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Teaching How to Write Construction Specifications Through the Narrative by Utilizing Tacit Knowledge

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Abstract

Knowledge management issues need to be addressed in architectural education, particularly in the areas of "building regulations and standards" and "design and specification. Transforming tacit knowledge into explicit knowledge in construction-related theory and practice is crucial for architectural education. However, the integration of tacit knowledge in this field remains significantly limited. On the other hand, imitating reality in the process of creating a narrative can provide a more holistic and in-depth understanding in architectural education. This article aims to present a method that combines tacit knowledge revealed by Ricoeur's imitation approach and Nonaka's SECI knowledge transformation model for teaching construction specification writing in architectural education. This study applied a method combining Ricoeur's Mimesis and Nonaka's SECI model to 32 interior architecture students in the 'Construction Cost' course at Istanbul Arel University, revealing their ability to produce sector-relevant technical specifications.

Keywords: *Construction specifications, narrative learning, tacit knowledge, explicit knowledge.*

Anlatı ile Zımni Bilgiyi Kullanarak Teknik Şartnamenin Nasıl Yazılacağının Öğretilmesi

Öz

Mimarlık eğitiminde, özellikle 'bina yönetmelikleri ve standartları' ile 'tasarım ve şartname' alanlarında bilgi yönetimi ile ilgili sorunlar mevcuttur ve bu konunun iyileştirilmesi gerekmektedir. Yapılabilecek iyileştirmeler kapsamında inşa faaliyetinin teorik bilgiye ve uygulamalı bilgiye aktarımında zımni bilgiyi açık bilgiye dönüştürmek mimarlık eğitimi için önemli hale gelmektedir. Ancak bu noktada, zımni bilginin mimarlık eğitiminde kullanımının çok sınırlı olduğu görülmektedir. Öte yandan, bir anlatı oluşturma sürecinde gerçekliği taklit etmek mimarlık eğitiminde daha bütünsel ve derinlemesine bir anlayış sağlayabilir. Bu makalenin amacı, mimarlık eğitiminde inşaat şartnamesi yazımının öğretilmesine yönelik, Ricoeur'un taklit yaklaşımı ile açığa çıkan zımni bilgiyi ve Nonaka'nın SECI bilgi dönüşümü modelini birleştiren bir yöntemi sunmaktır. Bu çalışma kapsamında İstanbul Arel üniversitesi İç Mimarlık Bölümünde verilen "Yapı Maliyeti" dersinde teknik şartname yazımında örtük bilginin potansiyelini göstermek amacıyla Ricoeur'un Mimesis ve Nonaka'nın SECI modeliyle geliştirilen yöntem, 32 iç mimarlık öğrencisine uygulanmıştır. Bu yöntem ile öğrencilerin, sektörde kullanılabilir teknik şartnameler oluşturma becerisi kazanabildiği görülmüştür.

Anahtar kelimeler: *Teknik şartname, anlatı, zımni bilgi, açık bilgi.*

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1. Introduction

The study of human knowledge is as old as human history, but in recent years, knowledge has gained renewed attention. Drucker (1999) viewed knowledge as a management resource and power. Knowledge is generally divided into explicit and tacit forms. Explicit knowledge can be formally and easily transmitted across individuals, whereas tacit knowledge is often considered more important and a critical source for organizations and groups (Nonaka, 1991).

Construction organizations are often overlooked in knowledge management literature, making it challenging to conceptualize how to share tacit knowledge within the construction industry (Nesan, 2012). In higher education institutes across all fields, managing knowledge has become a crucial issue. Taking advantage of the opportunities offered by knowledge management plays a vital role in the education of architecture students, as in many other fields. Equipping students only with design and theoretical knowledge does not provide competitiveness in the real-time construction industry. A proper understanding and utilization of both explicit and tacit knowledge will foster a culture of lifelong learning. Architectural and engineering curricula are overwhelmingly focused on design and construction, often at the expense of education in construction documents, including construction specifications (Dobson, 2014). A "Skills Survey Report" by RIBA identified the most problematic areas for recent graduates entering the construction industry as having more theoretical knowledge than practical ability and the lack of in-depth courses on specification writing. The survey also highlighted "building regulation, standards" and "design and specification" as the top two knowledge areas needing improvement. With the advent of Building Information Modeling and more integrated processes for design and construction, there is a growing recognition of the need for architects and engineers to have a basic education in written construction documents (Dobson, 2014).

