El-Eashy

Abstract— The field of architectural education is constantly evolving and adapting to the changing demands of industry, society, and technological advancements. Research-based learning is a critical aspect of architectural education that helps students to develop their analytical and creative skills. Funded research projects play a crucial role in advancing the development of architectural education by providing support for new pedagogical approaches, innovative teaching methods and improvement of the learning environment. This research paper examines the transformative impact of funded research projects on the development of architectural education, focusing on the "Delta-TU Partnership" project between Mansoura University and TU-Berlin. The study investigates whether such projects have a positive influence on architectural education in Egypt. By analyzing the project's activities and outcomes, this research explores the effects on curriculum enhancement, faculty development, learner experiences, and the learning environment. A mixed-methods approach was employed, including surveys and interviews with students and teaching staff. The findings reveal that the project significantly contributes to curriculum enrichment through workshops, dual-online courses, guest lectures, and study visits. The engagement of teaching staff in project activities leads to improved teaching methods and research endeavors. Learners benefit from enhanced skills, interdisciplinary collaborations, and exposure to practical applications. The establishment of specialized laboratories further elevates the learning environment. The research underscores the potential of funded research projects to elevate architectural education and offers recommendations for sustained growth. Ultimately, this study contributes to understanding the synergy between research initiatives and pedagogical advancement in architectural education.

Index Terms— Architectural Education, Funded Projects, Curriculum Development, and Learning Environment.

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1 INTRODUCTION

ARCHITECTURAL education is constantly evolving, with new technologies and methodologies emerging, and new trends in design and construction affecting the way in which buildings are created and used. Educational institutions have been striving to provide quality education that meets the needs of the rapidly changing architectural field. The introduction of new technologies, as well as the changing social, economic, and environmental conditions, has led to an increase in the focus on sustainability and innovation in architectural education. Moreover, partnerships between Egyptian and international universities have provided opportunities for the exchange of ideas and knowledge and have helped to further enhance the quality of architectural education in Egypt. These initiatives have aimed to not only strengthen the technical and design skills of students, but also to develop their critical thinking and problem-solving abilities, which are essential for success in the profession. International Union of Architects states that "*Architectural education should have two basic purposes: to produce competent, creative, critically minded and ethical professional designers/builders; and to produce good world citizens who are intellectually mature, ecologically sensitive and socially responsible.*" [1].

One of the keyways in which architectural education can

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evolve and develop is through funding provided by research projects. The Delta-TU Partnership Project between Mansoura University and TU-Berlin is a prime example of such a project, having been established to support the development of architectural education in Egypt.

In this paper, we will explore the impact of the Delta-TU Partnership Project on architectural education development in Mansoura University by examining the key elements of the educational process (curriculum, teaching staff, learners, and learning environment). Through the examination of this project, we will gain insight into the potential impact that research funding can have on architectural education and the ways in which this can support the development of the discipline.

The research defines architectural education development, elements, and funded projects. The case study will provide an overview of the Delta-TU Partnership Project, including its objectives, partners, and various activities. Present the results of the survey questionnaires conducted with students, teaching staff, and interviews. Analyze the quantitative and qualitative data to determine the perceived impact of funded research projects on architectural education development.

2 AIMS OF THE RESEARCH

The research aims to evaluate the impact of funded research projects on the development of architectural education in Mansoura University, by exploring the case study of the "Delta-TU Partnership Project" between Mansoura University and TU-Berlin. It aims to answer the research question: "To what extent do the funded research projects have a positive impact on the development of architectural education?" To achieve this aim, the

following objectives are set to:
- Understand architectural education development and elements of education process.
- Identify the various types of funded research projects available for architectural education development in Egypt, and their goals and objectives.
- Examine the impact of the "Delta-TU Partnership Project" on the development of architectural education, through an analysis of its activities, outcomes, and achievements.
- Make recommendations for future funded research projects in architectural education, based on the results of this study.

3 METHODOLOGY

The methodology for this paper will involve a mixed-methods approach, combining both qualitative and quantitative data to answer the research question.

Firstly, a review of existing literature will be conducted to gather information on the current state of architectural education in Egypt and the role of funded research projects in its development.

Secondly, a survey questionnaire will be designed and administered to a sample of architectural students, graduates, and teachers in Mansoura University. The survey will gather data on the participants' views on the impact of funded research projects on architectural education in Mansoura University, as well as their perceptions of the quality of current architectural education programs.

Thirdly, in-depth interviews will be conducted with a selected number of researchers Who participate in Guest-lecturers and study visit, and IP of the project. The interviews will be used to gather qualitative data on the impact of funded research projects on architectural education.

