

## Apprenticeship 4.0

**S**iemens AG is a German conglomerate company founded in 1847 and the largest industrial manufacturing company in Europe. Germany has a long tradition of apprenticeship, leading President Trump to ask Chancellor Merkel how he could expand and improve apprenticeship in the U.S. to be more like it is in Germany. Workforce shortages abroad have been solved using the same solution Siemens uses in Germany—apprenticeship.

Siemens began their apprenticeship program as an inaugural member of the famed Apprentice 2000 program in Charlotte, a program based of the German Model. Siemens' Charlotte employees produce highly-customized turbines and generators that require precision down to the micron.

**In 2014, Siemens began a standalone apprenticeship program, which now covers three trades:**

CNC machinist,  
mechatronics  
electrician, and  
mechatronics  
technician.

Beginning each fall, Siemens in Charlotte recruits youth apprentices primarily from local high schools in Mecklenburg County, counties in South Carolina,



Lettner, Christian. *Siemens Especially Encourages Young Women to Enter a Technical Career*. Digital image. *Apprenticeship 4.0*. Siemens, Jan. 2017. Web. June 2017.

and Central Piedmont Community College. They have built strong relationships with career counselors at the local high schools to help recruit motivated, and talented young people into their apprenticeship program. Basic requirements for the students include: a minimum 2.5 GPA; passing a CPCC placement test (if home school student or veteran); completion of Algebra 1, Algebra 2, and Geometry; and no more than 5 absences from school per year.

Once a pool of prospective apprentices is found, Siemens invites them to an open house at their Charlotte plant. At the open house Siemens is able to make their “pitch” not only to the prospective apprentices but their parents, who play an important role in recruiting apprentices.

Prospective apprentices that are interested in moving along in the process are put through

various pre-screening methods such as placement exam scores from CPCC, Accuplacer test scores, transcripts, and letters of recommendation, to select participants for an orientation that lasts four nights. During the orientation, candidates learn about workplace safety, measurement and conversion, light machining, and the basics of reading engineering drawings. At the same time, Siemens administers a custom-designed test in addition to a standard mechanical aptitude test to assess the participants' abilities and work ethic. After the orientation, Siemens invites strong candidates to a paid 6-week summer internship, in which Siemens can make a final evaluation.

The apprentices must complete highly technical training in the classroom and on the job to work on the Siemens factory floor. Over a span of four years,

## Siemens' apprentices spend 1,600 hours in the classroom and another 6,400 hours in OJT in the plant.

Apprentices earn their journeyman's certificate from the North Carolina Department of Commerce, as well as an associate's degree in computer integrated machining or mechatronics from Central Piedmont Community College. The graduates of the Apprenticeship program are placed into positions at Siemens as they become available.

One unique topic that Siemens highlighted was employee dress. Apprentices wear the same uniforms as all other employees, but with a patch to indicate their training status. In the past, apprentices dressed differently, but Siemens found that it hindered integration with regular employees. Siemens' estimates its typical per-apprentice cost at \$187,000, with apprentice and mentor wages and costs representing about 96 percent of program costs. Tuition at CPCC costs just \$76 per credit hour for North Carolina residents; as a result, tuition costs per apprentice are about \$5,500; books cost an additional \$4,800. A low-experience worker hired directly from the labor market is the best point of comparison for a graduate of the apprenticeship program. Our analysis assumes that the starting salary and benefits for that kind of worker would be \$56,000 while the net cost of onboarding an apprentice graduate is then \$131,000.

Like their experience in Germany, the benefits of apprenticeship have far exceeded the costs. Siemens has experienced better adherence to planned production times and higher capacity, because apprentice graduates are even more productive than pre-trained off-the-street hires. Apprentices also have increased capacity to do a variety of jobs, such as machining new generators and repairing old ones.

The direct benefits of Siemens' apprenticeship program yield an internal rate of return of about 8 percent over hiring a low-experience person off the street. Apprentices are less likely to be late and more productive than a pre-trained hire. The costs and benefits of apprenticeship are measured using the "internal rate of return," or the rate of return generated by investing in the apprentice's training upfront.



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