

Transforming lab research and teaching with Knovel and Engineering Village

Professor Heejin Jang used data and insights from the Elsevier Engineering solutions to enhance her research project, streamline workflows and optimize student learning



As a time-pressured academic, Professor Heejin Jang was on the lookout for tools that would help her find and analyze data faster, while providing her with relevant and reliable insights on her research specialty - corrosion engineering. In early 2022, she used project funding to purchase 12 months' access to two Elsevier products: the abstract and indexing database Engineering Village and the full-text knowledge platform Knovel. In this case study, she explains the vital contribution they made to her dual roles as lecturer and lab lead.



Prof. Heejin Jang
Chosun University, South Korea

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Background

Over the past 20 years, Professor Heejin Jang has published nearly 40 peer-reviewed papers on her key research area of corrosion in metals. Her work has attracted more than 540 citations to date.

For the last 15 of those years, she has been drawing on her in-depth knowledge of the topic to educate engineering students at South Korea’s Chosun University. At the same time, she heads up a corrosion engineering lab in the institution’s Department of Materials Science and Engineering, with three graduate students under her supervision. The research projects these students undertake have already engaged the interest of industries such as steel, car and appliance manufacturing.

She explains: “We look at the corrosion behaviors of metallic materials, mainly using an electrochemical method. Although we can deal with any of the metallic materials, steel, titanium, and aluminum are the ones that industries are prioritizing right now, so they have been our recent focus. We also study future materials like additively manufactured alloys, also known as 3D-printed materials, including medical titanium alloys, as well as super-high-strength, high-entropy alloys.”

The challenges

In her role as a lab leader and active researcher, Prof. Jang spends hours sifting through published data to identify the information she needs to support her work - for example, to identify upcoming research trends in corrosion engineering or to gather data points for research proposals. Extra hours are then required to build graphs and compile tables to analyze her search results and draw insights.

From a teaching and learning perspective, she seeks to develop graduates who can tackle the world's most complex challenges, adapt to rapid changes in requirements, and who are skilled in data intake, filtering, processing and knowledge implementation. That means ensuring that her students have access to educational materials that can help them excel in their studies. However, for many years, achieving that aim has involved searching for relevant graphs, diagrams and charts on open online sources, or investing her budget in a small number of books, usually at a price higher than she’d like to pay, and then “looking through every page.” This eats up valuable time that could be devoted to other important elements of her role.

The solutions

“Not only are Knovel and Engineering Village convenient for anyone who teaches and does research, they also help improve the quality of education and research.”

- Prof. Heejin Jang

When Prof. Jang encountered the Elsevier solutions Knovel and Engineering Village at a symposium of The Corrosion Science Society of Korea back in 2021, she soon realized their potential to help address her challenges.

The literature databases on Engineering Village enable researchers to identify the existing boundaries of their field and plan how to expand them with new discoveries. This is thanks to the system’s granular concept-indexing, which surfaces research assets (e.g., articles, preprints or standards) even when they don’t contain the keyword searched on. The database Compendex is updated yearly with new terms, while past papers with significance for developing topics are re-indexed to make them findable.

When it comes to turning foundational knowledge into practical solutions, Knovel's technical references and interactive tools enable researchers to find the data they need, and make calculations and decisions, e.g., evaluate physical material properties or work with equations and interactive graphs. In the case of students, Knovel is an ideal tool for those who want to:

- Evaluate risks in applying research solutions to comply with industry best practices
- Validate designs for prototyping, scaling-up and manufacturing
- Expand their knowledge of intersecting technical domains

Prof. Jang says: "When I saw what the solutions could do, frankly, I realized they could be a big help."

The results

During the 12 months she used the solutions, Prof. Jang was able to streamline processes for herself and her students, free up time to focus on other aspects of her role, and achieve a tangible increase in the quality of her results, as these two examples show:

Without Knovel

Prof. Jang invests many hours tracking down and reading physical books or scanning online sources to find suitable graphs, charts and photos for her teaching materials. However, this process has several disadvantages; for example:

- It uses up too much of her time.
- Locating the most up-to-date materials is difficult.
- The quality of images in physical books is not always ideal and post-processing is often required to improve their clarity.
- While online images are sharper, not all sources offer book previews, so extra research is required to determine the relevance of results.

