

Grande, V., Kinnunen, P., Barr, M., Cajander, Å., Daniels, M., Lewis, A. N., Sánchez-Peña, M. and Thota, N. (2022) Making Visible and Modeling the Underrepresented: Teachers' Reflections on Their Role Modeling in Higher Education. In: 27th ACM Conference on on Innovation and Technology in Computer Science, Dublin, Ireland, 8-13 July 2022, pp. 566-567. ISBN 9781450392006

(doi: [10.1145/3502717.3532170](https://doi.org/10.1145/3502717.3532170))

There may be differences between this version and the published version. You are advised to consult the publisher's version if you wish to cite from it.

© 2022 Copyright held by the owner/author(s). This is the author's version of the work. It is posted here for your personal use. Not for redistribution. The definitive Version of Record was published in 27th ACM Conference on on Innovation and Technology in Computer Science, Dublin, Ireland, 8-13 July 2022, pp. 566-567. ISBN 9781450392006

<http://eprints.gla.ac.uk/274713/>

Deposited on: 11 July 2022

Enlighten – Research publications by members of the University of
Glasgow

<http://eprints.gla.ac.uk>

Making Visible and Modeling the Underrepresented: Teachers' Reflections on Their Role Modeling in Higher Education

Virginia Grande*
Uppsala University
Uppsala, Sweden
virginia.grande@it.uu.se

Päivi Kinnunen*
University of Helsinki
Helsinki, Finland
paivi.kinnunen@helsinki.fi

Anne-Kathrin Peters*
KTH Royal Institute of Technology
Stockholm, Sweden
akpeters@kth.se

Matthew Barr
University of Glasgow
Glasgow, United Kingdom
matthew.barr@glasgow.ac.uk

Åsa Cajander
Uppsala University
Uppsala, Sweden
asa.cajander@it.uu.se

Mats Daniels
Uppsala University
Uppsala, Sweden
mats.daniels@it.uu.se

Amari N. Lewis
University of California San Diego
San Diego, USA
anlewis@eng.ucsd.edu

Mihaela Sabin
University of New Hampshire
Durham, USA
mihaela.sabin@unh.edu

Matilde Sánchez-Peña
University at Buffalo
Buffalo, USA
matildes@buffalo.edu

Neena Thota
University of Massachusetts Amherst
Amherst, USA
nthota@cs.umass.edu

ABSTRACT

This work contributes to understanding of computing teachers' perceptions of themselves as role models. Role models are described as important to address under-representation, yet there is little in-depth research on how role modeling works and what university teachers in computing can model to broaden participation in the discipline.

In this paper we analyze teachers' reflections on how they may, or want to, be perceived by their students, particularly in terms of professional competencies, emotions and attitudes towards well-being. We use and further develop an already existing framework on role modeling in computing, and we relate our findings to existing research on computing and science identities. Modeling aspects outside the computing norm can help provide students with a wider notion of what it means to be a computer scientist.

Besides developing the theoretical understanding of computing teachers as role models, our work supports various ways of developing computing teachers' competences and departments' teaching culture. The results are one way to contribute to student diversity and equitable access, and more broadly increase the relevance of computing education for sustainability.

*co-leader

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).
ITiCSE 2022, July 8–13, 2022, Dublin, Ireland
© 2022 Copyright held by the owner/author(s).
ACM ISBN 978-1-4503-9200-6/22/07.
<https://doi.org/10.1145/3502717.3532170>

KEYWORDS

teacher, role model, professional competencies, emotions, higher education

ACM Reference Format:

Virginia Grande, Päivi Kinnunen, Anne-Kathrin Peters, Matthew Barr, Åsa Cajander, Mats Daniels, Amari N. Lewis, Mihaela Sabin, Matilde Sánchez-Peña, and Neena Thota. 2022. Making Visible and Modeling the Underrepresented: Teachers' Reflections on Their Role Modeling in Higher Education. In *Proceedings of the 27th ACM Conference on Innovation and Technology in Computer Science Education Vol 2 (ITiCSE 2022)*, July 8–13, 2022, Dublin, Ireland. ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3502717.3532170>

1 INTRODUCTION AND BACKGROUND

This work contributes to a better understanding of computing teachers' perceptions of themselves as role models. In computing education research, work on role modeling focuses on underrepresentation, particularly in terms of gender and/or ethnicity (some examples of this important work are [2, 10]). In this working group, we expand that interpretation of role modeling to comprise any representation of an aspect or achievement that a teacher may embody for their students in higher education, e.g. displaying a fair attitude towards others or demonstrating programming skills. That is, all teachers are potential role models, as the students have many chances to observe and potentially emulate them. These teachers can represent ways of being and participating in computing that are marginalized and less visible.

While role models are often mentioned in initiatives to broaden participation, there is little in-depth research on how role modeling works. One reason for this lack of research is that the term role model is loosely defined [5] and is sometimes used interchangeably

with terms such as mentor or hero [6]. In our work we build upon Grande’s framework [6].

We study what computing teachers in higher education consider they may (not) model when reflecting on themselves as potential role models. Our initial research questions focus on the following themes: What do computing teachers intend to model for their students? What do they avoid modeling? This may include e.g., achievements like becoming a full professor, behaviors such as being confident, or competencies including leadership skills that the teachers make visible when interacting with students. In particular, we are interested in the modeling of competencies, emotions, and attitudes towards well-being.

