International Journal of Business and Applied Social Science

E-ISSN: 2469-6501
VOL: 11, ISSUE: 5
May/2025
DOI: http://dx.doi.org/10.33642/ijbass.v11n5p1

The Phenomenology of Creativity in Design using Building Information Modeling (BIM)

Dr. Faten Yanksari
Department of Interior Design
College of Designs and Applied Arts
Taif University, Saudi Arabia
Email: f.yanksari@tu.edu.sa
Saudi Arabia

ABSTRACT

This research endeavors to investigate the phenomenon of student creativity through their lived experiences with Building Information Modeling (BIM). The ongoing debate regarding BIM's impact on creativity—whether it acts as a suppressant or enhancer—prompted this phenomenological inquiry. Data collection involved semi-structured interviews with two graduate students specializing in interior design from two distinct North American universities. A post-reflection journal was employed for in-depth data analysis.

Targeted towards pedagogical designers and educators in interior design, the study's findings emphasize that an effective design foundation is established through comprehensive research for inspiration during the programming phase, alongside a well-defined design problem. A strong conceptual framework significantly benefits the design and creative process. Furthermore, students report heightened development in their designs when they experience a sense of ease and organization, successfully achieving virtual reality through BIM. Feedback is identified as a crucial element influencing the design process, aiding in substantial design refinement. Consequently, this study presents potential implications for evolving teaching methodologies within interior design, particularly in nurturing design thinking and problem-solving skills.

Keywords: Creativity, Design Thinking, Conceptual development, Design pedagogy, Teaching technique.

Introduction

Before the rise of Building Information Modeling (BIM), interior designers relied heavily on hand-drawn techniques and other digital drifting. However, BIM applications have simplified construction drawings in design firms. Revit, a BIM tool used by interior designers, facilitates the creation of two and three-dimensional designs (Yanksari, 2020). There's a debate over Revit's impact on students' creativity: one group argues it stifles creativity, while another believes it enhances it (Demchak et al., 2009; Gibson, 2015; Scribner 2004; Ahmad, Demian, & Price, 2013, Goulding & Rahimian, 2015, Zuo & MaloneBeach's, 2010). This disagreement led me to conduct a phenomenological study to understand students' experiences using Revit in design. This study is aimed at pedagogy developers and interior design instructors. The findings might inform interior design teaching methods and how design thinking and problem-solving are taught. I aim to explore the phenomenon of student creativity through lived experience while using Building Information Modeling (BIM).

Creativity

In the scholarly interpretation of Robert Galvin's perspective, creativity is founded on the principles of foresight and dedication. Foresight pertains to the ability to envisage future significance of an idea ahead of others, while dedication refers to the unwavering conviction that propels one to actualize the vision, in spite of skepticism and impediments. It is noted that individuals with creative tendencies are distinct in many ways, but they share a common trait: a passion for their work. Their driving force is not the aspiration for recognition or financial gain, but the pleasure derived from engaging in the work they relish (Csikszentmihalyi, 2013).

As per Sawyer (2012), creativity encompasses two key paradigms: the individualistic and the sociocultural. The individualistic perspective emphasizes the generation of novel outputs through the amalgamation of two or more concepts or ideas. The sociocultural perspective, on the other hand, concentrates on the creation of a product deemed by a social group as valuable, beneficial, and congruous to societal norms.

Csikszentmihalyi (2013) further contends that creativity is not a solitary cognitive process but an interactive one, occurring at the intersection of individual cognition and the sociocultural milieu. He proposes the 'systems model theory', arguing that creativity is any act, idea, or product that alters an existing domain or metamorphoses it into a new one. This theory underlines the mutual constitution of creativity through the interaction of the individual, field, and domain.

Theories of Creativity

1. Generativity Theory

Epstein's Generativity Theory, a formal theory of creativity, suggests that new behaviors result from an orderly competition among previously established ones. Epstein identifies four key competencies critical for creativity: capturing, challenging, broadening, and surrounding, and developed an inventory (ECCI-i) to measure these (Epstein, 1999). Epstein describes capturing as the process of preserving new ideas with tools like notebooks and

International Journal of Business and Applied Social Science

E-ISSN: 2469-6501
VOL: 11, ISSUE: 5
May/2025
DOI: http://dx.doi.org/10.33642/ijbass.v11n5p1

pencils. Challenging involves seeking out challenges and learning to cope with failure to boost creativity. Broadening refers to accumulating knowledge and experiences outside of one's expertise. Finally, surrounding involves altering one's physical and social environments to expose oneself to diverse stimuli (Epstein, 1999).

Early 20th-century cognitive psychologists, including Graham Wallas, began examining mental processes in creativity, with Wallas proposing a four-stage model of the creative process. Wallas' model comprises preparation, incubation, illumination, and verification/elaboration stages (Sawyer, 2012).

This model was expanded upon by Sawyer (2012), who outlined eight stages of the creative process which include problem identification, domain mastery, information gathering, incubation, idea generation (divergent thinking), idea combination (convergent thinking), idea selection, and idea execution.

This conceptualization of the creative process has been applied in various research contexts. For instance, Gibson (2007) explored the potential of computers to enhance creativity in the discovery and schematic phases. She employed Wallas' four-stage model in her theoretical framework and compared student outcomes using manual and digital approaches. Gibson's study revealed that utilizing cyber-ideation in the schematic phase resulted in more scenarios, thereby fostering design development.

