

CPHC Conference 2022

Exploring Pedagogy in CS Education

Activity A
Instructional approach opportunities

Activity A: Instructional approach opportunities

Instructional approach	I/we use this 1. Never 2. Occasionally 3. Usually 4. Always	I/we would like more information 1. No thanks 2. Yes, but not priority 3. Yes, this looks useful	I/we have expertise in this approach 1. Yes, but we can't share 2. Yes, and we can share
Semantic waves			
Unplugged approach			
Reading and tracing code			
Worked examples and subgoal labelling			
Parsons problems			
PRIMM (predict, run, investigate, modify make)			
Live coding			
Pair programming			
Peer instruction			
Peer mentoring			
Research experiences			
Learning community			
<i>Please add other approaches</i>			

If you have experience to share or would like more information about approaches or would like a copy of your activity sheet emailed back to you, please provide your email address here:

(Note your email address will not be used for any other purposes.)

CPHC Conference 2022

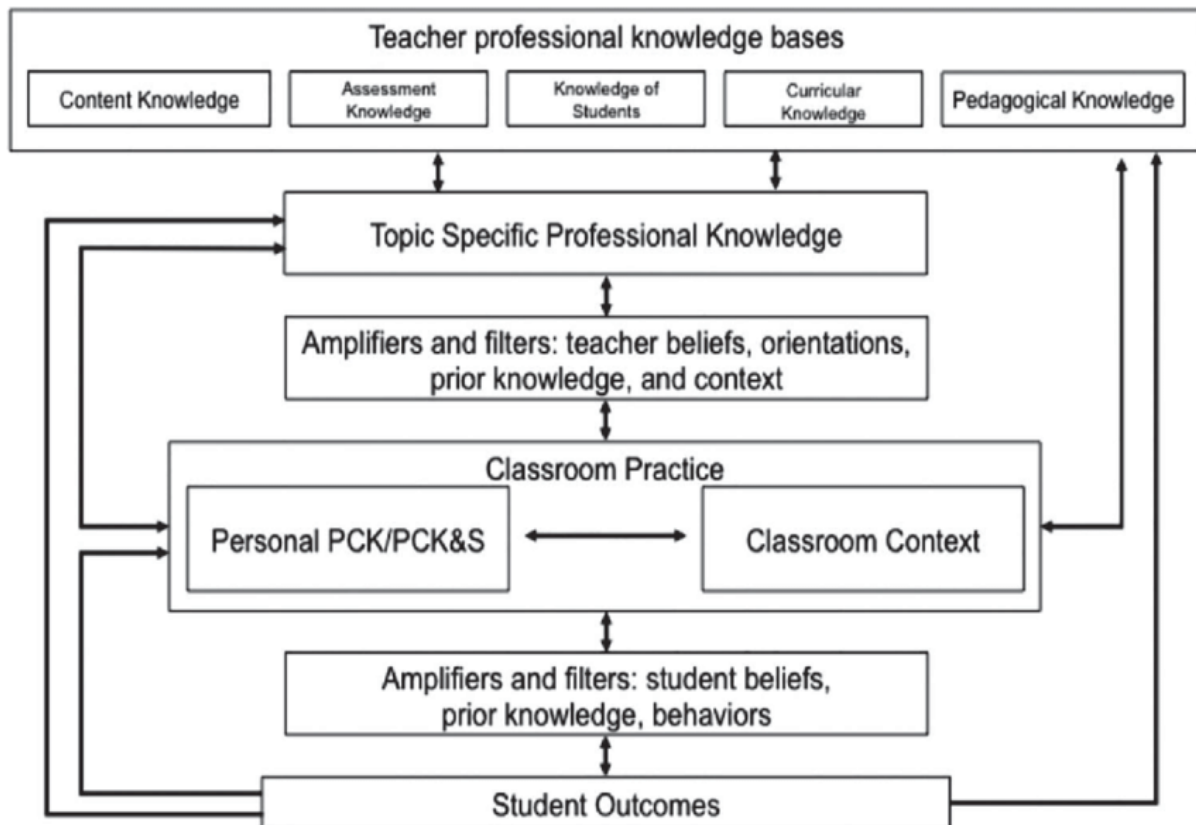
Exploring Pedagogy in CS Education

Activity B: The new PCK

The figure below shows an updated version of Shulman’s (1986) seminal pedagogical content model. The new model was devised in a 2015 workshop which Shulman attended. The new model is fast becoming popular.

Please review the model and identify hotspots of interest – where you think for yourself and/or your teaching group, there are **opportunities** for further professional development.

Circle and draw on this diagram, e.g., for Content Knowledge, you might add **AI/ML opportunity**, for Assessment Knowledge **Group work opportunity**, Knowledge of Students **A level results**, for Amplifiers and Filters **culturally relevant pedagogy**.



The 'PCK Summit Consensus Model' (Gess-Newsome, 2015, p. 31).

