

Managing Group Projects in Undergraduate Computing

Michael James Scott*

Games Academy
Falmouth University
Cornwall, United Kingdom
michael.scott@falmouth.ac.uk

Angela A. Siegel

Faculty of Computer Science
Dalhousie University
Halifax, Nova Scotia, Canada
siegel@dal.ca

Bedour Alshaigy†

Information Technology
Uppsala Universitet
Uppsala, Sweden
bedour.alshaigy@it.uu.se

Mark Zarb

School of Computing
Robert Gordon University
Aberdeen, Scotland
m.zarb@rgu.ac.uk

ABSTRACT

This panel convenes four educators, each from different institutions and each with experience managing group projects. Their expertise spans topics including: peer assessment and peer evaluation; entrepreneurship; transdisciplinarity; internationalisation; inclusivity; social values; educational technology and tools; feedback and feed-forward; peer rating; free-riders; as well as blended learning; and post-pandemic online discourse. They reflect on the delight of seeing students collaborate to deliver meaningful projects as well as the challenges posed by disengaged students. They also explore a common theme of discordance inherent to teamwork and systems to support student communities.

CCS CONCEPTS

• **Social and professional topics** → *Student assessment*; • **Applied computing** → *Collaborative learning*; • **Software and its engineering** → *Programming teams*.

ACM Reference Format:

Michael James Scott, Bedour Alshaigy, Angela A. Siegel, and Mark Zarb. 2023. Managing Group Projects in Undergraduate Computing. In *Proceedings of Proceedings of the 2023 Conference on Innovation and Technology in Computer Science Education V. 2 (ITiCSE 2023)*. ACM, New York, NY, USA, 2 pages. <https://doi.org/10.1145/3587103.3594163>

1 SUMMARY

Educators develop the professional skills of their students to help prepare them for future opportunities. An emerging trend involves situating so-called computing ‘hard skills’ within industry-aligned ‘soft’ contexts [6] in a way that nurtures professional competencies [5]. A popular strategy to enact this learning process is the use of group projects. Indeed, many educators have turned to group work to help their students develop professional skills. This is especially the case in higher education contexts. Such skills are important

*Convener
†Moderator

ITiCSE 2023, July 8–12, 2023, Turku, Finland

© 2023 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 *Proceedings of Proceedings of the 2023 Conference on Innovation and Technology in Computer Science Education V. 2 (ITiCSE 2023)*, <https://doi.org/10.1145/3587103.3594163>.

in helping graduates to become employable and to overcome the obstacles that they will likely encounter in the future. These challenge students to collaborate to realise a shared deliverable, typically a software application. Though, there isn’t anything ‘soft’ about these experiences—good teamwork is hard. These projects are also received in starkly differently ways [1] and many *ad-hoc* strategies are known to be ineffective [3]. It is also non-trivial to navigate the social challenges they present [4].

Whilst the recent decade has seen a remarkable increase in the use of group projects in the computing discipline, it is not clear which approaches work well to support teams. Methods that leave students to their own devices have been shown to be ineffective, whilst strategies to intervene and manage the learning experience are sometimes met with unfavourable responses. In light of these concerns, it is sensible to explore the experiences that different educators have had with group projects. So, what can educators do to make group projects work? A panel to elicit discussion on what has and hasn’t worked is proposed. Such a panel hasn’t been convened since 2012 [2], and at the time was limited to just capstone projects. It would be timely to revisit this topic equipped with more than a decade of new evidence. The panel will focus on the challenges of managing group projects, with particular attention to the pedagogic decisions course leaders need to make within the undergraduate computing context.

Four educators will come together from different institutions to present their respective experiences managing group projects. They each raise questions about how their approaches differ in terms of: assessing; orienting around industry needs; intersecting with other disciplines; supporting international students; promoting inclusion; resolving interpersonal challenges and socio-cultural differences; using educational technology; providing feed-forward and feedback; involving peers in (formative) assessment; tackling engagement; as well as adapting to changes since the pandemic. They reflect on the delight of seeing students collaborate to deliver meaningful projects as well as the challenges posed by disengaged students. Audiences will see examples of good practice across different contexts, and receive advice from panellists in response to their questions.

