Retaining Women in Engineering: Finding the Perfect Job

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Lynn Mayo holds a M.S. in civil engineering from Stanford University and a B.S in civil engineering from Bucknell University. After working for over 30 years as a civil engineer, she became CEO of RePicture Engineering, PBC. RePicture is dedicated to increasing interest and diversity in engineering by telling the stories of engineering projects, engineers, and organizations. Through the RePicture.com site, we are helping students discover careers shaping the future and helping companies attract innovators.
This talk is about a new tool that could help retain women in engineering by helping them discover areas of expertise within engineering that truly capture their interest.
Many of us know women who earned their engineering degree but then chose not to work in engineering.

In a 2011 study (Fouad, 2011) of 3,734 women who graduated with a bachelor’s degree in engineering, 15% never worked as an engineer. These women were asked their reason for not entering the engineering workforce. They were able to choose more than one response. For the women who graduated from 2000 to 2010 (the most recent data), the frequency of their responses is shown above.

The most common reason, at 10%, was that they were not interested in engineering. Interestingly, 8% said they never planned to enter engineering. Since they were able to select multiple responses, we don’t know how many of the women who were not interested in engineering after graduating with an engineering degree never planned to enter engineering. But clearly some women lost interest in engineering after starting school but before getting their first job in engineering.

This lack of interest in engineering is something I think we need to consider more often when discussing how to retain more women engineers.

There are so many things we can do as engineers – are 1 out of 10 women engineering graduates really not interested in any of them? Or is part of the problem that they aren’t aware of all the wide-ranging opportunities, the societal contributions available in engineering, and what they would actually be doing in different jobs?
When discussing retaining female engineers, it’s also critical to talk about a female engineer’s first job. 40% of female engineers leave engineering within the first 2 years. If a woman graduating with an engineering degree doesn’t find a first job in engineering that she likes and instead gets a first job outside of engineering, she will probably never work in the engineering field.

Also, when a woman leaves an engineering job, she often leaves the profession. Therefore, if a woman is not happy in her first engineering job, we may lose her from engineering for her entire career.


Since a lack of interest in engineering is a major reason why women leave engineering, how do early career engineers currently know what job will interest them?
We saw a need for a tool to help students and professionals better understand their career options. This is part of what motivated us to create a free web-based tool called RePicture.com.

The goal of RePicture.com is to help women (and men) better understand specific engineering career and job opportunities, which may help them find their best-fit job and increase the likelihood of them remaining in engineering after they get their degree, so they can have a long and rewarding career in the engineering field.
We also saw the need to develop a program where all STEM (science, technology, engineering, and math) students learn more about their career options through an activity that they can include on their resume. We created the RePicture STEM Resume-Builder program which students can do either in the classroom, or on their own, such as during the summer.
Some of the feedback we received from female engineering and high school students that participated in our program this summer include:

Salma, an engineering student, said the program helped her to expand her knowledge and unlock more potential career paths.

QiTong, also an engineering student, said she had a lot of fun exploring and learning new things.

Suhanna, a high school senior, said it helped her explore Aeronautical and Astronautical engineering.
This presentation will:

- provide an overview of the RePicture.com website

- give a demonstration of the website

- discuss the RePicture Resume-Builder Program, which can be done by students in the classroom or as a summer program
RePicture.com is a free website that helps you “RePicture Your Career” and find careers and jobs based on your interests.

It uses crowd-sourced data to inform students, professionals, and the public about STEM careers and jobs based on the user’s interests. It also contains information on a wide range of engineering projects, people and companies.

Information is presented in ways of interest to women and men.

When developing RePicture.com, we considered existing research on how to attract and retain women and other underrepresented groups in engineering. We hope that over time the site will help better inform students, graduates and early career engineers and therefore will result in retaining more women engineers. However, research regarding the effectiveness of RePicture.com has not yet been conducted.
RePicture.com presents information on engineering projects, people, companies, and jobs. The data is crowd-sourced. Anyone can add data if they have a valid email address.

Visitors to the website can add their own profile to RePicture (this is somewhat similar to LinkedIn, but RePicture includes information that is helpful to the next generation to learn about STEM career options). It provides a portfolio of professionals’ and students’ work that can help other students understand STEM and be used as a supplement the student’s resume.

The goal is for students to find profiles on the RePicture site that match their own demographic so they can connect with diverse engineers and see that all types of people belong in engineering.

Visitors can also add a project to RePicture. Projects have been added as part of College Engineering Classes and High School Lesson Plans. Several individuals and companies have also shared their project write-ups with RePicture.