Architectural education is evolving, with many colleges and universities offering classes on construction specifications, contracts, and materials (Dobson, 2014). Professional Practice and Construction Management courses typically cover architects' responsibilities from the pre-contract phase through cost estimating, specifications, and the construction of the building. The individual tasked with preparing the specifications should know the production and assembly process of construction elements.

Narrative transcends simple representations of reality by synthesizing actions and providing a deeper understanding of our worldview (Ricoeur, 2016). In architectural narratives, actions symbolize human behavior and incorporate elements such as cooperation, competition, and struggle. Physical conditions influence the narrative flow, and questions like "What?", "Why?" and "With whom?" guide our understanding of these actions. Integrating narrative principles, temporality, and mimesis into architectural education enhances students' comprehension of how narratives influence architectural theory and practice. This method assists students in conceptualizing and applying their knowledge to real-world situations, enriching their learning experiences and practical skills. Understanding narrative and temporality is crucial for comprehending both architecture and human experience, allowing for the reconfiguration of reality and the expansion of conceptual frameworks.

Given that construction is a labor-intensive industry, it is essential to capitalize on the expertise of those involved in the construction production process. These individuals represent the most valuable asset that a construction organization possesses.

This paper aims to utilize tacit knowledge through mimesis in teaching architecture students how to write construction specifications. After the introduction part, which comprises the background of the research, the second part includes literature studies on construction specifications, tacit knowledge, and architectural narrative. A method that integrates Nonaka's SECI (Socialization-Externalization-Combination-Internalization) approach, which understands the conversion between tacit and explicit knowledge, and Ricoeur's mimesis approach, both of which were reviewed in the literature studies. The findings section includes the examination of specifications prepared by 32 interior architecture students within the scope of the “Construction Cost” course taken in the 4th grade (Yalçın, 2023). By integrating Ricoeur's mimesis and Nonaka's SECI model, architecture students can develop a deeper

understanding of the narrative nature of construction specifications and effectively translate their tacit design knowledge into explicit, detailed documents. This approach enhances their ability to ensure that the design intent is accurately realized in the constructed building.

1.1. Construction Specifications

As per the AIA Document A201-2007, Paragraph 1.1.6, "The Specifications comprise the written requirements for materials, equipment, systems, standards, and workmanship for the work as well as the performance of related services." The entire "story" of the building of a new, renovated, remodeled, or rebuilt facility is shaped by each type of contract document, including specifications and drawings. AIA A201-2007 defines specifications as "that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards, and workmanship for the Work and performance of related services."(Harness & AIA, 2016). According to McKean (2005), the definition of specification in The New Oxford American Dictionary is "a detailed description of the design and materials used to make something; a standard of workmanship, materials, and other factors."

The information required for building a facility is developed by the architect/engineer and presented in two primary forms of documents: contract drawings and contract specifications. The Architect/Engineer and the Contractor exchange information through these two documents, but different forms of communication are used for each type. The first is verbal or textual, while the second is pictorial or graphic. The visual components of the contract documents that depict the layout, size, and design of the work are called drawings. These can include sections, plans, elevations, details, schedules, diagrams, and more. Material Selection & Specification (2013) states that specifications cover the kind and caliber of each product used in the project, from the most basic material to the fully functional system.

When these documents disagree, specifications—written instructions—are usually deemed by courts to be more significant than drawings. Judgments are typically based on the specifications' content. This implies that specifications ought to be meticulously drafted by experts. Specifications are as important as Drawings when it comes to the Contract Documents. They consist of the project's administrative needs, technical design specifications, and work scope. The intent of specifications is to provide contractors, suppliers, and inspectors with precise written technical information from the design engineer so that the necessary materials can be obtained and construction can be carried out and monitored (Kalin et al., 2011).

Additionally, the Architect/Engineer should possess the same level of expertise in creating the Specifications as they do in creating the Drawings. According to Kalin et al. (2011), the documents are complementary and have equal weight when interpreting the terms of the contract. Regretfully, written construction documents, including construction specifications, rarely provide more than cursory instruction to the architects, landscape architects, engineers, specialty designers, construction managers, constructors, inspection staff, code authorities, manufacturers, fabricators, installers, and applicators. Maybe this is because these people are more accustomed to and at ease with computations (spreadsheets and calculations) and graphic documents (drawings).