2. Creative Cognition Theory

The Creative Cognition Theory, defined by Ward, Smith, and Finke (1999), is a mental operation that functions when individuals engage in generative tasks. This theory was investigated by observing individuals' cognitive processes during generative tasks. Notably, Finke's book provided experimental studies on visual creativity. The Geneplore model, also developed by Ward et al., presents a framework for creative cognition, illustrating the relationship between mental cognitive processes and how creative ideas evolve through a generative phase and an exploratory phase (Sawyer, 2012).

The generative phase signifies the divergent thinking that produces various ideas, which Ward et al. (1999) termed "preinventive structures". These structures are initial ideas developed towards the final product and play a crucial role in creative exploration and discovery. Following the generative process is the exploratory process, where the ideas generated in the previous phase are explored. This process can involve finding new functions, implications, attributes, interpretations, or limitations. An interactive cycle occurs between these two phases until the idea is refined and produced (see Figure 1). The use of computer programs in design, such as BIM/Revit, allows students to experiment and refine their designs, as demonstrated in Gibson's study.

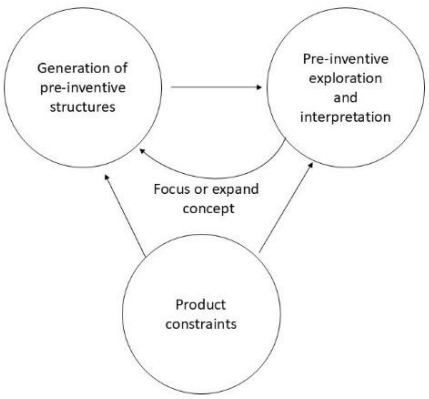

Figure 1: The Geneplore model presented by Ward et al. (1999) depicts a cyclical progression between the generative phase, the exploratory phase, and the product constraints. These constraints can be imposed at any stage of the process (p.193).

Interior Design

To gain comprehensive understanding, it is imperative to discern both the aesthetic and functional aspects of interior design, as well as the creative process involved. As explicated by the National Council for Interior Design Qualification (NCIDQ) (2004), interior design is the application of technical and innovative solutions to indoor spaces, adhering to a systematic methodology that promotes the health, safety, and welfare of the public. The design process, as elucidated by Aspelund (2015), consists of seven integral stages: inspiration, identification, conceptualization, exploration/refinement, definition/modeling, communication, and production. Slotkis (2017) further emphasized the holistic and reciprocal nature of the design process, highlighting its impact on and from the environment. Moreover, the design process employs various cognitive activities such as design thinking and problem-solving. It is vital to understand that design thinking embodies a human-centric approach to problem-solving, encapsulating emotional significance, functionality, requirements, and introducing creative innovations (Slotkis, 2017).

Design thinking, a concept attributed to Tim Brown, facilitates a comprehensive perspective to problem solving and emphasizes on intuitive ideas with emotional significance and functionality. It transforms needs into demands and promotes innovation and creativity within individuals and organizations (Slotkis, 2017).

Building Information Modeling (BIM) is a platform offering features such as parametric 3D modeling, automated

International Journal of Business and Applied Social Science
E-ISSN: 2469-6501
VOL: 11, ISSUE: 5
May/2025
DOI: http://dx.doi.org/10.33642/ijbass.v11n5p1

drafting, and compatibility with analysis programs (Clayton et al. 2010). Revit, a form of BIM application, is capable of producing 2D drawings and 3D models with computational analysis capacity (Slotkis, 2017; Gerber & Lin, 2014). The integration of Building Information Modeling (BIM) with AI facilitates real-time analysis and optimization, which helps designers save time and resources while ensuring high-quality, sustainable outcomes. This approach also allows students to generate and develop initial project forms, expanding their capacity for creating innovative designs (Almaz et al., 2024).

Creativity, in this context, is manifested through problem identification and problem-solving. According to Sawyer (2012), addressing well-defined problems primarily involves convergent thinking, while ill-defined problems require a higher degree of divergent thinking. Many researchers in the field of creativity now believe that creativity involves not just problem-solving, but also problem-finding. Cognitive psychologists often regard creativity as a form of problem-solving, comparing the stages of the creative process to those in problem-solving.

Thus, the design process, with its holistic and contextual nature, engages various cognitive activities such as design thinking and problem-solving. Furthermore, creativity is characterized through the dual aspects of problem identification and problem-solving, emphasizing the necessity of both convergent and divergent thinking. Consequently, this is the essence of the creative process in interior design.

Philosophical and Theoretical Conversation

This philosophical and theoretical conversation contains Heidegger, Ortega Gasset, Ihde, Csikszentmihalyi, Epstein, and my thoughts.

Me: what does technology mean in the philosophical context?

In a philosophical perspective, technology can be viewed through the lens of Heidegger's (1889-1976) philosophy. He suggested that metaphysics represents the theoretical aspect or "the science", while technology embodies the practical application of this science, referred to as 'techno-science' (Lewis, & Staehler, 2010). However, Heidegger also warned that technology itself could pose a significant threat to humanity, describing its essence as inherently dangerous. He believed that the fundamental nature of technology presents a profound risk (Hanks, 2009).

