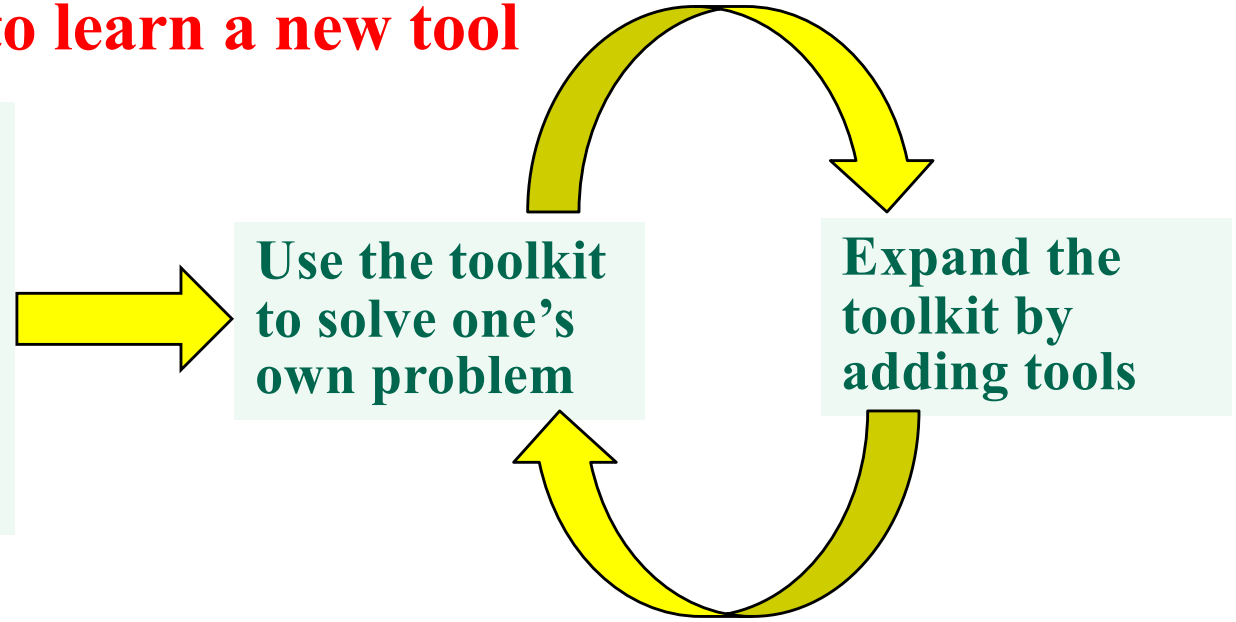
Why Assignments Are Too Easy?

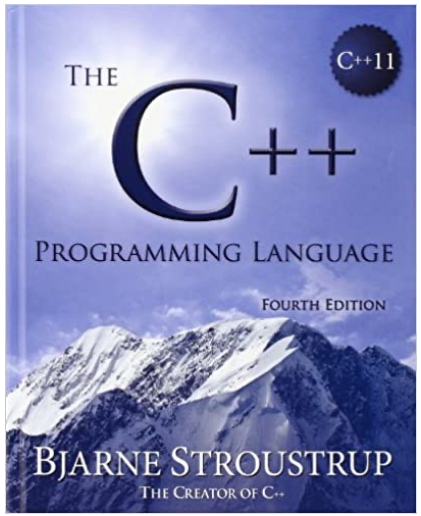
A: It's intentional. To provide hands-on seeds for you to start using tools in a self-sustained use-learn cycle

Most effective way to learn a new tool

Understand the smallest set of essential mechanisms by reading a minimalist program



