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Original Research Article

The Simultaneous Application of Flipped Classroom and Group Discussion to Improve the Quality of Learning the History of World Architecture Course: An Intervention Mixed Methods Design

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Abstract

Problem statement: the history of world architecture is full of little-used and unfamiliar words related to historic structures and buildings. The breadth of information and the complexity of the concepts of historical monuments, as well as the traditional lecture-based teaching methods, have made it difficult for students to analyze and organize the cognitive and metacognitive fields of the art and architecture of ancient civilizations in the history of world architecture classroom.

Research objective: The present research aimed to explain group discussion in a flipped classroom can improve the quality of learning in the History of World Architecture Course.

Research method: This research was conducted using an intervention mixed methods, in which the constructivist grounded theory introduced by Kathy Charmaz was used in the qualitative part and the experimental method was used in the quantitative part. Qualitative data collected from the notes of the experimental group members, behavior observation, and interview with some of them were analyzed using the initial and focused coding method. Then, in the quantitative part, the amount and quality of learning in the experimental and control groups were compared using a quasi-experimental design. The subjects of the present research consisted of 43 students studying architecture at Shahid Rajaee Teacher Training University, who were placed in two classes with relatively equal conditions using the convenience sampling method, one as the experimental group including 22 people and the other as the control group including 21 people, forming two intact groups. The instrument used for collecting quantitative data was the researcher-made test, the content validity of which was confirmed using expert judgment, and its internal consistency was confirmed with Cronbach's alpha coefficient of 0.82. Quantitative data was also analyzed using the Mann-Whitney U test and SPSS-22 software.

Conclusion: The findings of this research led to seven focused categories in the qualitative part. The categories of cognitive construction and collaborative knowledge construction for the difficulty of learning unfamiliar and underused words, the categories of visualization and graphic expression of textual content for the impossibility of visiting historical monuments abroad, and the categories of agency in learning educational content, linkages and networking between the contents of each chapter, promotion of effective communication skills, and resilience in learning abstract concepts for the breadth of information and the complexity of concepts were formulated. The findings of the quantitative section indicated that the simultaneous application of flipped classroom strategies and group discussion had a statistically significant effect on improving the quality of students' learning in the history of world architecture course ($p<0.01$). Therefore, the calculated effect size is 0.399, which indicates a 40% effect of this teaching method on improving the quality of students' learning. These results emphasize the importance of modern teaching methods in improving the quality of students' learning, and further research in this field may provide a deeper understanding of their effects.

Keywords: *Deep learning, Flipped classroom, Group discussion, History of world architecture, Intervention mixed methods design.*

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Introduction

The tendency to analyze and examine the results of the implementation of the flipped classroom (henceforth FC) in higher education, especially in experimental and engineering fields, is increasing (Galiana Martínez & Seguí, 2016). The flipped learning model, which involves moving passive content out of the classroom and using classroom time for active learning, has become increasingly popular in both secondary and higher education.

In higher education, the FC approach is of significant importance due to its effectiveness in enhancing learning experiences and increasing student engagement. Research has shown that the implementation of the FC can lead to an increase in the depth of experiential skills acquired, a better understanding of concepts, an improvement in reading comprehension, and an increase in listening and speaking skills (Anacona et al., 2023; Garcia-Bosque et al., 2023; Solano et al., 2023). Additionally, the use of the FC approach in higher education has been associated with such achievements as strengthening evidence-based instructional strategies, promoting sociability in the classroom, and providing positive feedback to engage students. As an educational tool, the FC indicates universal adaptability, acceptance, and approval (Wissman, 2023). Additionally, FC, as active learning in combination with information and communication technologies, improves the academic achievements of students.

The FC model makes it possible for students to receive basic educational content in the form of videos recorded by the teacher through the Internet to learn it even several days before the start of the class so that they can experience collaborative and meaningful learning while being more prepared to do classroom activities. The FC leads to active learning, better understanding, easiness of abstraction, effective interaction with the peer group (Gonçalves et al., 2020), deeper knowledge, more engagement, more interaction between the teacher and student, more creativity, and ultimately progress and better academic performance (Desa & Abd Halim, 2022). In addition, the FC provides students with the flexibility to learn at their own pace while having access to educational content from anywhere (Supriasih et al., 2023). Despite the benefits of the FC, there are challenges such as the time-consuming process of preparing educational content by teachers, lack of technical skills, and student motivation to watch videos before class, which require the use of effective implementation strategies (Desa & Abd Halim, 2022).

Architectural history courses are a treasure trove of ideas and ideals that expand and deepen architecture students' knowledge and ability to conceptualize from design experiences overtime on a historical-cultural basis so that one can learn design lessons from architectural history and experience architectural thinking from valuable ideas and concepts institutionalized in it considering today's architectural problem (Leach, 2013). Regarding the space design, composition, function, physical environment, and the need to preserve architectural heritage, architectural history is a field of architectural education (Qayyoomi Bidhendi, 2023), which includes the study of architectural works, buildings, and social structures from various civilizations and historical periods with multiple viewpoints (Yıldırım Özcan, 2022).

The History of World Architecture (henceforth HWA) course also plays an important role in the education of future architects because this course examines the history of large and skillfully built structures and their cultural significance (Piwek et al., 2020). The HWA shows how buildings pursued different goals concerning their historical context in ancient civilizations, have survived over time, and have become symbols of different historical ideas and contexts. Architectural history is the history of building, space-making, and human settlement (Leach, 2013). Therefore, a specific range of architectural quality attributes in the design of the environment provides the grounds for the realization of the desirability of the architectural space to improve the habitability of the environment for human activities (Majidi et al., 2023a). Due to the importance of the issue, the teaching of the HWA has been considered in the curriculum of the field of architecture in Iran to familiarize students with world architectural events, the evolution of architectural forms, and various factors affecting architecture while it covers such concepts as stylistic features, social and cultural elements, and diversity of architectural works. Research by Mirnezami Ziabari et al. (2023) also pointed out concepts such as educational approaches, educational strategies,

educational resources, and educational problems when analyzing the conditions of education in the HWA.

However, the education of architectural history in architectural schools goes beyond the transfer of facts and requires architects to understand spatial structures, analysis of buildings, and historical architecture through images and maps (Sołtysik, 2020). These buildings are often inaccessible to students due to their locations and the cost of holding educational camps. Like other courses in the field of architecture, teaching architectural history and urban planning faces many challenges, including the selection of content, textbooks, and methods of analyzing educational resources, and obviously, the HWA course is full of little-used words and terms and sometimes outdated information on the historical structures and buildings. On the one hand, the breadth of information and the complexity of concepts related to historical buildings, and on the other hand, traditional lecture-based teaching methods have made it difficult for students to analyze, perceive, and organize knowledge of different styles of architecture (Sanusi et al., 2018). The indicator of conceptual and technical fluidity is one of the most stable and surprising difficulties that architectural historians face. This means that the appearance of the building, building technology, materials and construction methods, applications, and dignity of architecture do not have a fixed and static status in terms of time and place and are constantly changing (Leach, 2013). Therefore, the difficulty of learning the content of the HWA course is one of the students' complaints. The study by Bahadur et al. (2013) also indicates that architectural history is not interesting for students. Therefore, it has led to problems in understanding and remembering basic concepts.

