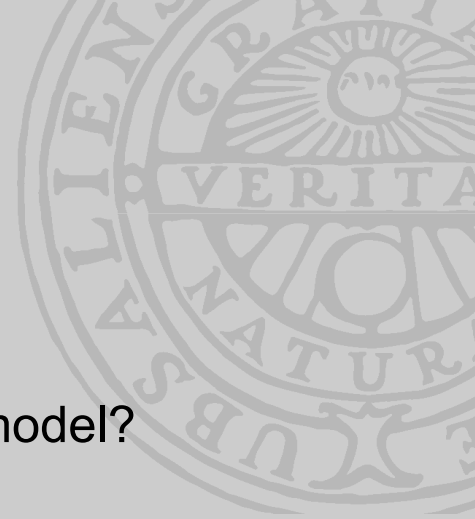


# Role Modeling in Computing and Engineering Education: A Framework to Support Reflection

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# Why should we talk about role models?

Particularly for members of marginalized groups:

- + motivation (Gladstone & Cimpian, 2021)
- + self-esteem (Wohlford et al., 2004)
- + academic achievement (Zirkel, 2002)

For professionals (and students):

- How can I be a “good” role model?
  - Ethical
  - Effective (Gladstone & Cimpian, 2021)
- How can I provide people around me (students, colleagues) with good role models?



Photo by Marko Subotin from Noun Project



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## Aims of my research

- “Draw a map” of role modeling
- Develop a framework
- For theory-based reflections
  - On who, what, how, why...
- That help you understand your context(s), and/or to enact change
- So that we can create a base to broaden participation in computing through role modeling
  - for people from marginalized groups
  - so that a more diverse set of ways of being and participating in computing are seen as legitimate



By [Tim Mossholder](#) on [Unsplash](#)



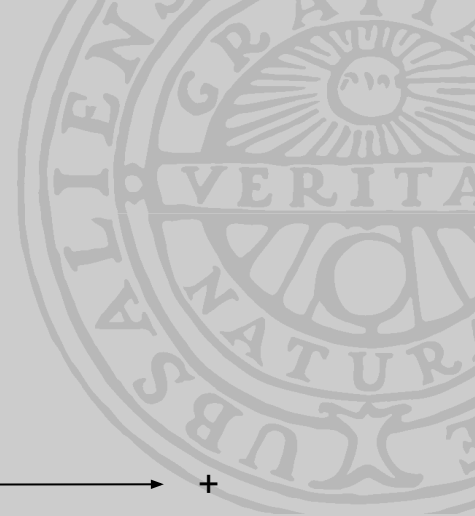
# Teachers as role models for their students

- Semi structured interviews with 9 teachers in computing at Uppsala University.
- Diversity in experience, expertise, origin, age, gender,....
- Phenomenographic approach (Marton and Booth, 1997)
  - How do teachers in computing experience being a role model for their students?
  - Phenomenon (role model) understood in different ways
  - Outcome space with related categories as different levels of understanding

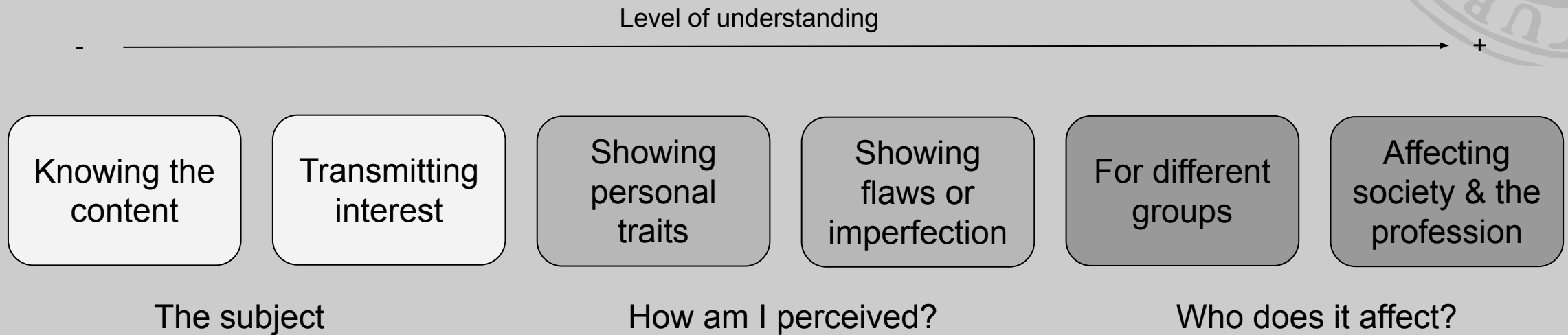


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# Experiences of teachers as role models



