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Dimensions of Design Competence in First-Stage Architecture Students

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ABSTRACT

Evaluating the design skills of first-stage architecture students is crucial in determining their proficiency and growth in the field. The lack of emphasis on key dimensions of design competence for first-stage architecture students in many universities often results in students being underprepared for the next stages of their education. This article adopted the method of comparison between the final projects submitted by the students in different university to express the competence of the students in the design. The assessment encompasses various aspects of design competence, including creativity, problem-solving abilities, conceptual thinking, spatial organization, use of design principles, and presentation skills. The evaluation methodology incorporates a combination of methods such as design portfolio analysis, design process evaluation, design critiques, problem-solving tasks, and knowledge assessments. By employing this multifaceted approach, educators can gain a holistic understanding of the students' design abilities. The article emphasizes the importance of considering both the process and the final design outcomes in evaluating students' skills, acknowledging that growth and learning occur throughout the design journey. The findings from this assessment can inform targeted instructional strategies and interventions to enhance the design skills of first-stage architecture students. Ultimately, this comprehensive evaluation approach contributes to fostering the development of competent and proficient architects during their early stages of architectural education.

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1. INTRODUCTION

Assessing the design skills of first-stage architecture students is a critical endeavor in architectural education. As these students embark on their journey to becoming competent architects, it is essential to evaluate their abilities and track their progress in various aspects of architectural design. An in-depth assessment of their design skills not only provides valuable insights into their individual strengths and areas for improvement but also guides educators in tailoring instructional strategies to foster their growth (Cho, Y. K., & Kwon, S. 2013).

1.1 Purpose of The Article and Overview of The Evaluation Approach

In this article, we present a comprehensive approach to evaluate the level of design skills exhibited by first-stage architecture students. Recognizing the significance of project-based assessments, our methodology centers around the evaluation of their design projects as the primary means of gauging their abilities. By examining the students' design portfolios, we delve into their conceptual clarity, design development process, creativity, problem-solving abilities, spatial organization, and adherence to design principles. Additionally, we emphasize the importance of their presentation and communication skills, as effective articulation of design intentions is fundamental to the architectural profession (Barton, 2010). To ensure a well-rounded evaluation, our approach encompasses multiple dimensions of design competence. It acknowledges the significance of both aesthetic and functional considerations in architectural design, taking into account the integration of sustainable principles and environmental considerations. Moreover, the methodology encourages the inclusion of design critiques and feedback from experienced architects, faculty, or professionals, fostering a constructive learning environment and promoting continuous improvement (Dikmenli, 2011).

1.2. Importance of Evaluating Design Skills in First-Stage Architecture Students

By adopting this comprehensive evaluation approach, educators gain valuable insights into the students ' design skills and their overall growth trajectory. The findings from these assessments facilitate targeted instruction, enabling educators to address specific areas where students may require additional support and guidance. Ultimately, our aim is to equip first-stage architecture students with a strong foundation in design skills, enabling them to thrive as they progress through their architectural education and embark on their professional careers (Fox, & Kemp, 2009).

2. BACKGROUND DIMENSION OF DESIGN COMPETENCE

2.1 The Conceptual Clarity

Conceptual clarity refers to the ability of first-stage architecture students to develop a clear and well-defined design concept. It involves establishing a coherent and compelling idea that serves as the foundation for the design project. Students are evaluated based on the clarity and coherence of their design concept, its alignment with the project brief or problem statement, and the degree of originality and uniqueness displayed in their concept development (Laseau, 2017).

2.2 Design Development Process

The design development process encompasses the iterative exploration and refinement of the initial design concept. It involves evolving the concept through various stages, integrating feedback, and responding to design challenges. First-stage architecture students'

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design development process is evaluated based on the evidence of iterative design exploration, logical progression and refinement of the concept, and the integration of feedback to improve the design (Lawson, 2006).