Me: why the technology is dangerous?

Heidegger posits that technology hinders our ability to fully comprehend our own existence or essence by prioritizing its own modality of understanding to the detriment of other non-technological forms of comprehension, such as those embedded in artistic creation and engagement (Hanks, 2009). Lewis and Staehler (2010) further highlight the exploitative nature of technology, suggesting it extracts energy from nature in a manner that can lead to significant depletion. Heidegger, as interpreted by Hanks (2009), encourages us to interrogate our relationship with technology in order to liberate ourselves from such a restrictive perspective of world experience. Upon acknowledging our technological comprehension of ourselves and the world, we have initiated the process of surpassing the technological framework, thereby enabling us to incorporate values beyond efficiency in our lives.

Examining technology through the lens of interior design reveals its indispensable and highly sought-after role within design firms and educational settings. The utilization of technology paves the way for a dual construction process: first digitally, followed by physical realization, thereby minimizing potential errors. Furthermore, the creation of prototypes through technology aids in refining products and designs. This raises the question: Can technology guide us towards the ideal in design? Should we define the ideal as a divine concept, as suggested by Plato, or can it be realized through technological means? In the digital realm, technology enables the execution of various tasks, ranging from programming, conceptual and detailed design, to analysis, documentation, fabrication, construction logistics, and even demolition, recycling, or renovation.

Heidegger states in the process of interrogating technology, we aim to establish an uninhibited relationship with it, thereby opening our human existence to its essence (Hanks, 2009). This interrogation leads to a nuanced exploration of technology, fostering a novel approach within the pedagogy of interior design that enhances student learning. This approach allows students to interact with technology in an innovative manner, experiencing the art of creation through its lens.

Spanish Philosopher Jose Ortega Gasset (1883-1955) contends that humans have become so intertwined with technology that it has evolved into a "second nature" He suggests that individuals possess a capacity distinctly separate from their natural or animalistic tendencies, becoming discernible within the context of technology (Hanks, 2009). In this regard, it's crucial for individuals to recognize their potential in using technology as a tool for creative production.

Don Ihde (1990) outlines four unique patterns of human-technology interaction, each serving as a form of mediation between an individual and the world: embodiment, hermeneutic, alterity, and background relations (Hanks, 2009).

In my design process, using tools like Revit enhances my creative capabilities. While Heidegger views technology's essence as malevolent and destructive towards nature, other philosophers posit that technology can be leveraged to conserve natural resources and promote user-friendliness.

The existential methods posited by Van Manen (2014), namely spatiality, temporality, and lived cyborg relations, provide the contextual framework for situating and reflecting upon the phenomenon under study. Spatiality can be employed to probe into the experience of space. Questions such as "How is space experienced? How do we perceive interior spaces? How do we mold space and how does it, in turn, shape us?" can be asked. For instance, one could examine the differential experience of a bed and bedroom when in good health versus when ill, or explore the experience of navigating cyberspace (Van Manen, 2014). Furthermore, temporality can be utilized to investigate the experience of time concerning the phenomenon being studied. It's worth considering how different activities and situations, such as

International Journal of Business and Applied Social Science

E-ISSN: 2469-6501
VOL: 11, ISSUE: 5
May/2025
DOI: http://dx.doi.org/10.33642/ijbass.v11n5p1

waiting versus active involvement, can alter our perception of time (Van Manen, 2014).

Van Manen (2014) states that the phenomenology of technology is unquestionably an emerging and significant area of research. Moreover, Van Manen (2014) refers to Cathy Adams' work (2006; 2012), which demonstrates how a phenomenology of technology and objects can shed new light on the evolving pedagogy of teacher-student relationships as educators acclimate to new media such as Power Point and Smart Boards.

Method

Primary Phenomenological Research Question:

- What form could creativity assume for interior design students utilizing BIM?

Secondary Research Questions:

- What is the experiential reality for research participants when designing with BIM?
- At what point in the design process should technology be incorporated to augment creativity?

Contexts and Participant Selection

A phenomenology study was executed, involving interviews with two graduate students in interior design from two distinct North American universities S and R. Both are international students from Saudi Arabia with an undergraduate background in interior design. They acquired knowledge of Revit during their master's degree studies. Their experiences with designing using Revit were explored in separate interviews. S's interview lasted for one hour and 23 minutes, while R's interview spanned 47 minutes.

Data Sources Selection: Consent forms were dispatched to the participants via email. Individual interview appointments were scheduled. Semi-structured interviews were conducted with both participants. These interviews, conducted via online web conferencing, were audio-recorded and subsequently transcribed. The participants were asked to provide detailed descriptions of their lived experiences while using Revit and their perceptions of designing with Revit. Additionally, a post-reflection journal was utilized for data analysis.

Post-Reflexion Statement

The objective of this study is to delve into the phenomenology of student creativity in relation to the use of BIM, with a particular emphasis on identifying the determinants of this phenomenon. The following assumptions have guided this study: 1) Revit is the optimal software for producing precise construction documents for interior design. 2) The design process is not a linear progression, but rather involves a cyclical process of data collection, conceptualization, drafting, and modeling until a satisfactory design is achieved. 3) Utilizing Revit to manage this non-linear process results in time, cost, and effort savings. Moreover, it enables students to concentrate on the design process and the design itself, facilitating the exploration of a broader range of options that contribute to the design's evolution. 4) Revit provides students and designers with a visual connection to their designs using three-dimensional modeling. 5) The process of creativity parallels the design process. Therefore, advancements in the design process will inherently lead to the evolution of the creative process.

