

CASE STUDY: LUIS VON AHN

Introduction

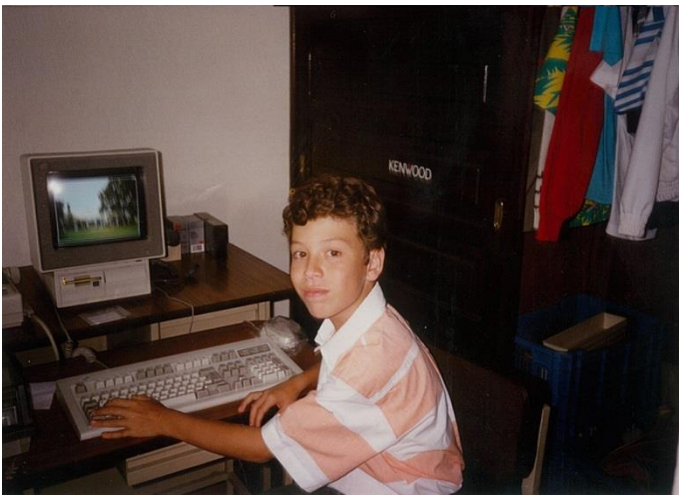
Luis von Ahn, the inventor of reCAPTCHA and co-inventor of CAPTCHA, set out to fight socioeconomic disparities by breaking down barriers to education. He co-founded Duolingo in 2011, a platform bringing free and accessible language-learning to everyone, helping to remove obstacles to social mobility across the globe. Von Ahn received the Lemelson-MIT Prize in 2018 for his groundbreaking inventions, commitment to youth mentorship, and dedication to improving the world through technological invention.



Luis von Ahn (Photo/Justin Merriman)

Background and Early Life

Luis von Ahn's experiences growing up in Guatemala shaped his future. Raised by his mother, a physician, he became interested in computers and science at an early age. When von Ahn was 8 years old, his mother bought him a Commodore 64 computer instead of the Nintendo he'd asked for. He slowly taught himself how to use it in the years before the internet, by reading manuals, books and magazines. His curiosity drove him to figure out how things worked in addition to learning the technical aspects of computers. He took apart candy-making machines at a factory owned by his mother's family, to the dismay of employees who came in to find 11-year-old von Ahn had only partially reassembled the machines. Von Ahn learned English at the American School in Guatemala City, and credits a good teacher when he was in his early teens for his excellence in math.



Von Ahn with a Commodore computer. (Photo/Luis von Ahn)

Learning English in Guatemala, as in many developing countries, can be transformative as a way out of poverty, but for many, it is an unattainable goal. Von Ahn witnessed firsthand how wealth determined access to educational opportunities. Growing up in the middle class, von Ahn learned English at the American School in Guatemala City. Even with his advantages and a supportive mother, he still faced obstacles when he wanted to apply to college in the United States. International students must pass an English language certification test as part of their U.S. college applications. When it came time for von Ahn

to take his English certification test in 1995, all of the seats in Guatemala City were filled. He had to fly to El Salvador, a conflict zone in the aftermath of civil war, to take his test. It cost him \$1200, an amount he realized millions of people around the world could not afford.

Building on his background in math and computers, von Ahn earned a bachelor's degree in mathematics from Duke University in 2000. He entered a computer science Ph.D. program after graduation at Carnegie Mellon University in Pennsylvania. Von Ahn studied under Manuel Blum, recipient of the 1995 Turing Award, often referred to as the Nobel Prize of computing. Blum was von Ahn's most important mentor who taught him what it means to deeply understand a concept. While von Ahn sees his own strengths lying outside of mentorship, he recognized key characteristics of a mentor in Blum: caring, patience, and clarity of thought and communication. Von Ahn recognizes that without Blum's mentorship, he would not have been able to achieve all that he has.

Process: From Intent to Impact

In his doctoral thesis, von Ahn introduced the idea of "human computation", also known as crowdsourcing. This concept laid the groundwork for several of his future innovations, including CAPTCHA, reCAPTCHA and Games With A Purpose.