2.3 Creativity and Innovation

Creativity and innovation are vital aspects of architectural design. Every profession that involves the creation of new objects like architecture requires a wide range of cognitive abilities (Mohamed et.al, 2023). Architecture is also a field of individuality, where understanding the individual differences of students along with their creative potential can help enhance their skills immensely (Hemdan et.al, 2023). In this dimension, first-stage architecture students' ability to think creatively and generate innovative design solutions is assessed. Evaluators consider the degree of originality and inventiveness in their design approaches, the demonstration of fresh perspectives and unconventional thinking, and the introduction of novel elements or strategies in their designs (Cropley et al., 2017).

2.4 Problem-solving Abilities

Problem-solving abilities are crucial in architecture, as students are tasked with identifying and addressing design challenges. This dimension evaluates the students' capacity to identify and analyze design problems, propose effective solutions, and demonstrate logical reasoning in their decision-making process. The evaluation focuses on the students' ability to apply critical thinking, problem-solving strategies, and evidence-based decision-making in their design solutions (Lawson, & Dorst, 2009).

2.5 Spatial Organization

Spatial organization assesses how effectively first-stage architecture students arrange and structure spaces within their designs. It involves evaluating the clarity and functionality of circulation patterns, the relationship between different spaces, and the overall flow and organization of the design. Evaluators consider how well students address user needs, circulation requirements, and the hierarchy and sequence of spaces (Ching, & Binggeli, 2014).

2.6 Design Principles

Design principles form the foundation of architectural design. This dimension evaluates how well first-stage architecture students apply fundamental design principles such as scale, proportion, balance, rhythm, harmony, and hierarchy. Evaluators assess the students' understanding and application of these principles, considering their integration into the design, coherence with the design concept, and contribution to the overall aesthetic and functional qualities of the project (Francis Ching, 2014).

2.7 Presentation and Communication Skills

Presentation and communication skills are essential for architects to effectively convey their design intentions and ideas. In this dimension, first-stage architecture students' ability to present and communicate their designs is evaluated. This includes assessing their proficiency in visual representation through drawings, renderings, and models, as well as their verbal and written communication skills in articulating their design concepts, strategies, and decision-making processes (Porter, 2011).

2.8 Materiality and Detailing

Materiality and detailing pertain to the selection and integration of appropriate materials and the attention to detail in architectural design. This dimension evaluates how well first-stage architecture students consider material choices, textures, finishes, and construction techniques that align with their design concept. Evaluators assess the level of thoughtfulness

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and precision in the students' handling of materiality and detailing, and how they enhance the overall design aesthetic and functional aspects (Allen, & Iano, 2014).

2.9 Overall Design Cohesion

Overall design cohesion evaluates the integration and harmonious composition of the various design elements and components within the project. It considers how well first-stage architecture students bring together different (Habraken, 2002).

3. METHODOLOGY

This study will review and analyze the design portfolios using a checklist prepared for this purpose, which aims to achieve the objectives of the study.

The aim of the study is to measure the acquisition and the awareness of the students by designing a framework and considering dimensions of design competence explained within the course. The hypothesis display to look an answer the questions:

1. Are there any update for architecture first stage projects from 2013 to 2023 at TIU?
2. Are there any parallelism for basic design course for first stage architecture project at different universities?

With this aim, experiment and questionnaire technique were analyzed by IBM SSPS 25 Was used in the study. The aim here is to measure the designing skills of the students within some limitations as follows;