1.2. Tacit Knowledge

Nonaka & Takeuchi (1995) defined knowledge as a dynamic human process of defending one's own beliefs about the truth. Knowledge has been defined and categorized in a variety of ways; however, Polanyi (1958), Nonaka & Takeuchi (1995) distinguished between tacit and explicit knowledge. Though knowledge can be categorized as private, public, shared, theoretical, hard, and soft, internal and external, foreground and background, etc., the tacit, implicit, and explicit classification is still the most widely used and useful. According to Nonaka, Toyama & Konno (2000), implicit knowledge is knowledge derived from personal experience that is expressed through human behavior in the form of judgment, attitudes, points of view, commitments, and motivation. Tacit knowledge is very hard, if not impossible, to articulate because it is personal to the individual. The unspoken knowledge that people possess and acquire through internal, personal processes such as experience, introspection,

internalization, or innate abilities is known as implicit knowledge (Herrgard, 2000). According to Polanyi (1958), tacit knowledge is a type of firsthand understanding that people can only gain via firsthand experience in a particular field. Furthermore, he captures the essence of implicit knowledge in the well-known adage, "we know more than we can tell." He claims that because tacit knowledge is held in a nonverbal form, its possessor is unable to explain it to another person in a way that would be helpful. Furthermore, as he argues, tacit knowledge is that elusive, subjective "awareness" of a person that is difficult to put into words.

In a situation where human resource management literature consistently emphasizes the need to treat people as a key resource, construction companies often assert that "people are their greatest asset" (Carrillo, Anumba & Kamara, 2000). Human capital is an organization's most valuable resource, and this is particularly true in labor-intensive, low-tech industries like construction (Green et al., 2008). Construction employs a highly diverse range of people from a wide range of occupational cultures and backgrounds, including people in unskilled, craft, managerial, and professional positions. As the industry's intrinsic characteristics highlight, this makes it difficult to manage people effectively to ensure organizational success. The notion of the knowledge worker has long been significant to construction organizations (Green et al., 2008), as the industry depends on skill and the ability to combine various skills effectively (Drucker et al., 1996). This highlights the importance of the construction worker.

It is generally accepted that the primary sources of personal knowledge are education, training, and experience. That's why tacit knowledge, which includes intuition and interpersonal skills, among other things, is a concept that's complicated and context-dependent and applies to a wide range of different situations. Some examples of tacit knowledge in the construction industry include plastering skills and supply chain interactions (Egbu & Robinson, 2005). Construction knowledge involves propositional, experiential, performative, and epistemological types, all of which interact with truth in different ways. It is multivalent and multidimensional. Together, these types of knowledge act, and the amount that can be readily codified and represented is small primarily of the explicit kind (Mingers, 2008).

According to another source, one of the options for construction organizations to manage knowledge is by exchanging tacit knowledge to facilitate innovation (Sheehan, 2005). The importance of people for knowledge management is emphasized, with 80% of useful knowledge being tacit in the construction industry and not easily written down. Some strategies should be defined to mobilize the appropriate tacit knowledge.

Howells (1996) defines "non-codified, disembodied know-how that is acquired via the informal take-up of learned behavior and procedures" as the definition of tacit knowledge. Converting tacit knowledge to/from explicit knowledge in a way that construction firms can easily assimilate is the primary challenge of knowledge-based technology transfer. Given that tacit knowledge encompasses intangible elements ingrained in individual experiences, values, and beliefs, the process of converting tacit knowledge into explicit knowledge ought to incorporate tacit and implicit elements as well.

The dynamic knowledge creation process, as articulated by Nonaka & Takeuchi (2000), involves the transformation of both explicit and tacit knowledge through the SECI model, which encompasses four key processes: Socialization, Externalization, Combination, and Internalization. Socialization facilitates the conversion of tacit knowledge into explicit knowledge through shared experiences among individuals. Externalization refers to the process of articulating implicit knowledge into explicit forms, thereby making it accessible for broader use. Combination involves the systematic integration and organization of various explicit knowledge components to create new knowledge structures. Finally, Internalization is the process through which explicit knowledge is assimilated into tacit knowledge through experiential learning, often described as "learning by doing." Collectively, these interactive processes contribute to a continuous spiral of knowledge creation, wherein knowledge is perpetually expanded and enriched.