Finally, the data collected from the literature review, survey questionnaire, and in-depth interviews will be analyzed and compared to determine the impact of funded research projects on the development of architectural education in Mansours University.

4 ARCHITECTURAL EDUCATION DEVELOPMENT

The research defines the architectural education development approaches in Egypt in terms of the development agenda of Egypt's vision 2030 and the Sustainable Development Goals. It also discusses the key elements of the educational process which affects architectural education development.

4.1 ARCHITECTURAL EDUCATION IN EGYPT

Architectural education in Egypt has a long and rich history, dating back to the early 20th century when the first schools of architecture were established in Cairo [1]. Since then, architectural education has evolved and diversified to meet the changing needs and challenges of society and the profession.

The architecture educational system in Egypt depends on the rules and standards set by the central government. All educational institutions working in this field are subject to these rules. On top of these institutions there are four major bodies: The Supreme Council of Universities, which is responsible for the affairs of public universities; The Private and National Universities

Council, which heads these universities; the Supreme Council of Private Institutes; and the Council of Technological Colleges. These four institutions are headed by the Minister of Higher Education and Scientific Research [2].

According to the Egyptian higher education system, the study in architecture programs within the framework of the faculties of engineering must include 5 years of study. The first year is considered as a preliminary year that includes general majors of all the departments of engineering. After that, students could major in architecture or any other department of engineering starting from the second year of study.

Some of the initiatives that have been taken to develop architectural education in Egypt include according to its Agenda 2030 and its 17 Sustainable Development Goals (SDGs) [3]:
- Establishing new programs and departments that focus on emerging topics such as sustainable design, digital fabrication, heritage conservation, and urban planning.
- Enhancing the collaboration and exchange between the schools of architecture and other academic institutions, professional bodies, governmental agencies, and civil society organizations.
- Promoting research and innovation in architecture and related fields through funding opportunities, publications, conferences, and exhibitions.
- Improving the quality and standards of architectural education through accreditation, evaluation, and quality assurance mechanisms.
- Supporting the professional development and lifelong learning of the faculty members and students through workshops, seminars, training courses, and scholarships.

4.2 Architectural Education Elements

The development of architectural education can be impacted through major elements of the educational process. These integrated elements make the process of education a purposeful activity. These elements depend on each other. The expected aims of the process of education can't be achieved without the mutual coordination of these elements [4].as shown blow **Fig. 1**:
- **Curriculum:** Updating the curriculum to incorporate current advancements in the field of architecture, emerging technologies, and sustainable design practices can enhance the quality
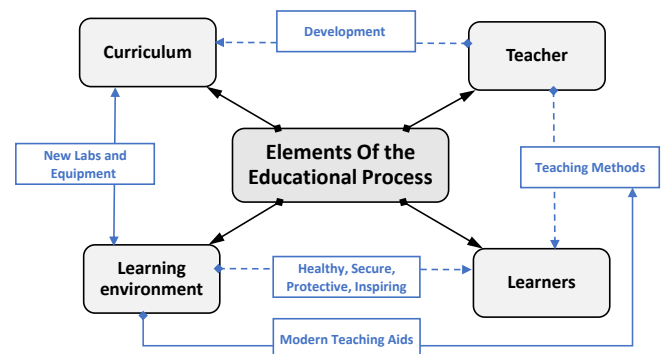

FIG. 1 ELEMENTS OF THE EDUCATIONAL PROCESS, SOURCE: AUTHORS

of architectural education. Moreover, incorporating real-life projects, case studies, and interdisciplinary approaches can make the learning experience more practical and relevant [5].
- **Teacher:** The quality of architectural education can be greatly impacted by the teachers. Having experienced and

knowledgeable architects as teachers who can bring in practical experience and industry knowledge to the classroom can help students better understand the real-world application of the concepts they are learning.

- **Learners:** The learner's level of motivation and engagement can greatly impact their learning experience. Encouraging critical thinking, problem-solving, and collaboration can help students develop essential skills that will be useful in their future careers. Moreover, providing opportunities for hands-on learning experiences can help students better understand the concepts they are learning.
- **Learning Environment:** The physical and social environment in which the learning takes place can impact the effectiveness of the educational process. Creating an environment that is conducive to learning, such as a well-equipped studio or lab, can enhance the learning experience. Additionally, fostering a supportive and inclusive learning environment can help to engage students and promote their success [6].

The development of architectural education can be impacted by changes to any of these elements. Funded research projects can play a significant role in promoting changes that enhance the quality of architectural education.