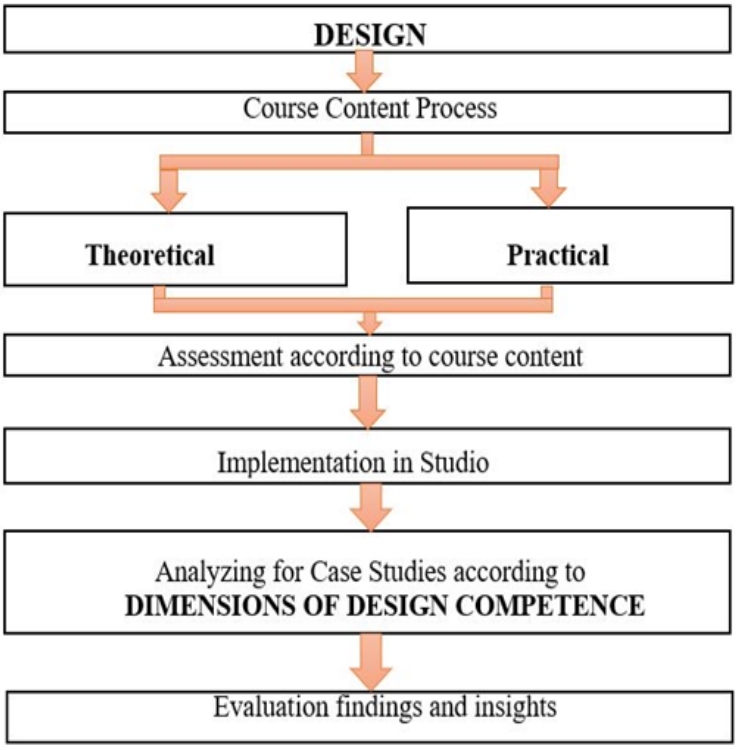

Figure 1. Systematic Approach of The Study
(Source by authors)

3. 1. Case Studies

Display a comprehensive visual summary of first-stage architecture student projects form academic years 2013-2014 to 2022-2023, showcasing the work done during both the fall and spring semesters. The projects in the fall semesters often involve exploratory and creative forms, focusing on developing an understanding of three-dimensional space, balance, and

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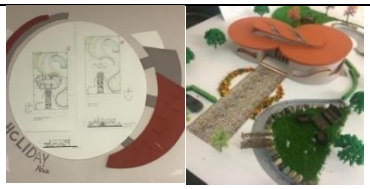
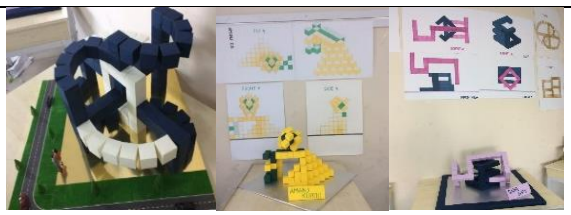
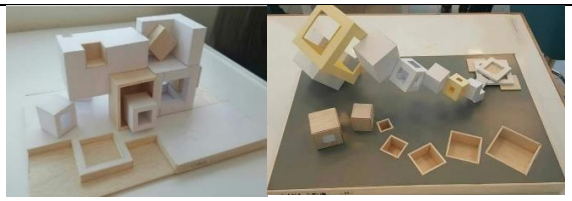
basic construction techniques. Spring Semesters by the spring semesters, students' projects become more complex, often involving more comprehensive architectural models, site plans, and detailed structures that demonstrate an integration of the skills learned in the fall as shown in table 1.

Progression Over Time:

- **2013-2014 to 2016-2017:** The earlier years show simpler, more abstract projects, indicating that students were focusing on basic design exercises.
- **2017-2018 Onwards:** There is a noticeable shift towards more detailed and realistic architectural models, particularly in the spring semesters, reflecting a deeper understanding of spatial organization, materiality, and architectural principles.

Table 1. Some final examples from 2D and 3D studies of the students at Tishk International University

First stage Architecture projects		
Years	Fall semester	Spring semester
2013-2014		
2014-2015		
2015-2016		
2016-2017		
2017-2018		
2018-2019		

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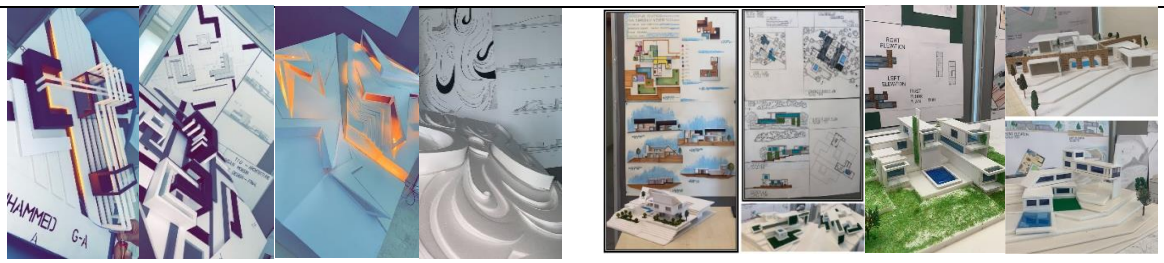
First stage Architecture projects	
2019-2020	
2020-2021	
2021-2022	
2022-2023	