With Knovel

Prof. Jang enjoyed access to a wide variety of quality books with no page limits. Knovel also identified the paragraphs with the knowledge she needed and extracted information, such as formulas or physical properties, meaning Prof. Jang didn't need to locate it manually; for example, by reading a book.

She notes: "I was impressed by how easy it was to find multiple books with similar content and compare them - this removed the need for extra background research. And I could capture a high volume of clear images on screen - this was much faster and more efficient!"

Without Engineering Village

Prof. Jang has access to tools that allow her to view research trends by year, but not by group or institution. And creating visualizations of results requires both time and effort: "I have to use a word cloud application," she explains.

According to Prof. Jang, these limitations make it almost impossible to ensure the originality of the research in her lab. "For example, I have difficulty securing credibility in analyzing research trends and presenting quantitative evidence for research originality claims."

With Engineering Village

Prof. Jang was not only able to identify the volume of researchers with the same particular research topic as hers, she was also able to establish which research group they worked in, and the capability of those groups. "That data helped me determine a strategy for our lab that has preserved its uniqueness."

Supporting students

Prof. Jang actively encouraged her lab students to use Knovel in their work. “Because Knovel coverage focuses on resources such as books and materials databases, rather than research articles, it was a great educational resource for them,” she explains. “As students don’t yet have an eye for research trends, they often have problems looking for general resources in books and it can be difficult for them to determine whether those they do find are recent. Knovel gave them the results they needed right away, which reduced the time they spent locating references for reports or papers.”

“Knovel was literally a library in my hand.”

- Prof. Heejin Jang

Crafting research plans

When writing project plans, Engineering Village was Prof. Jang’s first port of call to help her understand the relevant research trends. **“You can find articles in Google Scholar or on other websites, but what’s special about Engineering Village is that you have a lot of filtering options and the ability to visualize the data you select,”** she explains.

The insights that Engineering Village provides also proved valuable. “While other solutions enable you to analyze research trends, Engineering Village offers a higher level of completion and flexibility. I could not only see the number of documents published in a year, but analyze them by research group, related terms and types of journals. For example, without going through thousands of documents, it was simple to establish that most of the research articles about high-entropy alloys cover alloy composition and microstructure. Plus, I like how Engineering Village shows the results in graphs, which I could also share with others.”

Importantly, using Engineering Village not only saved Prof. Jang time, it also increased her effectiveness: “I spent at least 30 percent less time writing the ‘need for research’ part of the project plan, and the quality of the results doubled.”

Another benefit for Prof. Jang was the solutions’ ease of use: “Anyone familiar with computers can easily use them.” She concludes: “I would like to see universities subscribe to these solutions for their students and researchers. Not only are they convenient for anyone who teaches and does research, they also help improve the quality of education and research.”



Prof. Jang and her lab team



About Chosun University

Founded in 1946, Chosun University is one of the oldest private universities in South Korea. Today, it is one of the top 25 Korean universities according to the Times Higher Education World University Rankings 2023. Over the years, Chosun has built relationships with several outstanding foreign universities, partnerships that have supported the exchange of professors, students and knowledge.

The university aims to nurture talented students who can contribute to national and international welfare. It does this by providing education based on national educational ideals and the university's own mission to produce creative professionals who can become leaders in the fields relevant to society today. It also has an intensive academic research program.

Chosun has 13 colleges, many of which offer both undergraduate and postgraduate degrees. The university is home to more than 33,000 students – 25,900 undergraduates and nearly 500 international students – who are looked after by nearly 2,500 teachers and staff.



**CHOSUN
UNIVERSITY**

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Elsevier offices

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NORTH AMERICA, CENTRAL AMERICA AND CANADA

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Tel: +55 21 3970 9300

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Tel: +86 1085 2087 65



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