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Visual Communication for Students' Creative Thinking in the Design Studio: Translating Filmic Spaces into Spatial Design

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Abstract: Representing visual experiences is an essential part of architectural design education for creativity. The representation of creative ideas relates to the ability to communicate spatial design concepts. This study examined whether filmic spaces could function as visual communication to enhance students' creative thinking in architecture. It explored how creativity can be supported throughout an architectural design studio with a conceptual tool that translates filmic spaces into spatial design. To investigate the ways to translate filmic space into spatial design tools for creative thinking, we conducted a design studio with first-year university students. Focusing on using various elements of film, including movement, frame, montage, light, and color, and scene changes to represent architectural languages, a curriculum was developed and implemented in a Visual Communication Design Studio for one semester, stimulating students to engage in expressing their ideas in three-dimensional spaces. The overall results suggested that the design education method that used the filmic space as a stimulating tool for creative thinking, emphasizing the role of visual communication, could enhance students' creative thinking, leading to improved creative design processes.

Keywords: creative thinking; visual communication; filmic spaces; representation; architectural design studio; design education



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1. Introduction

The importance of nurturing students' creative thinking in design education has been emphasized by many researchers and educators because creativity is a crucial part of architectural design. Critical design thinking can be a powerful way to motivate various design ideas by allowing an interactive understanding of an ill-defined design problem; thus, researchers have tried to find effective methods to stimulate students' creative thinking [1–8]. Design education has generally been delivered to students via teachers' subjective teaching methods rather than through a systematic academic approach [9]. Thus, design education tends to be neglected as an academic category from a general educational perspective that focuses on logical and empirical education. However, design education should have an educational model with more academic methods for improving creativity because the promotion of creativity is crucial for design and should be emphasized on a holistic, interdisciplinary basis [10].

Overall, architectural design education in a department of architecture emphasizes the promotion of creativity among students and is largely divided into two approaches—the theoretical background of design and the practical application of design ideas. Students in design studios in the department of architecture are often instructed to gather information on a given problem, analyze the collected materials, transform them into spaces, and critically present their ideas to present a satisfactory solution. In the field of architecture, many studies have conducted mutual exchanges with other fields, and more diverse architectural languages have been used through interaction with them. However, such research

is still insufficient in the field of education, and most research is focused on theoretical approaches to the architectural space. This study introduces an architectural design studio to investigate multi-dimensional spatial expressions by taking filmic characteristics and discussing creative approaches to evaluating their achievements.

Architecture and film have similarities in the ways they are perceived in terms of the relationship between time and space, the experience of continuity, and movement. Therefore, it was expected that the exploration of film could promote students' creativity by revealing the applicability of spatial design through the correlation between real spaces and filmic spaces. Assignments given in courses would address the problem-based learning presented in previous literature, focusing on creative stimulation rather than functional consideration and reflecting a changing educational environment. The field of architectural design is particularly interested in creative spatial design because it always requires new and integrated solutions to the complex and multidisciplinary issues associated with spaces. In this respect, this study aims to introduce a Visual Communication Design Studio for first-year students at the department of architecture in a university located in Korea, which performed the translation of filmic spaces into spatial designs over one semester (16 weeks).

This study investigates how the students developed filmic spaces into spatial designs as a way of acquiring novel techniques of architectural expression. The Visual Communication Design Studio aims to find the constituent elements of the film that can be adopted into real space by analyzing the inter-relationships between the two fields based on the theoretical consideration of space and film. The main intention of this design studio was to enhance the creativity of its students by providing an alternative way to develop creative thinking in architectural design education. Rather than focusing on the final output to the problem, it sought an exploration of the challenges in the design development process in an effort to define the problem and the process of "finding a way to solve it" under the guidance of professors. In architectural design, it is important to reframe problems for solution formulation and to develop designs accordingly. Professors and students were encouraged to communicate by using various representation techniques in their design processes.

This research was developed based on the following assumptions: (1) It is essential to express creativity and visual experience in architectural design education; thus, representation skills should be provided to improve students' creativity in architectural design education; (2) the applicability of filmic language to architectural space can be expressed in various ways, leading to divergent interpretations; and (3) the introduction of a filmic component to architectural spaces would induce active and independent participation in the method of the experience, creating interactions between the two spaces.

2. Related Research

2.1. Creativity and Design Education

Creativity is characterized by the ability to address ideas of expression and produce unique and useful outcomes [11]. The creative design process is an extraordinary type of design for generating innovative ideas [12,13]. Creativity is a qualification often considered in the final result, but it can be associated with specific processes that are likely to generate creative artifacts in design [12,14]. Creative thinking is closely related to the concept of restructuring that reflects the designer's transformative perception of a problem [15]. Guilford pointed out that creativity is closely related to the ability to reconstruct problems and reinterpret thinking, which leads to freedom from fixedness when developing logical solutions [16]. Constructive awareness is essential for promoting reinterpretations in design development [17,18]. Constructive perception provides designers with the opportunity to be more creative by allowing them to change focus and perceive in different ways [19]. Dorst [5] defined design-derived reasoning patterns, studying the core of design thinking for idea generation and emphasizing abduction as a fundamental reasoning pattern for creative thinking. To create maximum value for students' design results, it is crucial to understand the key aspects of students' design problems and adopt effective reasoning methods to create a creative design process.

Many researchers have emphasized the need to encourage different ways of thinking to promote creativity in design education. Design education is important for improving the creativity of students in the early stages of architecture education [20,21], and new teaching methods are required accordingly. It is crucial to develop and use teaching strategies that promote student-centered thinking activities. Design education is related to the teaching methods that educate students to acquire relevant knowledge or skills. Students are generally educated to develop logical and convergent thinking for correct answers; therefore, they tend to adopt linear thinking even when solving ill-defined design problems in architectural design [2,6]. Most students follow a routine order of (1) site analysis, (2) planning, (3) basic design, and (4) creating a working drawing in the architectural design studios of universities in Korea. However, students should be educated to adopt a non-linear approach for developing divergent thinking in the design process. The design studio is the most fundamental course in architectural education, wherein students obtain practical and theoretical knowledge and learn how to transform this knowledge into representations of their design process with creativity [10,22]. By including effective strategies, such as filmic spaces for creative thinking, students' creativity can be stimulated and developed.

2.2. Architectural Representation

Many studies on architectural representation have suggested a distinct but similar framework for understanding its role in the design process [23]. Goldschmidt proposed culture/history, cognition, and technology/media as the main dimensions of the framework [24]. De la Fuente Suarez suggested a distinction between creative and interpretive processes [25]. Previous research on design representation attempted to define its roles and best practices in various design contexts and found that sketches are the fundamental representation of communication between mental and external images [26]. It was also found that representation methods play an important role in conveying design intentions [27], and computational technologies affect architectural representations in every step of the design process [28].

Numerous studies on visualization have compared human responses to object representations, but the methods were mostly limited to quantitative perceptual approaches [29], in which statistical differences depended on the degree of accuracy or realism, and the level of abstraction, participation, and comprehensiveness [30]. These methods have helped to understand the correlation of the various dimensions of evaluation with the reliability of representation; however, the results did not lead to practical standards for designers to create a visualization of architectural designs. In other words, guidelines for the selection, creation, and targeting of architectural representation along with the perceptual behaviors that support practical utilization have not been fully investigated for these methods [24,25].