Post- Intentional phenomenon

The manuscript was carefully constructed to incorporate empirical data, post-analytical reflections, and theoretical constructs, all of which interact within the design process. The evaluative process was compartmentalized into three distinct sections that represented the various stages of interior design. Section one, coded in 'Programming Phase', while section two, coded in 'Schematic Design Phase'. The third section, coded in 'Design Development Phase'. The assessment was an interchange between participant feedback and my reflective analysis. The interior design process is comprised of five pivotal phases: programming, schematic design, design development, contract documents, and contract administration. Each phase encapsulates one or two stages of the design process, as identified by Aspelund (2015): "inspiration, identification, conceptualization, exploration/refinement, definition/modeling, communication, and production" (p.1). To put it another way, the programming phase includes inspiration, identification, and conceptualization stages. The schematic design encompasses conceptualization and exploration stages. The design development encompasses refinement, definition/modeling, and communication stages. Finally, the phases of contract documents and contract administration include communication, and production stages.

1. Programming Phase

Slotkis (2017) characterizes the programming phase by student engagement in information gathering pertinent to design projects, followed by its subsequent analysis. Students are tasked with identifying a concept " that expresses the proposed character of the space " (p.88), examining client expectations. They are required to formulate a written program for the project along with an action plan. Consequently, this phase incorporates the stages of inspiration, identification, and conceptualization within the design process.

The participant (S) expanded on her experiences with various projects. I thus segmented her discourse based on her individual projects. She undertook a Hotel Design, a Pet Food Store, and a Universal Design Housing project. This led to questions about the participants' experience during this phase. Was this the stage where creativity was molded? What does experiencing the design process by undertaking a project feel like? She elaborated on her initial phase of the design process:

The participant (S): *Initially, I evaluated the design problem. Subsequently, I sought solutions to this problem. This was followed by the collection of data and information. Afterward, I created sketches and captured both interior and exterior photos of the site. This data served as a source of inspiration. I then began to study and generate additional sketches for the project until I achieved satisfactory results.*

The Hotel experience:

I conducted a thorough investigation of the city, delving into its history, distinctive features, and renowned areas. Additionally, I researched its agricultural practices, trade,

International Journal of Business and Applied Social Science

E-ISSN: 2469-6501
VOL: 11, ISSUE: 5
May/2025
DOI: http://dx.doi.org/10.33642/ijbass.v11n5p1

economic and social status. Subsequently, I visited three prominent hotels in my city of residence. I captured pictures and sketched areas within these hotels that I found inspiring. Following this, I began with the enticing floor plan of the hotel, creating three bubble diagrams and three block diagrams.

The Pet Food Store experience:

This project involved creating a pop-up shop in the hotel. Given the hotel's pet-friendly (specifically dog-friendly) policy. The concept was inspired by the people of Peru, with the pop-up shop selling organic dog food. I conducted research on pop-up stores in general, investigating the materials designers typically use in such stores and the various types of pop-up shops. Simultaneously, I researched the people of Peru. I gathered pictures, fabrics, and images of Machu Picchu in Peru to formulate my concept. In the second week, I began sketching the shop.

The Universal Design Housing experience:

I conducted research concerning the project, studying the location and concept. The project was a residential condominium where the concept was not specific but emphasized functional space. I utilized universal design principles, incorporating its equipment, tools, codes, and measurements to augment the quality of life. I catered to four clients, all of whom had health issues. The concept aimed to create a safe and disability-inclusive environment. The 'Aha moment' occurred post-research. I gained substantial knowledge about the universal design, which aided me in reaching this 'Aha' moment.

The interview reveals a lengthy and intricate programming phase preceding the utilization of BIM. In relation to Epstein's theory, two out of the four individual creativity competencies transpire during the programming phase: 1) 'Capturing', which conserves novel ideas through the use of tools such as a pencil and a notebook, and 2) 'Broadening', which entails acquiring knowledge and experience beyond the current areas of expertise (Epstein, 1999). Therefore, the creative process and design thinking are initiated from the programming phase. Moreover, the initial stages of the design process, encompassing inspiration, identification, and conceptualization, are conducted manually. These stages necessitate “a higher degree of divergent thinking” as students are required to define problems (Sawyer, 2012, p.90).

The student interviewed demonstrated a lived experience from Van Manen’s (2014) spatiality theme, “How do we shape space and how does space shape us?”. The student strived to design a space that would accommodate the clients' disability needs, ensuring their safety. Moreover, her role as a designer extended beyond these needs, aiming to meet their desires. This lived experience prompted her to contemplate how she could mold the space and how the space influenced her clients.

The participant (R) shared her experiences from various projects. Therefore, I have categorized her conversation based on these projects. She was involved in a project for a Non-Profit Organization Serving Homeless Women, and a Fantasy Space project.