Analysis of 5 interviews as a pilot study, short paper

V. Grande, A. Berglund, and M. Daniels, “Experiences of teachers in computing as role models: a phenomenographic study,” in *Proceedings of the 17th Koli Calling Conference on Computing Education Research*, pp. 133–137, ACM, 2017.

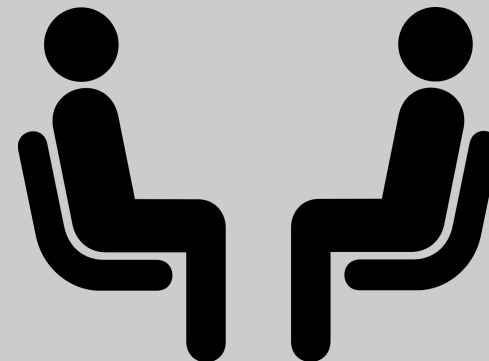




## Teacher perspectives (I)

Joe: *I remember, this was a student who started, he remembered sitting in meetings discussing research where people were being really aggressive and he thought: "OK, this is the way I have to be", just start doing the same thing. So the people who were being **aggressive**, they were role models **whether they wanted to be it or not**, they were **bad examples** of how you should behave.*

(Teacher, using an alias. Emphasis added)





## Teacher perspectives (II)

Max: *Also since I can't claim that I am perfectly **reflecting on myself all the time**, I don't 100% know exactly what is it that I **project**, \*laugh\* right? I don't have complete **control** of it. So there is a danger in that. \*long pause\* It's not like preparing a lecture [...], then you have complete control over what you want to say, what you project as a role model, you **don't control** in the same way.*

(Teacher, using an alias. Emphasis added)