An architects' primary medium is drawing [31], and architectural drawings bring into being something that did not yet exist [32]. Drawings and representations have always played a variety of roles within architecture, from technical explanations and expressions to radical proposals and the articulation of imagination. Representation helps designers form, experience, communicate, and evaluate design concepts throughout the design process [23]. Effective representation is a more efficient way of drawing viewers' attention to one aspect of the displayed object than directly experiencing it [25]. In terms of architecture, representation is a basic tool for transforming, for example, knowledge, ideas, and emotions, into specific ideas [33]. In architectural studios, representation has strong potential in the fields of art and design in that the entire process is carried out to portray ideas through various media [30]. Drawing has been much discussed as a medium for design and for communication in architecture, but the potential of its role as a medium for analysis, although recognized, has not been given the same attention [34]. In this respect, this study focuses on the perceptual category by comparing visual perception with different representations and focusing on the relationship between creativity and architectural design education through cognition, representation type, and perception.

2.3. Filmic Spaces

To stimulate creative thinking, it is necessary to break the fixating effects of precedents in design [35–37]. Problem framing is critical for identifying and understanding design problems, and it has been argued that encouraging designers to find new ways to frame problems may mitigate design fixation [36]. The initial definition of problems may be related to work contexts that are similar to those in which previous problems have been defined; thus, to avoid a fixation effect associated with existing solutions, design problems need to be redefined outside a designer's typical work situation [38]. For example, Choi and Kim [39] conducted an empirical study that used a digital world as a design strategic approach to negating design fixation.

Filmic spaces might have the potential to provide creative stimuli to architectural representation as a new approach to problem identification in designing. Filmic elements such as shooting, montage, and *mise-en-scène* are the design methods for visualizing aesthetics and style [40]. These elements provide a new opportunity to design a student interface that can provide a personalized way to find interesting films for the analysis of filmic spaces instead of using the traditional classifications of film based on explicit attributes such as genre and cast. Closer observation and analysis of these elements in film could provide a vastly improved way of viewing [41].

Similar to architecture, which has the characteristic of using a combination of time and space, film is an art that relies on sight to express time and space and is temporally and spatially expressive in that it largely depends on visual images. Space is also an object that is perceived by sight and is primarily dependent on vision. Many previous studies on filmic approaches in architecture relate to the motion of the camera [42–45]. Motion is a fundamental characteristic of films, and films provide a unique perceptual element with a sense of realism through images and movement. The film expresses movement on a two-dimensional plane within the frame and is generated as a combination of time and space, a reality that is distinct from the real world, and an immaterial means of expression. The temporal and spatial characteristics of the film have provided a rich spatial vocabulary in the architectural space by presenting a new expression method for design ideas.

In the Visual Communication Design Studio in Seoul, Korea, students were encouraged to find their own expression methods and interpretations to create a new three-dimensional space. Architectural design education is a product of processes in which architectural experiments are actively conducted through the diversification of spaces and the convergence of other fields. Thus, the studio sought to provide students with filmic spaces as a medium through which to experience new architectural spaces as reproduced through visual experiences. The hypothesis is that filmic spaces could be recreated as novel architectural spaces based on creative architectural thinking and design methods.

3. Methods

3.1. Curriculum and Architectural Design Studio Setup

Through exposure to academic offerings at the university, from first- to fifth-year programs, students are given broad access to the tools, strategies, and methodologies that are developed within the university at large. The visual communication class is a single-semester (16 weeks) course, providing a full-time introduction to architecture and design as part of a five-year undergraduate professional degree program in the university. The Visual Communication Design Studio is a place of experimentation and variation to pursue unforeseen opportunities and consequences in terms of architectural representations. The first year could be defined as an adaptation period by a learning-through-making approach; the students thus obtain basic architectural knowledge and the tools and methods that help to foster an exploratory and intellectual interest in the physical and social environment. In the first-year course, three individual studios were developed to encourage students to take a disparate range of approaches and techniques for the purpose of multiplicity, which discourages and disrupts the formation of a singular design methodology. This challenge required each student to proactively seek discussions to inform their work, establish the

skills necessary to communicate ideas, and actively challenge their approaches by working individually within studio projects.

Throughout the semester, the students were required to navigate a series of projects that generated a debate and confronted ambiguous definitions of architectural practice. The program was designed in accordance with the accreditation standards of the procedures and conditions of the Korea Architecture Accreditation Board (KAAB) [46]. The Korea Institute of Architecture Education Accreditation specifies the core competencies that each university/graduate architecture education program must meet to obtain KAAB certification, and its corresponding student performance criteria (SPC) [40]. Out of the 26 criteria of SPC, the Visual Communication Design Studio set its curriculum centered on five criteria. Details of each criterion are shown in Table 1.

Table 1. Student performance criteria (SPC) [40].

SPC	Criteria	Goals/Student Performance of the Studio
Communication	1	Oral and Literal Communication
	Ability to communicate architectural ideas in writing and speech, and the ability to communicate in a foreign language.	<ul style="list-style-type: none"> - The course encourages design thinking through drawings and the use of a variety of techniques, e.g., photography, drawing, painting, model making, and mapping. - By the end of the year, students will produce a comprehensive portfolio that explores different media throughout the semester.
	2	Various Means of Expression
	Ability to express architectural ideas appropriately by means of various media, such as sketches, models, drawing, writing, and digital drawings.	<ul style="list-style-type: none"> - The drawing workshop encourages the development of the technique of representation and translation by analyzing different elements of filmic spaces. - The project introduces observation, analysis, and inspiration.
Cultural Context (History–Behavior–Environment)	3	Architecture, Science, Technology, and Fine Art
	Understanding of the relationship between architecture, science, technology, and fine art.	<ul style="list-style-type: none"> - Students realize that form and function in architecture are strongly associated with the development of science, technology, and fine art. - Throughout the class, students are brought to understand the influence of artistic sense, acquired through the development of science/technology and fine art.
	7	Human Behavior
	Understanding of theories and methodologies that identify the relationship between the physical environment and human behavior.	<ul style="list-style-type: none"> - Students are led to understand theories and methods related to the physical environment and human behavior and to study the principles and methods to apply their understanding of functional and spatial design.
Design	9	Form and Spatial Organization
	Understanding of the basic principles of 2D and 3D forms, design, and architectural composition, and the ability to apply these principles to design a building.	<ul style="list-style-type: none"> - Architectural design requires, as a basis, a three-dimensional thinking ability to compose form and space. - Students learn the basic spatial elements, the basic principles, and composition methods, and develop a three-dimensional architectural form utilizing their learning.

3.2. Studio Course Procedure

The visual communication course is the first stage of architectural design education in the first semester and 15 first-year students worked on ideas for expressions using representation techniques over 16 weeks. The empirical basis of the studio consisted of the studies of these students, working on a small design assignment in a studio setting in the

context of the subject. The studio was designed based on the analysis of film techniques, aesthetics, and the various elements of the film scenes selected by students. Throughout the semester, the students explored creative ideas and representation techniques using various media, such as text, photography, drawing, model making, and mapping. The studio possessed a different environment for learning than a typical lecture room (see Figure 1).

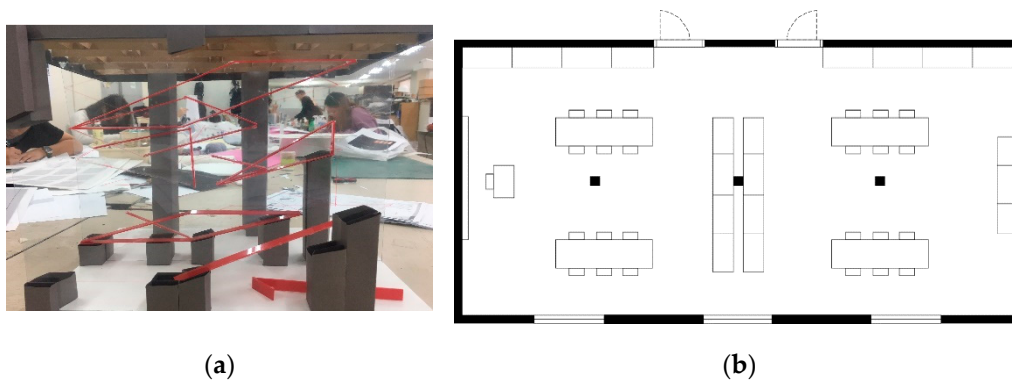


Figure 1. The view of the first-year design studio. (a) A group of students share the working table together. (b) Drawing of the studio space plan.

