Expanding Computer Science Learning Opportunities in K-12 Instruction in Virginia Schools

Kaushal Kafle, PhD Student, William & Mary, kkafle@wm.edu

Project as part of COVES fellowship, *Host Office* – VDoE, *Mentor*: Keisha Tennessee
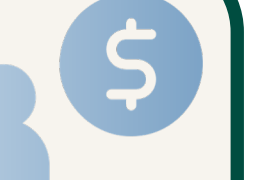
Motivation of Study

- CS Jobs are the number 1 source of all new wages in the U.S.[1]
- VA had 29,924 open computing jobs per month in 2022, with average salary $106,580[2].
- However, only 53% of U.S. high schools teach at least one CS course in 2022 [1].
- Integration and expansion of CS Learning is vital for VA economy. Hence, VA adopted CS Standards of Learning (SoL) in 2017.
- Code.org, an advocate for CS education, offers 9 metrics to make CS fundamental in K-12 education.
- This study analyzes the implementation of the SoL in VA Schools, as well as progress of VA in code.org metrics.

Methodology and Dataset

D1: *Enrollment and SoL Implementation*
- ➢ No. of Students enrolled, per course title, per school
- ➢ Years 2021-23, Source VDoE

- Schools in *D1* cross-referenced with Virginia School Directories (VSD), from VDoE. Provides district ID, county, school type (e.g. High) for each school.
- County cross-referenced with implementation phase status (e.g. beginning to plan) reported to VDoE.
- We assign each school with their superintendent regions from VSD, and finally implementation status.
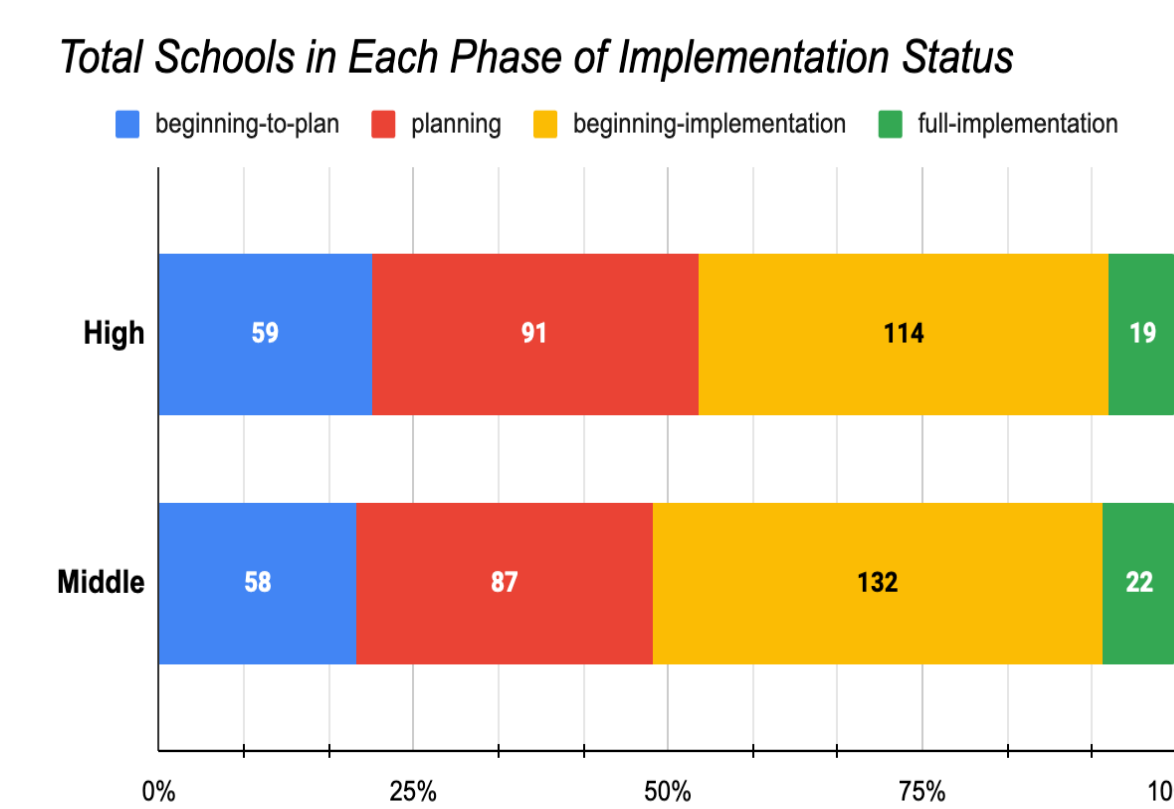
D2: *Code.org State Tracker*
- ➢ Yes/No per state per metric of CS education
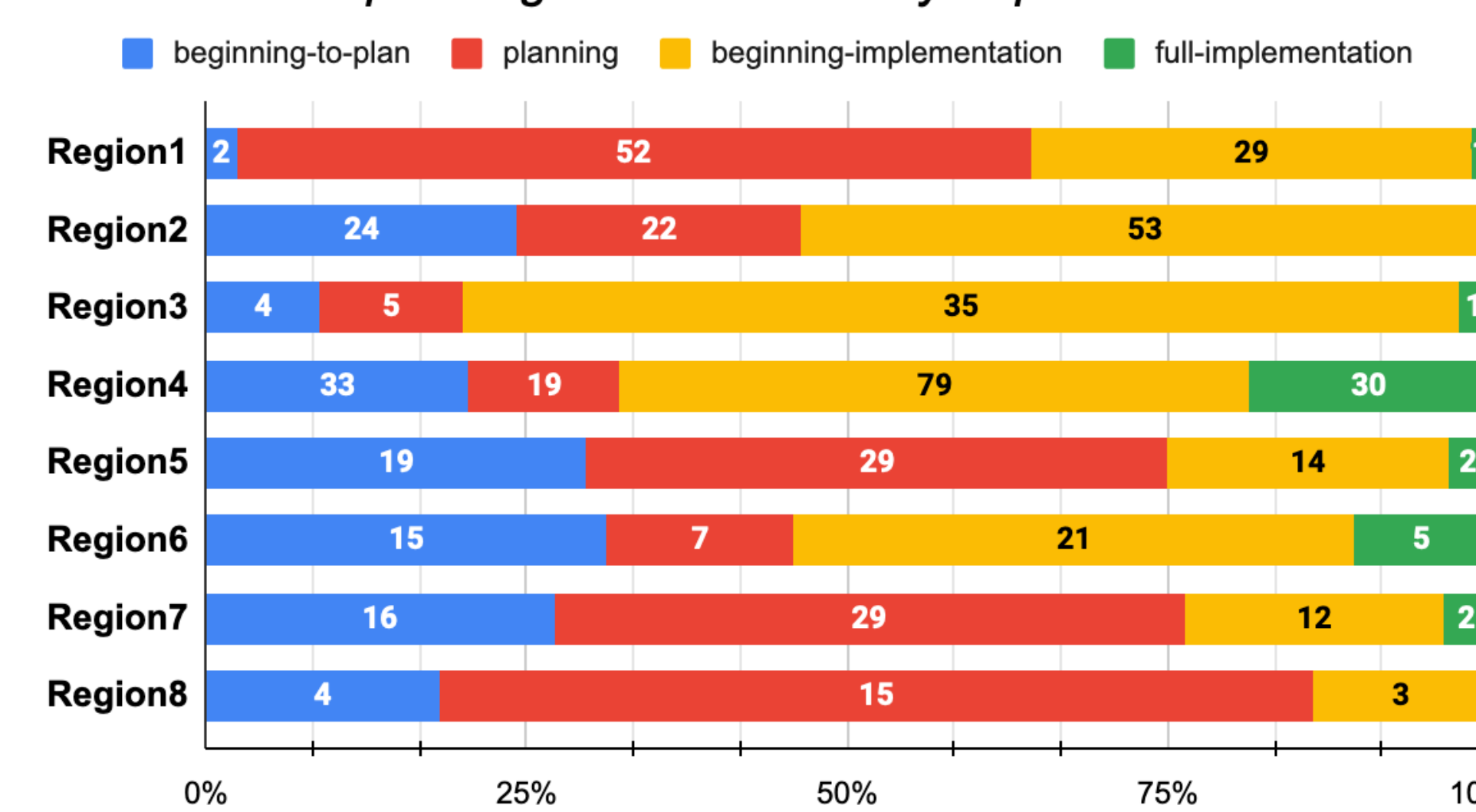- ➢ All 9 metrics are listed at code.org[3]
- ➢ Source Code.org[4]