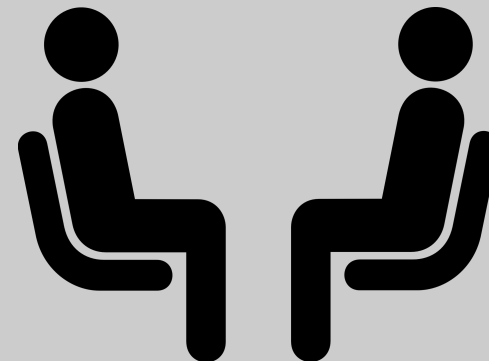
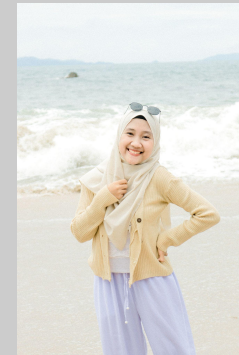
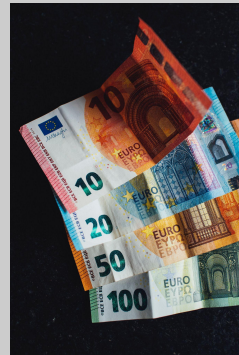
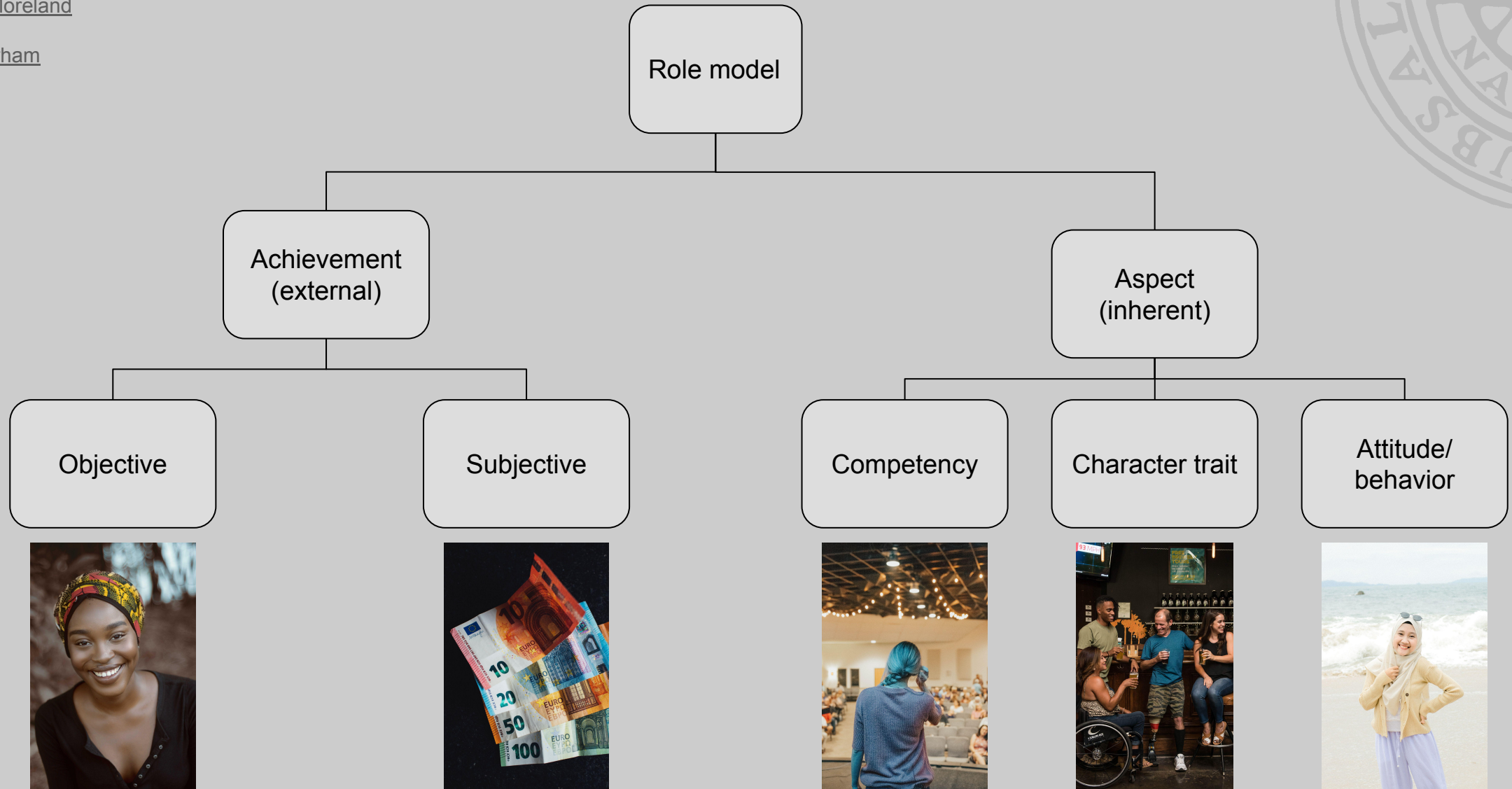