Tacit knowledge in architecture involves technical knowledge (scientific and practical knowledge related to systems, structures, and materials) and cognitive knowledge (related to design and

conceptualization). It encompasses various domains such as scientific knowledge (physics, chemistry, geography), human sciences (psychology, sociology), geographical knowledge (spatial location and relationships), and artistic knowledge. Architectural design knowledge integrates all these layers and is fundamentally based on know-how (practical knowledge).

The SECI model, created by Nonaka et al. (2000), describes the dynamic process of knowledge creation and transfer in organizations:

1. Socialization: Tacit knowledge is shared through direct interaction and shared experiences.
2. Externalization: Tacit knowledge is articulated into explicit concepts through dialogue and reflection.
3. Combination: Explicit knowledge is combined and systematized into a knowledge system.
4. Internalization: Explicit knowledge is internalized into tacit knowledge through practice and experience.

1.3. Narrative and Forms of Learning in Architecture

Narrative, as Paul Ricoeur explores in "Time and Narrative," is fundamental to understanding human experience and its representation. It involves constructing a plot and examining its connections to real-time actions, allowing for the creation of new worlds through texts. Narrative transcends simple representations of reality by schematizing and synthesizing actions, providing a deeper understanding and augmentation of our worldview (Ricoeur, 1988).

Aristotle's notion of narrative as a structured organization of events aligns with Ricoeur's ideas, suggesting that narrative shapes our understanding of time and experience. The concept of mimesis, or imitation, involves recreating experiences within a narrative plot, reflecting Aristotle's mythos as the systematic organization of events (Ricoeur, 1988).

Narrative functions as a deliberate human composition where the narrator constructs a coherent, complete plot. This process transforms preconceived notions of time into reshaped experiences, embedding actions within specific time frames designed to reveal truths through recognition and imitation of forms (Ricoeur, 1988).

In architectural narrative, actions within the plot are symbolic and reflect the reasons behind human behavior. The narrative incorporates cooperation, struggle, and competition, with questions like "What?", "Why?" and "With whom?" guide the understanding of the action. Each element contributes to the whole, with physical conditions influencing the narrative flow.

Architectural theory, as defined by Scheer (2014), addresses how and why buildings should be constructed. This aligns with Henri Cartier-Bresson's concept of capturing decisive moments through images, enabling a reevaluation of material things (Sennet, 2008). Ricoeur’s (2016) exploration of narrative and temporality connects with architectural theory by framing how architectural design and narrative both shape human experience. In this context, architecture can be seen as configuring space while narrative configures time. Ricoeur's analogy suggests that architectural design and narrative both contribute to shaping and understanding human experience. By integrating narrative frameworks, students can enhance their comprehension of architectural theory and practice, linking spatial configurations with temporal experiences.

Martin Heidegger's phenomenology of action emphasizes the concept of "place" and its relationship to the fundamental question of "What is being?" Heidegger’s focus on place extends beyond cognitive processes, emphasizing temporality and the construction of meaning Scheer (2014). This view complements Ricoeur’s understanding of narrative, highlighting how narrative configurations of time and place reflect deeper engagements with existence and memory.

Heynen (1999) explores mimesis in architecture, noting its intrinsic mimetic nature. Heynen examines how metaphorical relationships between nature, phenomena, and architectural design shape concepts. These metaphorical connections—explicit or implicit, conscious or unconscious—play a

critical role in forming architectural ideas. Through mimesis, architecture engages with symbolic and narrative dimensions, enriching its practice and theoretical foundations. The integration of narrative and symbolic forms in architectural design allows for a more profound understanding of how spaces and experiences are constructed and interpreted.

In architectural education, integrating these principles of narrative, temporality, and mimesis can enhance students' understanding of how narratives shape architectural theory and practice. By engaging with these frameworks, students can better conceptualize and apply their knowledge to real-world scenarios, enriching their learning experiences and practical skills. Narrative and temporality are central to understanding both architecture and human experience. They allow for the reconfiguration of reality and the expansion of conceptual frameworks. By examining how narrative and architecture interact, we can gain a deeper appreciation of how these elements construct and enrich our understanding of the world.