5 FUNDED RESEARCH PROJECTS

Funded research projects refer to projects that receive financial support from external sources such as government agencies, foundations, corporations, or individual donors. These projects are typically focused on advancing knowledge or solving problems in a particular field, and the funding helps to cover the costs associated with conducting the research [7].

In architecture, funded research projects may focus on developing new building materials and technologies, improving energy efficiency and sustainability in buildings, exploring innovative design approaches, or studying the impact of the built environment on human health and well-being. The results of these research projects can have a significant impact on the field of architecture, helping to inform design decisions, building codes and regulations, and construction practices.

6 CASE STUDY

The Architectural Department of Mansoura University has participated in many funded projects over the past five years, some of these projects are long term and some are short term as shown in **Fig. 2** .

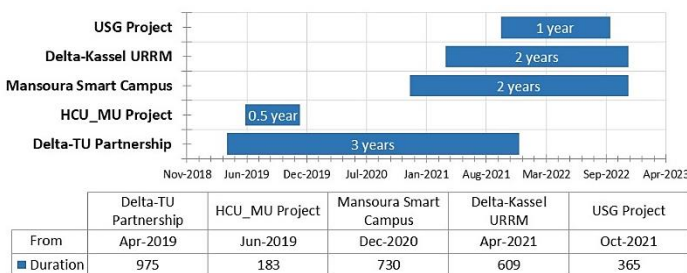|	Delta-TU Partnership	HCU_MU Project	Mansoura Smart Campus	Delta-Kassel URRM	USG Project
From	Apr-2019	Jun-2019	Dec-2020	Apr-2021	Oct-2021
■ Duration	975	183	730	609	365

FIG. 2 RESEARCH PROJECTS WHICH THE DEPARTMENT PARTICIPATED DURING THE PAST FIVE YEARS AND THEIR DURATION, SOURCE: AUTHORS

The Delta-TU Partnership project was chosen as the case study because it is a long-term project with diversity and multiplicity in its activities, in addition to Great financing, and many partners. Therefore, we can evaluate the impact of its actions on the development of architectural education at Mansoura University as a result.

6.1 DAAD

DAAD (German Academic Exchange Service) is a German organization that promotes international academic exchange and cooperation. It was founded in 1925 and is now the largest funding organization for international exchange programs in the world. DAAD offers a wide range of programs and services, including scholarships and grants for students, researchers, and faculty, as well as support for international cooperation between universities and academic institutions.

In the field of architectural education, DAAD offers scholarships and grants for international students who wish to study architecture in Germany. These programs provide financial support for tuition and living expenses and offer opportunities for cultural exchange and professional networking. DAAD also supports international cooperation between universities and academic institutions in the field of architecture, fostering collaboration and the exchange of ideas and expertise between German and international academics[8].

6.2 German-Egyptian University Partnerships Programme

The DAAD supports the "German-Egyptian Progress Partnership with partner universities in Egypt" with funding from the Federal Foreign Office. The Programme is one of several initiatives aimed at promoting international cooperation and exchange in the field of higher education, and provides opportunities for students, researchers, and faculty from both countries to collaborate and share their expertise. The program is part of a larger effort to strengthen the relationship between Germany and Egypt and to promote economic and cultural exchange between the two countries.

The cooperation between the Egyptian and German partner universities focuses on the following qualitative and quantitative objectives [9]:

Qualitative Objectives:
- Facilitate further qualification and sustainable structural development in teaching, research, services, and university management.
- Enhance the employability of graduates.
- Strengthen elements of entrepreneurship.

Quantitative Objectives:
- For individuals: Increase the number of qualifications, specify the number of months in stays (guest lecturers, study research stays).
- For events: Increase the number and description of planned events, specify the number of intended participants.
- For material resources: Plan purchases (e.g., lab and library equipment) and attain specific knowledge or aim.

6.3 "Delta-TU Partnership" Project

The "Delta Technical- Urban Partnership for Environmental, Social and Urban Quality (Delta-TU Partnership)" Project is a two-

year initiative aimed at establishing an Egyptian-German academic partnership between the Architectural Department of Mansoura University in Egypt and the Institute for Architecture of Technical University of Berlin in Germany. The project has been extended for another year due to the COVID-19 pandemic and is funded by the German Academic Exchange Service (DAAD) with a maximum grant of €100,000 per budget year.