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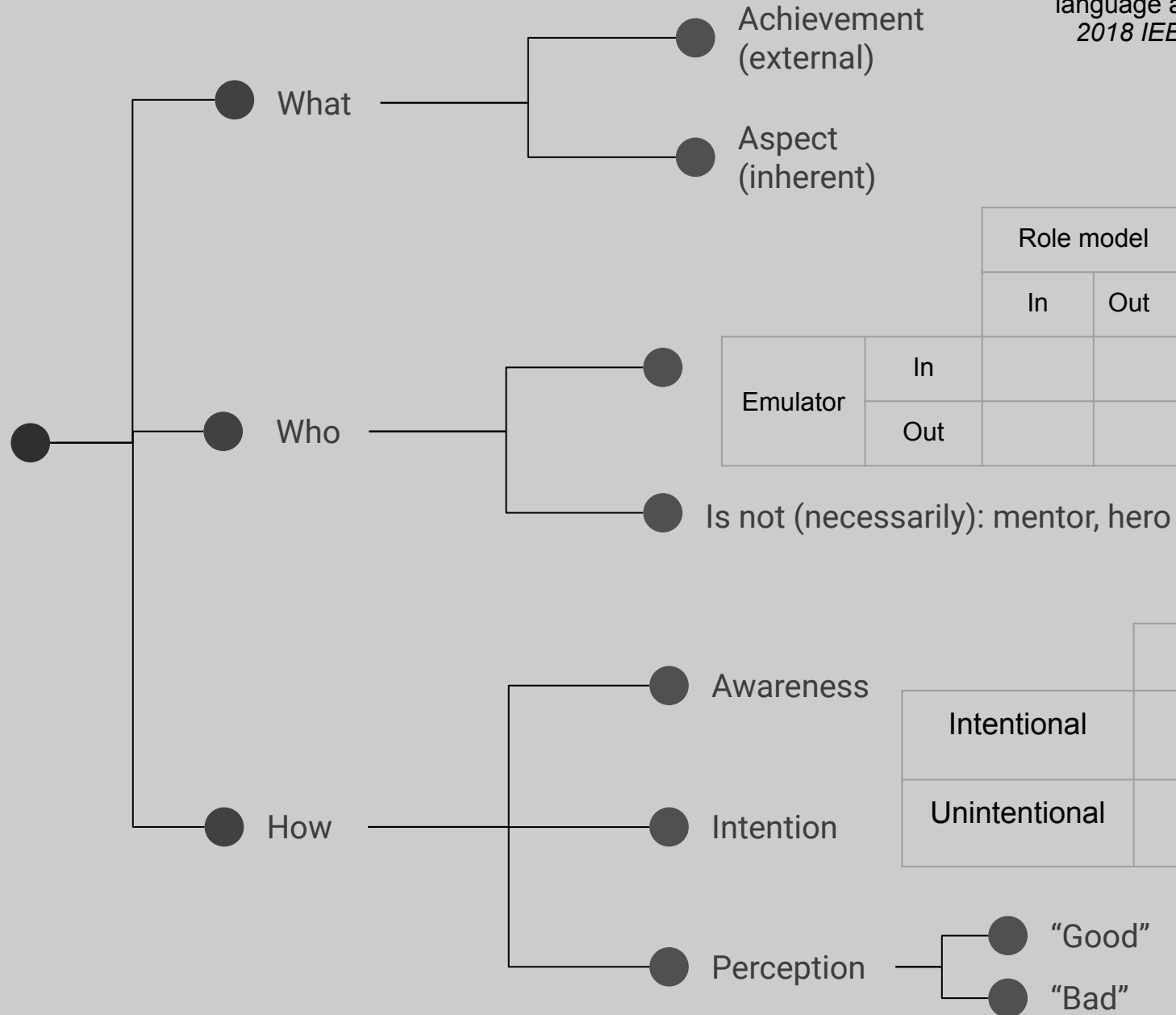
# What can be modeled?

Grande, V. (2018, October). Lost for Words! Defining the language around role models in engineering education. In *2018 IEEE Frontiers in Education Conference (FIE)* (pp. 1-9). IEEE.





Framework  
(Grande, 2018)



## Role model definition

- Someone who represents a concrete example of how to *achieve a goal* (Gibson, 2003)
  - By imitating them (positive)
  - Or by avoiding becoming them (negative) (Lockwood, Marshall & Sadler, 2005)
- What kinds of representation? (Grande, 2018)
  - Achievement
  - Aspect
- Needs to seem attainable (Lockwood & Kunda, 1997)
- Concrete representation of something abstract => embodiment (Grande, Berglund & Daniels, 2017)

A role model is a person who embodies a seemingly attainable achievement and/or an aspect which, through its imitation or avoidance, may help another individual achieve a goal (Grande, 2018)



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# A diversity of role models