The Non-Profit Organization Serving Homeless Women experience:

The participant (R): *I began my project by conducting research on homeless women and shelters. I believed that creating a pleasant environment for them did not necessarily require large funds. My approach was to enhance the space with creative use of colors and design elements. The chosen concept was hope and achievement of goals, intending to instill a sense of hope in the women visiting the center. The design included an office, gallery, and reception area. I envisioned the gallery as a central hub, visible from the reception area. I incorporated a skylight for natural lighting, symbolizing the concept of hope. I recalled the work of an architect named Santiago Calatrava, specifically a sketch of a hand reaching up to hold a bird. This image served as my inspiration, and I abstracted the hand into a column in the center of the floor plan, reaching towards the skylight, signifying hope.*

The Fantasy Space experience:

The instructor asked us to draw inspiration from a famous designer for our idea. I chose an innovative fashion designer, hoping to derive a new concept from his geometric designs, particularly his use of triangles and rectangles in garment design. I began by sketching and then creating models using paper and glue. However, I was not satisfied with the shape of the completed model. My concept was based on the ideas of flow and continuity, inspired by the notion that dreams are endless. I then drafted the plan using AutoCAD. As a novice student, I was just starting to learn how to use Revit. I had observed others who started the design process with 3D modeling in Revit. However, I found that their designs lacked creativity and a clear focal point. They did not seem to focus on the concept as much as they would have if they had conducted research or sketched their ideas before moving on to 3D modeling. Personally, I prefer to conduct research and create sketches first.

In my opinion, the 'aha' moment often comes during the research phase when selecting a concept. I don't believe Revit is a good tool to start conceptual thinking. I am opposed to this approach. For me, the 'aha' moment often comes during the research phase.

An extensive pre-Revit process was undertaken, involving data gathering, sketching, and image analysis. The student's approach to the design and creative process was non-linear, oscillating between sketching and studying an architect for inspiration until the desired outcome was achieved. The student exhibited divergent thinking, effectively abstracting the architect's idea and imbuing it with deep conceptual significance. The idea of hope, symbolized by a hand reaching towards the sky, was ingeniously translated into a design of four columns supporting a skylight. This concept materialized after constructing models using simple materials such as paper and glue, followed by digital rendering of the floor plan for further development.

This process resonates with the 'Geneplore' model of the Creative Cognition Theory (Ward, Smith, and Finke, 1999), as it straddles the programming phase and the subsequent schematic

International Journal of Business and Applied Social Science

E-ISSN: 2469-6501
VOL: 11, ISSUE: 5
May/2025
DOI: http://dx.doi.org/10.33642/ijbass.v11n5p1

design and design development phase. The student was engaged in both the generation and exploration of ideas throughout the process. Feedback played a crucial role in the design process, stimulating the generation of additional ideas.

2. Schematic Design Phase

Slotkis (2017) delineated the schematic design phase as the creation of drawings and associated documents that encapsulate the design concept and solutions. This includes the generation of ideas for space utilization, furniture and equipment layouts, and selection of materials for finishes. Thus, this phase encapsulates the stages of conceptualization and exploration within the design process.

The participant (S) proceeded to elaborate on her strategies during the schematic phase of her project: she began to explore the chosen concept using BIM. Feedback was provided by both her peers and professors, which she utilized to further adjust and enhance her idea.

The Hotel experience:

I presented all my work to my professor and classmates, and selected the most suitable design for the project. I then began to render the project in Revit, choosing appropriate furniture for each space. It was a challenging task to decide on the right arrangement, leading me to experiment with different furniture placements across all areas. Then, I selected materials for floors, walls, and fabrics, ensuring they were harmonious with one another. Next, I picked suitable lighting fixtures for each space, such as pendants, floor, and wall lights, and imported their specifications into Revit. Sometimes, I found myself stuck, spending too much time working in Revit. I had a specific concept, but my preference for classic style led me to design in that manner, which I typically do. The professor, knowing my predilection for classic style and furniture, encouraged me to think more expansively. I needed to incorporate modern elements into my design. My professor counseled me to blend various styles in the design. At this point, I had completed three-quarters of the hotel and created three renders, all in classic style. So, following her advice, I revisited my research, found images of hotels online, and revised my ideas, furniture, and fabric choices. I transformed my thought process, thinking more deeply and broadly, and moved away from just choosing classic style. I pushed myself out of my comfort zone, attempting to integrate various design styles.

The Pet Food Store experience:

I started using Revit, after gathering the necessary images. Due to the small scale of the project, I drew the plan, bubble, and block diagrams directly in Revit, by passing extensive hand sketching. I did, however, create three sketches to clearly communicate my ideas. My concept became clearer after I constructed a model using paper and glue. The inspiration for my design came from the Peruvian mountains, which was reflected in the fabrics I chose, using Peru's textiles. I was pleased with the result as I designed everything in the store based on my chosen theme (Peruvian mountains). In addition, I used Peruvian materials for the store, specifically wood. I chose a light-colored wood to complement the Peruvian colors in the fabrics, such as red, orange, and yellow. As I delved deeper into the 3D view, I further developed and adjusted the design to enhance its functionality and safety. Sometimes, my ideas didn't adhere to safety standards. For instance, when I designed a wall made of glass panels and wanted to install shelves on it, my professor pointed out the practical issue: "How will you do it? How could you install these shelves on the glass?" So, I modified the design. I also initially designed the shop without a door, promoting openness, but received feedback that it was a safety concern. So, I added a door to the shop to address this issue. Afterwards, the design was perfect.