Theory-based subjects, such as architectural history, are usually presented in a lecture format, and a large amount of factual data to remember does not engage students with architectural history. The process of remembering data requires a clear understanding of events that have already occurred (Dave et al., 2018). Some students think that learning the HWA requires memorizing relevant dates and events. Thus, this course is less attractive for them. Field evidence shows that traditional lecture-based teaching methods strongly rely on memorization while putting learners in a passive position as mere listeners. This condition has such consequences as students' lack of interest in the HWA, and even in some cases, it leads to their dislike of this course. Additionally, the study by Mirnezami Ziabari et al. (2023) indicates that the main problems of teaching the HWA in the educational system of Iranian universities are the lack of teaching time, the greater attention of architecture faculties to design courses, the lack of reliable sources in the Persian language, and the impossibility of visiting historical monuments abroad. Although the learning model based on the FC has been widely used, the existing studies show that this model has not been fully exploited in higher education and limited research has been done in this field (Chen et al., 2014).

To overcome the relatively widespread problem of the lecture-based teaching method in the HWA course, the present research has investigated the use of the mixed method of the FC and group discussion for teaching this course. The use (implementation) of face-to-face group discussions as one of the strategies for implementing the FC can encourage students to actively engage with educational content, share their views, and develop critical thinking skills in themselves while strengthening the formation of collaborative learning environments (Akbaripordanjani & Salehi, 2024). In addition to investigating the effectiveness of the mixed method of group discussions in the context of the FC, the present research has explained the educational strategies used by the students in the experimental group when facing the content of the HWA course.

Review of Literature

The FC, also known as flipped learning, is an educational approach that challenges the traditional model of education. This approach is based on theories such as the zone of proximal development, constructivism, humanism, and discovery and reverses the usual sequence of instruction (He et al., 2018). In an FC, instead of teachers presenting the content during the class and students doing exercises after the class, the students engage in self-learning outside the class through the tasks assigned and the teaching materials uploaded in advance (ibid.). This approach encourages active learning and offers students more autonomy and flexibility in their learning path

(Campanyà et al., 2021; Chukwuma-Uchegbu, 2021). It allows for more personalized education tailored to students' individual needs during class (Liu, 2019). The FC approach also enables students to take responsibility for their learning and fosters international and multidisciplinary perspectives. In addition, flipped learning provides both students and teachers with the tools and resources needed to succeed in the 21st-century academic world (Chukwuma-Uchegbu, 2021).

The FC model includes two distinct elements. The first involves access to digital resources outside of the class, allowing students to engage with content at their own pace. A significant part of learning takes place outside of the traditional classroom environment and often through online resources. Online learning models correspond to the FC concept, where students engage with online learning content before face-to-face classroom sessions. The second element revolves around interactive learning activities within the class, where students can apply theoretical concepts to real-world scenarios through practical tasks (Ozenen, 2023).

The FC approach can improve student engagement more than traditional lecture-based teaching (Cronhjort et al., 2018). Flipped learning is a student-centered approach where students are more active than the teacher in classroom activities (Chukwuma-Uchegbu, 2021). This approach is based on the concept of active learning and problem-based learning, where students participate in practical activities, discussions, and collaborative projects (Campanyà et al., 2021; Elrayies, 2017). Flipped learning is a model of delivering instruction that shifts lectures from a class-time activity to an activity at home and shifts homework from an activity at home to critical thinking activities in class (Chukwuma-Uchegbu, 2021). Flipped learning aims to increase student engagement, promote critical thinking and problem-solving skills, and foster a deeper understanding of the subject (He et al., 2018).

The integration of multimedia information technology, especially micro-video technology, has been effective in changing the traditional teaching methods in architecture education. Visualization tools and micro-video technology have contributed to the adoption of the FC model, transforming face-to-face education into highly engaging and evidence-based learning environments (Liu, 2019). For example, in architectural design studios, students can engage with educational materials before class, allowing for more interactive and collaborative activities to take place during class time.

In general, the implementation of inverted learning in architecture education has been associated with positive results. FCs have received attention due to their ability to increase student engagement and overall satisfaction with the course, especially for students who may have difficulty in traditional learning environments (Cronhjort et al., 2018; Fleischmann, 2021; Lo, 2017). By creating a dynamic and student-centered learning environment, flipped learning promotes deeper engagement with course content, equipping students with the skills necessary to navigate the complexities of an ever-evolving global landscape (Chukwuma-Uchegbu, 2021; Fleischmann, 2021). This approach has been effective not only in promoting student interaction with content but also in peer learning in design education (Fleischmann, 2021). It allows students to prepare questions about challenging topics and fosters an active approach to learning (Ozenen, 2023).

When using the FC approach, students submit their questions electronically before class, allowing teachers to adjust group activities based on identified difficult areas. Collaborative group projects encourage students to delve into complex material, which supports peer learning and teamwork. Group collaboration allows students to encounter different points of view and approaches and prepares them for the collaborative dynamics common in this field (Elrayies, 2017; Ozenen, 2023). This approach integrates interdisciplinary perspectives and explores various concepts and methods of architecture, preparing students for the changing needs of the field of architecture in the contemporary era (Chukwuma-Uchegbu, 2021). Instructors facilitate group discussions and provide targeted assistance to improve understanding and answer students' questions. Through this process, students develop critical thinking and problem-solving skills and prepare themselves for real-world architectural challenges (Ozenen, 2023). Instructors play an essential role in fostering teamwork by providing guidance, resources, and feedback throughout the project process (Elrayies, 2017).

Adopting the FC model in architecture education not only aligns with contemporary educational trends but also has significant benefits for both instructors and students. This approach enhances active learning and cognitive engagement among students by using pre-recorded lectures and problem-solving activities in the classroom (Ozenen, 2023). By empowering students to take responsibility for their own learning outside of the classroom, the FC model fosters self-directed learning skills (Coyne et al., 2017; Fleischmann, 2021; Ozenen, 2023) so that the learners can improve their educational performance independently and self-reliantly across the curriculum while utilizing critical thinking (Orozco-Messana & Martinez-Rubio, 2021) and experience a deeper understanding of architectural concepts. In addition, while facilitating the process of integrating students' personalized learning experiences, the FC model brings a better understanding of educational content, the development of critical thinking and problem-solving skills in the light of peer learning opportunities, and student engagement.