# A diversity of role models?

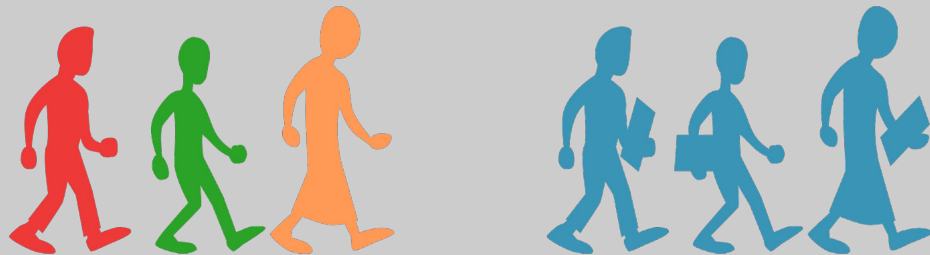




## Who gets to *actually* be a role model?

*The teacher [of the Human-Computer Interaction course] was very interested in HCI. [...] We thought: 'He is not a real computer scientist!'. (laughs)*

*But then it turned out that he actually could program and that he was as good as we are, [...] just that he had an interest for that which was a bit fuzzy.*



Chris\* (CS, year 3)

\*Not the student's actual name

A.-K. Peters, "Learning Computing at University: Participation and Identity: A Longitudinal Study". Phd thesis, Uppsala University, Sweden, 2017



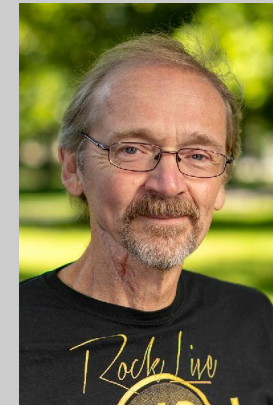


## Social contexts, cultures and norms affect role modeling

- Which disciplinary and professional identities are seen as legitimate?
- Identity as negotiated, constructed in social interaction (Pozzer and Jackson, 2015)
- Emulator (e) and role model (rm) as:
  - Anyone in computing (e) and high profiles (rm)
  - Student (e) and teacher (rm)
  - Student (e) and student (e)
- Call for action: giving more visibility to role models representing ways outside the norm



Anne-Kathrin Peters  
(she/her)



Mats Daniels  
(he/him)



Matti Tedre

Grande, V., Peters, A. K., Daniels, M., & Tedre, M. (2018, October). "Participating Under the Influence": How Role Models Affect the Computing Discipline, Profession, and Student Population. In *2018 IEEE Frontiers in Education Conference (FIE)* (pp. 1-9). IEEE.



## Role modeling emotions, types of care and professional competencies

- Exploratory survey: 199 educators in computing
- What emotions, ways of caring, and other parts of role modeling do computing educators in higher education think they show or do not show? Do they vary according to their level of experience?
- What situations or contexts do educators describe in which they show/do not show emotions, care, and other parts of role modeling?
- What reasons do computing educators give for not showing emotions, care, and other parts of role modeling?



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. Role Modeling as a Computing Educator in Higher Education: a Focus on Care, Emotions and Professional Competencies. In 2022 ITiCSE Working Group Reports (ITiCSE-WGR '22), July 8–13, 2022, Dublin, Ireland. ACM, New York, NY, USA, 27 pages.  
<https://doi.org/10.1145/3571785.3574122>





# Applications of the framework (examples in academia A)

As a [role], what do I model and what could I model?

- Example ([in video](#)): as a teacher,
  - a) what achievements/aspects do I model for my students?
  - b) what achievement/aspects could I model for my students?



| Achievement              |  | Aspect            |           |                     |
|--------------------------|--|-------------------|-----------|---------------------|
| Objective                | Subjective                                   | Competency        | Behaviour | Character attribute |
| Immigrant pursuing a PhD | Immigrant <i>successfully</i> pursuing a PhD | Leadership skills | Fair      | Humble              |
|                          |  |                   |           | Proud               |





## Applications of the framework (examples in academia B)

What kind of role modeling do I think is needed in [my context]?

