

# Promoting and Teaching Responsible Leadership in Software Engineering

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## Abstract

As software and computer technology is becoming more prominent and pervasive in all spheres of life, many researchers and industry folks are realizing the importance of teaching soft skills and values to CS and SE students. Many researchers and leaders, from both academic and non-academic world, are also calling for software researchers and practitioners to seriously consider human values, like respect, integrity, compassion, justice, and honesty when building software, both for greater social good and also for financial considerations. In this paper, we propose and wish to promote teaching soft skills, values, and responsibilities to students, which we term as “Responsible Leadership”. We describe what we mean by teaching Responsible Leadership and describe what many of the researchers and faculty are doing to teach soft skills to students and that they can incorporate some material to introduce Responsible Leadership to students through both dedicated soft skills and ethics courses as well as other computer science courses and through existing clubs and organizations at universities.

## 1. Introduction

There is a great need to inspire and help students and practicing software engineers and researchers to develop soft skills, acquire a multi-disciplinary perspective, and to help them understand their professional values and responsibilities. Many faculty and researchers have passionately emphasized teaching soft skills like communication, collaboration, and emotional intelligence to students and they incorporate them in their teaching and research (Capretz, 2014; Capretz et al. 2017; Carter, 2011; Brown et al., 2009; Hazzin & Har-Shai, 2013). Industry folks are also realizing the importance of the soft skills in the success of their projects. For example, a new book “Software Engineering at Google” has six chapters devoted to explaining and teaching culture and soft skills (Winters & Manshreck, 2020).

Soft skills, and having a positive mindset and right habits is not only necessary for the success and productivity, but also for the well-being of workers, especially as many workers face new challenges when working remotely (Sochat, 2021). As the students of today will transition into leadership positions in their organizations in future, their soft skills and behaviours will impact the productivity and well-being of their employees as well as influence innovations in those organizations (da Silva et al., 2016).

At the same time, there is a call from researchers, leaders of the society, and many public/private institutions like IEEE and ACM, to research and teach ethics, trust, fairness, and building systems and software that are appropriate, safe, and reliable and that technology is used to improve the lives of all people (Gotterbarn et al., 2018; Whittle, 2019). Whittle (2019) suggests investigating and trying many techniques like, a designated value guardian in a Scrum team, participatory design methods ensuring that end-user values are taken into account, and a values maturity model that helps organizations to self-assess their values culture.

The cost of failing to appropriately teach these skills and responsibilities is very high, resulting in failed systems, stressed employees, frustrated customers, loss of national GDP, and threat to business and national interests and security.

Many researchers are investigating teaching soft skills to students and this is still an active research area finding new and more effective ways to teach soft skills to students (Capretz 2014; Capretz et al., 2017; Carter, 2011; Brown et al., 2009; Hazzin & Har-Shai, 2013). In this paper, we include teaching values and responsibilities to students as well which we call “Responsible leadership”. In the first part of the paper, we describe what constitutes and what we mean by teaching Responsible Leadership. In the second part we describe what many of the researchers and faculty are doing to teach soft skills to students and propose that they can incorporate some material to introduce Responsible Leadership to students. We also present a need for future research to explore other avenues to teach soft skills and Responsible Leadership to students

## **2. Soft Skills and Responsible Leadership**

Based on surveys and various reports, Carter (2011) describes the following list of soft skills needed for the success of CS/SE students and professionals: written / verbal communication, teamwork, leadership, collaboration across disciplines, professional attitude (ability to give/take constructive feedback, empathy to deal with conflict, and responsibility), passion and commitment for work, self motivation and learning, efficiency and deadline conscious, problem solving / creativity, and organization.

Some of the ethical principles, behaviours and considerations of professional responsibility specified by ACM code of conduct (Gotterbarn et al., 2018) are as follows:

1. General Principles:
  - a. Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing.
  - b. Avoid harm.
  - c. Be honest and trustworthy.
  - d. Be fair and take action not to discriminate
2. Professional Responsibilities
  - a. Strive to achieve high quality in both the processes and products of professional work.
  - b. Maintain high standards of professional competence, conduct, and ethical practice.
3. Professional Leadership Principles
  - a. Create opportunities for members of the organization or group to grow as professionals.
  - b. Articulate, encourage acceptance of, and evaluate fulfillment of social responsibilities by members of the organization or group.

In the sections below, we present the approaches taken by some of the researchers and educators in teaching soft skills and our analysis of how including teaching of CS/SE related values and responsibilities can be part of those approaches.

### **2.1. Dedicated Soft skills and Ethics courses**

Students can also be encouraged to take leadership minor or Leadership Certificate courses that are being offered by other departments at their universities. These specialized minors and certificates offer courses

such as self leadership, team leadership, and communication. These courses, however, lack the CS/SE technical aspects and context. Some computer science departments offer students ethics courses taught by the Philosophy department, but they may also lack adequate CS/SE technical context. One recommendation to enrich the general ethics course with technical context is to include discussing the case studies described in ACM code of conduct. Some engineering and CS programs are realizing the need to give a broader context to students by designing special courses within engineering colleges. For example, the Technion – Israel Institute of Technology offers a course on computer science and software engineering soft skills (Hazzin & Har-Shai, 2013).

## **2.2. Other Computer Science courses**

It is useful to include even a few lecture hours to discuss the topic of soft skills in many of existing undergraduate courses (Capretz, 2014). It is also possible to help students develop soft skills in many of the other CS/SE courses by making them do a group project, give a project demo, make a presentation, and write a technical report. For example, Pausch (2008) describes a course where he asks students to do a group project, help them to become cohesive as a team, and then in the end students do a peer review of other students. It is also possible to discuss the broader context of ethics and human values in these courses. In some other CS/SE courses, students can be encouraged to write a research report or make a presentation for extra credit.

## **2.3. Capstone or Service Learning Course**

Another method of helping students develop soft skills is to explicitly incorporate things like writing, presenting, reflections, teamwork, and human values in a capstone or service learning course. In both kinds of courses students attempt to complete large projects, possibly for an outside client. These projects are generally completed in teams, may require communication with the client, and are usually structured to incorporate presentations or written reports. Brown et al. (2009) describes a capstone game design course where students work in multidisciplinary teams, interact with end users, and complete design and writing assignments. Huff et al. (2016) describe how one service learning approach, Engineering Projects in Community Service (EPICS) program at Purdue University, helped students develop professional skills related to leadership, project management, customer interactions, documentation, and oral presentations. We suggest possibly organizing some workshops before and during capstone and service learning projects to help students be aware of soft skills required for client and team interactions. There is also an opportunity to train and help students consider ethics and professional responsibilities during the work.

## **2.4. Existing Professional clubs at school**

The extracurricular activities taken by students such as site visits, hackathons, competitions, involvement in various clubs and societies help students develop soft skills like teamwork, communication, and leadership skills. However, a large portion of the students seem to have very limited relevant exposure to these activities due to various social and personal reasons. Again, the university administration, faculty, and senior students can mentor and incentivise new students for participation in these clubs and also provide a context for teaching broader professional values and responsibilities.

In the sections above, we advocated for teaching soft skills, human and social values and responsibilities to CS/SE students and presented some approaches to do that in a University setting. In our experience, even short exposure to developing these soft skills and understanding values and responsibility is good for students. We, however, believe that teaching soft skills and values is so important to the success of students, of businesses and of nations, that educators and administrators should avail as many avenues as possible to

teach these skills. In our research, we plan to look into more such avenues and how to possibly make them more effective in teaching students soft skills and Responsible Leadership concepts and behaviours.

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