Research Method

Considering the nature of the subject and the research questions, the current research aimed to study the simultaneous use of the group discussion and the FC compared to the lecture-based teaching method for the HWA course. For this purpose, an intervention mixed methods design was used. In the mixed approach, qualitative and quantitative data collected by the researcher are analyzed (Creswell & Clark, 2017) to minimize errors and use the effective capability of qualitative and quantitative methods (Salehi & Golafshani, 2010) and the research findings enjoy more conceptual richness and accuracy in terms of processing details (Creswell, 2015). In the intervention mixed methods design, the research is mainly based on the qualitative study, and priority is given to the qualitative data when collecting, analyzing, and interpreting the findings to describe and explain a phenomenon. The study by Creswell and Creswell (2022) indicate that the intervention mixed methods design is suitable for testing the elements of the emerging theory resulting from the qualitative phase, and it can also be used to generalize the qualitative findings to different samples. Additionally, They explained the selection of a intervention mixed methods design as determining the distribution of a phenomenon in the selected community. In the second step, using a quantitative approach, the effect of the focused codes extracted from the qualitative section on two experimental and control groups was investigated to achieve a broader perspective of the research problem.

In the first part, based on the qualitative approach and the constructivist grounded theory introduced by Charmaz, qualitative data collection techniques such as obtaining information from the experimental group's notes, observing their behavior in the class, and also conducting focus group interview with a number of the members of the experimental group were used. The analysis of data collected in the present research, which was done by the authors using Charmaz's grounded theory approach, was based on a cyclical process including two stages of initial coding and focused coding so that using the main tasks in the analytic cycle of qualitative data (Hennink et al., 2020), analytical concepts were developed inductively, not deductively, from the data while forming the internal connections between data. The nature of the analytical cycle of qualitative data is important because it allows a more refined perception and understanding of inductive inference of propositions while deepening and clarifying the data, and this mental exploration is representative of the abstraction process (Abul Ma'ali, 2021).

In the stage of initial coding, 453 documents were extracted from the handwritten notes- consisting of text and images- of the students in the experimental group, who learned the HWA course with the technique of group discussion in the context of the FC during 16 sessions of active engagement, were studied and analyzed. The words, sentences, and paragraphs included in the note-taking versions were scrutinized, and the visual and graphic elements in the text of the notes were used to recognize the categories and analyze the qualitative data. Additionally, recorded reports resulting from the professor's longitudinal observations of the behavior of students participating in group discussions during 16 educational sessions and focus group interview were used to discover abstract concepts in the data and improve

the conceptual level of the data. In the stage of focused coding, while discovering data and connections between abstract concepts, evidence related to social processes in the data was collected.

In the second part, both experimental and control groups were examined using a quantitative approach based on the nonparametric Mann-Whitney U test. Generally, following a pragmatic view, mixing quantitative and qualitative methods provides a more fruitful interpretation of the findings (Fig. 1) and better opportunities to answer important research questions (Johnson & Onwuegbuzie, 2004; Salehi & Golafshani, 2010).

Research Field

The research field included 22 female and male students aged 19 to 20 years old, who studied a bachelor's degree program in architecture at Shahid Rajaee Teacher Training University and were placed in the experimental group using a convenience sampling method. They were completing the HWA course in the second semester of their study program.

In this research, qualitative data were collected from three sources. First, the textual and graphic versions of the notes taken by the students in the experimental group from the videos recorded in the FC were studied and carefully analyzed. The second source was observing and recording students' classroom activities during their participation in group discussions. In the last stage, simultaneously with the intervention in the educational plan, focus group interview were conducted with some students in the experimental group. In the grounded theory method, data collection and analysis, drawing conclusions, theory development, and theory testing can work in a circling spiral manner, and like the experimental method, theory design is not linear (Payne, 2007).

Content Selection

The syllabus of the HWA course aims to acquaint students with the process and evolution of form, structure, and space in architectural works from the beginning to the threshold of the contemporary period (Table 1). The realization of this goal requires firstly rereading the factors forming architecture and the stylistic characteristics of different historical and geographical periods and secondly analyzing the intellectual roots and social, cultural, and religious components affecting the valuable buildings throughout the HWA.

Procedure

As the HWA course was taught to the experimental and control groups in two separate classes using group discussion-FC and lecture-based methods, respectively, the exchange of information between the subjects was almost impossible. The experimental intervention applied to the experimental group was the group discussion (Fig. 2) in the context of the FC, and during the semester, the experimental group learned the content of the HWA course using the mentioned approach.

In each session, the educational content was provided in the form of a video for the experimental group through virtual space, and after watching the video and taking textual and visual notes, the students were prepared sufficiently to attend the class and participate in the group discussion. Figs. 3, 4 & 5 show examples of a total of 453 pages of notes taken by the students in the experimental group during 15 sessions. At the beginning of each class, the professor[1] asked questions about each student's

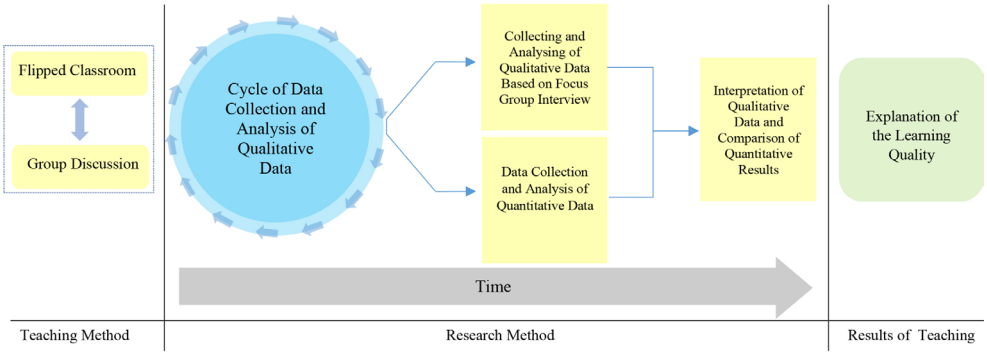

Fig. 1. Intervention mixed methods design. Source: Authors.

Table 1. Syllabus of the HWA course. Source: Planning, Development, and Educational Supervision Council of Tehran University, 2023/10/29.