- Example (in [slides](#), video upon request): as conference organizer\*,
  - a) what achievements/aspects do I want to give visibility to [through invited speakers, etc.]?
  - b) When sharing a) with the rest of organizers, what do we agree on?
  - c) How does our view overlap with the actual pool of candidates that we have?



| Achievement                              |  | Aspect             |                 |                       |
|--|--|--------------------|-----------------|-----------------------|
| Objective                                | Subjective                             | Competency         | Behaviour       | Character attribute   |
| Multidisciplinary education / experience | Long career, broad experience          | Convey credibility | Confident       | Charisma              |
| Technical Background                     | Interesting job/ High-ranking position | Good speaker       | Have initiative | Constant, persevering |



## To think about

- In what contexts
  - am I potentially a role model?
  - do I have the power to give visibility to others as role models?
- In these contexts, what do I believe it is important to model?
- How does context (culture, norms) affect this role modeling?

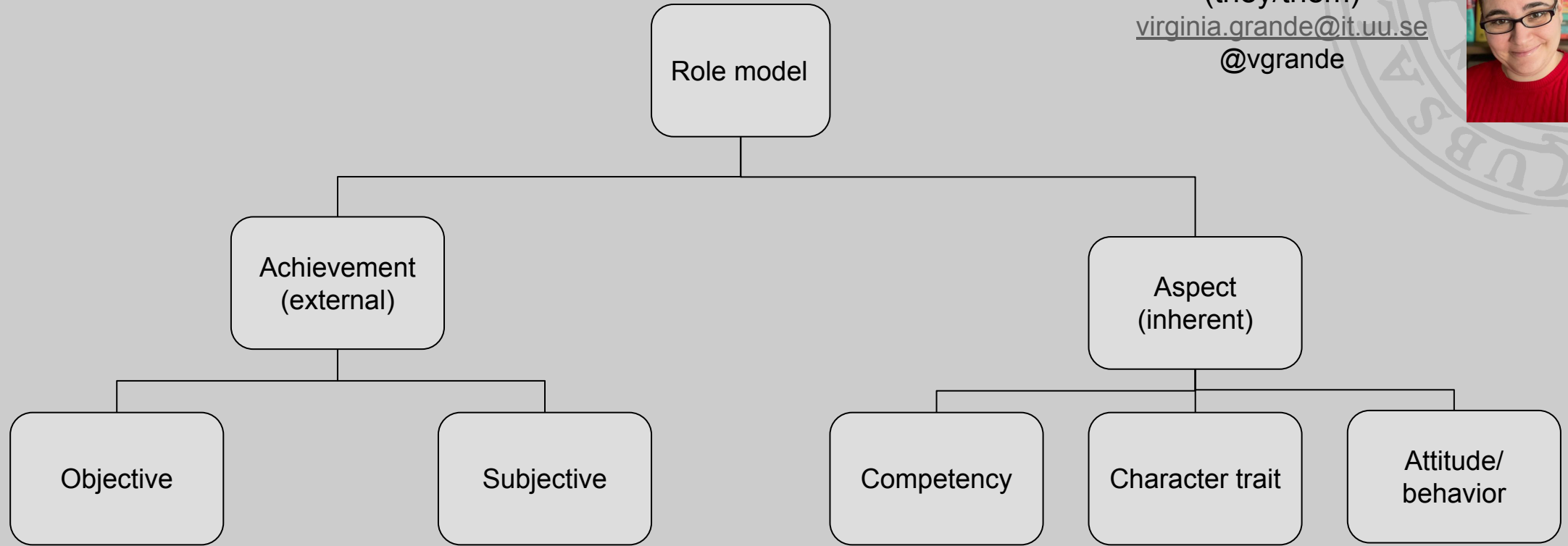


By [Joao Cruz](#) on Unsplash



# Thank you!

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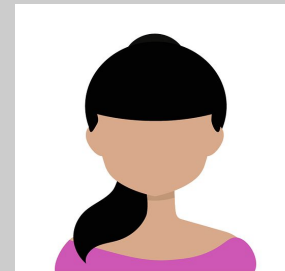


|          |     | Role model |     |
|----------|-----|------------|-----|
|          |     | In         | Out |
| Emulator | In  |            |     |
|          | Out |            |     |