To further elucidate this interplay, Ricoeur's mimesis provides a threefold model of interpretation and narrative construction that is particularly relevant in this context. The first aspect, Mimesis1 (Prefiguration), involves the pre-understanding of the world, including cultural and historical context, which forms the background of any narrative. This foundational understanding is crucial for both narrative and architectural interpretation. The second aspect, Mimesis2 (Configuration), refers to the act of employment, where events are configured into a coherent narrative structure. This process parallels the way architectural elements are organized to create meaningful spaces, emphasizing the importance of structure in both narrative and design. Finally, Mimesis3 (Refiguration) represents the stage where the narrative is received and reinterpreted by the audience, influencing their understanding and actions. This stage highlights the dynamic relationship between the audience and the narrative, akin to how users interact with and interpret architectural spaces. By applying Ricoeur's mimesis approach, we can deepen our exploration of how narratives inform architectural practices and enhance the learning experience in architectural education (Ricoeur, 2016).

2. Material and Method

The aim of this study is to provide an effective use of tacit knowledge in the structured teaching processes of writing technical specifications for students. The ability to prepare technical specifications can be developed not only through theoretical knowledge but also by utilizing and externalizing tacit knowledge. The research process included a literature survey and was structured around two main subjects: tacit knowledge and the narrative way of learning.

Additionally, this process included a pilot project that was carried out with 32 students who took the "Construction Cost" course at Istanbul Arel University, Department of Interior Architecture. In this pilot project, the group of participants tries to write construction specifications by mimicking real-world practices via narratives. At the end of the pilot program, researchers analyzed three random outcomes based on Ricoeur's Mimesis framework and Nonaka's SECI model.

2.1. Data Collection

To identify the potential of tacit knowledge in writing construction specifications, data were obtained from the "Construction Cost" course offered in the first semester of the fourth-year program in the Department of Interior Architecture at Istanbul Arel University. Within the scope of the "Construction Cost" course, students make project drawings at different scales from the preliminary project process to the application project and system drawings production process. Then, they move on to writing technical documents supporting construction contracts. Technical specifications are important documents that include information related to the whole process of building elements. Within the "Construction Cost" course, students were asked to prepare a technical specification for a product. In the scope of this research, three Student Works related to writing technical specifications were analysed from a total of thirty-two students' works. Out of thirty-two students, three were selected randomly based on successful completion of the research and accurate data collection. A new approach combining Ricoeur's Mimesis and Nonaka's SECI model was tested in the 'Construction Cost ' course. In the process of providing technical specification writing training, the integration of Ricoeur's

Mimesis and Nonaka's SECI model was continued with the implementation of the items detailed below.

2.2. Integrating Ricoeur's Mimesis and Nonaka's SECI

This section outlines an approach that integrates Ricoeur's Mimesis framework with Nonaka's SECI model in the context of teaching construction specification writing. The integration is presented as a comprehensive process that guides students through the stages of knowledge acquisition, application, and internalization.

2.2.1. Prefiguration (mimesis1) and socialization (SECI) phase: The aim of this phase is to help students learn the basic elements of writing technical specifications by observation and interaction. This phase contains two steps as defined below.

- **Associate with Professionals:** Students will have the opportunity to benefit from the experienced architects and specification writers. This hands-on experience allows them to see the details and implicit knowledge involved in writing specifications, including industry practices and decision-making processes.
- **Analysing Existing Specifications:** Students will have the opportunity to analyze different construction specifications. By analyzing these documents, they will learn about the standards, language, and structure commonly used in the field, which will help them in their writing.

2.2.2. Configuration (mimesis2) and externalization (SECI): The aim of this phase is to help students express their knowledge through practical writing exercises and the use of industry standards. Students searched industry-standard templates and guidelines for specifications. They will adapt these templates for their specific specifications, which helps them turn their implicit knowledge into clear, written documents. Afterwards, students were asked to complete the written part of the technical specifications they would prepare for the building element they selected. This practice allows them to configure and externalize the implicit knowledge.

2.2.3. Refiguration (mimesis3) and combination (SECI): This phase aims to improve students' explicit knowledge through collaborative feedback and reflective practice.