D3: *Salary Data*
- ➢ Source: US Bureau of Labor and Statistics, 2022

- High/Middle school salaries are based on the job label '*Career/Technical Education Teachers*'.
- Elementary school salary is based on the job label '*Elementary School Teachers, Except Special Education*'.

CS Standards of Learning Implementation

- ✅ 94.77% of High and Middle schools offer at least one CS course.
- ✅ Total number of schools offering a CS course is increasing each year.
- 🟡 At the current average rate of increase of 4.94%, full implementation across all VA schools including all Elementary, Middle, High, Combined and Virtual schools. will take at least 19 years
- 🟡 4/8 Superintendent regions have majority of High and Middle schools in '*beginning*' or '*full*' implementation phase. 47% High and 51.51% Middle schools are in these phases.

Total Schools in Each Phase of Implementation Status

Total Schools per Region Distributed by Implementation Phase

Code.org Policy Metrics

- ◈ VA has enacted 7 out ot 9 code.org's policies. Not enacted are P1-'*Create a State plan*' and P2-'*Allow CS to satisfy a core graduation requirement*'.
- ◈ 8 States have implemented all, including neighboring MD. VA is one of 17 states without P1 and one of 29 without P2.
- ◈ Among neighbors, only MD (all 9) and TN (8) have implemented more. KY, WV have also implemented 7.
- ◈ VA ranks 13th among states regarding the funding invested into CS education. PA, FL, NY, CA and AR are the top-5 states in terms of funding.

Teacher Salary Comparisons

- ◈ When adjusted for Cost-of-Living index, VA's salary ranks 7 out of 51 for Elementary, 9 out of 38 for Middle and 13 out of 50 for High school teachers.
  - ◈ Most salary difference is with OH for High ($14,622) and Elementary school ($5,106) and IL for Middle school ($19,398).
- ✅ Among Southern states[5], VA ranks 4th for High, and 2nd for Middle and Elementary schools.
  - ◈ Most salary difference is with AL for High school ($8,348), and with GA for Elementary ($4,297) and Middle school ($1,217).
- ✅ VA's teacher salaries are higher than the median of southern states; $14,299 higher for Elementary, $7,558 higher for Middle and $8,110 higher for High school.

CS Teaching vs CS Industry in VA

- ◈ In this analysis, average salary of '*Educational Instruction and Library Occupations*' (`teaching`) is compared with '*Computer Science and Mathematical occupations*' (`industry`).
- ◈ VA `teaching` salary ($64,730 annual) is less than the average `industry` salary ($118,100) by 82.45%.
  - ◈ Nationally, `teaching` salary is less than the average `industry` salary by 70.98%

Recommendations

- Increase funding towards CS Education to ramp up SoL implementation
- Create a pipeline for recent CS graduates to teach.
- Salary has to be keep up with CS industry salaries to attract and retain skilled teachers.
- Compete and account for salary and incentives from neighboring states to discourage qualified teacher out-migration.

References:
1. 2022 State of Computer Science Education, Code.org,
2. Support K-12 Computer Science Education in Virginia, Code.org
3. Nine Policy Ideas to Make Computer Science Fundamental to K–12 Education, Code.org
4. State Tracking 10 Policies, Code.org
5. Southern Regional Education Board (SREB), sreb.org