2 PANEL STRUCTURE

The panel will consist of a moderator, Bedour Alshaigy, and three other panelists Michael James Scott, Angela Siegel, and Mark Zarb, all of whom have extensive experience in supporting group projects. Each has a different perspective based on their teaching practice, being at different institutions in different countries, with the panel representing a plurality of approaches.

The itinerary will commence with the moderator introducing the panel and providing a brief background on recent concerns raised in the literature (6 minutes). After, all four give one case example of how they manage group projects (20 minutes, 5 minutes each). The differing position statements are briefly outlined with reference to the challenges, their perspective, and case example (4 minutes, 1 minute each). The panel then responds to questions from the audience (30 minutes). It is anticipated that questions will primarily be asked verbally by the in-person audience, but the panel is happy to accept questions fed to the moderator digitally.

2.1 Dr Bedour Alshaigy

A computer science education researcher and a working group member of the European Network For Gender Balance in Informatics (EUGAIN). They have experience across academic, business startups, and outreach contexts, both nationally and internationally. Bedour is a strong advocate for diversity in computing and in promoting its image.

Team synergy is integral to success. As such, collaborators should be cognizant of the racial, ethnic, and gender differences existing in heterogeneous groups, especially those typical of universities with an international population. Considerate team allocation can minimise isolation. In addition, educators should center diversity, equity, and inclusion in team training and building activities. Beyond management skills, this cultivates cultural intelligence, nurturing a safe and positive working environment whilst also promoting justice, sustainability, and other social values.

2.2 Dr Michael James Scott

Associate Professor and Head of Computing at Falmouth University. He has convened many computing degree programmes and conducts scholarship on computing education. This includes being involved in working groups on game development and introductory programming, and recently leading a working group on esports. His students work in challenge-led multidisciplinary teams and embrace a ‘doing it for real’ ethos to deliver publishable work.

Transdisciplinarity connects art and science, empowering people to critically challenge norms and strive for meaningful change. Being ‘t-shaped’ couples broad adaptability with deep expertise. With intellectual property rights and business support, students can successfully collaborate and release their work. Entrepreneurship is motivating and imparts maturity, helping students towards solving real problems and being rewarded by society. Accountability is crucial, both in supporting fairness and team function. The facilitating conditions for effective peer evaluation are not yet known, but many practices promote professionalism.

2.3 Dr Angela A. Siegel

Assistant Dean (Academic Outreach) in the Faculty of Computer Science at Dalhousie University. Serving the university in a position that encourages wider access, she values the transferable, durable skills learned through group work.

An important benefit of team-based projects is exposure to other ways of thinking and different ways of tackling challenges. Though, guidance is needed to facilitate reflection and learning from this exposure. Teams need to make observations, consider how the choices made individually and by peers either promoted or impeded progress, exchange feedback, and reconsider their approaches. Such peer evaluation is critical, and so it is imperative that all team members are encouraged to give fair and thoughtful feedback. A concern that is often raised within teams, however, is assessment with respect to free-riders. Disengaged students need to be identified and helped to overcome the barriers that are affecting them. Peer rating practices enable this and algorithms can be used to re-weight ratings to reflect group consensus. This helps reassure students that their individual contributions will be fairly assessed. It also becomes possible to reward accurate evaluations.

2.4 Dr Mark Zarb

Teaching Excellence Fellow based within the School of Computing at RGU. He has a research focus on computing education and pedagogy, having led international working groups on transitions into higher education in 2018 and post-pandemic educational landscapes in both 2021 and 2022.

With the growing reliance on online communication tools for team projects, students are finding that professional boundaries are becoming blurred, and they are rarely trained on how to make that switch. It is becoming increasingly more important to ensure that students understand both the expectations we place upon them, but also that they understand the expectations they should have on each other, and that they are taught how to effectively communicate and collaborate with their peers.

REFERENCES

- [1] Efthimia Aivaloglou and Anna van der Meulen. 2021. An Empirical Study of Students’ Perceptions on the Setup and Grading of Group Programming Assignments. *ACM Trans. Comput. Educ.* 21, 3, Article 17 (mar 2021), 22 pages. <https://doi.org/10.1145/3440994>
- [2] