Student Computer Science Attitude Survey: CS Principles

Purpose: The purpose of this questionnaire is to answer research questions

What is the snapshot status or change in students' confidence and interest levels, and perceptions of belongingness in CS, usefulness of CS, and being encouraged in CS change as a result of participation in CS Principles (CSP)? Did these statuses or changes vary by student group (e.g.., by gender, under-represented minority status)?

The CS education literature suggests that exposure to computer science experiences situated within encouraging and collaborative learning environments that allow students to engage in active problem solving are particularly important for broadening participation (e.g., Google, 2014; Margolis, Goode, & Binning, 2015; Lewis, Yasuhara, & Anderson, 2011). This instrument draws upon scales from Hoegh and Moskal (2009); Lewis, Jackson, & Waite (2010); Wiebe, Williams, Yang, & Miller (2003); and Wilson (2010) measuring confidence, interest, belongingness, perceived usefulness of CS, and encouragement in computer science. From 2010-2016, based on data from class administrations, survey items and scales were iteratively refined by the CS Principles Research and Evaluation Team, project PIs, and pilot partners (e.g., Haynie & Packman, 2017).

Intended Audience: The intended audiences for this survey are students within CS Principles or other computer science courses, in 8th grade or beyond (ages 13+), based on readability indices.

Survey Constructs: Definitions for each construct are

1. Students' confidence in their ability to learn CS skills and solve CS problems
2. Students' interest in learning computer science and solving problems
3. Students' perceptions of belonging in computer science
4. Students' beliefs in the usefulness of learning computer science
5. Students' perceptions of being encouraged to study computer science

Survey Administration: The student computer science attitude survey will be administered as a snapshot, pre/post survey or a pre/mid/post survey whereby students will answer their level of agreement to statements about their feelings and perceptions at the time they complete the survey. The Administrator should keep a secure list that maps student IDs to student information, until pre/mid/post matching is completed. Classroom teachers give an online software link (or paper copy of the survey) to administer the survey to their students. Pre-course surveys should be administered within three weeks of the first day of class. Mid-course surveys should be administered on or within three weeks after the mid-point of the course. Post-course surveys should be administered *following* students' completion of all consequential assignments, projects, and examinations. The expected time required for this survey is 10-15 minutes.

Scoring: Within each construct, item scores are summed for a 5-item subscore with a potential range of 5 to 20. Alternatively, items are scored as '1' = agree or '0' = disagree and summed for a 5-item subscore with a potential range of 0 to 5.

Construct Reliabilities[1]	**Items** Scale: 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree
Confidence: α=.890 (n=802)	I have self-confidence when it comes to computer science. I am confident that I can solve problems by using computing. I can learn computer science without a teacher to explain it. I am sure I could do advanced work in computer science. I think I will do well in computer science.
Interest α=.932 (n=802)	I would take additional computer science courses if I were given the opportunity. I hope that my future career will require the use of computer science. I like to use computer science to solve problems. The challenge of solving problems using computer science appeals to me. I like writing computer programs.
Belongingness α=.850 (n=803)	I feel comfortable in computer science. I feel I belong in computer science. I feel accepted by my peers in computer science. I know someone like me who uses computer science in their work. I know a lot of students like me who are interested in computer science.
Usefulness α=.892 (n=802)	Knowledge of computer science will help me earn a living. Learning to use computing skills will help me achieve my career goals. Computing skills used to understand computer science material can be helpful to me in understanding things in everyday life. I'll need a mastery of computer science for my future work. Computer science is a worthwhile and necessary subject.
Encouragement α=.858 (n=805)	A friend or peer has encouraged me to study computer science. Someone I know has given me the desire to study computer science. Someone I know has praised my work in computer science. Someone I know has discussed with me the computer science field. Someone in my family has encouraged me to study computer science.

Based on Nunally's (1967) guidelines for Cronbach's alphas, the Interest construct has an excellent reliability level, and the other constructs have very good levels.

Reliability	**Interpretation (Nunally, 1967)**
.90 and above	Excellent. At the level of the best measures (high stakes testing)
.80-.90	Very good
.70-.80	Good (low stakes testing). Probably a few items could be improved
.60-.70	Acceptable. Probably some items that could be improved.
.50-.60	Poor. Need for revision of measure, unless it is quite short.
.50 or below	Unacceptable. This measure should not contribute heavily to the outcomes and needs revision.

[1] From Haynie & Packman, 2017, AP CS Principles Phase II Final Evaluation Report.

References

Google (2014). Women Who Choose Computer Science – What Really Matters: The Critical Role of Encouragement and Exposure. http://static.googleusercontent.com/media/m.cdjltz.com/en/us/edu/pdf/women-who-choose-what-really.pdf

Haynie, K.C. and Packman, S. (2017). *AP CS Principles Phase II: Broadening Participation in Computer Science Final Evaluation Report.* Prepared for The College Board and the National Science Foundation, February 12, 2017. Skillman, NJ.

Haynie, K.C. and Packman, S. (2016). *AP CS Principles Phase II: Broadening Participation in Computer Science Year 3 Evaluation Report.* Prepared for The College Board and the National Science Foundation, February 22, 2016. Skillman, NJ.

Haynie, K.C. and Packman, S. (2015). *AP CS Principles Phase II: Broadening Participation in Computer Science Year 2 Evaluation Report.* Prepared for The College Board and the National Science Foundation, February 25, 2015. Skillman, NJ.

Haynie, K.C. and Packman, S. (2014a). *Year 1 Evaluation Report for AP CS Principles Phase II: Broadening Participation in Computer Science.* Prepared for The College Board and the National Science Foundation, February 19, 2014. Skillman, NJ.

Haynie, K.C. and Packman, S. (2014b). *Evaluation Plan for CS Principles Phase II: Broadening Participation in Computer Science.* Prepared for The College Board, April 11, 2014. Skillman, NJ.

Hoegh, A., & Moskal, B. (2009). *Examining Science and Engineering Students' Attitudes Toward Computer Science*. Presentation at the 39th ASEE/IEEE Frontiers in Education Conference. October 2009.

Lewis, C., Jackson, M.H., & Waite, W.M. (2010). Student and Faculty Attitudes and Beliefs about Computer Science. *Communications of the ACM, 53,* 78-85.

Lewis, C.M., Yasuhara, K., Anderson, R.E. (2011). Deciding to Major in Computer Science: A Grounded Theory of Students' Self-Assessment of Ability. *ICER'11*, August 8-9, 2011.

Margolis, J., Goode, J., Binning, K. (2015). Expanding the Pipeline -Exploring Computer Science: Active Learning for Broadening Participation in Computing. *Computing Research News*. Oct. 2015, Vol. 27/No. 9.

Nunally, J.C. (1967). *Psychometric Theory*. New York: McGraw-Hill.

Wiebe, E.N., Williams, L., Yang, K., & Miller, C. (2003). *Computer Science Attitude Survey.* Report No.: NCSU CSC TR-2003-1, Dept. of Computer Science, NC State University, Raleigh, NC.

Wilson, B.C. (2010). A Study of Factors Promoting Success in Computer Science including Gender Differences. *Computer Science Education*, Vol. 12, 2002 [1-2], 141-164.