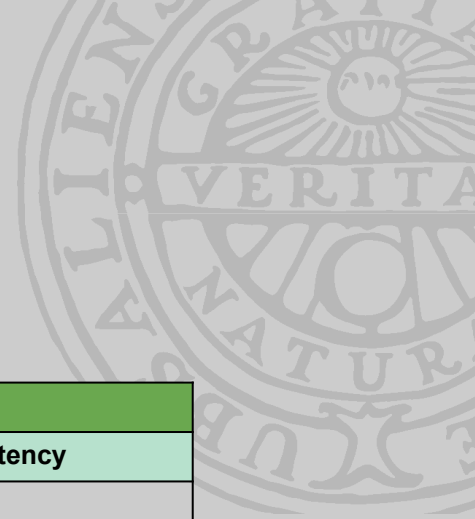
|               | Aware | Unaware    |
|---------------|-------|------------|
| Intentional   | Fair  | X          |
| Unintentional | Jokes | Aggressive |

Example: “What achievement/aspects can I model for my students to copy?”

*I want to show my students that **not only technical skills** are important in computing. I try to be a **kind** person, **fair** (in my own interpretation of fairness). As an **immigrant**, I'd like for all of my students to see that we have our place in (**Swedish academic**) computing too. I want to show them that I can be **proud** of who I am but **humble** enough to admit when I'm wrong.*

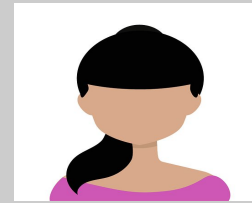


# Intention + awareness



| Achievement              |  | Aspect              |           |               |
|--------------------------|--|---------------------|-----------|---------------|
| Objective                | Subjective                                   | Character attribute | Behaviour | Competency    |
| Immigrant pursuing a PhD | Immigrant <i>successfully</i> pursuing a PhD | Kind                | Fair      | Non-technical |
|                          |  | Humble              | Proud     |               |

Can I add to any column?

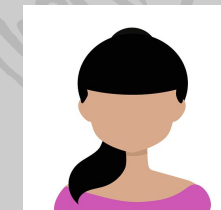


| Achievement              |  | Aspect              |           |               |
|--------------------------|--|---------------------|-----------|---------------|
| Objective                | Subjective                                   | Character attribute | Behaviour | Competency    |
| Immigrant pursuing a PhD | Immigrant <i>successfully</i> pursuing a PhD | Kind                | Fair      | Non-technical |
| Publications             |  | Humble              | Proud     | Programming   |



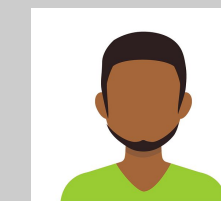
# Intention + awareness + unawareness

| Achievement              |  | Aspect              |           |               |
|--------------------------|--|---------------------|-----------|---------------|
| Objective                | Subjective                                   | Character attribute | Behaviour | Competency    |
| Immigrant pursuing a PhD | Immigrant <i>successfully</i> pursuing a PhD | Kind                | Fair      | Non-technical |
| Number of publications   |  | Humble              | Proud     | Programming   |



Teacher

| Achievement                         |  | Aspect              |           |                      |
|-------------------------------------|--|---------------------|-----------|----------------------|
| Objective                           | Subjective                             | Character attribute | Behaviour | Competency           |
| Multidisciplinary background        | Good strategies for good mental health | Perseverant         | Proactive | Intercultural skills |
| Positions outside of the university | Part of a good network                 |                     | Fair      | Networking           |



Colleague

| Achievement          |                                   | Aspect              |           |                      |
|----------------------|-----------------------------------|---------------------|-----------|----------------------|
| Objective            | Subjective                        | Character attribute | Behaviour | Competency           |
| Technical background | Good work-life balance kept       | Charismatic         | Fair      | Intercultural skills |
|                      | Recognized by others as competent | Patient             |           |                      |



Students



# Image credit

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Three happy female students leaving campus together by Marko Subotin from NounProject.com  
Portrait of female professional with curly hair wearing eyeglasses by Jacob Lund Photography from NounProject.com

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