(Source by authors)

This combined table provides a clear visual representation of the evolution of first-stage architecture students' work over a decade. It highlights how students' skills develop from basic exercises in the Fall to more complex and cohesive architectural designs in the Spring, reflecting a structured learning process that gradually builds their design competence. The table also shows how the curriculum likely adapts to better equip students with the necessary skills to progress in their architectural education.

3. 2. Project Analysis

In this paragraph, the variables presented in the theoretical framework and the statistical analysis of the selected projects will be analyzed to reach the conclusions and recommendations. The analysis appears to track the emphasis on various dimensions of design competence within the curriculum for first-stage architecture students across different academic years, from 2013-2014 to 2022-2023. This is done by assigning values (1 or 0) as indicated in Table 2.

1. Early Years (2013-2017): In the years 2013-2014 through 2016-2017, there is a noticeable lack of emphasis on several dimensions of design competence. Only **Spatial Organization** and **Design Principles** are consistently addressed, while other important dimensions like **Conceptual Clarity**, **Design Development Process**, **Creativity and Innovation**, and **Problem-solving Abilities** are neglected.
2. Middle Years (2017-2020): Starting from 2017-2018, there is a gradual improvement, with more dimensions being addressed in the curriculum. However, **Overall Design Cohesion** remains consistently unaddressed until the year 2022-2023.

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3. Recent Years (2020-2023): The most recent years show a more comprehensive approach, with almost all dimensions being emphasized. The year 2022-2023 marks the first time that every dimension is addressed, indicating a well-rounded curriculum.

Table 2. Checklist for evolution projects at Tishk International University

Years	DIMENSIONS OF DESIGN COMPETENCE								
	Conceptual clarity	Design development process	Creativity and innovation	Problem-solving abilities	Spatial organization	Design principles	Presentation and communication skills	Materiality and detailing	Overall Design Cohesion
2013-2014	0	0	0	0	1	1	0	0	0
2014-2015	0	0	0	0	1	1	0	0	0
2015-2016	0	0	1	0	1	1	0	0	0
2016-2017	0	0	0	0	1	1	0	0	0
2017-2018	0	1	1	0	1	1	0	1	0
2018-2019	0	0	1	0	1	1	0	0	0
2019-2020	0	0	0	0	0	1	0	0	0
2020-2021	0	1	1	0	1	1	0	0	0
2021-2022	1	1	1	1	1	1	1	1	1
2022-2023	1	1	1	1	1	1	1	1	1

1: Indicates that the dimension was emphasized or addressed in the curriculum during that academic year.

0: Indicates that the dimension was not emphasized or addressed during that year.

(Source by authors)

3.2.1. Discuss the results of the analysis of frequency ratios according to the student projects at TIU from 2013-2023

The graphical analysis of the criteria has been done by dividing the number achieved by the one standard on the total number that is supposed to be multiplied by the percentage, to obtain a percentage of the repetition of the single criterion in the selected examples of the practical study.

In the context of the theoretical framework, our analysis focused on the dimensions of design competence within first-year architecture design projects at Tishk International University from the period 2013 to 2023, by using checklist as our evaluation tool (table 1), and it's mentioned that the highest percentage of achievement in design competence was observed in the last two years for (2021-2022), (2022-2023) as shown in (table 2), fig (2). This suggests a potential improvement in the projects over time. There was a remarkable increase in the achievement of design competence. Specifically, this upward trend was most pronounced around fostering creativity among students, which has led to the development of diverse cognitive structures and a significant enhancement of their abilities in this domain.