	Title	Description of the geographical and civilizational scope of architecture and art
1	Prehistoric architecture and art	Lascaux Cave in France and Cave of Altamira in Spain, Paleolithic, Mesolithic, Neolithic, Jericho, and Çatalhöyük era
2	Architecture and art of early civilizations in Mesopotamia	Architecture of Sumer, Akkad, Old Babylon, Assyria, and New Babylon
3	Ancient Egyptian architecture and art	Old Kingdom, Middle Kingdom, New Kingdom
4	Architecture and art of early civilizations in Iran	Old Elam, Middle Elam, New Elam, Medes, Achaemenians, Parthians, and Sasanians
5	Indian architecture and art	Mohenjo-daro, Harappa, Buddhist era, Hindu temples, Jain temples
6	Architecture and art of China and Japan	The rituals of ancient China, the pillars of Chinese architecture/ Japanese rituals, Japanese architecture: temples, Shrines, palaces, tombs, and houses
7	Architecture and art of Aegean civilization and ancient Greece	Old Minoan, Middle Minoan, and Late Minoan architecture, Mycenaean architecture/ Ancient Greek architecture: Doric, Ionic, Corinthian, elements of Greek architecture, classical and Hellenic historical periods
8	Etruscan architecture and art and ancient Rome	Etruscan architecture/ Architecture of the Kingdom Period, First Republic Period, Empire Period, Late Archaic Period
9	Architecture and art of early Christianity and Byzantium	Pre-Constantine and Post-Constantine era, various types of architectural drawings of the Early Christian period/ The reign of Justinianus and the first golden age, axial, central, and combined axial-central plans, Late Byzantium, mosaic work, and Byzantine painting
10	Carolingian and Romanesque architecture and art	Romanesque architecture, French Romanesque, Italian Romanesque, English Romanesque, sculpture and relief in Romanesque architecture
11	Gothic architecture and art	Early Gothic, developed Gothic, late Gothic, Gothic in England, Germany, and Italy, sculpture in Gothic architecture, stained glass in Gothic architecture
12	Renaissance architecture and art	Early, middle, and developed renaissance
13	Baroque and Rococo architecture and art to the beginning of modern	The concept of Baroque, and introduction to Baroque churches and palaces/ The concept of Rocco, and introduction to Rocco buildings

notes to prepare them mentally for participating in group discussion. Additionally, in proportion to each part of the educational content discussed by the experimental group, additional points related to the subject were emphasized by the professor. At the end of the HWA course which included 15 educational sessions, each lasting 120 minutes and held over 3 months, both experimental and control groups were examined using post-tests.

The instructions on how to implement the group discussion were the main part of this research and the guarantor of the realization of the hypothesis. These instructions included preparation before the discussion, structuring the discussion during its implementation, and activities after the discussion, as described in Table 2.

Criteria For the Evaluation of Qualitative Research

There are various methods to confirm the precision, validity, and reliability of the data extracted from the qualitative part. Following the criteria proposed by Lincoln and Guba (1985) to improve the trustworthiness of the findings, which is equivalent to validity and reliability in quantitative research, the present research considered four criteria of credibility, transferability, dependability, and confirmability to be evaluated (Salehi et al., 2015). The relevant titles, definitions, and measures have been presented in Table 3.

Findings

The systematic search conducted in the present study to explain the themes hidden in the simultaneous application of the FC and the group discussion for teaching the HWA course was at the level of conceptual ordering. According to the findings, 32 meaningful units extracted from qualitative data were organized under the title of initial codes in the first stage. By repeatedly referring to previous and new categories to find semantic holes, conceptual gaps, and similarities and differences in text elements, the categories were integrated or separated and the titles of the categories were reviewed to achieve saturation. In this way, the necessary action is taken to ensure the accuracy, compatibility, stability, significance, generality,

Fig. 2. Students participating in group discussion. Source: Authors.

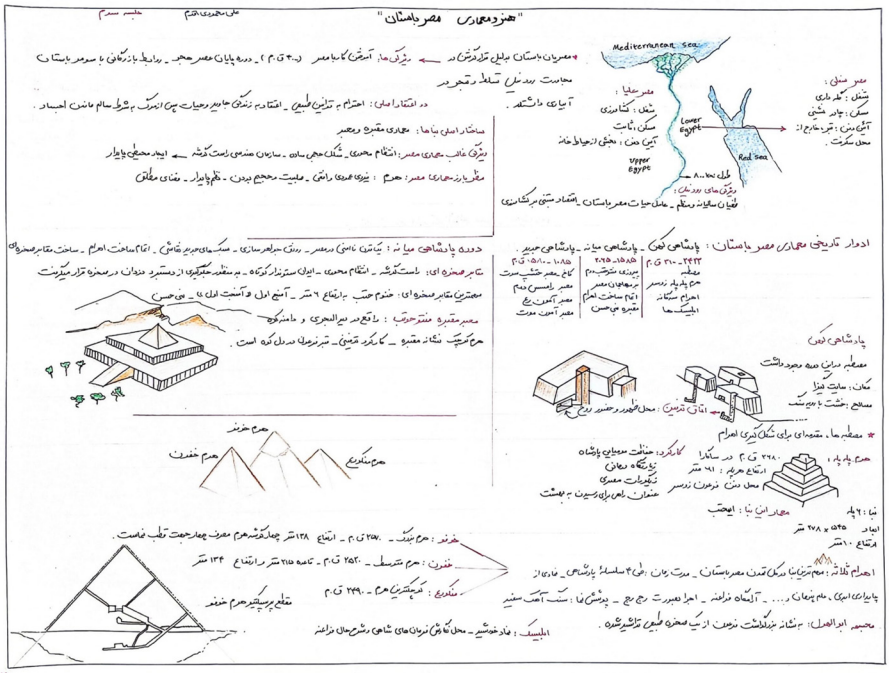

Fig. 3. The use of coloring and classification of textual and visual content in a part of 453 documents of notes taken by the experimental group. Source: Authors.

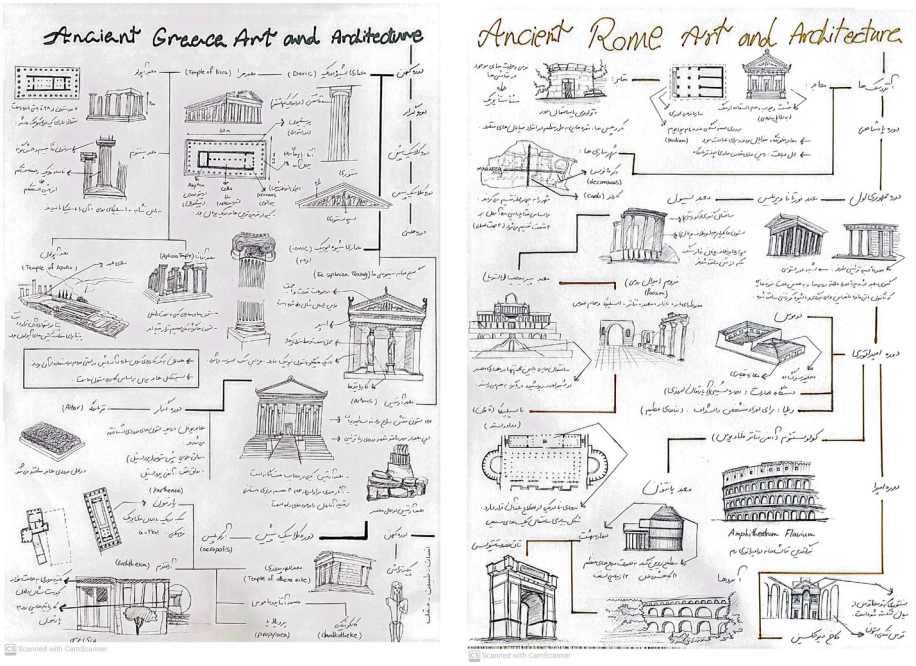

Fig. 4. Reducing textual information and drawing designs to classify historical periods in a part of 453 documents of notes taken by the experimental group. Source: Authors.

