

On Involving Infrastructure Topics in the Civil Engineering Department Curriculum-Survey of Graduate Students Views

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Abstract: In this work, a survey on the Ishik-University graduate students' level of awareness of the importance of infrastructures on the community, on their views on the curriculum versus infrastructures' topics, and the most important topics found better for their future work. Our goal is to prepare our students to be future engineers educated with the concepts of infrastructures and how to improve and maintain these facilities. Students have been given a chance to evaluate current curriculum with particular focus on the infrastructure topics. Students have shown their high level of awareness, and gave their opinion on the curriculum and infrastructure as shown in tables and graphs. Conclusions and recommendations for the civil engineering department in Ishik University are drawn. It is the aim of the authors to further improve the curriculum of the civil engineering department of Ishik University, particularly aiming at providing our graduates a better understanding of infrastructures.

1. Introduction

Infrastructures are the fundamental facilities serving a country, city, or area, as transportation, dams, hydraulic structures, communication systems, water supply and sewage systems, power plants, hospitals and schools (Fulmer, 2009). For economic and sustainability reasons, these infrastructures are taking a great concern in planning and maintaining them, and now it is required to put these issues into the curricula of civil engineering department in exclusive way. Infrastructure has a direct impact on our personal and economic health. Civil engineers are stewards of the national's infrastructures, charged to design, construction, operation and maintenance of the vital public works (American Society of Civil Engineers, 2005). In this context, it is better to address the issue to graduate students and let them involve at least in expressing their view. This feedback would be considered in designing a curriculum that is concerned with infrastructure issues.

2. Background

Civil engineering department in Ishik University was established in 2010, and since then it becomes a well-known academic body in Kurdistan region and in the other parts of Iraq. In reviewing the curriculum, it is clear that it had changed significantly from a local, traditional, crowded edition to a dynamic, smart, of international dimension. The current curriculum of Ishik University is shown in

Tables (1), (2), (3), (4) and (5).

Table (1): Courses program of civil engineering /third grad students /fall semester

Courses		Weekly Course Distribution			Ishik	ECTS
code	Course Name	Theory	Pract./Tut.	Total hours	Credits	
CE 311	Structural Analysis I	4	0	4	4	5
CE 317	Soil Mechanics I	2	2	4	3	5
CE 313	Reinforced Concrete I	4	0	4	4	5
CE 319	Engineering Economy	3	0	3	3	5
CE 315	Hydraulics I	3	0	3	3	5
CE 316	Summer Training				NC	
	Technical Elective II	3	0	3	3	5
Semestral Total		19	2	21	20	30

Table (2): Courses program of civil engineering /third grad students /spring semester

Courses		Weekly Course Distribution			Ishik	ECTS
code	Course Name	Theory	Pract./Tut.	Total hours	Credits	
CE 320	Structural Analysis II	4	0	4	4	5
CE 322	Soil Mechanics II	2	2	4	3	5
CE 326	Reinforced Concrete II	4	0	4	4	5
CE 324	Construction Management	4	0	4	4	5
CE 328	Hydraulics II	3	0	3	3	5
	Technical Elective II	3	0	3	3	5
Semestral Total		20	2	22	21	30

Table (3): Courses program of civil engineering /fourth grad students /fall semester

Courses		Weekly Course Distribution			Ishik	ECTS
code	Course Name	Theory	Pract./Tut.	Total hours	Credits	
CE 411	Structural Concrete Design I	4	0	4	4	5
CE 415	Foundation Engineering	3	0	3	3	5
CE 413	Estimation and Specifications I	3	0	3	3	5
CE 417	Supervised Independent Study & Research	1	4	5	3	5
	Technical Elective	3	0	3	3	5
	Technical Elective	3	0	3	3	5
Semestral Total		17	4	21	19	30

Table (4).Courses program of civil engineering /fourth grad students /spring semester

Courses code	Course Name	Weekly Course Distribution			Ishik	ECTS
		Theory	Pract./Tut.	Total hours	Credits	
CE420	Structural Steel Design	4	0	4	4	5
CE422	Sewage Systems Engineering	2	2	4	3	5
CE426	Highway Engineering	2	2	4	3	5
CE424	Graduation Project	1	4	5	3	5
	Technical Elective	3	0	3	3	5
	Technical Elective	3	0	3	3	5
Semestral Total		15	8	23	19	30

Table (5).Technical elective courses of civil engineering Department

CE331	Enviromental Engineering	3	0	3	3	5
CE321	Architecture for Civil Engineering	3	0	3	3	5
CE418	Traffic Engineering	3	0	3	3	5
CE434	Railway Engineering	3	0	3	3	5
CE431	Airport	3	0	3	3	5
CE 439	Computer Application for Civil Engineers	2	1	3	3	5
CE 440	Construction Site Management &Safety Control	3	0	3	3	5