You can add your profile and projects today - go to RePicture.com, select “join” in the top right.
While anyone can add information into the website, the most common source of information is from:

- students using RePicture as part of a project-based class assignment, or
- students participating in the free RePicture STEM Resume-Builder Program
I will now show a demonstration of the RePicture.com website.
This shows the home page of RePicture.com.

There are 5 main components of the site regarding science, technology, engineering, and math (STEM):
- Projects
- Professionals
- Companies & organizations
- Jobs & careers
- Lesson plans

The lesson plans use RePicture.com to help high school and college students understand STEM careers.
RePicture.com is a tool that can be used in many different ways. I’m going to provide two examples of how it can help women find their first right-fit job that interests them. These examples showcase two of the five major features in RePicture. The examples will show how students and professionals can 1) explore engineering projects all around them, and 2) discover and learn from the experiences of other engineers.
My first example is of using engineering projects on RePicture to help women find the type of projects that may interest them.
We’ve probably all heard an engineering student ask: “What types of project would I work on as a [insert type of engineer]” and “What would I do on those projects.” Knowing this type of information can help women find jobs that match their interests.
Let’s see how RePicture can help answer this question. Let’s assume the woman is taking a hydrology class and is interested in water. She wants to know what type of projects she could work on as a Water Resources Engineer.
Above is the RePicture home page. If you select projects, it goes to the Project Explore Page....
This is the Project Explorer Page.

The Project Explorer Page contains hundreds of engineering and science projects. (With your help we are adding more projects all the time.) You can scroll through these projects and find a project that interests you.

Or, you can use the filters (left side of above picture). You can filter on several different criteria. For example, you can filter for projects that contain a keyword. You can also filter for only project write-ups that include a video since many students prefer to get their information via videos. If the project has a location, you can also use the map view to see a map of all the projects in a geographical area.

For our example, we want to know what types of projects Water Resource Engineers work on. Therefore, you can do a search for “Water” by typing “Water” in “disciplines that worked on project” and hitting “Review Results”......
What comes up is several water related projects that Water Resource Engineers work on. If you see a project that interests you, you click on the project to learn more about it.

Say you are interested in “The Wharf Phase 1” project, you click on it.....
... and a Project Page about The Wharf project comes up. Since the above screenshot is hard to read, the following slides show the details that are provided on the Project Page.
Each Project Page starts with one or more pictures. Above you see pictures of The Wharf Phase 1. The goal is for the site to be visually attractive, so we’ve required every project to have a graphic. In some cases, the graphic may represent the project.

The Project Page also includes basic information about the project such as the name, location, and project tags to help people find the project.
There is also a short description of the project details. The website does not go into a lot of details about the project and we don’t provide a lot of technical information. Instead, we provide enough information about the project so the user can determine if they are interested in this type of project. All information is optional, so every field is not completed for every project.

The project details include a short overview of the project (i.e., About this project). It also discusses who benefits from this project and how. Research has shown that many women are interested in a job that helps people and communities, so this section highlights the societal impact of the project. We also include the environmental considerations, which is often important to young people. In addition, we include what’s unique about project.

We also provide funding information, including the project cost, when available. Therefore, if someone wants to work on mega-projects, they could filter for only projects above a certain dollar amount.

The Project Page includes links to more information and videos. Since we don’t provide a lot of information about the project, there are links to get additional information.

I think the most interesting part of the Project Page is the Project Team section. This section includes the disciplines that worked on the project. In this example, you can see that several different types of civil engineers worked on the project, as well as architects, environmental scientists, planners, etc. Within civil engineering, specialists in water, geotechnical, site design, structural and other areas worked on it.

This Project Page also includes some of the people that worked on the project and some of the organizations.

If you want to learn more about one of the team members, such as Aelisa Carr, who is a civil engineer, click on their name.
... and it brings up her profile.

On the left side is general information about Aelisa. Under Technical Expertise, you can see she specializes in flood studies and stormwater management.

On the right side is information about the projects she has worked on. For The Wharf Phase 1, you can learn about what she did on the project, her typical day on the project, and what she liked about the project.

Using RePicture, a student or professional can learn about actual projects they may work on as a water resources engineer, an example of what their typical day would be like, and then decide if water resource engineering jobs interest them.
That example was just one way that you can use projects on RePicture to provide students and professionals information to help them make informed career choices.

The RePicture projects can be used in several other ways to help an engineer find a career that interests them. The slide above lists some of the questions students and early career professionals may have. RePicture can help answer these questions and help engineers find their right-fit job and career using the project information.
The RePicture People Profiles can also help students find their right career. What follows is an example of using the professionals on RePicture to help engineers better understand their career options.
A question that engineering students often ask is: “What jobs have [insert type of engineer] from my university gotten?”
Let’s see how RePicture can help answer this question. Let’s assume the person wants to know what jobs civil engineers from the University of Virginia have gotten.
On the home page, you can select “professionals”...
This brings you to the People Explorer page. This is set-up similar to the Project Explorer page we’ve already seen. You can scroll down to see engineers and scientists, or you can use the filters. You can filter on items such as keyword, professional role (such as electrical engineer or mechanical engineer), university attended, if their RePicture profile includes a video, or if their profile includes projects that they’ve worked on.

In this example, we will filter for Professional Role= Civil Engineer and University Attended = Virginia. You add this information and select “Review Results”.....
You will see the profiles of civil engineers who went to college in Virginia.

If you see someone whose career you’d like to learn more about, you can click on their photo to learn more. So if you are interested in learning more about Emily’s career, click on “Go to Profile” …
... and up comes her profile. This is similar to what we saw on the earlier example of a person’s profile.

At the top you can see how many years of experience they have and what university they attended.

On the left side you see general information about them. In this case Emily provided a video about her experiences. On the right side you can learn about the project(s) she worked on.
On the left side of Emily’s profile page, the general information includes items such as her technical expertise, why she likes her job, what her typical day at work is like, what college classes she has used the most, and the skills most important to her career.

On the right side is information about the project, as we’ve previously seen. If you want to learn more about the project, you can click on the project name and it will bring you to a Project Page, as we saw in the previous example.

So a student or professional can see if the type of work Emily (a civil engineer from the University of Virginia that specialties in Energy) does interests them.
That was just one example of ways students and professionals can use RePicture People Profiles to help make informed career choices. We are continuing to add more information to RePicture, so currently not all universities or specialties are well represented.

The RePicture People Profiles can be used in several other ways to help an engineer find a career that is most likely to interest them. The slide above lists some other questions students and early career professionals may have. RePicture can help answer these questions too by further exploring the People Profiles so engineers can find their right-fit job and career.
That was a quick overview of the RePicture website. It showed how students can learn from the information already on RePicture.com.

However, more exciting is that students can use the RePicture Resume Builder Program for project-based, active learning. Students write up engineering projects for the RePicture website. Their work is then used by others to learn about engineering. Students also compete for prizes and they can include a portfolio of their RePicture Program work on their resume.
Students can do the Resume-Builder Program either on their own or as part of their engineering class. We have a dashboard for teachers and professors that use RePicture as part of their class. The dashboard lets teachers/professors track the status on assignments. They can also comment on the students’ work, so only the student sees their comments.

Options for Resume-Builder Program

- Independent project outside of the classroom
- Incorporated into Engineering class
  - Teacher dashboard to track and comment on assignments
The program involves:
1. Students identify a STEM Project.
2. They research the project. This can be an online research, interviewing a professional who worked on the project, or it could be a project that they personally worked on.
3. They write up the project and enter it into RePicture.com, where it can be used by other students to better understand the types of projects engineers work on.
4. Students can then submit a project for contest(s). The nominated projects are reviewed by professionals to select the winner. For example, the American Society of Civil Engineering, National Capital Section sponsored a contest on an innovative infrastructure project in the Nation’s capital. A student wrote about an innovative building that was recently constructed in the Washington DC area and won the contest.
5. Students can then add the RePicture Program (and any awards) on their resume.
We started the program this summer and students have submitted about 250 projects.
Most of the projects were submitted by the student on their own, i.e., not part of a class. They spent hours researching and entering information into RePicture because they wanted to learn more about STEM projects and careers, have their work reviewed by professionals, strengthen their resume, or compete for prizes. While doing this, they were also improving their writing skills.
We quickly developed the Resume-Builder Program this summer, when many students had their summer jobs and internships canceled. We recruited students mostly by emailing STEM professors and asking them to tell their students about the program. We did not target or mention gender in our outreach.
This shows the first twenty students that submitted projects. You will notice it was mostly women. In fact, 75% of our active participants this summer were women.
Why did we attract so many women to a STEM program?

We think it’s because we presented STEM in a way that’s attractive to women. For example, we had students tell the “stories” of engineering and science, and we had students emphasize the benefits of the engineers’ and scientists’ work.

We also provided many female role models, so all students felt they belonged.
Here is some more of the feedback we got from the students.

Alexis said “RePicture is an amazing virtual community where you can learn about STEM projects helping people across the world”

Emily said “the competition aspect was there as a motivator if you chose to become competitive”

We found the competitive aspect motivated many of the students to participate.
We had college and high school students nationwide, as well as from three other countries, participate this summer.
We’ve also used RePicture in the classroom. For example, Dr. Katie Wheaton from Case Western Reserve University used the RePicture program in her structural engineering class.

Students researched structural engineering projects and competed in a contest sponsored by the American Institute of Steel Construction.

Dr. Wheaton said the program provided the students with a wide variety of experiences – including writing for a professional audience, reaching out to potential interviewees, following a workflow, and avoiding plagiarism.

She also liked that their final product is a published project students can showcase on their resume to potential employers.

The pictures on this slide show some of the structural engineering projects the students wrote about.
Students are also adding RePicture to their resume. It can be used as a portfolio of actual projects the students have worked on. For example, as shown in this slide, Alyssa has written about many of the projects she has personally done.

The student’s work can also be used as a writing sample, which is often requested by employers. We had an engineer from the summer program say his RePicture work helped him get a job. The employer asked for a writing sample and he provided a link to one of the projects he wrote on RePicture. The hiring manager was impressed and gave him the job.
In a survey of managers who reviewed a resume with and without RePicture experience:

- 100% of managers rated students with RePicture Program experience on their resume higher compared to students with no experience.

- 8 out of 10 managers said they would click on the student’s RePicture.com profile link if it was included on their resume. Through this link to RePicture, employers can learn more about the student than fits on a one-page resume.

- On a scale of 1 to 10, the average score for a resume without RePicture was a 5. By adding RePicture experience, it increased the resume score to 8.

So we hope RePicture can help deserving students get a job.
We are starting to talk with companies about using the RePicture contests to find staff to interview for job openings.

A company we worked with this summer said “The RePicture program is a great way to see who the top-notch candidates really are. The high-performers- the students that went above and beyond and did the best work- were not who I expected.”

So RePicture is a great way for companies to find the best job candidates.
Using RePicture contests to find job candidates is expected to reduce implicit bias in hiring. Therefore:

- We’re giving women and others a **fair chance** to get a job interview

- Companies identify candidates to interview based on the students’ actual work, which is their submission for the contest
I’m going to end with one story from this summer

AISC sponsored a contest on Innovative Bridge Designs.

Students identified innovative bridges, researched the bridges, and wrote about them on RePicture.com.

Professionals from AISC then reviewed the submitted projects to select a winner.

The winning project was called “The Bailey Bridge: a bridge that aided victory in World War II”

The industry professional reviewers rated the project write up as a perfect 10
The student who did this work was Noran. Noran is a senior civil engineering student.

Noran may not look like a typical engineer, but she was recognized by industry professionals as doing the highest quality work.

If AISC was hiring, this would have been a great way for them to find the best qualified job candidate.
Noran also gained from the program.

Some of the feedback Noran provided includes:

"I used to see the steel bridge competition team working out in the field at my school, but I never joined because I thought I didn't know enough. This [RePicture] program helped me because I learned that if you want to know something, go find out about it. If you want something, go get it." – Noran, engineering student

Although at the time of the quote she had completed three years towards an engineering degree, it was through the RePicture program that she gained more confidence about pursuing engineering as a career choice.
Noran also said “After participating in the RePicture Program I was exposed to a lot of different career options within civil engineering and ... I was able to find a career path that aligned with my interests and that I could really see myself doing and enjoying.” -Noran, engineering student

Through the RePicture Program she was able to find a career path that aligned with her interests.
Imagine if every student used project-based, active learning to help make their career decisions, based on

- Actual, real-word projects they identify based on their interest
- Stories of diverse role models and the projects they've worked on

Would this help them select their best-fit first job and keep them from losing interest?
Our future plans include:

• partnering with more STEM professors to integrate RePicture into the classroom

• outreach to more students to participate in our program

If you or your students are interested, email me at Lynn@RePicture.com or have your students go to RePicture.com/students.
Let’s fix the leaky pipeline after graduation and help women find their right-fit first job.

Let’s fix the leaky pipeline for women engineers after graduation and help women (and men) find their right-fit first job.
In summary:
• ~40% of women engineering graduates leave engineering within 2 years of graduating
• The reason many leave engineering is that they lose interest in engineering, but how much do they really know about their engineering career options?
• RePicture.com is a way for engineers to learn about different engineering specialties/jobs that align with your interests.
Together we can help students discover careers shaping the future™ Lynn@RePicture.com

Together we can help students discover careers shaping the future.

Visit the site at RePicture.com or email me at Lynn@RePicture.com.