In the Visual Communication Design Studio, students' works were developed using the following methods: conceptual sketches, divergent drawing transformations, and convergent physical-model making. The course was intimately coordinated to provide a theoretical framework for design studios from three areas—cultural context, technology, and professional practice. The studio course schedule and teaching methods are shown in Table 2.

Table 2. Studio course schedule and teaching methods.

Week	Design Task/ Tutorial	Given Materials/Teaching Method	Phase	SPC
1	Project introduction	<ul style="list-style-type: none"> - Introduce the studio agenda. - Explain the representation techniques for filmic spaces. - Select a film and choose interesting scenes. 	(1) Conceptual sketches: the analysis of the filmic space	1, 2, 3
2–3	Drawing workshop	<ul style="list-style-type: none"> - Develop students' conceptual ideas through experiments with a wide range of representation techniques. - Analyze unreal cities from filmic spaces and apply critical thinking to self-initiated research. 		1, 2, 3
4–6	Design tutorial	<ul style="list-style-type: none"> - Develop the scenes found in the film. - Find their own representation techniques. 	(2) Extract architectural elements: the expression technique	1, 2, 3
7	Mid-term presentation	<ul style="list-style-type: none"> - Individual presentation in groups. - A jury with invited critics from outside of class. 		1, 2, 3
8–13	Design development	<ul style="list-style-type: none"> - Revise and improve the works. - Articulate works in greater depth by applying the representation technique to a real city. 	(3) Synthetic drawings: the design development	1, 2, 3, 7, 9
14–15	Representation technique development	<ul style="list-style-type: none"> - Develop own representation techniques. - Make physical models. 	(4) The ongoing project and review	1, 2, 3, 7, 9
16	Final presentation	<ul style="list-style-type: none"> - Individual presentation in groups. - A jury with invited critics from outside of class. - Production of a comprehensive analog and digital portfolio for the exhibition. 		1, 2, 3, 7, 9
Exhibition				

3.2.1. Introduction Stage: In-depth Lectures and Conceptual Ideas

In the first stage, students were given in-depth lectures to orient the project and then to investigate prior design studies for analyzing film scenes in filmic spaces (weeks 1–3). Students were encouraged to develop their conceptual ideas through experiments with a wide range of representation techniques during the drawing workshop for two weeks. The drawing workshop encouraged students to develop representation and translation techniques by analyzing unreal cities in filmic spaces and applying critical thinking to their self-initiated research. Individual projects helped students to undertake the constant translation from observation to material interpretation and to focus on developing skills through a series of references.

3.2.2. Expression Technique and Design Development Stage: Ideas Transformation

During the expression technique stage (weeks 4–7), a design idea was developed from the scenes in a film for translation into spaces by using expression methods selected by the students. We provided weekly comments on the students' initial designs, and the students used representation tools to instantly revise the design work in progress. Ongoing work was regularly discussed in individual tutorials, individual presentations in groups, and juries with invited critics, and, accordingly, students developed their work in greater depth and articulated individual inquiries. During the design development stage (weeks 8–13), the students undertook speculative experimentation and methodical interaction using a wide range of techniques. In the mid-term presentation, the jurors were invited to critique the students' work and provided suggestions for the designs. The guest judges sought to ascertain how creatively the students had developed the filmic spaces and translated them into architectural spaces. The students used a variety of design tools to present their designs effectively in the critical sessions.

3.2.3. Final Critique Stage: Articulation of Visual Representation

Following the final critique stage, the students revised and improved the design for the end-of-semester display as the final step in the studio process (weeks 14–16). The students articulated their work from an unreal city into a real city in greater depth by applying their representation technique. Physical models were proposed after deriving the characteristics of space expressed in the films. By the end of the semester, each student had produced a comprehensive analog and digital portfolio that illustrated their own highly personal journey through the design studio. In addition to completing the portfolio and the summative assessment, the students were given an opportunity to reflect on the work produced throughout the semester and exhibit their products.

3.3. Design Task: Idea Stimulation

The course aimed to analyze the types and features of the effective manipulation of filmic spaces to improve the students' creativity. In the first phase, the students watched *Citizen Kane* (1941) by Orson Welles; *Rear Window* (1954) and *Vertigo* (1958) by Alfred Hitchcock; *The Mirror* (1975) by Andrei Tarkovsky; and *The Purple Rose of Cairo* (1985) by Woody Allen. The students then developed skills from the observation of a spatial fragment through the images of filmic spaces. Those films were selected because of their juxtaposition of virtual and real spaces [47] with highly recognizable and remarkable visual elements. The students conducted theoretical research and focused on the expressions and techniques of editing in films.

In the Visual Communication Design Studio, students developed a "filmic space" concept based on Bernard Tschumi's *Manhattan Transcripts* [48], which applied the montage theory, a form of film composition to think about the relationship between space and motion, and expressed this by borrowing the film's methodology (see Figure 2). Through Tschumi's theory, they found the concept of a film in which pieces of fragments are merged, collided with, and confronted, and wherein new meanings and continuity are formed by the superposition of disconnected scenes.

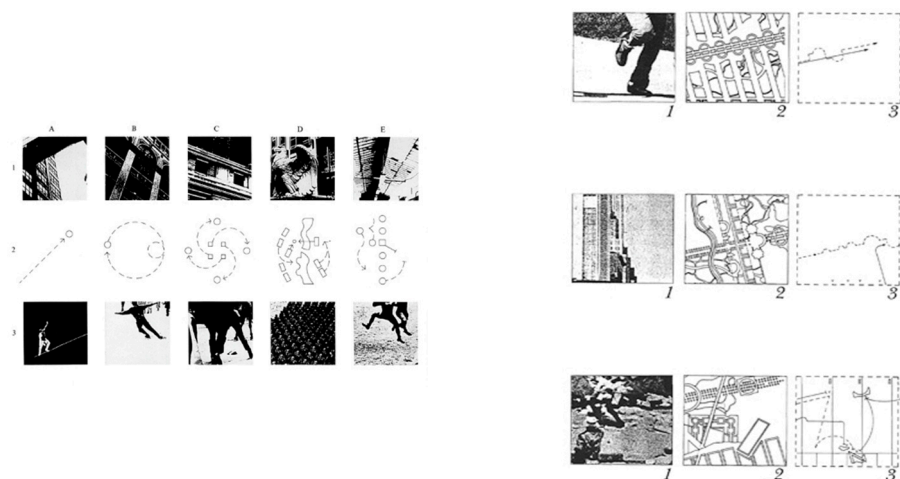


Figure 2. Bernard Tschumi's *Manhattan Transcripts* provide the possibility of different interpretations of architecture through a set of disjunctions among use, form, and social values [42].

To achieve the translation of filmic spaces into spatial design, the students presented a study in two stages. In the first stage, they researched different elements of filmic spaces mainly in terms of editing technique, encompassing movement, frames, zooming in/out, montages, and express emotional changes. In particular, they focused on the fact that real and virtual spaces coexist in films so that the method of conversion or expression between the two spaces is remarkable. In the second stage, each film's scene was analyzed according to the editing techniques listed above, in addition to the spatial image that appears in the film and the corresponding motion.