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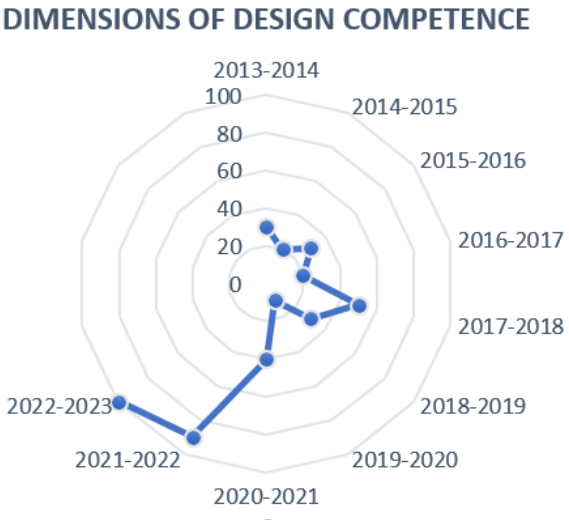


Figure.2. Dimensions of Design Competence Rates
(Source by authors)

3. 3. Basic Design Course in the Department of Architecture in Tishk International University

Course content can often be divided into two main arts focused on architectural design, with an emphasis on both theoretical and practical aspects. Here are the issues typically discussed in each part as follows:

3.3.1. Basic Design Elements and Principle

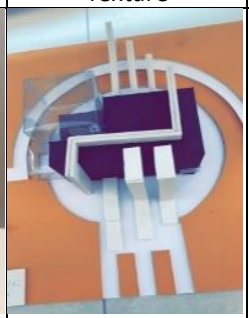
This section would cover fundamental concepts related to architecture, including elements like line, shape, form, texture, color, and principles such as balance, rhythm, proportion, and scale. Understanding these elements and principles is crucial for any architectural design.

3.3.2. Practical Application

In the second section, students would engage in hands-on activities to apply the theoretical concepts they've learned. This could include creating 2D compositions and 3D compositions. The goal is to translate their understanding of design principles into actual architectural representations.

Overall, this course content aims to provide students with a comprehensive understanding of architectural design, from theoretical foundations to practical application, while also addressing contemporary issues and considerations in the field of architecture.as (table 3).

Table 3. Some examples from two- or three-dimensional studies of the students at year 2022, 2023 at Tishk international university