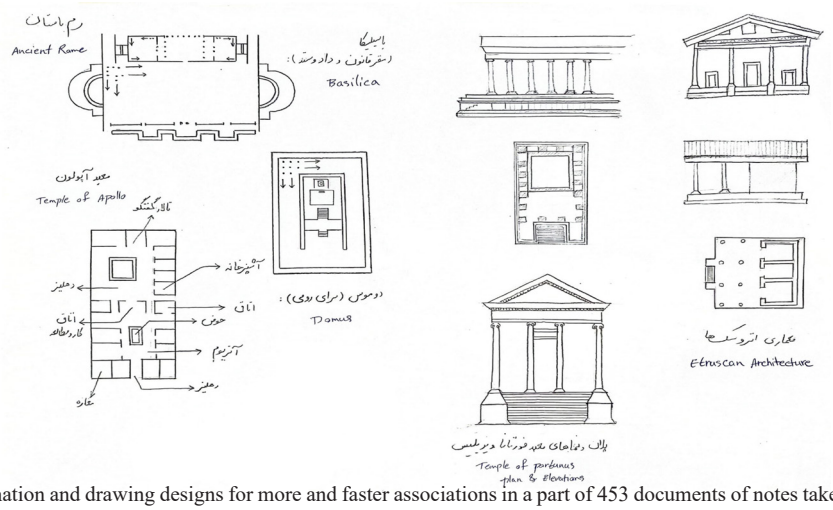

Fig. 5. Reducing textual information and drawing designs for more and faster associations in a part of 453 documents of notes taken by the experimental group. Source: Authors.

Table 2. Instructions on how to implement group discussion. Source: Authors.

	Steps of group discussion	Description
1	Preparation before the discussion	- Determining, defining, and explaining the objectives of the group discussion considering 4 objectives extracted from the curriculum and the syllabus of the courses in the field of architecture: 1.The process of formation, change, and evolution of architectural works in different historical periods and how the form, structure, and space of historical buildings and complexes have affected each other from the beginning to the threshold of the contemporary period/ 2. Knowing the factors forming the architecture and stylistic features of architectural works in different cultural and geographical areas and analyzing the intellectual roots and social, cultural, and religious components affecting architectural works/ 3. Introducing prominent examples of architectural history and analyzing and interpreting the formation and evolution of their shape, structure, and spatial features./ 4. Understanding and comparing the interaction of historical events, architectural styles, social and cultural events, and the features of the architecture of similar civilizations - Choosing each of the subjects included in the four objectives according to the lesson plan of each session - Presenting videos recorded by the professor according to the general objectives and the lesson plan of each group discussion session - one week earlier - in the virtual group of the class.
2	Structuring group discussion	- Obligation to follow the rules of participation in group discussion, including respectful communication, listening, and active participation in the discussion - Guidance of the discussion by the professor as a facilitator - Encouraging the expression of various viewpoints using open questions and the analysis from different cultural-historical points of view
3	During the group discussion	- Engaging the minds of the participants in the discussion using visualization of textual content and graphic techniques - Formation of focus groups, summarization of discussions, and asking follow-up questions to encourage students to think about historical buildings - Developing subgroup discussions to encourage the participation of quieter students to share their ideas and strengthen their communication skills
4	Activities after group discussion	- Short reflection and brief writing of the learned for deeper processing of the concepts presented in the lesson plan - Holding feedback sessions and expressing opinions about the format and content of group discussions to improve future discussions - Connecting the final part of the discussions in each session to the topics of the next session

and verifiability of the theory. In the second stage, by discovering the theoretical connections between the initial categories to achieve a logical connection model, 7 focused codes were conceptualized.

Through the analysis using Charmaz's constructivist grounded theory to achieve coherence, integration, collocation, and enrichment of the explanatory power, as well as the conceptual density, and conceptual specificity of the theory (Farasatkhah, 2009), focused codes with a higher level of abstraction, including cognitive construction, collaborative knowledge construction, visualization and graphic expression of textual content, promotion of effective communication skills, agency in learning educational content, linkages and networking between the contents of each chapter,

Table 3. The criteria for the evaluation of qualitative research and the measures taken to meet them in the present study. Source: Authors.

Criteria	Definition	Measures taken in this research based on features
Credibility	The confirmation of the researcher's interpretation by other experts refers to reliability. This concept is an alternative to internal validity and aims to ensure the accuracy of the findings.	The level of believability of the interpretations made by the researchers, the data, and the research process were confirmed by 5 professors with expertise in educational research and architectural education who were familiar with the nature of the current research (peer-checking).
Transferability	It is concerned with providing enough information to the reader to judge the applicability of the findings in other settings. This concept is an alternative to external validity.	The strategy of triangulation of data (using both documents and narrative data from students' notes), triangulation of the investigator/researcher (using a research assistant in the process of data collection, analysis, and interpretation (member checking)), and environmental triangulation (by conducting interviews in different places and times) were used to increase the level of believability of the interpretations made
Dependability	It is concerned with documenting the data, methods, and decisions related to research, which makes it possible for other researchers to scrutinize and investigate.	By preparing sufficient evidence and documentation related to the phenomenon under study, the procedures, the background, and the conditions of the research were described precisely in detail.
Confirmability	It is concerned with using inspection tools to prove quality, in which the researcher can provide a self-reflective analysis of the methodology used in the research.	This research tried to ensure the confirmability of the findings by explaining sufficient details of the process of data collection and analysis.

Table 4. Seven focused codes extracted for the application of FC and group discussion. Source: Authors.

Initial codes	Focused codes
- Improving the knowledge range and developing the scope of perception by using Latin equivalents of words - Making educational content meaningful - Improving critical thinking skills by using summarizing skills and choosing the most important concepts - Questioning the learning experiences from the educational content presented in the FC during the group discussions	Cognitive construction
- Relating the topics raised in the group discussions with the educational content learned in the FC to achieve a general schema of knowledge - Creative ideation when expressing diverse approaches from the content of the HWA course - Discovering the physical features of architectural works belonging to each civilization using tables designed during group discussions - Discovering targeted search strategies on the Internet and achieving a deeper understanding of the explicit and implicit concepts of the HWA - The dynamic nature of group discussion as a basis for more engagement	Collaborative knowledge construction
- Visual and textual coding when taking notes of concepts to improve conscious control over mental activities and processes - Using coloring for better coding of textual information - More and faster association of textual information in the light of visual note-taking - Drawing tree diagrams of textual information for better organizing the content in the mind - The skill of using software to produce and present enriched, dense, and themed digital educational content	Visualization and graphic expression of textual content
- Developing the four skills of listening, speaking, writing, and reading - Emphasizing the importance of the way of speaking and improving verbal skills - Improving expression techniques when participating in group discussions - Engaging students in communication with each other in the process of learning world architecture	Promotion of effective communication skills
- The skill of managing limited time of class with an emphasis on expressing the most important concepts related to the educational content of each session - Ideation and creativity in the preparation and production of textual-graphic notes - Spontaneity and active engagement in class and leading group discussion - Effective action to learn how and what the basic principles of educational content are - Expressing feelings and belonging to the meaningfulness of educational content	Agency in learning educational content
- Eager to learn and discover new concepts of architecture in relation to civilizational events - Separation and classification of architectural materials from cultural, social, and mythological concepts - Scrutinizing learned content using tables related to the content of each subject - Identifying the similarities and differences of the architectural features associated with each civilization	Linkages and networking between the contents of each chapter
- Increasing the level of accuracy, attention, and engagement when facing new educational content - Boosting self-confidence - Effective learning in the light of promoting effective interaction and cooperation with the peer group - Having a sense of sufficiency and worth when expressing criticism and opinion - Representing a positive self-image	Resilience in learning abstract concepts

and resilience in learning abstract concepts were developed (Table 4).