In filmic spaces, the cause of events or movements could be found through the concept of simultaneity, and the real spaces could be expressed using techniques found in filmic spaces. In other words, the meaning of the continuous experience was enhanced by applying filmic components into spatial design. It was also possible to create an interaction between the filmic space and the real space by introducing the characteristics of filmic spaces.

3.4. Analysis Framework

The study aimed to identify the features and potential of the manipulation of filmic spaces for the improvement of students' creativity. An analysis framework was developed to investigate the translation of filmic spaces into spatial design, emphasizing the creativity of visual communication. The analysis framework was derived from the research of Choi and Kim [39] and extended by factors associated with the characteristics of the creative design process (see Table 3).

Table 3. A framework for analyzing the features of visual communication.

Classification	Key Analysis Point
Problem reframing	Reconstituting the problem from various perspectives
Unconventional ideation	Reflecting on ideas in a different way
Brainstorming/Reflection	Mutual evaluation and communication to enable understanding
Divergent reasoning	Inferential thinking to produce diverse ideas
Representation of architectural language	Movement, frame, montage, light and color, and scene changes

4. Results

4.1. Project Development

4.1.1. Translating Filmic Spaces into Spatial Design

Phase 1: Conceptual Sketches

Sketching is another means to communicate what is happening inside the designer's mind. Many activities and processes, such as conception, perception, evaluation, decision making, and representation, occur during conceptual designing [49]. After watching the selected films listed above (in Section 3.3), the students selected their own interesting scenes to analyze and then extracted the lines or circles and derived layers for creating a new space. In this step, the students did not focus on the concept of a city or a building; instead, they focused on creating a filmic space and making a single, completed space by using different aspects of each layer founded on conceptual sketches. For instance, the students chose various elements, including the movement of the camera angle, the static/dynamic coexistence between actors, and their emotions. The students sought to emphasize lines, faces, and spatial aspects using various materials (see Figure 3).

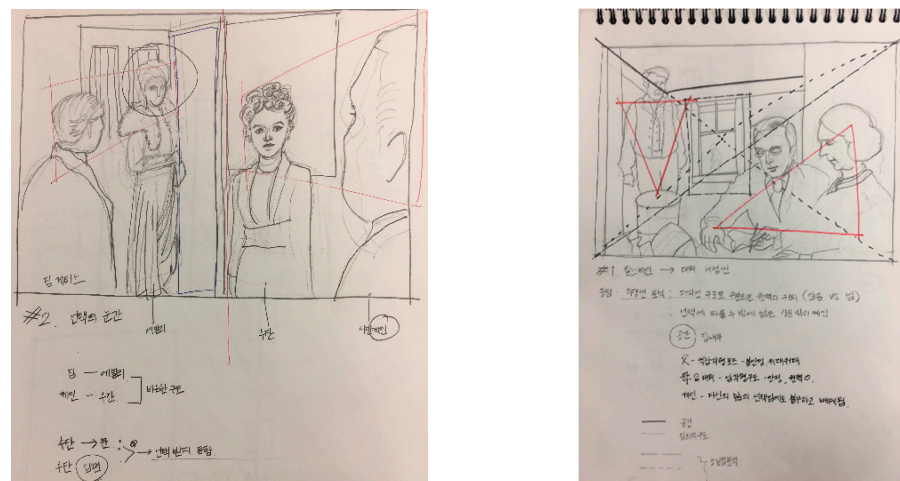


Figure 3. An example of a student's work: The process of concept development and sketches during the first stage of the two-week drawing workshop.

At the beginning of the class, the students had difficulty defining exactly what the filmic spaces would be. They were obsessed with the idea of finding architectural elements and tended to participate in the evaluation of which process would be the “right” or “wrong” one to develop for the next step. Through a one-on-one design tutorial in weeks 2–3, each student analyzed the scene and managed to learn how the elements could comprise spaces. We found that it was interesting for students to express the subject of space through the scenes of the film they analyzed rather than the limited subject of the city or buildings. They also analyzed the space for creative ways to represent using their own techniques and tried to avoid stereotypical thinking about the architectural design process. Through the conceptual drawings, the ability to categorize and determine things that did not fall into exact criteria was also enhanced. Not only did the students undertake problem reframing to understand and create spatial elements from the given filmic space, but they also tried to analyze and reflect on filmic spaces in an unconventional way that was different from a general architectural design approach.

Phase 2: Extract Architectural Elements

In weeks 4–6, each student tried to analyze and develop a set of architectural tools using various factors in each scene to create their own filmic space. For instance, a student watched the film *Vertigo* (1958) by Alfred Hitchcock. She selected a scene because she found

it interesting when the long shot was taken, and the camera moved from the actress's side to the front and then zoomed out to show the emotional changes of the actress.

To represent the filmic space, she first captured a picture of the film and drew lines or shapes on the paper to show the progress of the analysis. Next, the student represented the camera's movement by zooming in/out and then expressing emotion changes with different colors (see Figure 4a). The student drew the octant, marked the path through which the camera moved, and wrote down all the time periods at which the emotion changed (see Figure 4b). This accumulation of analysis naturally produced one's own filmic space. Through this process, the student managed to find ways to express emotional changes, using precise circles to show an exact octant and connecting emotion with colors.

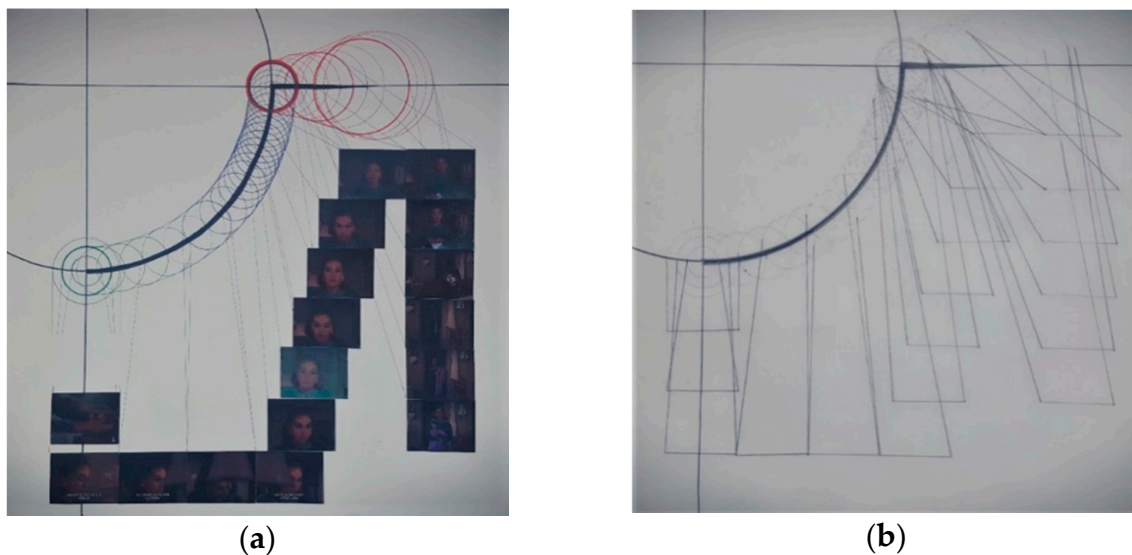


Figure 4. An example of a student's work: (a) representing filmic space and (b) extracting architectural elements from the conceptual sketch.