- **Feedback Sessions:** Regular review sessions are held where students present their draft specifications to their classmates and instructors. This teamwork allows them to gather different types of explicit knowledge, such as feedback and industry standards, which helps them improve their documents.
- **Reflective Practice:** Students are encouraged to think about the feedback they receive and their own writing processes. They revise their specifications based on this feedback, which helps them turn new explicit knowledge into a deeper understanding. This ongoing process promotes better learning and skill development.

2.2.4. Refiguration (mimesis3) and internalization (SECI): The aim of this phase is to make a change in the type of knowledge. Explicit knowledge is turned into tacit knowledge in this phase.

- **Feedback Sessions:** Refiguration focuses on how the use of industry-available (written specifications) affects the audience, shaping their knowledge of the related information. Students gained an impression of how the technical specifications they wrote would be perceived in the industry.
- **Nonaka's Perspective:** In this phase, students analyzed and internalized the explicit knowledge they acquired, transforming it into tacit knowledge. They used the knowledge they acquired in the field in the formation of their own products.

Integration:
The refiguration stage shows how explicit knowledge (such as feedback, templates, and standards) becomes internalized. How students interpret the narrative affects how they absorb and apply this knowledge in their future professional work.

3. Findings and Discussion

In this section, three randomly selected student works were analyzed, focusing on their application of the SECI conversion model combined with Ricoeur's mimesis approach in writing technical specifications for selected building elements/components. Nonaka's SECI model emphasizes the dynamic interaction and interchange between tacit and explicit knowledge, which is foundational to this study. According to Nonaka, these knowledge types complement each other and are essential in creative human activities, termed "knowledge conversion" (Nonaka, Takeuchi & Umemoto, 1996). Students are managed knowledge according to this model to write their specifications.

3.1. Application Results

The application of the SECI model in student projects revealed valuable insights into the learning process and the development of technical specifications. The following sections detail the experiences of students as they engaged with the model's various stages, highlighting the practical implications of their learning.

3.1.1. Prefiguration (mimesis1) and socialization (SECI)

Student Example 1: One student visited a construction site and spent time with experienced workers, observing and discussing the practical aspects of installing a particular building component. This firsthand experience allowed the student to internalize practical knowledge, which formed the foundation for their technical specification.

Through ceramic labor, student 1 observes the workers' operations and develops a specific understanding of the application procedures. Write a script outlining the procedures and primary tools needed for this task. The student even understands how and where the worker should apply pressure to the material (Table 1).

Table 1. Prefiguration (mimesis1) and socialization (secı) in course outputs (Yalçın, 2023)

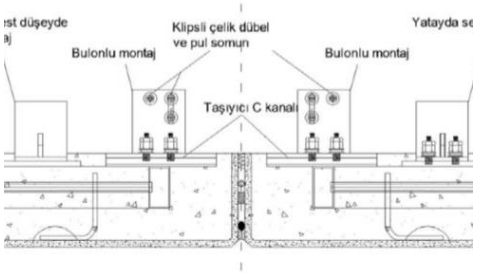
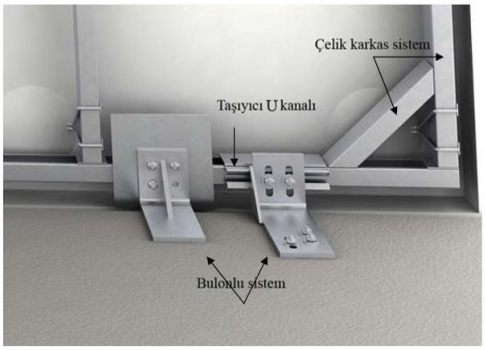
		Nonaka's SECI Model
		Socialization
Ricoeur's Mimesis Approach	Preconfiguration	 1. The merley comb with the appropriate tooth size selected according to the coating size is combed with a 45 to 60 degree angle of grip.
		 2. Before the adhesive applied to a certain area starts to dry (max. 40 minutes), our plates are placed so that there are no air bubbles inside.
		 3. In order to ensure better spreading of the adhesive on the back of the coating material and to increase its adhesion, the coating material is fixed and adhered to the wall with the help of a trowel.