Courses code	Course Name	Weekly Course Distribution			Ishik	ECTS
		Theory	Pract./Tut.	Total hours	Credits	
CE330	Legal Aspects in Construction Works	3	0	3	3	5
CE429	Estimation and Specifications 2	3	0	3	3	5
CE340	Construction Site techniques	3	0	3	3	5
CE427	Construction Planning	3	0	3	3	5
CE438	Foundation Engineering II	3	0	3	3	5
CE386	Structural Drawing	3	0	3	3	5
CE412	Structural Concrete Design II	3	0	3	3	5
CE428	Concrete Bridges	3	0	3	3	5
CE432	Prestressed Concrete	3	0	3	3	5
CE433	Matrix Structural Analysis	3	0	3	3	5
CE435	Introduction to Earthquake Resistance	3	0	3	3	5
CE421	Design of dams	3	0	3	3	5
CE430	Design of Hydraulic Structures	3	0	3	3	5
CE318	Water Resources Engineering	3	0	3	3	5
CE327	Ground Water Engineering	3	0	3	3	5
CE419	Water Supply Engineering	3	0	3	3	5

Elective courses provide the freedom to improve the curriculum, to stay up-to-date, and to be familiar with new developments and technologies.

3. Aim of the Study

Our goal is to prepare our students to be future engineers educated with the concepts of infrastructures and how to improve and maintain them. Students have been given a chance to evaluate current curriculum with particular focus on the infrastructure topic. It is the aim of the authors to further improve the curriculum of the civil engineering department of Ishik University, particularly aiming at providing our graduates a better understanding of infrastructures.

4. Infrastructure as Recommended by an International Accreditation Agency

The civil engineering department was accredited for 5 years by ZEvA **international accreditation agency**. The assessment is based on ZEvA's "Assessment Framework for the Evaluation of Study Programs" as laid out in the agency's "Manual for Evaluation and Certification of Study

Programs”. This assessment framework is in part based on the “European Standards and Guidelines for Quality Assurance in Higher Education (ESG)” (ENQA 2009), the “Framework for Qualifications for the European Higher Education Area” (2005) and the “ECTS User’s Guide” (European Communities, 2009) (Report by Zeva, 2017).

The report quotes: “The experts conclude that the civil engineering department program, based on worthy general aims and a differentiated and well-documented set of Learning Outcomes, meets the standards and levels of a general Bachelors program in Civil Engineering. It serves its intention to prepare students for the local/regional labor market in building and construction and has a considerable focus on practical components, including laboratory work, on site-visits, group and project work.” (Report by Zeva, 2017).

This issue of infrastructure courses was recommended in the said accreditation report by ZEvA international accreditation agency. The report quotes “While maintaining the basic aspects of a CE program, the Department and Faculty should measure up to its own set goals by proactively strengthening competencies in the realm of sustainable and innovative fields of CE. This should include a stronger focus on technical infrastructure and planning ... The experts would like to propose a two-tier concept with a shared, compulsory core curriculum in the first semesters, followed by two parallel tracts – ‘construction’ and ‘technical infrastructure’ – where students can thoroughly specialize, while at the end receiving the same CE-degree.” (Ishik University, Engineering Faculty Curriculum).

The authors, in their efforts to improve the curriculum according to agency remarks, attempted to explore the graduate students view for many reasons; to introduce the infrastructure issue to them, demonstrates its importance, to study the state of mind of our future civil engineer, and to consider their view in our curriculum review.

5. The Questionnaire

The following questionnaire form was distributed to 61 students of the fourth grade class of Civil Engineering Dept. in Ishik University, with its results:

1. Are you aware of the importance of infrastructures to the community?

Yes No

2. Did you find that “infrastructures”, as defined above, are covered in your curriculum?

Yes No

3. What do you suggest to provide courses of “infrastructure”? Choose what you think is most suitable (you can choose more than one).

Course Name	Selection
Pavement Design	16
Retaining Walls	14
Design of Concrete Structures	30
Design of Steel Structures	27
Design of Highway System	25

Design of Airport	25
Design of Railway	17
Design of Dams	24
Design of Hydraulic Structures	11
Design of Water Supply Systems	12
Design of Sewage Systems	16
Design of Power Station	26
Design of Communication Systems	12

4. Do you prefer to study and make research on infrastructure in your graduation project?

46 Yes 15 No

5. Which of the following infrastructure projects do you prefer to study and make research on?

Course Name	Selection
Transportation (highway)	36
Transportation (bridge)	15
Transportation (airports)	20
Dam Structure	22
Water Supply projects	9
Sewage Systems	8
Power Stations (electric power) structures	8
Power Stations (nuclear energy) structures	14
Communication	12

The questions help to explore whether the graduate students are aware of the importance of infrastructure to the community, and whether they think it is substantially covered in their curriculum. Also the questions invite their suggestion of the best courses of infrastructures to be included in the curriculum. Moreover, the questions explore the interest of the graduate students to research on infrastructure issues in their graduation projects. If they do prefer, then they were asked about which specific project title or theme is preferred to make their research on. Presentation of results and discussion are followed.