At this stage, the students were not initially convinced of how to translate their own interpretation of the filmic space into architectural elements. It seemed difficult to realize enough ideas in the inspiration and idea stages under the pressure to find something original and unique, or methods that other students had not chosen. Additionally, a number of students frequently stated, "I have no idea what I have to do," or asked, "Is this correct?" When developing the project, students grew concerned when their idea became "stuck" or when there was no "confidence," and they approached the work worrying that they had difficulty expressing images in their minds and that their expressions might be wrong. However, as time passed, the students tried to reflect intensively in their sketches to solve the given task and gradually began to undertake active brainstorming for mutual evaluation and communication to enable a more in-depth understanding of the given problem.

Phase 3: Synthetic Drawings

The students started designing using various synthetic drawings through which they could develop their concepts and the representation of filmic spaces. After performing the initial designing tasks, an analysis of filmic spaces, the concept articulation, and the form composition and proposition through conceptual sketching, the students were encouraged to explore and develop their conceptual ideas by drawing synthetic drawings. All lines were produced based on an analysis of the scenes of the films (see Figure 5).

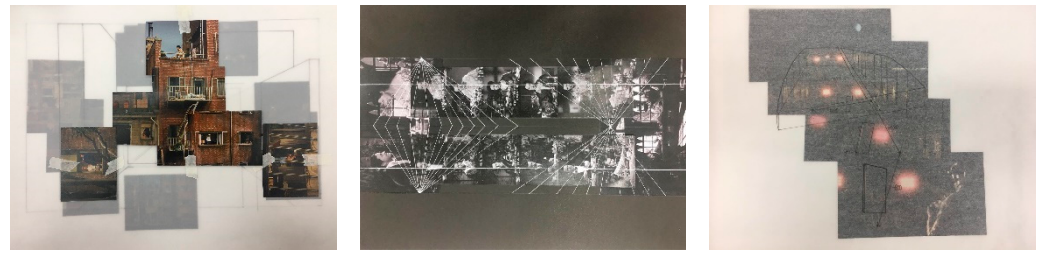


Figure 5. Various synthetic drawings of students' designs.

Based on the synthetic drawings conducted as part of the Visual Communication Design Studio, we found that the use of filmic spaces for translation into architectural spaces could create unique architectural drawings because the filmic spaces, by developing projects beyond students' limits of expression, could become novel venues for students to produce unusual ideas. Not a single student synthesized the drawings in the same way, which suggests that the students performed inferential thinking to produce diverse ideas through their drawings. Each student was satisfied with making their own drawing using unique techniques founded in architectural elements.

4.1.2. Self-Evaluation Questions

In the architectural design studio course, we applied self-evaluation questions to investigate difficulties and solutions in the design phase every week and identify the contributions of applied techniques to the design process and the students' interests. The questionnaire was specifically designed to help the students review their performance on their own during the design process. These questions were used to encourage reflection and facilitate students to spend time considering what they wanted to achieve at each stage. The questionnaire was applied to 15 students every week. Examples of the questionnaire and the students' responses are shown in Table 4.

Table 4. Self-evaluation questions: an example of the questionnaire and the student responses.

Questionnaire	Students' Response
1. What tasks did you perform this week?	1-1 This week, I developed my ideas into pictures. I've got some useful ideas from Professor Park.
	1-2 I chose the movie that I wanted (from) among the list that the professor suggested. Then, I watched and analyzed three scenes that I found interesting . . . technically and aesthetically.
2. How do they relate to your current concept?	2-1 Those basements are related to my design concept directly. Those are the foundation of my work. And I try to add color and use various ingredient(s) on them to develop my idea.
	2-2 Although the first conceptual drawing was deeply connected to the film, the plan was quite unrealistic, and I found it would be difficult to make a model for the next step.
3. Why and how were these tasks useful?	3-1 I learn the reason why I have to do this kind of task and how those works help to improve my initial idea. And I found that I should try a lot of trials rather than just doing nothing.
	3-2 This project was very interesting because I could see the very basic theory of architecture. Every architecture has a concept and inspiration. I could understand the fundamental principle of architecture while taking the Visual Communication class.
4. What were the difficult concepts to understand?	4-1 I did not know what to do and was still confused about my works. I could not decide what to draw, and how to draw exactly.
	4-2 At the first time, I could not understand how I could analyze the filmic spaces. Naturally, I just focused on the narrative and tried to describe the story well, and I could make my idea . . . clear[er] after communicating with [the] Professor.

Table 4. Cont.

Questionnaire	Students' Response	
5. What difficulties did you have in progressing your work?	5-1	Self-determining and progressing of imagination into the design was the most difficult part of [the] work. In the beginning, I was occupied with my own thoughts that I should do my work perfectly and this made me stuck.
	5-2	The most difficult part of the work was representing my idea in visual [mode]. I wanted to analyze the perspective, but I could not find the best way to express what I want[ed] to show.
6. How did you overcome the difficulties?	6-1	Communicat[ing] with [the] professor and searching for useful references helped me to think and determine my idea. I could develop my ideas gradually every week.
	6-2	The system of "every class 1:1 critique" was very helpful to me. Giving the critique is the best thing I think since the work should be done by myself. Just giving the direction to get in the right way must be the best way in this design studio.

Most students answered that they found these design tasks useful and agreed that the process was interesting. However, some students responded that certain stages of the process were difficult, especially because they had never experienced them before. By referring to the students' difficulties and solutions on a weekly basis, the design studio course enabled a discussion of approaches to creation, research, conceptualization, and solution processing. The students were then asked to evaluate the difficulties and methods for spatializing creative thinking obtained beyond the architecture. This allowed us to measure the performance achieved in the studio process, the positive or negative attitudes, and the perceptions of the process.

It was important to ask how to use the self-evaluation questions in the studio. We could see how the students understood the class well and how they developed their design methods at each stage. This helped the students who were new to architectural design to understand the detailed design process by including when they found it difficult and how to solve problems in more depth. Through the self-evaluation questions, we intended to develop a teaching method that would enable communication with students in both directions rather than requiring the students to follow the professor's classes unilaterally. This method was also used as a means of communication between students.

4.2. Representation Outcomes

4.2.1. Representation of Architectural Languages

The contents of the students' analysis of filmic elements were as follows:

(1) Movement: Filmic space associated a spatial form with a specific camera movement. In a film, these movements could be seen in three ways—the movement of the person, the movement of the camera, and the movement of the scene through the change of time. The movement brought about by the change of gaze would become a realistic space, the movement of the scene resulted from the editing of the film, and the other scenes were arranged in a continuous and unified manner; (2) frame: the frame was a unit of a film and was a rectangular image that appeared when projected onto the screen. The frame confined the object within a rectangular box; however, students expanded the image beyond the frame. Therefore, the screen was not the concept of a frame, but a window or city that showed a part of the whole; (3) montage: Montage was the most basic and important element in the film. The basic concept of montage was the confrontation and integration of disparate elements, that is, juxtaposition, which means editing. The montage affected the motion of images toward the whole and indirectly revealed the image of time; (4) light and colors: The use of light and color in a *mise-en-scène* produced filmic realism. Light and color played an important role in determining the overall mood and emotion of the filmic spaces. The contrast in lighting expressed the color, shape, and texture of the subject, and was crucial in revealing the psychology of the subject; and (5) scene change: The narrative of the movie was the flow of time and space. The reduction and expansion

of time and the movement of space accompanying the scene change could be presented more originally and creatively according to the pattern of the mise-en-scène composition, situation, and shape similarity. For scene changes, various optical effects, such as dissolve, overlap, flashback/forward, and fade in/out were used.