Von Ahn worked on a security scheme to prevent computer bots from creating email accounts to distribute spam at Carnegie Mellon. He identified tasks that people can do easily, but that are difficult for computers, in order to solve this problem. Together, von Ahn and Blum created "Completely Automated Public Turing test to tell Computers and Humans Apart," or CAPTCHA, a pioneering crowdsourcing project. CAPTCHA displays distorted letters and numbers, which a human must type in to confirm they are a person and not a computer program.



A CAPTCHA's distorted letters. (Image/Wikimedia Commons)

Von Ahn's next project, known as Games With A Purpose, drew on his childhood love of games. He developed multiplayer online games, in which users completed tasks that were beyond the capabilities of computers to improve internet image and audio searches and enhance artificial intelligence. Although von Ahn met early resistance to this concept, he continued to push forward, learning to accept that it can take extra work and intense collaboration over months or even years to prove skeptics wrong. Google licensed von Ahn's interactive extrasensory perception game in 2006, in which players generated descriptions of images through accomplishing fun tasks to improve its image search capabilities.

Von Ahn received a \$500,000 MacArthur Foundation grant in 2005 as a new computer science professor at Carnegie Mellon. Advancing the concept that the human brain can work through problems that computers cannot yet solve, he built reCAPTCHA, a cybersecurity tool similar to CAPTCHA. Von Ahn developed an efficient system with reCAPTCHA, where users decipher one distorted word from scanned text, which was unrecognizable by computers, as part of an online security check. These deciphered words could then be used in the digitization of books, newspapers, maps and AI challenges. Internet users decoded several million CAPTCHAs on a daily basis, equivalent to 500,000 hours of work each day. Von Ahn sold his second invention to Google in 2009, joining the company for the next two years while on leave from Carnegie Mellon. ReCAPTCHA has facilitated the digitization of about two million books per year from the Google Books project, and more than 13 million articles in *The New York Times* archives dating back to 1851. This has helped make historical works previously confined to specific physical library locations widely available online, opening up possibilities for research and ensuring long-term digital access to a wide range of people.



*reCAPTCHA is both a security check and a text digitization program.
(Image/Wikimedia Commons)*

Curiosity and elegant, novel ideas inspired von Ahn as a student and young professor. While these still influence him, they are no longer what drive him. After von Ahn sold reCAPTCHA to Google, his goals shifted as a result of his new financial freedom. His desire to have an impact on societal problems started to propel him forward.

Von Ahn's passion for education has remained at the forefront. Growing up in an impoverished country shaped his ideas about education, which he views not as something that brings equality to different social classes, but as a self-perpetuating factor in inequality. Wealthy people can pay for a high-quality education that allows their families to prosper for generations, while people with few resources may not even have the opportunity to learn to read and write, particularly in poor countries like Guatemala. When von Ahn wanted to study math, he attended Duke in North Carolina because Guatemala lacked opportunities to pursue that course of study at a high level. Von Ahn realized while at Duke that, despite his own privileges, he still lacked the resources of many students in the United States.