The project focuses on integrating technical-urban and environmental topics into the Bachelor and Master curricula in architectural engineering at both universities and developing a joint curriculum for a Master or bachelor's degree in Technical-Urban studies. The project emphasizes the dual-teaching approach, guest study of researchers and student work on the Nile-Delta region as an experimental lab for pilot projects and research. The joint-academic work will aim to enrich the students' and researchers' understanding of design and planning in relation to diverse local and environmental conditions and promote the learning by doing and research-based practice methods in the joint-program.

The "Delta-TU Partnership" Project aims to promote the German-Egyptian academic partnership in the Nile-Delta region and to tackle local problems through a national, regional, and international cooperation. The project also seeks to enhance the quality of academia, R&D, and research-oriented practice, promote young graduates and academics based on gender equality, and contribute to achieving the Sustainable Development Goals (SDGs) in the Nile-Delta region.

6.3.1 The Project Partners

The project consists of an interdisciplinary team including researcher, academics specialized in civil environmental engineering, R&D Company, a Non-Governmental Organization NGO to cooperate in developing an optimize the project implementation and its cultural, academic, and socio-economic impacts in the study locations.

- **The main university partners**: Technical University Berlin, and Mansoura University.
- **Co-Beneficiaries**: Tanta University, and Galala University in Egypt.
- **Associated partners**: TU-Berlin Campus EL Gouna, DUCO company, BENAA Foundation, Engineering Syndicate of Dakahlia Governorate, and ESCWA United Nation.

6.3.2 The Project Activities

The Delta-TU Partnership project included a range of activities aimed at promoting an interactive exchange of ideas and contributing to local development efforts in the Egyptian Delta region. The following is a list of the main activities that were undertaken as part of the project [10]:

1. **Guest-lecturers:** from both countries will participate in a dual-seminar in TU-Berlin and Mansoura University. Intensive development steps on the teaching and administrative levels to sustain the development and self-standing of the architecture content and the new curriculum program.
2. **Online-Guest-Lecturers** of Egyptian academics.
3. **Dual-Online-Course**: in "Building Technology & Design-Build". Targeted group: Students of undergraduate, postgraduated 1st- 2nd Master year, interested PhD students with related thesis content and case studies.

4. **Open lectures**: associated to the "1st & 2nd German Architecture Day in Egypt". professionals from practice and academia will present state-of-the-art applications in technical-urban practices and examples in Germany and MENA region.
5. **Open lectures and Workshops**: in the "1st & 2nd Delta-Symposium in Egypt" **Fig. 3**.

1ST GERMAN ARCHITECTURE DAY   1ST DELTA-SYMPOSIUM
FIG. 3 THE OPEN LECTURES IN EGYPT, SOURCE: [10]

6. **Workshops**: 'practice-oriented skill' through the "Design-Build Training in Egypt", provide socio-academic exchange and cooperation between the German-Egyptian students and the society through meeting, interviews, questioners, and discussions **Fig. 4**.

DOME BUILDING TRAINING   VAULT BUILDING TRAINING
FIG. 4 1ST BENAA WORKSHOP IN FAYOUM, SOURCE: [10]

7. **Study visits:** students, young researchers, and a teaching staff from both countries will have the opportunity to explore the culture, social and academic environment of the partner country **Fig. 5**.

VISIT THE REICHSTAG BUILDING   WORKSHOP IN TU-BERLIN
FIG. 5 1ST STUDY VISIT IN GERMANY 2019, SOURCE: [10]

8. **Establishment of a new laboratory**: Design-Build Lab (DB), Environmental Design Unit (ED), and Digital & Documentation Unit (DD). Integrating Labs and practical techniques into the teaching methods of the Egyptian universities in Delta region, as a learning-by-doing education progress. Providing new equipment, lab, materials, and space required for the pilot project construction in labs **Fig. 6**.
9. **Development of the Architectural Models Lab (AM).**
10. **Architectural competition**: between German-Egyptian students. The competition encourages the young architects

to form a team and cooperate in providing a new concept for urban development and 1:1 design-build prototype for construction by the winning teams.

DESIGN-BUILD LAB (DB)   ENVIRONMENTAL DESIGN UNIT (ED)

DIGITAL & DOCUMENTATION UNIT (DD)   ARCHITECTURAL MODELS LAB (AM)

FIG. 6 NEW LABS ESTABLISHED BY PROJECT ACTIVITIES, SOURCE: AUTHORS

6.3.3 The Project Participation

Many teaching staff and students participated in the various activities of the project, and the following **Table 1** shows the numbers of participants in each activity separately[10].