The main purpose of this phase was to extract architectural language from the filmic scenes. The students derived the elements—movement, frame, montage, light and color, and scene change—from the filmic space that could be schematized in the architectural design stage, for example, line, layer, and thickness. For instance, a student could gain practical knowledge, such as the thickness and symbol of the line, by using tracing paper to extract different layers. In analyzing the students' work, it could be confirmed that segments, temporality, and spatiality appeared in the frames. In each case, not only one but several characteristics appeared at the same time. The three components of frame, shot, and montage were not clearly distinct elements but interacted with each other (see Table 5).

Table 5. Student representations of filmic elements.


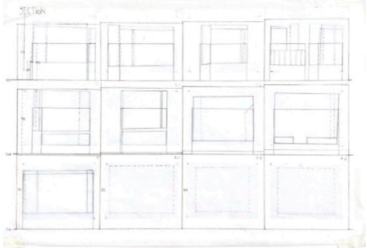
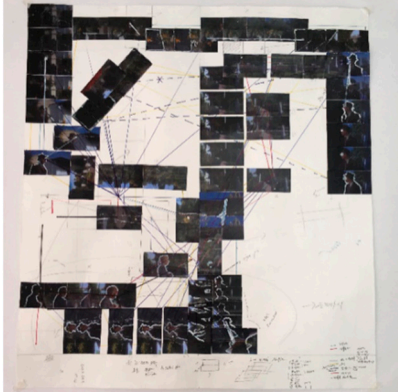
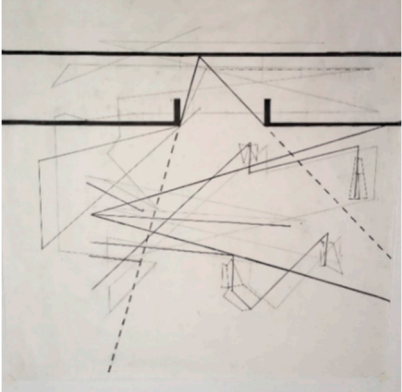
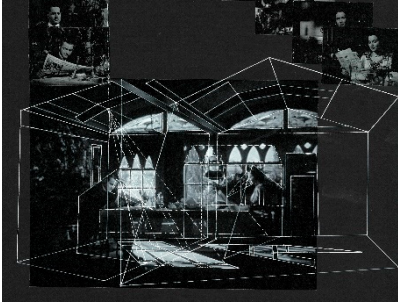
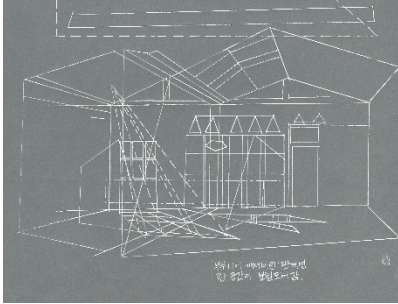
Elements	Phase 1	Phase 2
Movement and Frame		
<p>After watching the film <i>Rear Window</i>, a student analyzed the scenes in which the main character, Jeff, was watching a window across from his house. These scenes were arranged in the order in which they occurred, and the window frames and the shapes of the man being observed were analyzed using lines and faces, respectively.</p>		
Movement and Montage		
<p>After watching <i>Vertigo</i>, a student made a photo collage and analyzed the filmic spaces. He could express his thoughts about the concept in various ways, such as by drawing conceptual sketches on tracing paper. By drawing these sketches, he could gain practical knowledge of elements such as the thickness and symbolic function of the line.</p>		

Table 5. Cont.

Elements	Phase 1	Phase 2
Montage and Frame Scene Change		
<p>A student analyzed the film scene—the process of breaking up in a newlywed couple’s golden age—and then drew the space to describe how, when a couple is newly married, they share love in one place, and as they become estranged, space is divided into two.</p>		

4.2.2. Physical Models

The students applied various expressions from filmic space and conceptualization to drawing and physical model making. In the process of making models, the students began to think about how to translate lines, layers, and thickness from drawings to models (see Figure 6). We encouraged the students to play with various materials and media and made several mock-up models following the processes with which they had already become familiar in the drawing workshop. The students’ creative ideas and various perspectives were supported by the studio atmosphere to stimulate intellectual curiosity and to physically express it. By examining the model-making processes related to developing visual creativity, the study could identify how the translation of the filmic spaces into architectural spaces was achieved more specifically because physical modeling is an effective way to record the innovative transitions of forms during conceptual design.

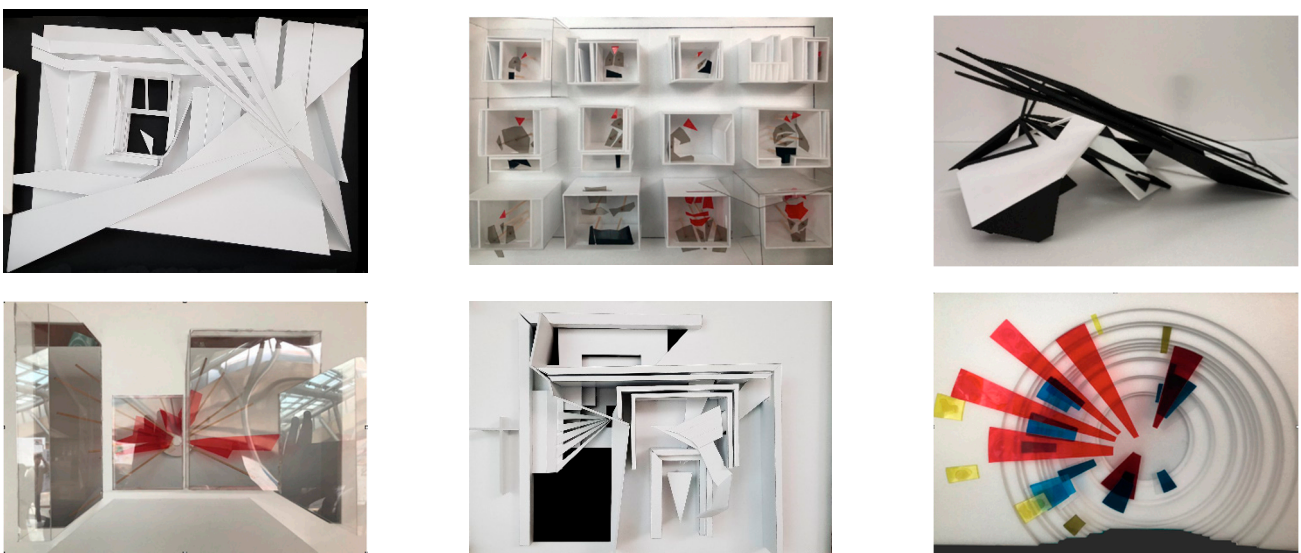


Figure 6. Physical model examples of students’ work.

4.2.3. Phase 4: Juries and Exhibition

In the middle of the semester (week 7), we invited external jurors to review the students’ progress and provide feedback. The students presented their projects in front of the jurors and other students in the studio for the first time. In front of the mid-term jury, most

students were not properly prepared because they did not know how to undertake their first university presentation. However, through the process of organizing their work and presenting it in front of others, students were able to check the logic of the project's process and derive a conception of the direction in which to develop it. The discussion specifically revolved around some of the most memorable comments from the jurors. The collaborative brainstorming process occurred through ongoing communication with professors, students, and the invited jurors. The final jury created a greater awareness of the possibilities of how criticism could be integrated into the design studio setting. The students were encouraged to participate in the jury discussions of other students' projects, and critiques from jurors and peers gave the students inspiration to better represent their creative ideas (see Figure 7a). The jury was pleased to advise on the possibility of development over the next semester without pointing out the negatives; thus, the students were satisfied that they had completed the process for the first semester. For the end-of-semester exhibition, the students produced a comprehensive portfolio that explored different media throughout the course. Through the exhibition, the students had an opportunity to appreciate their own work and other students' work, further contributing to the work's development and student motivation.