point-Line	Shape-Form	Texture	Color	Asymmetry
				

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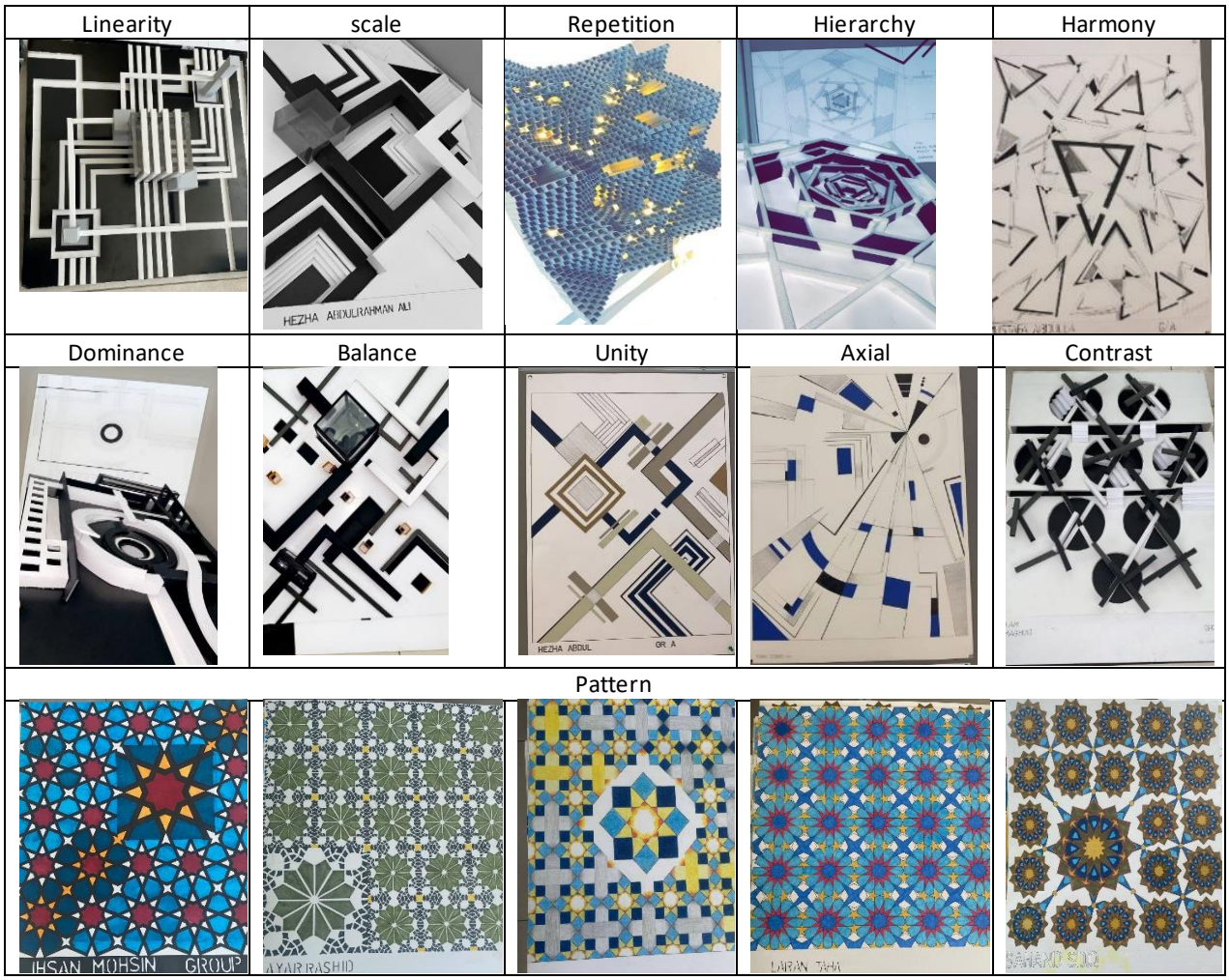

(Source by authors)

4. EVALUATION FINDINGS AND INSIGHTS

4.1. Discuss the results of the analysis from statistical analyzing as follow

Findings According to the results of the questionnaire, the usage rates of the subjects explained in basic design course in the designs made by the students at the end of the term is given in (table 3) , The research aim is to explore the significant relationship between variables influencing the first grade projects from different universities. The researcher gathered all data from different universities, furthermore statistical analysis estimated by utilizing IBM SPSS statistics 25.

4.2. Data collection

The questioners dispersed arbitrarily to architects who work in various sectors, as consultant architect, private sector, governmental sector, and engineering teaching staff at universities, who they have an alternate scholarly capability, from 105 questioners, 93 returned, out of 93 only 81 responded questioners selected, 12 disposed of as result of missing answers.

4.3. Descriptive analysis

The aim of analysis is to assess the relationships the Dimensions of competence from Different Five University in Iraq since (University 1) as we are mentioned is Tishk International University, to define the significant correlation between dependent variables and independent variables, and to test Are there any parallelism for basic design course for first stage architecture project at different universities?

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Table 4. significant Correlation at level 0.01

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		p*
					Lower Bound	Upper Bound	
University 1	81	4.40	0.730	0.082	4.24	4.57	p<0.001**
University 2	81	3.33	0.878	0.098	3.14	3.53	
University 3	81	3.72	0.767	0.085	3.55	3.89	
University 4	81	3.93	0.834	0.093	3.75	4.12	
University 5	81	2.87	1.097	0.122	2.63	3.11	
Total	405	3.65	0.861	0.096	3.46	3.04	

* ANOVA test is Used

** Significant at Level (p<0.01)

Consequently, by following statistical analyses were performed, It appears that University 1 (Tishk International University) has the highest score of 4.40 among all the universities, with a relatively low standard deviation of 0.730, indicating that its scores are clustered closely around the mean. On the other hand, the minimum range of mean was for university 5 with 2.87 for mean and 0.861 for standard deviation. So, the means of university 2, University 3, University 4 were 3.33, 3.72, and 3.93, and for standard deviation 0.878, 0.767, 0.834 respectively, as appeared in (Table: 4).