TABLE 1

NUMBER OF PARTICIPATION IN PROJECT'S ACTIVITIES, SOURCE: AUTHORS

	Projects activities	Number of participants	
		Student	staff
1	Guest-lecturers	-	2
2	Online-Guest-Lecturers	-	3
3	Dual-Online-Course	15	5
4	Open lectures, "1st & 2nd Delta-Symposium in Egypt"	500	
5	Open lectures and Workshops, "1st & 2nd Delta-Symposium in Egypt"	800	
6	Workshops	45	15
7	Study visits	12	8
8	Establishment of a new laboratory	10	5
9	Development of the Architectural Models Lab	10	5
10	Architectural competition	30	-

7 RESULTS

7.1 Survey Questionnaires

The survey questionnaires (electronic and paper) were made for teaching staff, and students in the Department of Architecture to determine the extent to which research project activities were utilized at the personal and practical level and to measure the extent to which the laboratories established by the research project were used and the impact of those laboratories on the content of the curricula.

Also, the extent to which these activities affect the development of the performance of teaching staff and the level of students.

Inventory of the advantages and disadvantages of research projects from the point of view of participants and knowledge of their future proposals for the development of research projects.

7.1.1 Survey Questionnaires Design

The questions were classified into three sections, the first one was participation and experience in project activities, the second was utilization of laboratories and curriculum development, the last section was impact on students, teaching staff, and architectural education. The structure of the questionnaires and its' objectives are shown in **Table 2** as follows:

TABLE 2

STRUCTURE AND OBJECTIVES OF THE QUESTIONNAIRES, SOURCE: AUTHORS

Questions	Objectives
Section 1: Participation and Experience in Project Activities	
- Did you participate in the project activities?	To determine whether (teaching staff /students) actively engaged in the project activities.
- What are those activities that you participated in?	To identify the specific project activities in which (teaching staff /students) participated, providing a comprehensive view of their involvement
- Evaluate your overall experience in project activities and why?	To gauge the overall satisfaction and experience of (teaching staff /students) with the project activities, enabling insights into their perception of the effectiveness and impact.
- How does your participation in research project activities affect your personal and professional development? And how?	To explore how (teaching staff /students) participation in the research project activities contributed to their personal and professional growth, highlighting tangible benefits.
- What is the impact of these activities on architectural education from your opinion?	To understand the perceived influence of the project activities on the advancement and development of architectural education from the perspective of (teaching staff /students).
Section 2: Utilization of Laboratories and Curriculum Development:	
- What is the extent of benefiting from the laboratories that were established and developed through the project in architectural education?	To assess the extent to which (teaching staff /students) have utilized the laboratories established through the project and their perceptions of the benefits gained.
- What are the curricula (you teach/you steady) whose content was developed throw the project activities?	To identify the curricula that have undergone improvements as a result of project activities, indicating the scope of curriculum enhancement.
- From your opinion to develop the academic courses, what are the laboratories that can be used in the curricula?	To gather insights into which specific laboratories could be integrated into curricula to further enhance academic courses and facilitate experiential learning.

Section 3: Impact on Students, Teaching Staff, and Architectural Education

- Do you find a development in students' performance as a result of the project? At any stage of study? In which curricula?	To ascertain whether faculty members have noticed positive changes in students' academic performance attributed to the project initiatives, indicating potential pedagogical enhancements.
- Do you find a development in the performance of the teaching staff who participated in the project? In which curricula?	To identify any noticeable improvements in the teaching faculty's performance due to their involvement in the project, offering insights into professional growth.
- From your point of view, how did these research projects affect architectural education?	To capture teaching staff' perceptions of the broader impact of research projects on the holistic development of architectural education.
- What are the Pros and Cons that you encountered in the activities of research projects in the department?	To provide a balanced view of both positive outcomes and challenges encountered during the execution of research project activities within the department.
- What are your suggestions for the development of research project activities?	To gather constructive suggestions and recommendations from (teaching staff /students) to enhance the quality and effectiveness of future research project activities in the context of architectural education development.

7.2.1 Teaching Staff Questionnaire Results

Number of participants in the survey of teaching staff: 26 out of a total of 34, 81.25%. that have a confidence level of 90% and the real value is within ±5% of the surveyed value, the results of the questionnaire are listed in **Table 3**.