7

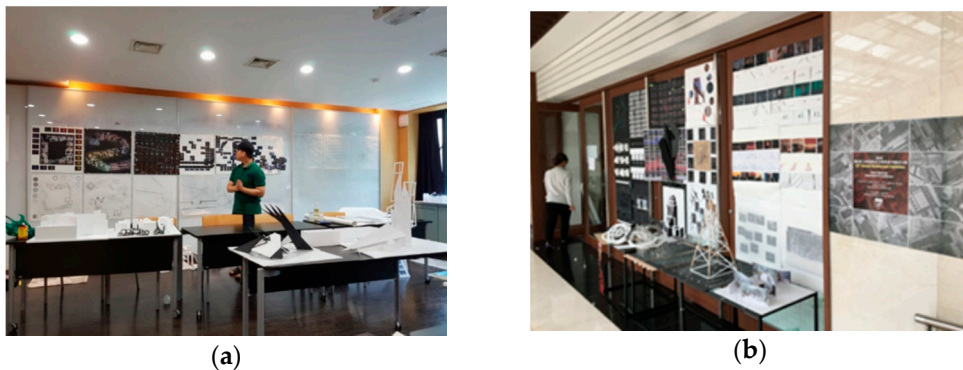


Figure 7. Final jury and exhibition of student work: (a) a student presented his work in front of jury members and (b) the view of the end-of-semester exhibition.

5. Discussion and Conclusions

This study was conducted in the architectural department to investigate the value of the Visual Communication Design Studio over one semester, specifically using representation tools in the development of students' design-related thinking processes. The Visual Communication Design Studio offers a basic course, aiming to give students the foundations of creativity through representation useful for understanding and controlling visual and spatial relationships between two-dimensional images (filmic spaces) and three-dimensional spaces, in addition to their role in architectural design processes. While working in studios, students generally have similar situations for their creativity and expression. However, the exploration of the design task in this study allowed the students to understand that careful observation, analysis, and representation are essential components to contextualizing and articulating design works. Furthermore, because individual characteristics are different, the outcome of creativity varies for each individual. We were interested in research focusing on the architectural design process, characterizing the generation of concepts and ideas, and on the processes related to creative practices necessary for developing students' own methods of expression as ways to solve problems when they encounter difficulties. Based on the results, some issues to be considered at different stages of the design studio were identified as follows.

First, representation should not be considered irrelevant during design exploration in architectural education or as something to be performed after students have completed the design process. Representation techniques should follow an ongoing process of experi-

mentation and reflection, as occurs during an architectural project. Issues of representation associated with creativity in architecture seem to bring uncertainty to professors and students, and other fields—films, in this course—need to be utilized to find reliable explanations that could be applied to architecture in some way. Second, the design studio should include various aspects of design education, such as subject analysis, idea discussions, and problem-solving; individual tutorials, which were the most distinctive components of the design studio education; juries comprising external jurors; and, finally, time to work on projects in the studio individually. Each of these elements has specific protocols and requirements to be respected.

Design is associated with subjective creativity, but the empirical university paradigm emphasizes objective rationality in education [50,51]. To address more rigorous and more academic approaches to design education [50], it is necessary to adopt a new paradigm of education based on creative experience within the standards set by the university. From this perspective, the Visual Communication Design Studio has the potential to provide students with creative stimulation within the theoretical foundations during the first phase of the education process. Students can learn the main elements, principles, and design methods to identify how to implement them in the course of practical application, produce innovative visual representations, and express their ideas through drawings or models.

It is believed that creative thinking occurs with good knowledge hardware, but no one can create innovative designs with knowledge alone [21]. Creativity enhancement is of great importance to the design major and assists students to discover their vision, acquire key expertise and knowledge, and understand the professional philosophy and its foundations in the design process. It is worth noting that the curriculums, such as the programs recognized in these specializations, or the nature of goals and results, are developed based on design creativity in one part and on theoretical foundations and knowledge in another. Students can learn from the design process and intensively demonstrate their creative abilities, dealing with how to communicate, discuss, and acquire knowledge [51]. Basic steps should be implemented to improve students' thinking abilities and teach them to solve design problems, improving their skills so that they can perform more design activities professionally at further stages in their careers.

It is difficult to generalize the results of this study to all architectural design education environments because the research was conducted on first-year students' limited works. In design research, the interpretation of the data can be achieved by reflecting researchers' perspectives; thus, opinions on the efficacy of the approach may be subjective in some respects; however, such an approach is still significant in the analysis of design activities.

A more thorough investigation of the available information on the visual communication design course is needed to determine whether these theories would be useful in the learning situations that are found in studios. Future studies on subjects may involve carefully observing and recording the behavior of professors and students' responses in an objective manner, in addition to considering how artifacts can be used in the architectural design process and their applicability to other contexts by coding them within a different approach. Another suggestion for future study would be to use a weekly criticism journal in which to record responses and thoughts to the criticism received from individual jurors and the design review that follows. It would thus be possible to evaluate various ways of expressing creativity in architectural design studios by adding other factors to further studies.