We also consider socio-cultural factors in teachers’ reflections on themselves as role models. For example, we envision these factors to be present in reasons for why teachers model certain aspects, or what may support or hinder role modeling in a socio-cultural teaching context. Social and cultural contexts affect who is recognized as a role model, and who may not [7]. We ask: what opportunities and challenges for role modeling do teachers identify? Here, again, we focus on questions such as which professional competencies are perceived as important to model given the teacher’s context; which emotions are seen as valid; and, which well-being attitudes teachers promote.

2 THEORETICAL FRAMEWORK

We use and further develop an existing framework on role modeling in computing [6]. Aiming to bring aspects outside of computing norms to the foreground, we relate our findings to existing research on computing and science identities. There is an increasing body of work on identity that provides understanding of how certain people and practices are systematically marginalized or privileged (e.g., [1, 8, 9]). We see identities as socially constructed, in performances and recognition of competencies [3]. We build on existing competence frameworks in our analysis [4]. They emphasize the integrative and context-specific nature of competency components (knowledge, skills, and dispositions), and dependency relationships among competencies that illustrate learning progression differences among learners. Competencies are another tool to understand education holistically, beyond acquiring knowledge and skills, and including dispositions or attitudes, which are related to emotions.

3 METHOD

An international, multi-institutional survey was distributed to collect data for this work. These data will then be complemented with small-scale qualitative studies at different institutions. The participants of this ITiCSE working group have a range of experiences in diversity, equity and inclusion in computing and engineering education. We will build on their expertise and experiences, using a variety of work on competencies, emotions, and well-being in our data analysis and interpretation.

4 EXPECTED RESULTS/CONTRIBUTION

We aim to contribute to an understanding of what it means to be a role model as a teacher in computing. Besides a more detailed understanding of what is modeled, our work can expand Grande’s framework on the “who” and “how” in role modeling. Insights

gained into challenges and opportunities for role modeling can inform different stakeholders, e.g. directors of studies, program coordinators, and point towards systemic barriers and scaffolding.

Overall, our work can support various ways of developing CS teachers’ competences and departments’ teaching culture. Teachers may be unaware of (part of) their role modeling [6], and so, our work can stimulate more explicit reflections on what is modeled by a teacher and how they perceive that their role modeling can be supported by their department and other contexts. Integrating these reflection exercises in pre-service and in-service teacher training can lead to teachers whose role modeling implies awareness and intention [6]. If within a study program different teachers are modeling aspects outside the computing norm, e.g. caring for the impact of technology on society and the planet, the students are provided with a larger range of disciplinary identities. This can broaden the students’ view of what it means to be a computer scientist and how the students perceive themselves. Besides contributing to student diversity and equitable access, it may more broadly increase the relevance of computing education for sustainability.

5 FUNDING

This work is partially supported by National Science Foundation - Computer and Information Science and Engineering (NSE-CISE) award grant number: 2137928 and by the Center for Teaching and Learning at University of Massachusetts Amherst (SoTL Professional Development Award).

REFERENCES

- [1] Lucy Avraamidou. 2020. Science identity as a landscape of becoming: Rethinking recognition and emotions through an intersectionality lens. *Cultural Studies of Science Education* 15, 2 (2020), 323–345.
- [2] Jonathan Black, Paul Curzon, Chrystie Mykietiak, and Peter W McOwan. 2011. A study in engaging female students in computer science using role models. In *Proceedings of the 16th annual joint conference on Innovation and technology in computer science education*. ACM, 63–67.
- [3] Heidi B Carlone and Angela Johnson. 2007. Understanding the science experiences of successful women of color: Science identity as an analytic lens. *Journal of Research in Science Teaching: The Official Journal of the National Association for Research in Science Teaching* 44, 8 (2007), 1187–1218.
- [4] Stephen Frezza, Mats Daniels, Arnold Pears, Åsa Cajander, Viggo Kann, Amanpreet Kapoor, Roger McDermott, Anne-Kathrin Peters, Mihaela Sabin, and Charles Wallace. 2018. Modelling competencies for computing education beyond 2020: a research based approach to defining competencies in the computing disciplines. In *Proceedings Companion of the 23rd Annual ACM Conference on Innovation and Technology in Computer Science Education*. 148–174.
- [5] Donald E Gibson. 2004. Role models in career development: New directions for theory and research. *Journal of Vocational Behavior* 65, 1 (2004), 134–156.
- [6] Virginia Grande. 2018. Lost for Words! Defining the Language Around Role Models in Engineering Education. In *2018 IEEE Frontiers in Education Conference (FIE) (FIE 2018)*. San Jose, USA.
- [7] Virginia Grande, Anne-Kathrin Peters, Mats Daniels, and Matti Tedre. 2018. “Participating Under the Influence”: How Role Models Affect the Computing Discipline, Profession, and Student Population. In *2018 IEEE Frontiers in Education Conference (FIE) (FIE 2018)*. San Jose, USA.
- [8] Andreas Ottemo, Maria Berge, and Eva Silfver. 2020. Contextualizing technology: Between gender pluralization and class reproduction. *Science Education* 104, 4 (2020), 693–713.
- [9] Anne-Kathrin Peters. 2017. *Learning Computing at University: Participation and Identity: A Longitudinal Study*. PhD Thesis. Uppsala University, Sweden.
- [10] Allison Scott, Alexis Martin, Frieda McAlear, and Sonia Koshy. 2017. Broadening participation in computing: examining experiences of girls of color. *ACM Inroads* 8, 4 (2017), 48–52.