TABLE 3
TEACHING STAFF QUESTIONNAIRE RESULTS, SOURCE: AUTHORS

Activities Impact	Individuals	Participation in project activities	84.6%				
		Impact on Participants	80%				
		1 min. – to 5 max.	1	2	3	4	5
		Impact on Architectural Education	0.0%	3.8%	11.5%	46.2%	38.5%
Learning Environment	Labs Benefit	1 min. – to 5 max.	1	2	3	4	5
		AM -Arch. Models	0.0%	0.0%	7.7%	15.4%	76.9%
		DB – Design Built	3.8%	11.5%	30.8%	34.6%	19.2%
		DD -Digital and Documentation	3.8%	15.4%	34.6%	30.8%	15.4%
		ED-Environmental Design	3.8%	19.2%	34.6%	34.6%	7.7%

			AM	**DB**	**DD**	**ED**	None
	Impact of labs on Curriculum	Architectural design	100%	38.5%	57.7%	46.2%	0.0%
		Architectural construction	50.0%	80.8%	3.8%	23.1%	0.0%
		Executive designs	50.0%	76.9%	0.0%	23.1%	0.0%
		Urban planning and design	69.2%	30.8%	42.3%	65.4%	0.0%
		Computer applications	26.9%	38.5%	15.4%	57.7%	0.0%
		Visual training	57.7%	7.7%	84.6%	7.7%	0.0%
		Graduation projects	100%	65.4%	57.7%	73.1%	0.0%
		Summer training	96.2%	76.9%	69.2%	76.9%	0.0%
		Elective courses	69.2%	57.7%	38.5%	61.5%	0.0%
		Environmental control	7.7%	19.2%	3.8%	34.6%	0.0%

Curriculum Development	Curriculum Developed Through Project Activities	Architectural design	84.6%
		Architectural construction	11.5%
		Executive designs	15.4%
		Urban planning and design	42.3%
		Computer applications	11.5%
		Visual training	11.5%
		Graduation projects	42.3%
		Summer training	46.2%
		Elective courses	15.4%
		Environmental control	3.8%

		1	2	3	4	5
1 min. – to 5 max.		1	2	3	4	5
Impact on Students Performance		0.0%	11.5%	38.5%	46.2%	3.8%

Performance	In Which Curriculum	Architectural design	88.5%
		Architectural construction	7.7%
		Executive designs	23.1%
		Urban planning and design	57.7%
		Computer applications	23.0%
		Visual training	11.5%
		Graduation projects	50%
		Summer training	15.4%
		Elective courses	11.5%
		Environmental control	11.5%

Pros and Cons

- Develop some curricula. Contribute to the establishment of advanced laboratories that help in developing the educational process.
- Research projects provided students with new ways to solve and study problems on the architectural and urban scale.
- Strong effect in the case of using specialized laboratories.
- It had a positive impact in terms of the work of specialized laboratories in the field of architecture serving the educational process through the architectural models lab and the design-built lab and providing them with modern equipment that helps students deepen their understanding of information and courses.
- The exchange of views and visions with foreign universities. Knowledge of new ideas, projects, building materials and laboratories
- It added new experiences to participations.
- It provided financial funding to support devices and equipment that help students during design in making architectural models, as well as environmental measurements and simulation devices - in addition to external and internal workshops, increasing opportunities for students and researchers to open and meet with peers from other universities, and increasing opportunities for exchanging cultures, knowledge, and research cooperation.
- Provide an opportunity for students to communicate with scientific scholars abroad and learn sound methods of scientific research methodologies.
- Knowledge of new technologies in the field of

architecture and construction and the possibility of applying and testing them through laboratories that have been established through research projects.
- Poor participation of department staff in project activities.
- The difficulty of some administrative and financial procedures
- Red tape and bureaucracy.
- Lack of scientific work and paper publishing on our side. We need to participate in these events with knowledge and experience as well.
- Some projects are limited to topics related to urban planning, and almost very rarely, topics related to architecture and interior design.

Teachers' Suggestions for the new projects	- Increasing financial support for educational activities and equipment. - Participation in research projects on various topics such as Smart architecture, Smart Governance and Sustainable Urbanism, heritage, and BIM.

7.2.2 Learners Questionnaire Results

Number of participants in the survey of learners: 200 out of a total of 500, 40.00%. that have a confidence level of 90% and the real value is within ±5% of the surveyed value, the results of the questionnaire are listed in **Table 4**.