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References

1. Peters, R.S. *Education as Initiation*; Routledge Kegan Paul: London, UK, 1965.
2. Cross, N. Designerly ways of knowing. *Des. Stud.* **1982**, *3*, 221–227. [[CrossRef](#)]
3. Teal, R. Developing a (non-linear) practice of design thinking. *J. Art Des. Educ.* **2010**, *29*, 295–297. [[CrossRef](#)]
4. Dorst, K. The Nature of Design Thinking. In Proceedings of the Design Thinking Research Symposium, Sydney, Australia, 19–20 October 2010; pp. 131–139.
5. Dorst, K. The core of ‘design thinking’ and its application. *Des. Stud.* **2011**, *32*, 521–532. [[CrossRef](#)]
6. Choi, H.H.; Kim, M.J. The Effects of Analogical and Metaphorical Reasoning on Design Thinking. *Think. Ski. Creat.* **2017**, *23*, 29–41. [[CrossRef](#)]
7. Baker, M.; Rudd, R. Relationship between critical and creative thinking. *J. South. Agric. Educ. Res.* **2001**, *52*, 173–188.
8. Combs, L.B.; Cennamo, K.S.; Newbill, P.L. Developing Critical and Creative Thinkers: Toward a Conceptual Model of Creative and Critical Thinking Processes. *Educ. Technol.* **2009**, *49*, 3–14. [[CrossRef](#)]
9. Orbey, B.; Sarioğlu Erdoğdu, G.P. Design process re-visited in the first year design studio: Between intuition and reasoning. *Int. J. Technol. Des. Educ.* **2020**, 1–25. [[CrossRef](#)]
10. Choi, H.; Cho, M.E.; Kim, M.J. A Critical Review of Research on Design Education Focusing on Creativity in Architectural Design. *Arch. Des. Res.* **2013**, *26*, 119–138.
11. Runcio, M. Commentary: Divergent Thinking Is Not Synonymous With Creativity. *Psychol. Aesthet. Creat. Arts* **2008**, *2*, 93–96. [[CrossRef](#)]
12. Gero, J.S. Shape Emergence and Symbolic Reasoning Using Maximal Lines. unpublished notes. Design Computing Unit, Department of Architectural and Design Science, University of Sydney, Sydney, Australia, 1992.
13. Dorst, K.; Cross, N. Creativity in the design process: Co-evolution of problem-solution. *Des. Stud.* **2001**, *22*, 425–437. [[CrossRef](#)]
14. Visser, W. Dynamic aspects of design cognition: Elements for a cognitive model of design. In *Theme 3a-DatabasesKnowl*; INRIA: Le Chesnay-Rocquencourt, France, 2004.
15. Ohlsson, S. Restructuring revisited: I. Summary and critique of the gestalt theory of problem solving. *Scand. J. Psychol.* **1984**, *25*, 65–78. [[CrossRef](#)]
16. Guilford, J.P. Creativity. *Am. Psychol.* **1950**, *5*, 444–454. [[CrossRef](#)] [[PubMed](#)]
17. Suwa, M.; Tversky, B. External representations contribute to the dynamic construction of ideas. In Proceedings of the Diagrams '02 Second International Conference on Diagrammatic Representation and Inference, London, UK, 10 April 2002; pp. 341–343.
18. Kim, M.J.; Ju, S.R.; Lee, L. A Cross-Cultural and Interdisciplinary Collaboration in a Joint Design Studio. *Int. J. Art Des. Educ.* **2015**, *34*, 102–120. [[CrossRef](#)]
19. Damski, J.C.; Gero, J.S. *An Evolutionary Approach to Generating Constraint-Based Space Layout Topologies*; CAAD Futures: Munchen, Germany, 1997; pp. 855–864.
20. Potur, A.; Barkul, O. Creative Thinking in Architectural Design Education. In Proceedings of the 1st International CIB Endorsed METU Postgraduate Conference Built Environment & Information Technologies, Ankara, Turkey, 17 March 2002.
21. Danaci, H. Creativity and Knowledge in Architectural Education. *Procedia-Soc. Behav. Sci.* **2015**, *174*, 1309–1312. [[CrossRef](#)]
22. Schon, D.A. *Educating the Reflective Practitioner*; Jossey-Bass Publishers: San Francisco, CA, USA, 1987.
23. Park, J.; Jin, Y.; Ahn, S.; Lee, S. The Impact of Design Representation on Visual Perception: Comparing Eye-Tracking Data of Architectural Scenes Between Photography and Line Drawing. *Arch. Des. Res.* **2019**, *32*, 5–29. [[CrossRef](#)]
24. Goldschmidt, G.; Porter, W. *Design Representation: Private Process*; Springer: London, UK, 2004.
25. Alfonso de la Fuente Suárez, L. Towards experiential representation in architecture. *J. Archit. Urban.* **2016**, *40*, 47–58. [[CrossRef](#)]
26. Schön, D.A. *The Reflective Practitioner*; John Wiley & Sons: New York, NY, USA, 1983.
27. Jansen, S.; Boumeester, H.; Coolen, H.; Goetgeluk, R.; Molin, E. The effect of presentation: What you see is what you value. *J. Archit. Plan. Res.* **2011**, *28*, 181–193.
28. Kalay, Y.E. The impact of information technology on design methods, products and practices. *Des. Stud.* **2006**, *27*, 357–380. [[CrossRef](#)]
29. Downes, M.; Lange, E. What you see is not always what you get: A qualitative, comparative analysis of ex ante visualizations with ex post photography of landscape and architectural project. *Landsc. Urban Plan.* **2015**, *142*, 136–146. [[CrossRef](#)]
30. Appleyard, D. Understanding professional media: Issues, theory, and a research agenda. In *Human Behavior and Environment*; Altman, I., Wohlwill, J.F., Eds.; Plenum Press: New York, NY, USA, 1977.
31. Evans, R. *Translations from Drawing to Building and Other Essays*; The MIT Press: Cambridge, MA, USA, 1997.
32. Sues, E. Constructing the Architectural Moving Drawing: Transdisciplinary Practices between Architecture and Artists’ Film. Ph.D. Thesis, University of the Arts London, London, UK, 2020.

33. Elena-Codina, D. Architectural Representation between Imagination and Revelation. *J. Civ. Eng. Archit.* **2017**, *11*, 199–211. [[CrossRef](#)]
34. Unwin, S. Analysing architecture through drawing. *Build. Res. Inf.* **2007**, *35*, 101–110. [[CrossRef](#)]
35. Jansson, D.G.; Smith, S.M. Design Fixation. *Des. Stud.* **1991**, *12*, 3–11. [[CrossRef](#)]
36. Linsey, J.; Tseng, I.; Fu, K.; Cagan, J.; Wood, K.; Schunn, C. A Study of Design Fixation, its Mitigation and Perception in Engineering Design Faculty. *J. Enginerring Des.* **2010**, *132*, 1–12. [[CrossRef](#)]
37. Christensen, B.T.; Schunn, C. The Relationship of Analogical Distance to Analogical Function and Pre-Inventive Structures: The Case of Engineering Design. *Mem. Cogn.* **2007**, *35*, 29–38. [[CrossRef](#)] [[PubMed](#)]
38. Smith, S.M.; Linsey, J. A Three-Pronged Approach for Overcoming Design Fixation. *J. Creat. Behav.* **2011**, *45*, 83–91. [[CrossRef](#)]
39. Choi, H.H.; Kim, M.J. Using the Digital Context to Overcome Design Fixation: A Strategy to Expand Students' Design Thinking. *Int. J. Archit. Res.* **2019**, *12*, 228–240. [[CrossRef](#)]
40. Deldjoo, Y.; Elahi, M.; Cremonesi, P.; Garzotto, F.; Piazzolla, P. Recommending Movies Based on Mise-en-Scene Design. In Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA '16), New York, NY, USA, 7–12 May 2016; pp. 1540–1547.
41. Sreekumar, J. Creating Meaning through Interpretations: A Mise-En-Scene Analysis of the Film 'The Song of Sparrows'. *Online J. Commun. Media Technol.* **2015**, *5*, 26–35.
42. Goldman, G.; Zdepski, S. *Form, Color and Movement*; Bancroft, P.J., Ed.; CumInCAD: Raleigh, NC, USA, 1987; pp. 39–50.
43. Garcia Alvarado, R.; Castillo, G.; Carlos Parra, J.; Navarro Mayorga, S. Filmic Development of Architectural Animations. *Int. J. Archit. Comput.* **2005**, *3*, 299–316.
44. Calderon, C.; Nyman, K.; Worley, N. Architectural cinematographer (AC): Creating architectural experiences in 3d real-time environments. *Int. J. Archit. Comput.* **2006**, *4*, 71–90.
45. Alvarado, R.G. Analysis of filmmaking techniques. *Metu J. Fac. Archit.* **2008**, *25*, 133–149.
46. KAAB. Korea Architecture Accreditation Board. Available online: <http://eng.kaab.or.kr/> (accessed on 28 September 2020).
47. Mazur, J. Applying Insights from Film Theory and Cinematic Technique to Create a Sense of Community and Participation in a Distributed Video. *J. Comput. Mediat. Commun.* **2000**, *5*, JCMC542. [[CrossRef](#)]
48. Architects, B.T. The Manhattan Transcripts. Available online: <http://www.tschumi.com/projects/18/> (accessed on 3 October 2020).
49. Abdelhameed, W. Architectural form creation in the design studio: Physical modeling as an effective design tool. *ArchNet-IJAR Int. J. Archit. Res.* **2011**, *5*, 81–92.
50. Wang, T. A New Paradigm for Design Studio Education. *Int. J. Art Des. Educ.* **2010**, *29*, 173–183. [[CrossRef](#)]
51. Ustaomeroglu, A.; Aydintan, E.; Erbay, M.; Kucuk, P.; Sadiklar, Z. The Impact of Basic Design Studio Courses on Interior Design: KTU Model. *Procedia-Soc. Behav. Sci.* **2015**, *197*, 173–183. [[CrossRef](#)]