Self-sustained Use-learn cycle



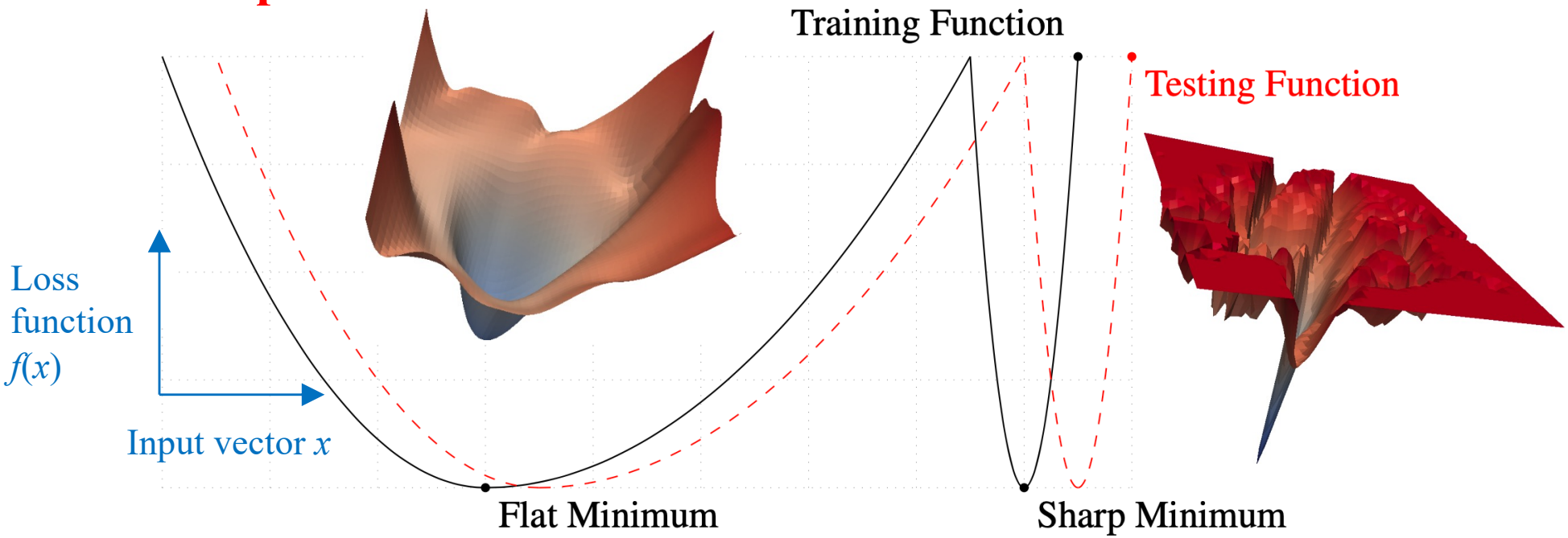
Start the cycle in your final project

Alternative way

"You bought a 1300+ page (480K+ word) book for $40 or $60, not a subscription service. How much support do you expect?"

Learning-Theory Foundation

- **Minimum description length (MDL) theory: Models described by fewer bits (*i.e.*, low Kolmogorov complexity) are more generalizable**
- **Spectral theory: Low-bit (low-complexity) models have flatter loss landscape**



Keskar *et al.*, ICLR 2017 [https://arxiv.org/abs/1609.04836]
Forest et al., ICLR 2021 [https://arxiv.org/abs/2010.01412]

Allegro-Legato

H. Ibayashi *et al.*, *ISC23—LNCS* 13948, 223 ('23); *arXiv*: 2303.08169

https://github.com/mir-group/allegro

Why C?

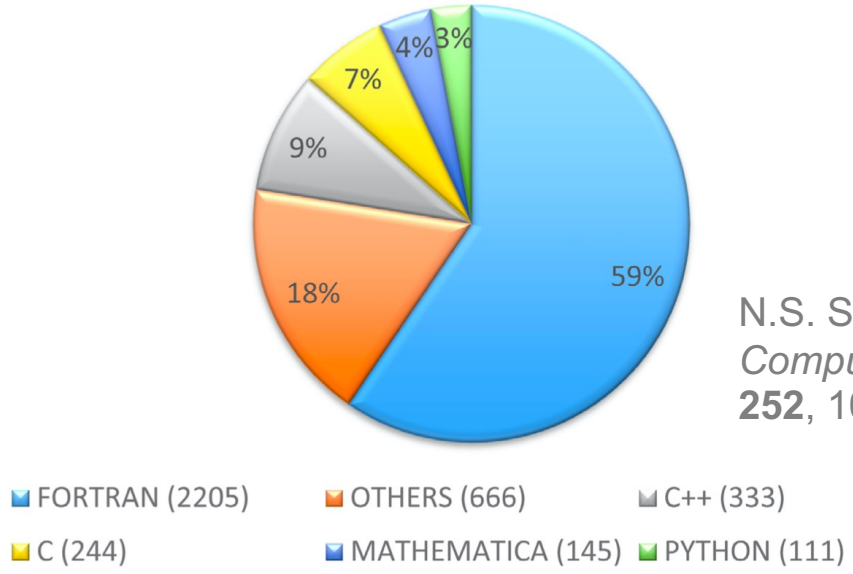
A: Only native language that initially comes with any new supercomputer, followed by Fortran (don't underestimate it*) then Python, *etc*.

*https://aiichironakano.github.io/phys516/Perkel-ScienceCode-NPhys21.pdf

- **Backend engines of popular software (*e.g.*, Pytorch for machine learning) are written in C/C++, if you would like to modify the "black box"**

  https://github.com/pytorch/pytorch/tree/fbf274f5a7c55f58ee1f7eb9b515f23f29bff443/aten/src/ATen/native

- **Knowing second language improves one's first-language skill**
- **Better to start when you are still young**
- **Use Phys 516 assignments as minimal-pain, second-language learning of C**



N.S. Scott *et al.*, *Comput. Phys. Commun.* **252**, 107269 (2020)

Fig. 13. The range of programming languages used across the Program Library's 3224 published programs (1969–2016).