Discussion

• Analysis of qualitative findings

- Cognitive construction

Cognitive construction refers to the process of actively constructing knowledge and meaning through the interaction between existing knowledge and new information. The process of cognitive construction is based on the idea that knowledge is not passively absorbed, but is actively constructed by learners based on their existing cognitive structures and experiences, which provides grounds for a deeper understanding of the educational subject. In the FC, students organized the main concepts contained in the educational content in their minds when taking intelligent notes from the educational content recorded in the videos, and using analytical writing skills, they paid attention to the Latin equivalents of keywords. In other words, summarizing with an emphasis on keywords provided them with the grounds for improving their analytical thinking skills. Additionally, in cases where the educational content offered in the FC was ambiguous and complicated for them, they expanded their knowledge and the scope of perception of the subject of the HWA course by raising relevant questions in the group discussion.

The studies by Çakiroğlu and Öztürk (2023) and Elrayies (2017) indicate that in the FC model, the focus is on the active construction of knowledge and the cultivation of higher-order thinking skills among students. This is achieved through the implementation of active learning strategies, including problem-solving, discussion, joint teamwork, brainstorming, and project-oriented activities during face-to-face meetings. The construction of knowledge and meaning takes place actively through the interaction between existing knowledge and new information, which motivates students in an FC to take responsibility for their own learning, review material independently, and participate in peer group learning, contributing to the active development of knowledge (Fleischmann, 2021). Involvement of learners' minds in the dynamic process of group discussion with the peer group leads to a deeper understanding of the educational topic. In other words, it is the intellectual activities of students in group discussions that actively provide the grounds for the formation of cognitive structures and experiences necessary to construct meaning (Majidi et al., 2024).

During the group discussions in the context of an FC for the HWA course, the participants were actively involved with the material by giving explanations to their peers. The study by Van Blankenstein et al. (2011) also indicates that students remember the information for a long time when they explain course concepts to others. In such a process, the formation of a meaningful relationship between new knowledge and existing cognitive frameworks provides the grounds for deeper understanding and memorization of the content. Therefore, the interactive nature of group discussion that actively facilitates effective social communication in the classroom strengthens memory through structured learning environments. Encouraging students to explain concepts, participate in meaningful conversations, and collaborate with peers allows instructors to significantly improve students' cognitive results with the aim of a deeper understanding of the subject.

- Collaborative knowledge construction

When using the technique of group discussion in the context of the FC, the student's participation in the discussions of each educational session provided the grounds for innovation and identification of important content, and their cooperation with each other in group discussions led to the formation of the process of collaborative knowledge construction so that the students constructed new knowledge while integrating their knowledge and sharing it (Tomoto et al., 2011). For example, in the process of collaborative knowledge construction, creative ideas were also expressed by the students when expressing diverse approaches from the content of the HWA course, including the analysis of historical buildings based on construction technology, materials, building systems, and functional and aesthetic characteristics in comparison to the chronological explanation of buildings.

Discovering the physical features of the architectural buildings of ancient civilizations and analyzing and

representing them in the form of tables provide the grounds for students to form a strategy for targeted search on the Internet and achieve a deeper understanding of the explicit and implicit concepts related to the subject of the HWA. Therefore, the dynamic nature of collaborative knowledge construction in group discussions of the HWA course leads to a better quality of learning by taking advantage of the relative mastery and diverse perspectives of students participating in the class. The results of the research by Elrayies (2017) on the FC approach indicate the empowerment of students in controlling their learning so that they can review the material independently and provide themselves with the grounds for collaborative knowledge construction in the learning community. Additionally, activities such as discussions or problem-solving assignments, compared to less interactive formats, firstly allow the encouragement of active and critical participation of students and secondly lead to better cognitive results. The study carried out by Stewart (2018) demonstrates that the intellectual explorations of students in group debates about the subject under discussion cause cognitive knowledge growth while facilitating success in achieving knowledge construction in the light of meaningful conversations by directing different perspectives toward combining and organizing information based on a kind of structured participation.

During class time, students can achieve deep learning through group discussion, assessment, workgroup, and self-made questions. While at home, they only focus on lower-level cognitive skills such as remembering and understanding, they can develop higher-level skills such as application, analysis, evaluation, and creation during face-to-face sessions (Çakiroğlu & Öztürk, 2023).

- Visualization and graphic expression of textual content

Since the educational content of the HWA course involves reading maps and graphic images of buildings, students in the experimental group used the skills of sketching, visualization, and graphic expression of textual content when taking notes on the educational content recorded in the FC. Observations of Zeyab et al. (2020) also indicate that visual note-taking facilitates information recall, simplifies complex ideas, develops critical and visual thinking skills, and enhances constructive learning through real student engagement. In other words, the institutionalized capacity for note-taking and visualization of textual content goes beyond merely recording information so that it creates new insights into the educational content and reveals new meanings (Crowe & Laseau, 1986).

In the present research, when watching educational videos in the FC, the students in the experimental group experienced the meaningfulness of the content of the HWA course by creating visual signs through drawing diagrams, flowcharts, and tree diagrams of the temporal and spatial status of each of the historical monuments. Additionally, by drawing and coloring the plans, views, sections, and perspectives of the buildings while reducing the textual information, they improved the speed and accuracy of memorization and recall in the light of intelligent coding (Majidi et al., 2023b; Majidi et al., 2025). As the educational content of the HWA course is full of Latin and rarely used equivalents, the students in the experimental group developed their knowledge range and perception scope in a fully conscious way through internet searches about the topic under discussion.