Activity A: Instructional approach opportunities – further information

Instructional approach	Research (one of many papers for each of these topics)	Quick Read, webpage...
Semantic waves	Paul Curzon, Jane Waite, Karl Maton and Jim Donohue 2020. <i>Using Semantic Waves to Analyse the Effectiveness of Unplugged Computing Activities</i> WiPSCSE '20: The 15th Workshop in Primary and Secondary Computing Education, October 28–30, 2010, Online. ACM, New York. In Press.	https://teachinglondoncomputing.org/semantic-waves/
Unplugged approach	Bell, T., Alexander, J., Freeman, I., & Grimley, M. (2009). Computer science unplugged: School students doing real computing without computers. <i>The New Zealand Journal of Applied Computing and Information Technology</i> , 13(1), 20–29	https://www.csunplugged.org/en/
Reading and tracing code	Lister, R., Fidge, C., & Teague, D. (2009). Further evidence of a relationship between explaining, tracing and writing skills in introductory programming. <i>ACM SIGCSE Bulletin</i> (Vol. 41, pp. 161–165). ACM.	https://raspberrypi-education.s3-eu-west-1.amazonaws.com/Quick+Reads/Pedagogy+Quick+Read+14+-+Code+Tracing.pdf
Worked examples and subgoal labelling	Margulieux, L. E., & Catrambone, R. (2016). Improving problem solving with subgoal labels in expository text and worked examples. <i>Learning and Instruction</i> , 42, 58–71	https://www.youtube.com/watch?v=ukm_JGdZsfo
Parsons problems	Barbara Ericson, Austin McCall, and Kathryn Cunningham. 2019. Investigating the Affect and Effect of Adaptive Parsons Problems. In <i>Proceedings of the 19th Koli Calling International Conference on Computing Education Research Koli Calling '19 Association for Computing Machinery</i> , New York, NY, USA, Article 6, 1–10. DOI: https://doi.org/10.1145/3364510.3364524	https://js-parsons.github.io/
PRIMM (predict, run, investigate, modify make)	Sue Sentance, Jane Waite, J., and Maria Kallia 2019. Teaching computer programming with PRIMM: a sociocultural perspective. <i>Computer Science Education</i> , 29(2-3), 136-176.	https://primmportal.com/
Live coding (modelling)	Marc J. Rubin. 2013. The effectiveness of live-coding to teach introductory programming. In <i>Proceeding of the 44th ACM technical symposium on Computer science education (SIGCSE '13)</i> . Association for Computing Machinery, New York, NY, USA, 651–656. DOI: https://doi.org/10.1145/2445196.2445388	
Pair programming	Karthikeyan Umapathy and Albert D. Ritzhaupt. 2017. A Meta-Analysis of Pair-Programming in Computer Programming Courses: Implications for Educational Practice. <i>ACM Trans. Comput. Educ.</i> 17, 4, Article 16 (December 2017), 13 pages. DOI: https://doi.org/10.1145/2996201	https://www.codio.com/blog/the-benefits-of-pair-programming-in-cs-education
Peer instruction	Leo Porter, Cynthia Bailey Lee, Beth Simon, and Daniel Zingaro. 2011. Peer instruction: do students really learn from peer discussion in computing? In <i>Proceedings of the seventh international workshop on Computing education research (ICER '11)</i> . Association for Computing Machinery, New York, NY, USA, 45–52. DOI: https://doi.org/10.1145/2016911.2016923	https://raspberrypi-education.s3-eu-west-1.amazonaws.com/Quick+Reads/Pedagogy+Quick+Read+4+-+Peer+Instruction.pdf
Peer mentoring e.g., Peer Led Team Learning (PLTL)	Leo Gafney and Pratibha Varma-Nelson 2008 Peer-Led Team Learning: Evaluation, Dissemination, and Institutionalization of a College Level Initiative <i>Innovations in Science Education and Technology</i> https://doi.org/10.1007/978-1-4020-6186-8	https://serc.carleton.edu/sp/library/pltl/index.html
Research experiences e.g., Research Experiences for Undergraduates	Audrey Smith Rorrer, Joseph Allen, and Huifang Zuo. 2018. A National Study of Undergraduate Research Experiences in Computing: Implications for Culturally Relevant Pedagogy. In <i>Proceedings of the 49th ACM Technical Symposium on Computer Science Education (SIGCSE '18)</i> . New York, NY, USA, 604–609. DOI: https://doi.org/10.1145/3159450.3159510	https://reu.charlotte.edu/
Learning community	Amber Settle, John Lalor, and Theresa Steinbach. 2015. Evaluating a Linked courses Learning Community for Development Majors. In <i>Proceedings of the 16th Annual Conference on Information Technology Education (SIGITE '15)</i> . Association for Computing Machinery, New York, NY, USA, 127–132. DOI: https://doi.org/10.1145/2808006.2808031	https://learncom.unl.edu/firstyear/computing-good

Activity B: References

Shulman, L. S. (1986). Those Who Understand: Knowledge Growth in Teaching. *Educational Researcher*, 15(2), 4–14.

<https://doi.org/10.3102/0013189X015002004>

Gess-Newsome, J. (2015) A Model of Teacher Professional Knowledge and Skill Including PCK. *Re-Examining Pedagogical Content Knowledge in Science Education*. 28-42.