3.1.2. Configuration (mimesis2) and externalization (SECI)

Student Example 2: Another student translated the observations and discussions with site workers into detailed diagrams and written descriptions. By externalizing the tacit knowledge gained from the site visit, the student created a clear and comprehensive technical specification for the building component.

Student example 2 drew a technical drawing and created the model for the installation of GFRC. Then she discussed it with the workers and observed it on-site. Following all of this work, she made some adjustments and was able to produce an understandable and thorough technical specification on the installation of GFRC (Table 2).

Table 2. Configuration (mimesis2) and externalization (secı) in course outputs (Yalçın, 2023)

		Nonaka's SECI Model
		Externalization
Ricoeur's Mimesis Approach	Configuration	 1.Only bolted system.
		 2. Placing the bolted system the carrier U channel during production.
		 3. Application of bolted and welded systems together.
		 4. The usage of only bolted system

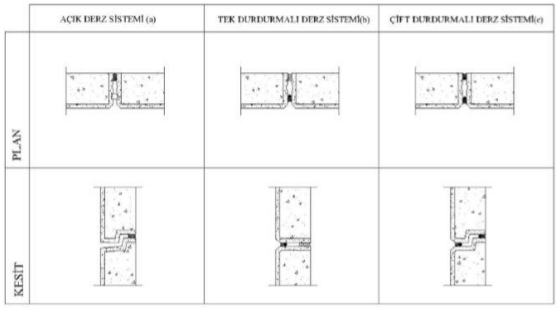
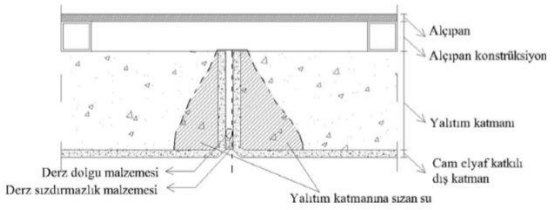
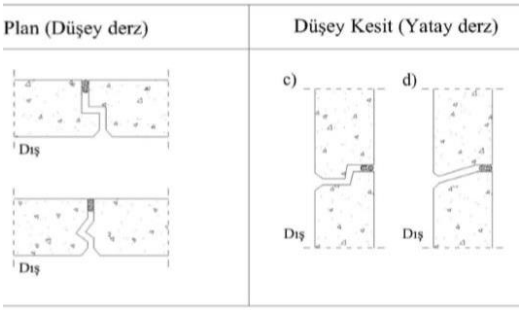
3.1.3. Refiguration (mimesis3) and combination (SECI)

Student Example 3: A third student integrated the practical observations with theoretical knowledge from textbooks and lectures. He combined these explicit sources to develop a cohesive and well-

structured technical specification, ensuring that all necessary details and procedures were thoroughly documented.

Student example 3 collected all possible details from textbooks and lectures. He integrated all of these materials while investigating every option and seeing applications. He produced a thorough technical specification with the help of all this organized material (Table 3).

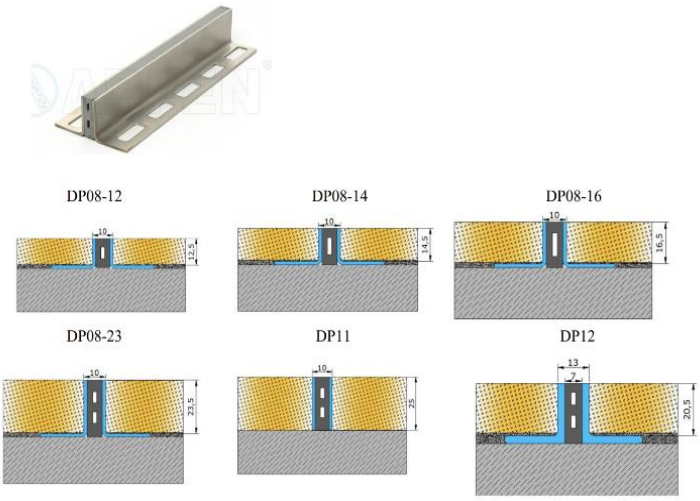
Table 3. Refiguration (mimesis3) and combination (secı) in course outputs (Yalçın, 2023)

		Nonaka's SECI Model
		Combination
Ricoeur's Mimesis Approach	Refiguration	 1.Use of joint sealant degradesion because of adhesion   2. Sealing of joints by special shaping  3. Application of joint sealant

3.1.4. Refiguration (mimesis3) and ınternalization (SECI)

Student Examples 1, 2, and 3: All students demonstrated internalization by applying the explicit knowledge they documented in their specifications to their term projects. Through iterative practice and reflection, they refined their understanding and developed a deeper, more intuitive grasp of the construction processes involved (Table 4).