Using visualization and graphic expression, which requires seeing the basic connections between themes hidden in the HWA course, facilitates understanding some architectural concepts, including the analysis of the logic of the establishment of the building according to the geographical orientation of the site, the circulation system and the hierarchy of each of the spaces in the body of the building, the recognition of the geometric relationships of shapes, and the regularity of geometric structures, for students (Majidi et al., 2023b). Thus, every continuous effort in visual note-taking leads to the discovery of newer layers, reveals the secret of other unknowns about the nature of the place and allows deeper penetration and a more elevated perception of the richness of the complex places. The development and empowerment of visual thinking and visual perception as the common mental processes in architectural education require an exploration of hidden layers and the plurality of views on the world and the details of each monument. Therefore, visual note-taking as a bridge between the scattered world of external information and the internal visual world in the mind plays an effective role in

processing, refining, organizing, and storing information dynamically and actively in long-term memory.

- Promotion of effective communication skills

Textual and visual note-taking of recorded videos in the FC has a positive effect on the development and improvement of students' listening, writing, and reading skills, and when students express their opinions by participating in group discussions, their speaking skills are also strengthened. Therefore, in every session of the class, they improved their verbal skills by using the techniques of speech. In general, the spontaneous participation of students in group discussions provided them with opportunities to develop effective communication skills and interact with peers and instructors through joint teamwork (Çakiroğlu & Öztürk, 2023).

- Agency in learning educational content

The agency is related to such features as intentionality, forethought, self-reactiveness, and self-reflectiveness and enables a person to ensure the occurrence of an activity. Discovering and developing individual values (Chang, 2011), increasing the level of deep attention and active participation in group discussions, spontaneous leadership of class discussions considering time management, and competency of effective communication with peer groups (Anderson, 2017) are among the components of students' agency in learning the content of the HWA course. The study by Inouye et al. (2023) also shows that self-reflectiveness and proactive self-regulation (Cotterall, 2015) strengthen self-formation (Marginson, 2014) and personal growth and development in students (Tran & Vu, 2018). Therefore, the students' agency to participate in group discussions makes it possible for them to express their opinions and take thoughtful actions, and textual-graphic note-taking, allows them to express creative interpretations of the space.

- Linkages and networking between the contents of each chapter

Identifying the similarities and differences between the physical features of the historical monuments and a deeper understanding of the concepts hidden in them are among the advantages of group discussion in the context of the FC. As the titles and sub-titles of each topic in the HWA course are related to buildings with relatively similar forms and functions, preparing tables for the content of each topic, separating and categorizing the buildings, and finding distinct and unique features in each of the historical buildings allow students participating in group discussions to form innovatively integrated linkages and networks (Chua & Islam, 2021) between the contents of each chapter. In this way, by understanding the relationships between the components included in the educational content of each session, as an organized whole, they can realize the entirety of the situation; and by comparing the content of each chapter with the help of their enriched perception power, they can organize the content values under titles and sub-titles. The findings of the research by He et al. (2018) also indicate that active participation in group discussions, problem-solving activities, and self-evaluation under the guidance of the professor, provides the grounds for dynamism and enthusiasm of the students to analyze and internalize knowledge through linkages and networking between the contents of each educational session.

- Resilience in learning abstract concepts

Resilience is the ability to change adverse conditions into experiences that lead to the growth and development of a person. In other words, resilience is the appropriate response to high levels of stress (Polk, 1997). The impossibility of visiting historical monuments of world civilizations and the unfamiliar, less common, and sometimes obsolete words used for the introduction of architectural historical monuments of the world lead to a kind of difficulty in learning in comparison with other courses in the field of architecture.

The textual and visual notes taken by students from the videos recorded for an FC, as well as the use of the group discussion technique, while improving the level of engagement of the student's mind with the educational content, increase the threshold of their precision and attention. In this way, they can properly experience resilience in the learning process. Temporary forgetfulness may happen for some students in the learning process. In the method of FC along with group discussion, maintaining a positive mindset and the desire to review the notes to overcome forgetfulness prove the students' resilience in learning. It seems that due to the formation of deep learning in this method, suitable grounds are provided for students to continue learning similar courses at higher levels. The study by Darabi et al. (2011) also

demonstrates that in group discussions, students engage in reflective thinking by expressing their thoughts and listening to others. Structured collaborative activities such as group discussions can effectively guide students in the process of learning complex concepts and extensive information to achieve a cognitive presence.

The students' recognition of the advantage of group discussions in the HWA course indicated the formation of a psychologically safe space in which they could express their thoughts and feelings without fear of the judgment of the peer group. Such a feeling of emotional support during group discussions is vital for achieving resilience because it allows students to share their possible vulnerabilities and receive constructive feedback from the peer group when facing problems. Providing such an environment increases the possibility of risk-taking in a learning setting and improves the resilient behavior of students while strengthening the sense of trust. Additionally, the participation of students in group discussions of the HWA course makes it possible to learn different strategies, identify effective ways to control stress, or deal with possible failures when expressing the semantic concepts related to the subject in a supportive environment. Therefore, the application of the group discussion in the context of the FC allowed the students in the experimental group to achieve a cognitive and metacognitive capacity.

Group discussion also strengthens the growth mindset in a collaborative environment (Ricci, 2021). Emphasizing effort and progress and recognizing thinking skills create the determination central to resilience, and enables students to see difficulties as transient and temporary failures in learning. Overall, group discussions in architectural history and theory courses foster resilient learning when dealing with complex issues by promoting collaborative classroom activities, providing emotional support and coping strategies, and fostering a growth mindset. The synergy of these elements brings self-confidence and adaptability to academic challenges while forming a solid framework in the student's mind.

To test the qualitative findings, the learning quality in both experimental and control groups was compared using a quantitative method using a researcher-made questionnaire. In this questionnaire, pictures of the ancient civilizations of Mesopotamia, Egypt, Greece, and Rome were presented, and the physical and semantic features of the buildings were measured to evaluate the cognitive scope in the experimental and control groups (Fig. 6).

• Statistical population, sampling method, and sample size

The statistical population of this research included 43 male and female students aged 19 to 20 years old who studied a bachelor's degree program in architecture at Shahid Rajaee Teacher Training University and were completing the HWA course in the second semester of their study program. To experiment, 22 participants in the class were included in the experimental group using the convenience sampling method, and 21 participants were included in the control group with the same conditions.

Using Cronbach's alpha, the internal consistency of the questions was obtained to be 0.82, which was more than 0.7, and confirmed the internal consistency of the test. After collecting the questionnaires, scoring the answers to each question, and calculating the overall score of the students in both groups, the results were analyzed independently using SPSS-22 and analysis of covariance (ANCOVA). To measure the content validity of the test, Lawshe's method was also used. Referring to the opinions of 11 experts and specialists, the value of the content validity ratio was obtained to be in the range of 0.63 to 1, which was above the cut-off value.

