THE IDEA LIFECYCLE

THE PATH FROM IDEAS TO FACTS IN RESEARCH

1 THINK

After many years of education and training (generally PhDs), researchers develop a deep understanding of the known and missing facts in a field. Not all research involves labs and experiments. Researchers can also explore novel ideas, or summarize or repeat previous studies. **KEY PEOPLE:** Researchers, universities.

Researchers seek out the truth, whatever form it takes. Research is not the same collecting "facts" that confirm a particular point of view. Science truth builds on itself over time. Most science research takes small steps, confirming and extending proven ideas. "Breakthroughs" are exciting, but not the norm.

2 DESIGN

How should an idea be tested? Studies need to be cleverly and carefully designed. Standard elements are a description of how a study is connected to existing facts, how it will be conducted, what will be measured and how, and what resources will be needed. **KEY PEOPLE:** Principal investigators (PIs), funders.

3 FUND

To get money (grants) to investigate an idea, a research idea has to be scientifically sound. Grant funding can be difficult to find, and the grant process is highly competitive. Different grant agencies have different funding priorities. **KEY PEOPLE:** Grant writers, government funders, philanthropies, industry.

Studies need to be carefully designed, justified, and conducted in order to receive grant funding and be accepted by other researchers. Quite often, good studies aren't funded. Studies also need to be "transparent" so researchers can follow along, debate conclusions, and later, confirm findings.

4 STUDY

Studies need to be conducted carefully. Not all studies are conducted with the same amount of care. Many steps happen here: collaboration, safety, data collection, analysis, writing, and more. **KEY PEOPLE:** Researchers, technicians, project managers, statisticians, review boards.

5 REVIEW

Research review takes many forms. Peer review is where other experts make critical comments about the study. Conferences and preprint publishing are other ways research gets reviewed. The goal is to improve research quality. **KEY PEOPLE:** Reviewers, editors, researchers.

There is constant debate in research about the methods and conclusions of studies. This debate is a crucial part of how science improves. There is also much tension about "publish or perish," where university researchers are judged by how many journal articles they write.

6 PUBLISH

Most university research gets published in journals; most non-university research does not. Prestigious journals have high rejection rates and publish only the best, highest quality work. About 3.5 million articles are published ever year in 40,000 journals. **KEY PEOPLE:** Publishers, authors, editors, scholarly societies, universities, funders.

Technology and costs are fueling a push for more "open" (generally, free to access) research, which has created markets for new ways of publishing and sharing. More open research might lead to easier confirmation of studies, which will make research stronger.

7 SHARE

Libraries acquire journals for sharing. Other organizations catalogue research to make sure it's discoverable and safely preserved. Research is also shared through social media and science journalism. **KEY PEOPLE:** Librarians, publishers, indexers, journalists, advocates.

8 CONFIRM

Unless tests and calculations can be repeated, scientists can't know for certain if a study's conclusions are correct. New studies might be needed, or the study data might need to be reexamined by other experts. This "final" stage of research is often heated as researchers seek out the truth. **KEY PEOPLE:** Researchers.