The Universal Design Housing experience:

I utilized Revit, making many modifications to the placement of furniture. Key areas like the bathroom and kitchen needed to be outfitted with universal design equipment. I designed spaces with more openness and fewer pieces of furniture, to allow for easy movement. I ensured there was ample circulation space in the bedroom, living room, and kitchen for a wheelchair. In the bathroom, I included a grab bar, and the sink and bidet were specifically designed for the disabled. The fabric in the living room was different from the other rooms and walls, allowing clients to identify their location by touch. I incorporated round edges for safety purposes.

In all my projects, I employed the "what if" technique. Using Revit expedited this process. Experimenting with alternative designs didn't consume too much time. Sometimes, after trying out different ideas using the "what if" approach, I would revert to my original design upon realizing that the alternatives weren't feasible. I experimented with the arrangement of furniture and visualized it in 3D. I used the "what if" technique in all my projects, testing various color combinations on walls, or leaving some walls plain while coloring others. I experienced this process in all my projects, experimenting with various aspects, and Revit proved to be a helpful tool for this.

Given the limited timeframe, the student initiated the drafting process directly in BIM following data collection, creating only a few sketches. The clearly defined concept facilitated appropriate design. Furthermore, BIM simplified the schematic design process by enabling visual analysis and circulation studies of the spaces. It also assisted in determining the most suitable arrangement of areas, corridors, stairs, doors, windows, exits, furniture, and lighting. Importantly, the use of the 'what if' technique disrupted the student's habitual thought patterns. BIM contributed to enhancing the safety and functionality of the space, and helped identify design weaknesses. Feedback further assisted in the design's evolution. BIM also aided the student in material selection and idea development. The student's personality played a crucial role in shaping her creativity. The design process was non-linear, and the use of BIM significantly eased this process.

The participant (R) continued explaining the schematic phase of the design process:

The Non-Profit Organization Serving Homeless Women experience:

International Journal of Business and Applied Social Science

E-ISSN: 2469-6501
VOL: 11, ISSUE: 5
May/2025
DOI: http://dx.doi.org/10.33642/ijbass.v11n5p1

The floor plan phase was accomplished using Revit. Subsequently, I embarked on 3D modeling within Revit. Upon completing the plan drawing and applying the concept, I noticed the space was still devoid of furnishings! I commenced testing furniture distribution, such as the placement of the TV screen and waiting area, examining their relationship in both 2D and 3D simultaneously. One significant feature of Revit is its ability to display the plan, section, and 3D view all at once, allowing me to observe modifications from multiple perspectives and understand their interconnections. This involved testing numerous options and repeatedly altering the stairs. The positioning of various elements, including stairs, doors, areas, reception, etc., took several days to finalize. The design underwent significant development in Revit. I applied materials, contemplating the use of elements that symbolize women, such as diamonds. Therefore, I opted for terrazzo flooring, which includes fragments of glass, creating a shimmering effect when daylight from the skylight reflects off it during renderings. Despite changing the material multiple times, I ultimately returned to terrazzo.

Although I had envisioned my design before implementing it in Revit, the resulting output greatly enhanced my initial imaginings. It even exceeded my expectations as I experimented with numerous options, leading me to realize I had created an innovative design. I then turned my attention to color selection and area relationships. I opted for a simple design, adding luxury with color and furniture choices. Revit allowed me to envision people's movements across different areas, thereby enabling me to establish relationships between areas through movement analysis. The project was sustainable, creative, and successful, and I am quite pleased with the outcome.

The Fantasy Space experience:

I tried to design a wall composed of small cubes in Revit, but due to the high number of points, this proved difficult. As a result, I turned to 3D Max, which made the process much smoother. The final design went through significant development and differed greatly from my initial sketches. I frequently use the 'what if' strategy in design, as Revit allows me to experiment with numerous options while saving time. This flexibility allows me to revert to previous ideas if needed. During the conceptual, modeling, and rendering phases, I was able to test different colors or even combine multiple colors. Revit is a time-saving tool that simultaneously encourages the creation of new ideas.

The learner required the ability to visualize the design and explore alternatives for its progression. Employing manual tracing techniques, such as sketching, analysis, and rearrangement, to imitate a digitally crafted floor plan also facilitated the design's evolution. Nonetheless, BIM poses certain constraints. Novice users of BIM often struggle with creative design due to the time spent understanding commands and identifying tools, as opposed to focusing on the design itself. Moreover, free forms and complex organic designs are challenging to execute with BIM.

This hermeneutic relationship between the student and BIM aligns with Don Ihde's patterns of human-technology interactions. As Hanks (2009) explains, "The hermeneutic relation is one in which we experience some aspect of the world through experiencing some aspect of technology" (p.134). Consequently, when BIM displays the application of selected materials and color palettes to the design, the student can envision the final design. In essence, the student experiences a facet of the world (design) through BIM. To address Van Manen's (2014) question, "How do humans identify with or become extensions of computerized technologies?" (p.309), we can turn to Ihde (1990) who described an embodiment relation as one of four patterns of human-technology relations (Hanks, 2009).