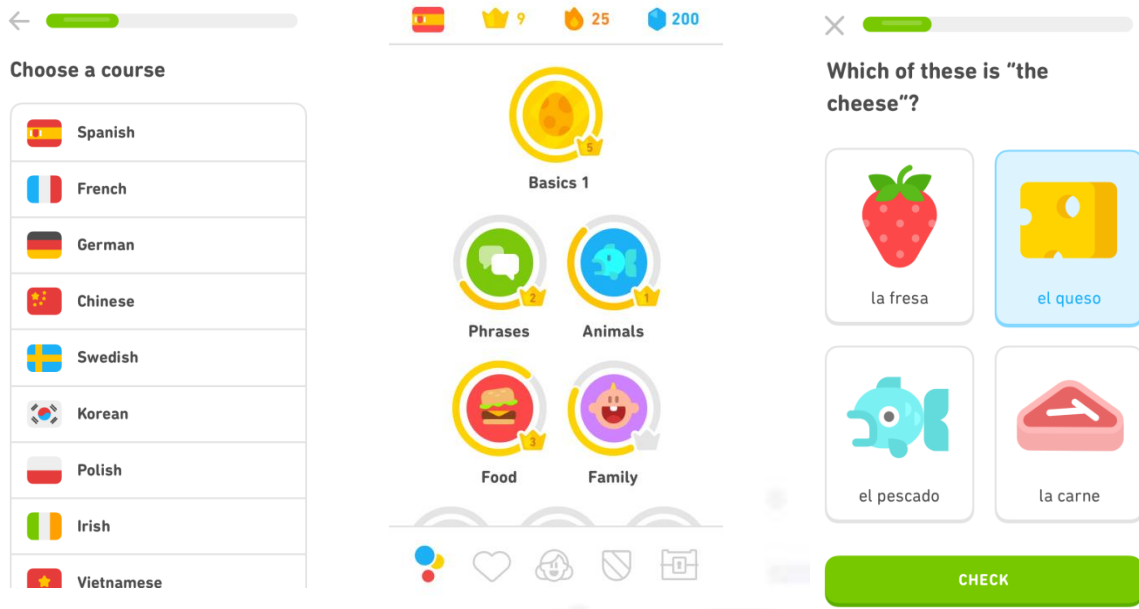


Hacker, left, with von Ahn, right. (Photo/Duolingo/Luis von Ahn)

Von Ahn returned to Carnegie Mellon in 2011 after working for Google for two years. He sought to create a tool that would give everyone equal access to education to combat the inequality he had observed throughout his life, no matter their income level or social status. He worked with Swiss-born graduate student Severin Hacker to create Duolingo, a free digital language learning tool. Drawing on von Ahn's earlier experiences, the Duolingo platform uses gamification to motivate learners to complete what can be difficult but rewarding lessons. Von Ahn and Hacker co-

founded a company and jump-started Duolingo with venture capital funding to get their project off the ground, rather than relying on the cumbersome university grant funding process. Von Ahn has taken a long view with Duolingo as an entrepreneur, fostering a corporate culture of risk-taking to promote further innovation. This approach has paid off; as of 2020, the platform offered nearly 40 languages and had around 40 million active users each month.

Von Ahn saw an opportunity to make it easier for people to demonstrate English proficiency as Duolingo grew. Often prohibitively expensive, standardized English certification tests are required for international students from non-English speaking countries to enroll in U.S. universities or obtain work visas in English-speaking countries. Duolingo's English certification test can be taken from home for \$49 and lasts 45 minutes, in contrast to the \$250 and three hours required for traditional proctored tests. By 2021, over 3000 institutions worldwide — including Duke, UCLA, Columbia, Dartmouth, New York University and Yale — accepted Duolingo's test as part of their admissions process. Duolingo can help people gain economic advantages because knowing English in non-English speaking countries increases job prospects and earning potential. Von Ahn is working to lower socioeconomic barriers around the world by making English language certification more affordable and accessible with Duolingo. The app has also played a role in humanitarian crises, helping Syrian refugees assimilate and communicate by teaching them the language of their new countries.



Screenshots of Duolingo's mobile app, which offers dozens of language courses. (Image/Duolingo/Luis von Ahn)

When the COVID-19 pandemic shuttered schools in early 2020, Duolingo moved up its release of a literacy app for children ages three to six years old in Australia, Canada, Ireland, New Zealand, the U.K. and the U.S. This new app, Duolingo ABC, combats problems of global illiteracy and gives more children the opportunity for social mobility through learning to read and write English.

Von Ahn, as Duolingo's CEO, has guided the app's growth into the largest language-learning platform in the world. He sits on the board of directors of the U.S. Foundation of the University of the Valley of Guatemala and has given talks about Duolingo at universities in Turkey, India, Guatemala, Chile, Argentina, Mexico and Costa Rica. Von Ahn is redefining what invention looks like with a belief that doing good for the world can be good for business too, as he continues to seek out innovative ways to improve lives and help shape the future of education around the world in all of his endeavors.