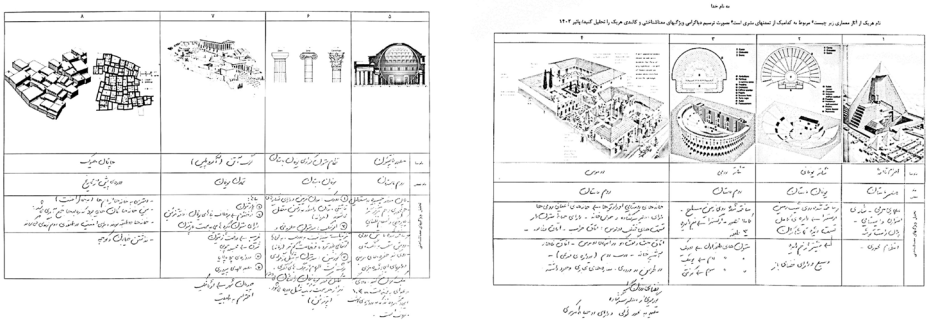

Fig. 6. The questionnaire made by the researcher and a sample of the answers of the students in the experimental group. Source: Authors.

- **Analysis of quantitative findings**

The results of the non-parametric Mann-Whitney U test presented in Table 5 shows that the quality of learning between the two experimental and control groups has a statistically significant effect at the 0.01 level. Additionally, the mean for the experimental and control groups was 26.84 and 16.93, respectively, with an effect size of 0.399. Therefore, the 40% improvement in the quality of students' learning in the HWA course is explained by the application of flipped classroom and group discussion strategies.

Conclusion

The results of this research demonstrate that teaching the HWA using the technique of group discussion in the context of the FC is an effective method for improving the learning experience and academic performance of students. Using this technique, the experimental group experienced significant opportunities for functional-cognitive, individual-interpersonal, and critical thinking competencies. The functional-cognitive competency of the experimental group included a range of cognitive, methodological, and linguistic skills related to historical monuments. Their individual-interpersonal competency included language, writing, and visual communication skills, which were well developed by notes taken from videos published in the FC and participation in group discussions. Critical thinking competency included agency in learning with an emphasis on effective reasoning, understanding the relationships between components, linkages, and networking between the educational content related to each of the ancient civilizations and their relationship with historical contexts and monuments as an organized whole and provided the grounds for the application of holistic thinking (Gestalt style). Additionally, the experimental group experienced critical thinking competency when classifying and encoding information and concepts related to historical monuments in their notes to develop or improve their resilience in learning abstract concepts (Fig. 7). Therefore, the technique of group discussion in the context of the FC made it possible for the students in the experimental group to improve memory performance and promote deep cognitive processing of complex concepts and extensive information available in the HWA course. It should be noted that although the syllabus of the HWA course, presented in Table 1, seems to address the historical course, such issues as the course of development of construction technology, aesthetic examples in the course of the formation of civilizations, the relationship of myth, religion, tradition, and system of governance with the triad of culture, civilization, and architecture are among the integral concepts taught in the HWA course, and the combined strategy of the FC and group discussion forms a basis for guiding class discussions in the direction of thinking and questioning about the above issues. As understanding of the basic concepts in architecture requires passing the basic courses and learning the principles of architectural design, one of the serious criticisms of the teachers and experts on the teaching of architectural history and theory courses in the educational system is the early presentation of the HWA course in the second semester. It is appropriate that the prerequisites, the hours allocated, and the time of presenting this course during the bachelor's degree program are revised by the Planning, Development, and Educational Supervision Council of Tehran University.

However, further research can be done in two general areas explaining how to contemporize ideas institutionalized in historical buildings in the context of teaching the HWA course and the analysis of the application of emerging technologies and innovative educational methods such as the large language model (LLM)- artificial intelligence. In this way, the history and theory courses for architecture students can be planned by the curriculum development and educational planning department in a dynamic way based on the interaction with architectural design courses on one hand, and the quality of learning can be improved in the light of the developments of educational technology on the other hand.

Table 5. Nonparametric Mann-Whitney U test results. Source: Authors.

	Descriptive Statistics					Ranks				Mann-Whitney U	Asymp. Sig. (2-tailed)
	N	Mean	Std. Deviation	Minimum	Maximum	Group	N	Mean Rank	Sum of Ranks		
Posttest	43	63.0909	21.99980	17.00	92.00	EXP	22	26.84	590.50	124.500	0.01
		53.3810	7.37208			CONT	21	16.93	355.50		

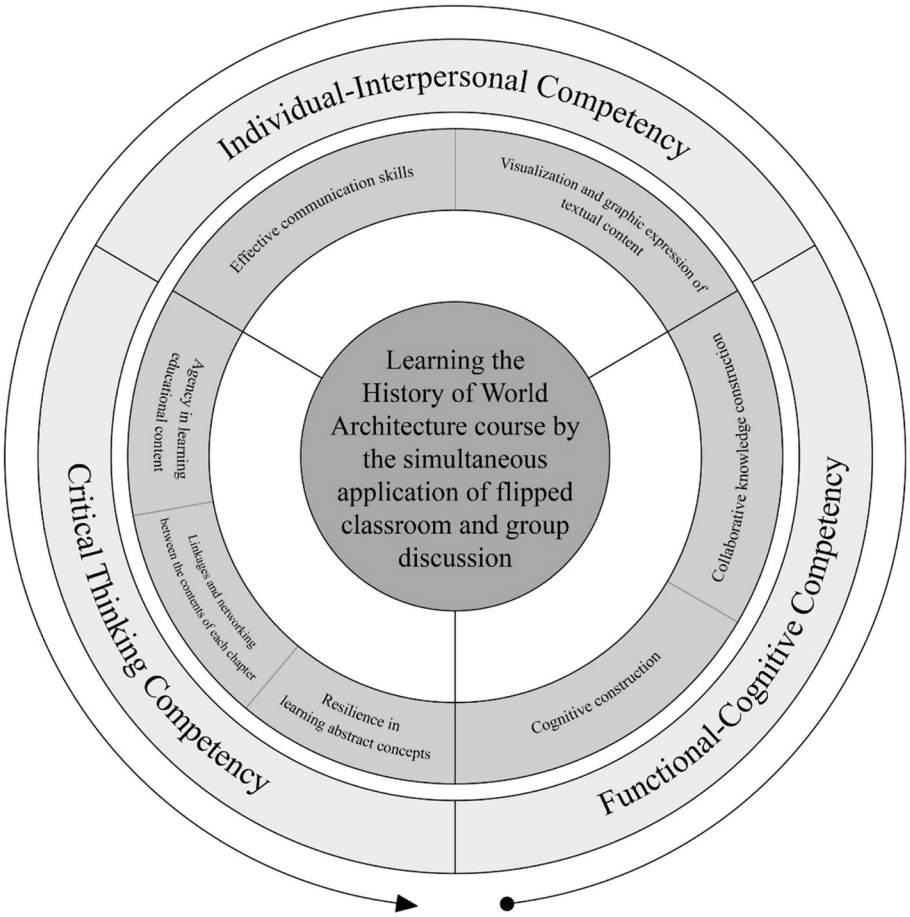

Fig. 7. Mapping of the conceptual order of the focused categories of learning the HWA course by the simultaneous application of FC and group discussion. Source: Authors.

Conflict of Interest

The authors declare that there was no conflict for them in conducting this research.

Endnotes

1. First Author of this research.

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