6. Results and Discussion

The students expressed their awareness of the infrastructure subject in a very high percentage (97%). This is considered very impressive and promising.

On a high percentage (84%), the graduate students agreed that our curriculum contain many subjects that considered within the infrastructure literature, regardless of the GPA level of the students as shown if Fig.(1) below.

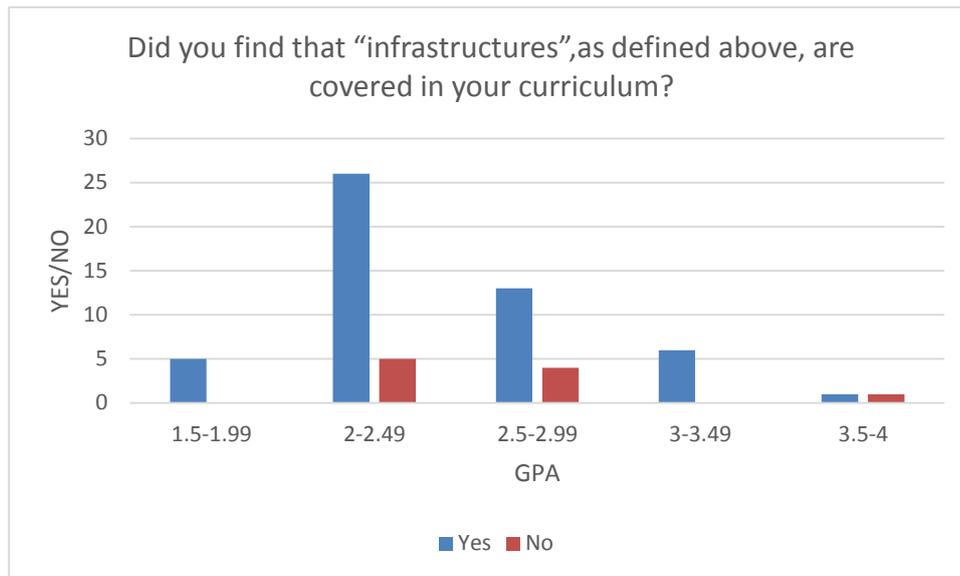


Fig.(1): Answers of students against their GPA on the infrastructure topics in curriculum.

In the students answer to question 3, a variety of infrastructure courses were selected, which shows that the state of mind is varied among the students which reflects a variety of desired disciplines of infrastructures. This is also shown in Fig.(2).

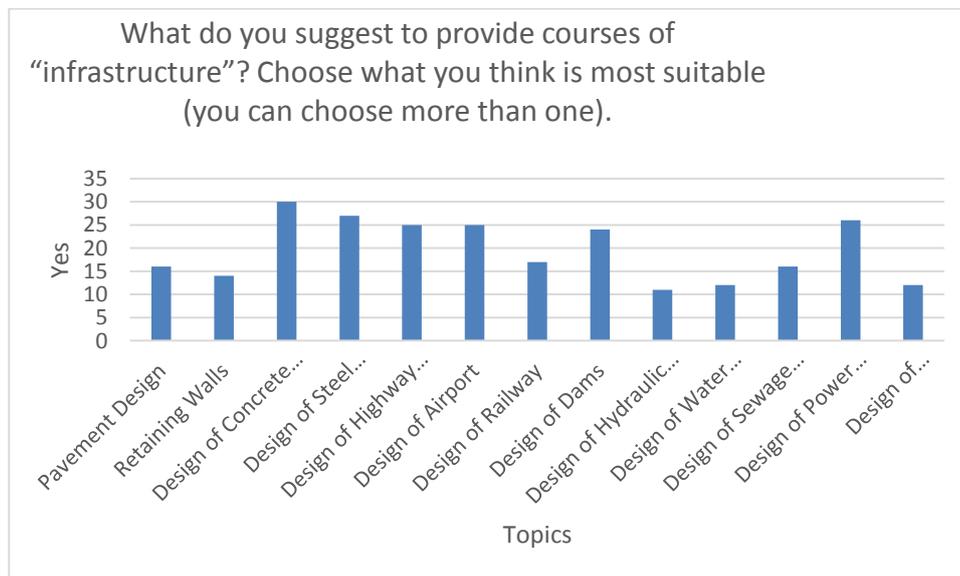


Fig.(2): Answers of students against their selection of the desired infrastructure topics in curriculum.

In their response to whether they like to do research on infrastructures topics in their graduation projects, 75% have agreed. In Fig. (3), students of higher GPA seem to have greater interest in the research on infrastructures.