TABLE 4
LEARNERS QUESTIONNAIRE RESULTS, SOURCE: AUTHORS

Activities Impact	Individuals	Participation in project activities	32.90%				
		Impact on Participants	80.90%				
		1 min. – to 5 max.	1	2	3	4	5
	Impact on Architectural Education		6%	4.7%	19.5%	53%	16.8%
Learning Environment	Labs Benefit	1 min. – to 5 max.	1	2	3	4	5
		AM -Arch. Models	5.4%	3.4%	14.8%	28.9%	47.7%
		DB – Design Built	24.8%	28.2%	24.8%	14.1%	8.1%
		DD -Digital and Documentation	30.2%	28.2%	19.5%	14.8%	7.4%
		ED-Environmental Design	31.5%	31.5%	18.1%	10.7%	8.1%
	Impact of labs on Curriculum		**AM**	**DB**	**DD**	**ED**	**None**
		• Architectural design	91.3%	10.7%	6.0%	6.7%	8.1%
		• Architectural construction	26.2%	18.1%	1.3%	4.0%	57.7%
		• Executive designs	16.8%	13.4%	2.7%	3.4%	69.1%
		• Urban planning and design	81.2%	10.1%	7.4%	8.7%	12.1%
		• Computer applications	20.1%	16.8%	2.0%	7.4%	58.4%
		• Visual training	21.5%	6.0%	17.4%	6.0%	59.7%
		• Graduation projects	43.0%	16.8%	10.1%	10.1%	50.3%
		• Summer training	80.2%	24.2%	10.7%	14.1%	37.6%
		• Elective courses	43.6%	11.4%	6.7%	5.4%	47.0%
		• Environmental control	12.1%	17.4%	2.0%	30.2%	52.3%
Performance		1 min. – to 5 max.	1	2	3	4	5
	Impact on Teachers Performance		2%	8.7%	26.2%	40.3%	22.8%
	In Which Curriculum	• Architectural design	78.5%				
		• Architectural construction	26.8%				
		• Executive designs	31.5%				
		• Urban planning and design	57%				
		• Computer	29.5%				

applications		
• Visual training	18.1%	
• Graduation projects	28.9%	
• Summer training	36.9%	
• Elective courses	8.1%	

Pros and Cons	- Administrative complexities of the university administration. - There is not enough publicity for the project's activities. - just a small number of people participate in each activity.
Learners' Suggestions	- Applying for more research projects, even if the funding is less. - Cooperation between all departments of the college. - Providing incentive prizes in these activities as a form of competition and indulgence between the participants and the topics presented in those activities. - Conducting introductory seminars for students about research projects and their activities. - Giving more people the opportunity to go through these experiences will greatly develop them at all levels. - Participate in international architectural competitions as teams and use laboratories to make well-studied projects. - Follow up the individuals who participate in these activities, do other research, and form a team that seeks to develop architectural study through various activities. - Interest in the field of sustainable architecture and the application of this research to actual projects.

7.2 Interviews

A semi-structured interview is performed as a qualitative research method with 6 researchers who participated in the fellowship grants as guest-lecturers, and IP of the project. The interview aims to discuss the impact of their experience regarding their academic skills, networking, and research outputs. The results are summarized as follows:

7.2.1 Training

The Project activities help researchers (master and PhD students) who participated in the fellowship grants to develop their research skills and knowledge transfer through training in different courses, workshops, and programs at the host universities.

7.2.2 Networking & Co-operation

The partnership is developed with different stakeholders including main Delta region universities, Engineering syndicate and NGOs. It offers the researchers to establish more cooperation with international institutions seeking more funding possibilities for staff mobility exchange and upgrading the lab capacity.

7.2.3 Research innovation

The project is designed to stimulate an interactive exchange of ideas between the partner universities (Egyptian-German), contributing to the plans of the local authorities, and fulfilling the ambitions and needs of local societies. This includes considering the nowadays relation to; transformation of rural areas to urban, informality issues, socio-economic and socio-cultural aspects, quality of local resources, efficient uses, low and high urban-technologies, urban quality in the Egyptian Delta.

8 DISCUSSION

In this section, we will discuss the impact of the TU-delta project on the development of architectural education at Mansoura University through the four major elements of the educational process.

8.1 Impact on Curriculum

There was a direct impact of the project's activities on developing many curricula as stated in the questionnaire of teaching staff, such as Architectural Design (84.6%), Graduation Projects (42.3%), Urban Planning (42.3%), and Summer Training (46.2%). This is because most of the project activities were applications and case studies related to these courses.

Workshops on "Design-Build Training" also had a direct impact on the development of the content of the Architectural construction and Executive designs.

Add the dual-online courses in "Building Technology and Design-Build" between the two universities.

The guest lecturers and Study visits exchanged between German-Egyptian partners contributed to the ability of the participating teaching staff to participate in the development of the scientific curricula they teach.