The student can utilize BIM to experiment with materials, colors, and forms, reposition furniture for optimal distribution, and analyze occupant circulation. This clearly illustrates an embodiment relation between the student and BIM, with BIM serving as an intermediary between the student and design, functioning as an extension of the self. It amplifies the student's imaginative capabilities. As the student expressed in the interview, *"The results in BIM developed my imagination so much, and beyond my imagination because I tested and tried so many options"* (The participant (R). Thus, BIM fosters the student's creativity.

3. Design Development Phase

Slotkis (2017) further elucidated the design development phase as the stage where drawings and related documents are elaborated and executed with more precision, often to scale, for the client's endorsement. The preliminary budget estimates may also be adjusted during this phase. The design development encompasses refinement, definition/modeling, and communication stages.

The participant (S) noted that Revit is an inclusive software that caters to all design needs.

Revit is a comprehensive tool that caters to all design necessities. Through my experience, I've noted how it significantly reduces the time and effort required in the design process. The software is equipped with a wide array of furniture options available in the market, and even facilitates the design of new items from scratch with ease. It's a user-friendly tool that's easy to master. Revit fosters and enhances the creative process and personal creativity. On comparing my previous work with projects completed using Revit, the difference was striking. The extent of creativity exhibited in my design assignments using Revit was remarkable. Moreover, the software simplifies the comprehension of the design for any observer.

Revit streamlines the design process, ensuring precision and ease. It provides accurate dimensions and saves time. It aids in organizing my work and fosters creativity by offering a variety of options for furniture, doors, windows, among others. The cloud rendering feature is integral to the success of the design process as it provides high-quality renders. While creativity is crucial, the most important aspect is knowing how to effectively use Revit. Without a clear understanding of how to use Revit, it would be impossible to articulate my ideas clearly or execute any part of the design process. A solid understanding of Revit is indispensable; otherwise, I'd be unable to accomplish anything. This knowledge

International Journal of Business and Applied Social Science

E-ISSN: 2469-6501
VOL: 11, ISSUE: 5
May/2025
DOI: http://dx.doi.org/10.33642/ijbass.v11n5p1

is the key to project success and allows me to present my ideas in the desired manner.

The participant (R) continued explaining her design development phase of the design process:

Other drafting programs proved to be time-consuming. I had to manually create all floor plans, sections, 3D models, and details, which was a lengthy procedure. Balancing between developing my design and making necessary alterations in the drawings was quite challenging. However, Revit has considerably simplified this process. Once the 3D model is created in Revit, all changes are automatically reflected in other drawing sheets, floor plans, and sections. This has allowed me to dedicate more time to the conceptualization and development of my designs. Even with extensive research and hand-drawn sketches, the final idea was not as clear as when executed in Revit. Revit allowed me to continually refine the design, furniture arrangement, material selection, and rendering. Through constant modification and testing, the design elements became clearer. Revit has indeed contributed to about 70% of the development of my ideas and designs when I have a robust concept.

I believe my creativity was significantly enhanced while using Revit, given its precise dimensions and multiple views. The ability to simultaneously access floor plans, sections, and 3D views helped me to focus more on the design process. I was able to devote myself completely to developing the design until I created something new and unique. In case of large projects, I made numerous renders, especially after finalizing my ideas and applying materials. The rendering process allowed me to visualize the space and make necessary changes to evoke the desired feeling in people occupying that space. Hand sketches, though beautiful, could not effectively depict the relationship between various areas. These relationships became evident when using Revit, which took the design beyond ordinary and made it distinctive. Designing in 3D allowed me to explore the interaction between the floor, wall, and ceiling, enhancing the design's visual appeal. I explored various materials and colors to find what best complemented my design. Feedback from instructors and peers also played a crucial role in developing my designs.

Yanksari (2020) stated that during these phases, BIM aids in exploring and developing concepts, spatial forms, and relationships, and identifying conflicts. It also helps in making the design understandable and facilitates design communication. It aids in exploring and developing design details and conducting a series of renderings for final design execution.

Findings

The use of Building Information Modeling (BIM) in interior design education opens up new avenues for creativity by allowing students to replicate real-world elements and create a tangible essence within their designs.

The primary research question was what form creativity could assume for interior design students utilizing BIM. The findings suggest that the cornerstone of the design process is a thorough research phase for inspiration, coupled with a clearly defined design problem. Having a robust concept positively influences the design and creative process. Furthermore, students refine their design when they achieve comfort, organization, and a sense of virtual reality through BIM. Feedback also plays a crucial role in the design process, enhancing its development. Beyond aesthetics, BIM aids in enhancing the safety and functionality of the space.

The secondary question asked about the participants' experience of designing using BIM. The findings reveal that BIM improves the quality of work, offers more time for contemplation, and less time for design execution. Additionally, BIM enables students to visually connect with their design and experiment with various design alternatives.

The other secondary question pertained to the stage of the design process in which technology should be employed to augment creativity. The schematic design and design development phases emerge as the suitable stages for employing BIM to boost creativity, given that these stages involve conceptualization and exploration/ refinement of the design process.

Thus, BIM not only reshapes the design process but also enriches the experiential reality of students, guiding them to achieve innovative outcomes through technological augmentation.