4.4. Extraction Method Principal Component Analysis

A Scree Plot is a simple line segment plot that shows the eigenvalues for each component. It shows the eigenvalues on the y-axis and the number of factors on the x-axis. The first component will always have the highest total variability and the last component will always have a small fraction of the overall variability. We will focus the differences on the output between the eleven and two-component solution.

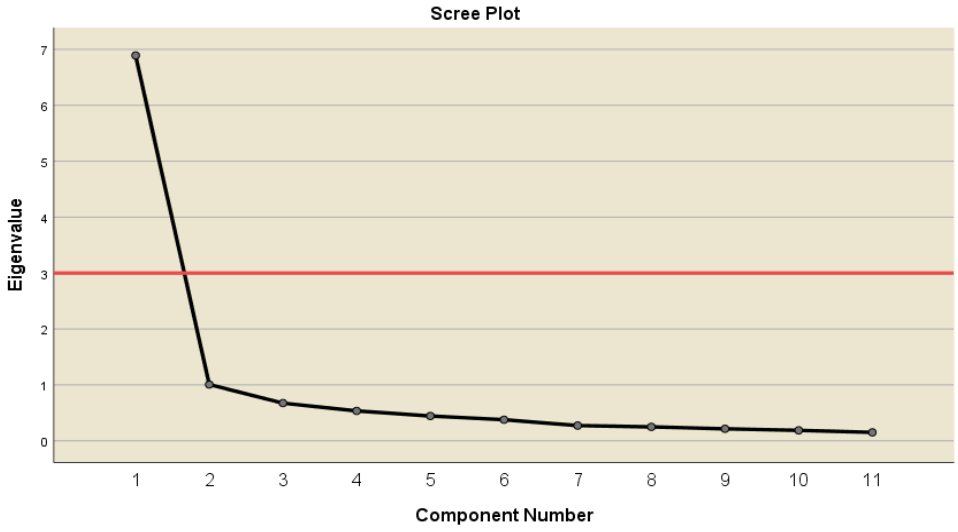

Figure 3. Dimensions of design competence rates
(Source by authors)

Under total variance explained, that the initial eigenvalues no longer equal the extraction sums of squared loadings. The main difference is that there are only two rows of eigenvalues, that the first and second component reach (6.8 and 1.0) respectively, so the cumulative

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percent variance for both component goes up to 71.797% for all dimensions of design competence, which are conceptual clarity and design development as shown in fig.3.

5. CONCLUSION

Assessing the progress and performance of first-stage architecture students should be a holistic process that considers both their technical abilities and their capacity for creative and critical thinking. It should also aim to provide constructive feedback that supports their growth as future architects. The aim of first-stage architecture students with a strong foundation in design skills is a fundamental goal of architectural education. they learn by experiencing what are the basic design elements and principles that they can use as designers against the identified problems and how they can bring these elements together, this strong foundation not only sets the stage for success in their academic journey but also prepares them for future professional careers in architecture. This research determines to analyze the dimensions of design competence between different five universities , The framework consists of (Conceptual clarity, Design development process, Creativity and innovation, Problem-solving abilities, Spatial organization, Design principles, Presentation and communication skills, Materiality and detailing, Overall design cohesion) which have been derived from recently proposed models, through out experiment and questionnaire technique were analyzed by IBM SSPS 25 Was used in the study. It appears that University 1 (Tishk International University) has the highest score of among all the universities. In this process Course executors, which likely refer to instructors or curriculum designers, should thoroughly plan concerning what sort of information and what kind of experience that student face. In this and similar studies, it is important to suggest alternative routes, to implement and share the outcomes of the implementation to emphasizes the importance of careful planning and a forward-thinking approach when designing courses and educational experiences with architecture/design education circle and even to establish new grounds for discussion for all educators, This includes defining the intended learning outcomes, identifying the type of information to be covered, and determining the nature of experiences students will encounter throughout the course.

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