Table 4. Refiguration (mimesis3) and ınternalization (secı) in course outputs (Yalçın, 2023)

<table>
<tr><th colspan="3">Nonaka's SECI Model</th></tr>
<tr><td colspan="3">Internalization</td></tr>
<tr><td rowspan="2">Ricoeur's Mimesis Approach</td><td rowspan="2">Refiguration</td><td>
1. Special joint sealant (aluminum)</td></tr>
<tr><td>

2. Special joint size should be preferred</td></tr>
</table>

3.2. Key Findings of Ricoeur's Mimesis and Nonaka's SECI Model Application

The application of Ricoeur's Mimesis and Nonaka's SECI model in student projects yielded several significant findings:

- **Enhanced Understanding and Articulation:** Students who actively engaged in the socialization and externalization stages demonstrated a deeper comprehension of construction processes. Their ability to articulate tacit knowledge into explicit forms improved, resulting in more precise and comprehensive technical specifications.
- **Integration of Theory and Practice:** The combination stage underscored the critical importance of integrating theoretical knowledge with practical experiences. Students who successfully merged these elements produced more robust and detailed specifications, illustrating the value of a holistic approach to learning in the field of construction.
- **Development of Tacit Knowledge:** The internalization stage highlighted the continuous nature of knowledge development. Students who applied their explicit knowledge in practical settings and

engaged in reflective practices cultivated a richer and more intuitive understanding of construction processes. This iterative learning process significantly enhanced their overall competence and confidence in the field.

- **Narrative Coherence and Traceability:** By applying Paul Ricoeur's concept of mimesis, students structured their technical specifications into coherent narratives. This narrative approach improved the traceability of their work, making the specifications easier to follow and implement. Additionally, the narrative structure facilitated the transformation of complex technical details into accessible and understandable documents.

4. Conclusion and Suggestions

The analysis of student works demonstrates the effectiveness of using the SECI model combined with Ricoeur's mimesis approach for teaching construction specification writing. By facilitating the conversion of tacit knowledge into explicit forms and integrating theoretical and practical knowledge, the model enhances students' understanding and articulation of construction processes. The application of narrative structures further supports the clarity and coherence of technical specifications, making them more usable in real-world scenarios. This approach not only enriches students' learning experiences but also prepares them to apply their knowledge effectively in their professional practice.

This approach enables architecture students to understand knowledge deeply and comprehensively. Students can question the implicit meanings of the knowledge they acquire, evaluate their arguments, and develop logical conclusions. They will gain the ability to connect information from various sources within a broad framework. Additionally, using observations and real-world information allows students to transform theoretical knowledge into practice. The use of tacit knowledge will help students succeed in their professional lives, enabling them to analyze and consider information from real events with a broader perspective. This method helps students understand and apply theoretical knowledge practically.

Tacit knowledge has implications in many areas. This research is important for both utilizing tacit knowledge for writing technical specifications and doing so while educating. Teaching how to write specifications fills a gap in architecture and construction education institutions. By the assignment given, students prepare technical specifications beyond those created through copying and pasting from company catalogs or websites.

This process fosters a deeper understanding of the content, encouraging students to critically analyze and synthesize information, resulting in more robust and detailed specifications. This approach not only enhances the quality of technical specifications but also equips students with essential skills for their future careers in architecture and construction.

By merging Ricoeur's mimesis with Nonaka's SECI model, students can enhance their knowledge creation and transfer processes through a deeper understanding of the role of narratives and interpretation. Also, they can effectively learn to write comprehensive and accurate construction specifications. This integrated approach ensures that students not only acquire technical skills but also develop a deep, tacit understanding of the specification writing process.

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Author Contribution and Conflict of Interest Declaration Information

All authors contributed equally to the article. There is no conflict of interest.

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