Conclusion and Interpretation

In conclusion, Yanksari (2020) studies developed an understanding that BIM could serve not just as a drafting tool but as a method of design to stimulate students' design thinking. The study's results showed that BIM significantly impacts the schematic design and design development stages of the design process. Both manual sketching and BIM are important in the exploration process.

Creativity can manifest in innovative designs where attention to detail plays a crucial role, as exemplified by choosing textures and lighting that reflect a conceptual theme like 'sweet dreams.' Students experience a digital environment where they can handle multiple design aspects efficiently, enabling them to focus more on creativity. BIM facilitates the production of unique work by accelerating the design process and offering insights through interactive 3D views. The incorporation of BIM technology should occur early in the design process when forming the conceptual foundation, allowing students to feel comfort, maintain organization, and achieve a sense of virtual reality within their designs. This integration transforms their perception of time, compressing the duration spent on tasks while expanding time for contemplation and creative thinking, closely aligned with Van Manen's (2014) concept of temporality.

This research study could impact areas such as design thinking and conceptual development. The findings might enhance design education by promoting a teaching strategy that boosts creativity. This method could have students sketch designs using BIM, create a digital 3D model, print it out, and then manually trace it to further refine the design. This iterative process can be repeated to advance the design, though this approach is now considered somewhat traditional compared to AI tools. Integrating

International Journal of Business and Applied Social Science

E-ISSN: 2469-6501
VOL: 11, ISSUE: 5
May/2025
DOI: http://dx.doi.org/10.33642/ijbass.v11n5p1

AI afterward could further develop the design while mindful of the risks of over-reliance, which could potentially hinder human originality, as noted by Hwang (2022).

REFERENCES

Ahmad, A. M., Demian, P., & Price, A. D. F. (2013). Creativity with building information modelling tools. *International Journal of 3-D Information Modeling* (IJ3DIM), 2(1), 1-10.

Almaz, A. F., El-Agouz, E. A., Abdelfatah, M. T., & Mohamed, I. R. (2024). The Future Role of Artificial Intelligence (AI) Design's Integration into Architectural and Interior Design Education is to Improve Efficiency, Sustainability, and Creativity. *Civil Engineering and Architecture*, 3(12), 1749-72.

Aspelund, K. (2015). *The Design Process.* New York: Bloomsbury Publications, Inc.

Csikszentmihalyi, M. (2013). *Creativity: The Psychology of Discovery and Invention*, reprint ed.

Clayton, M. J., Ozan, O., James, H., & Francisco, F. (2010). Towards Studio 21: Experiments in Design Education Using BIM. *SIGRADI* 43–46.

Demchak, G., Dzambazova, T., & Krygiel, E. (2009). I*ntroducing Revit architecture 2009: BIM for beginners*. John Wiley and Sons.

Epstein, R. (1999). *Generativity Theory.* In M. A. Runco, & S. Pritzker (Eds.), Encyclopedia of Creativity (pp. 759-766).

Gerber, D. J., & Lin, S. H. E. (2014). Designing in complexity: Simulation, integration, and multidisciplinary design optimization for architecture. Simulation: *Transactions of the Society for Modeling and Simulation International*, 90(8), 936–959.

Gibson, K. (2007). Automated creativity: Digital morphology and the design process. *Journal of Interior Design*, 32(3), 41-47.

Gibson, K. (2015). A Reflective Journey in Teaching Interior Design: The Virtual Studio. *The Handbook of Interior Design*, 524.

Goulding, J. S., & Rahimian, F. P. (2015). Design Creativity: Future Directions for Integrated Visualisation. *International Journal of Architectural Research:* ArchNet-IJAR, 9(3), 1-5.

Hanks, C. (Ed.). (2009). *Technology and values: Essential readings*. John Wiley & Sons.

Hwang, A. H. C. (2022). Too late to be creative? AI-empowered tools in creative processes. In *CHI conference on human factors in computing systems extended abstracts* (pp. 1-9).

Lewis, M., & Staehler, T. (2010). *Phenomenology: an introduction*. A&C Black.

NCIDQ. (2004). Definition of Interior Design. *National Council for Interior Design Qualification*, Inc. Retrieved from. http://www.ncidqexam.org/about-interior-design/definition-of-interior-design/

Vaikla-Poldma, T. (2003). *An investigation of learning and teaching processes in an interior design class: An interpretive and contextual inquiry.* Unpublished doctoral dissertation, McGill University, Montreal, Canada.

Van Manen, M. (2014). *Phenomenology of practice: Meaning-giving methods in phenomenological research and writing.* Thousand Oaks, CA: Left Coast Press.

Sawyer, R. K. (2012). *Explaining creativity: The science of human innovation* (2nd ed.). New York: Oxford University Press.

Scribner, S. A. (2004). *Novice drafters' spatial visualization development: Influence of instructional methods and individual learning styles.* Southern Illinois University at Carbondale.

Slotkis, S. J. (2017). *Foundations of Interior Design: Studio Instant Access*. Bloomsbury Publishing USA.

Yanksari, F. (2020). *Exploring Building Information Modeling (BIM) and the Design Process in Interior Design Pedagogy* (Doctoral dissertation, University of Minnesota).

Zuo, Q., & MaloneBeach, E. E. (2010). A comparison of learning experience, workload, and outcomes in interior design education using a hand or hybrid approach. *Family and Consumer Sciences Research Journal*, 39(1), 90-106.