A proof-of-principle experiment (E-166) has been performed in the Final Focus Test Beam at SLAC to demonstrate production of polarized positrons in a manner suitable for implementation at the ILC. A helical undulator of 2.54-mm period and 1-m length produced longitudinally polarized photons of 1st-harmonic endpoint energy = 8.5 MeV when traversed by a 46.6-GeV electron beam. The polarized photons were converted to polarized positrons in a 0.2-radiation-length tungsten target. The polarization of these positrons was measured at several energies, with a peak value of ~ 80% according to a preliminary analysis of the transmission polarimetry of photons obtained on reconversion of the positrons in a second tungsten target.