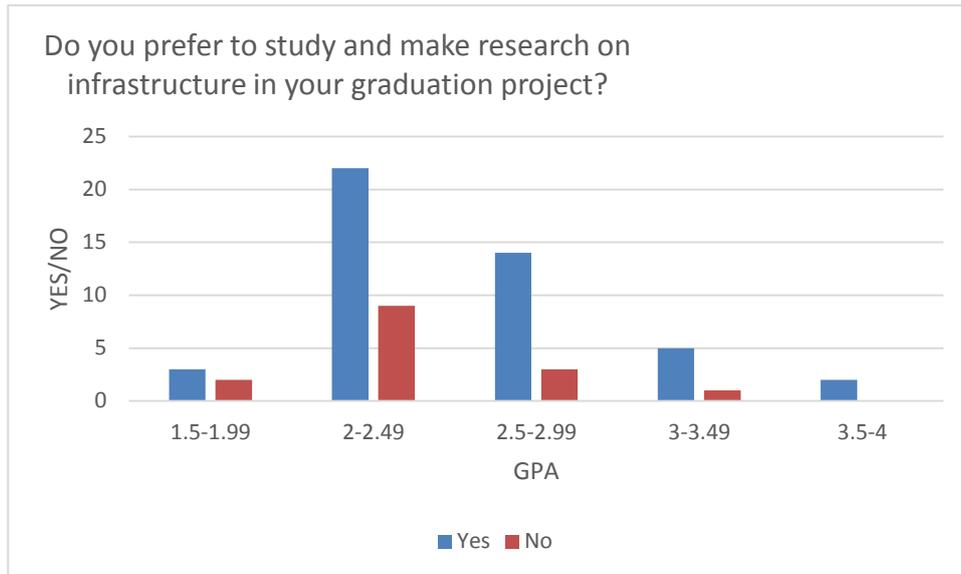


Fig. (3): Answers of students against their GPA on their desire of infrastructure research

In connection to the previous question, the students in their answer on which topic they prefer to make research on, it seems that transportation has got the major interest, see Fig.(4).

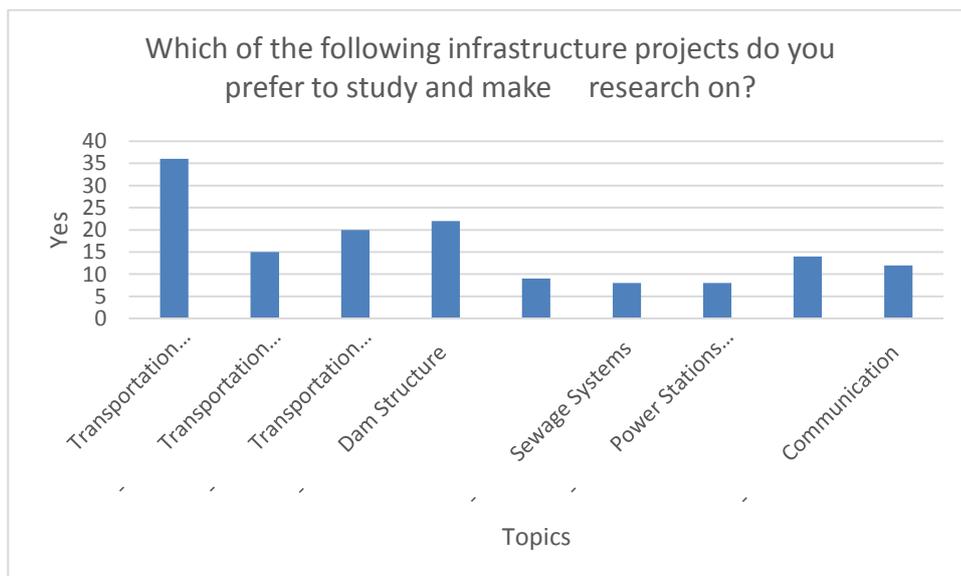


Fig.(4): Answers of students against their desired infrastructure topic of research.

Conclusions

Based on the survey performed in this work to explore the views of graduate students of civil engineering department of Ishik University on the topics of infrastructures in their curriculum, the following conclusions can be drawn:

1. The awareness of the infrastructure subject is very high (97%) among the graduate students.
2. The graduate students agreed (84%) that the current curriculum covers many infrastructures

topics.

3. The graduate students' response was varied on which infrastructures topics they desire.
4. The graduate students agreed (75%) on continues research on the infrastructures topics.
5. In connection to point 4, the transportation topics have got the major interest.

Recommendations

The authors agree on the ZEvA agency recommendations (Report by Zeva, 2017), and recommend that the infrastructure topics to be entered in every core course given in the curriculum. However, the current minimum 159 credits required to be completed by the students should not be increased. Therefore, some courses should be removed or merged with others.

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