In addition to the indirect impact of the laboratories established from the project on curriculum, Where the impact of the Architectural Models Lab (AM) was great on most of the curricula, Architectural Design (91.3%), Urban Planning (81.2%), and Summer Training (80.2%) in the questionnaire of students.
It was noted that the number of curricula that were developed was limited because of the project focusing on specific topics such as building techniques and urban development, in addition to the limited number of teaching staff participating in the project activities due to the limited number required in the project.

8.2 Impact on Teaching Staff

The results of the questionnaire show that the participation of teaching staff in the project activities with ratio of 84.6% had a positive impact (85%) on their performance, increasing their research and teaching experience and developing some of the courses they teach.

The student's questionnaire shows a strong enhancing (63.1%) in teachers' performance who participated in the project. in curricula, such as Architectural design (78.5%) and Urban planning and design (57%).

It is also clear from individual interviews with researchers who participated in the fellowship grants as guest lecturers that they have a role in developing research studies in master's and doctoral studies, in addition to teaching skills, as some of them attended some scientific courses abroad. This contributed to their ability to participate in the development of scientific curricula, to contribute to the development of laboratories, and to their continuous attempts to obtain grants and international cooperation projects.

8.3 Impact on Learners

The project activities contributed to strengthening students' scientific and social skills through participation, teamwork, and scientific competition through an architectural competition between German-Egyptian students, in addition to the scientific techniques and applications that they participated in implementing.

The Study visits encouraged many students to apply for scholarships to study abroad and to communicate with international donors and specialists at international universities.

The teaching staff's questionnaire also shows a medium improvement (84.7%) in students' performance in many curricula that are directly related to the project's activities, such as Architectural design (88.5%) and Urban planning and design (57.7%).

8.4 Impact on Learning Environment

The project contributed to the establishment of three laboratories: the Design-Build Lab (DB), the Environmental Design Unit (ED), and the Digital and Documentation Unit (DD). And Development of the Architectural Models Lab (AM).

The questionnaires show the very strong impact (staff 76.9%, student 47.7%) of the Architectural Models Lab on its role in developing applications related to scientific curricula and students' performance in design and presentation skills using models. This is due to equipping the laboratory with all the necessary devices, equipment, and raw materials, in addition to the organization and management as shown in.

COMPUTER APPLICATIONS ARCHITECTURAL CONSTRUCTION
FIG. 7 STUDENT PROJECTS IN THE ARCHITECTURAL MODELS LAB,
SOURCE: AUTHORS

The results indicate that the other three laboratories are less effective in evaluating teaching staff and students alike due to the lack of some equipment for these laboratories and the lack of management and technical follow-up.

In addition, some curricula have not been updated to incorporate applications that can be conducted in those laboratories.

9 CONCLUSION AND RECOMMENDATIONS

In conclusion, the "Delta-TU Partnership" project has demonstrated a significant impact on the development of architectural education at Mansoura University across various dimensions of the educational process. Through its diverse activities and collaborations, the project has contributed to curriculum enhancement, teaching staff growth, learners' skill development, and the improvement of the learning environment. The integration of funded research projects into architectural education has showcased the potential to drive positive changes, aligning educational practices with the demands of modern architecture and urban development.

Based on the discussions and findings presented, several recommendations emerge to further harness the benefits of funded research projects for architectural education:
- Continuous Curriculum Development: Building on the success of the project's activities, it is advisable to maintain a dynamic

approach to curriculum development. Regularly updating courses and integrating practical applications will ensure that architectural education remains relevant and aligned with industry advancements.

- Enhanced Faculty Engagement: Encouraging more teaching staff to participate in funded projects can lead to continuous growth and development. Faculty members' engagement not only enriches their teaching but also contributes to the overall quality of architectural education.

- Expanding Student Experiences: Creating more opportunities for students to engage in collaborative projects, workshops, and competitions can further enhance their skills and exposure. Encouraging participation in study visits and exchange programs can broaden their perspectives and boost their employability.

- Optimized Learning Environments: While the Architectural Models Lab demonstrated substantial impact, enhancing the effectiveness of other laboratories through proper equipment, management, and technical support should be a priority. Regular maintenance and updates will maximize their potential in enhancing students' practical skills.

- Sustaining Interdisciplinary Collaborations: The success of the project's interdisciplinary collaboration between German and Egyptian partners emphasizes the importance of continued engagement with international universities and experts. This exposure enriches both teaching staff and students with global perspectives and best practices.

- Expansion of Research Projects: Encouraging the initiation of more funded research projects in collaboration with other universities and institutions will amplify the impact on architectural education. These projects can address diverse challenges and offer holistic approaches to education and urban development.

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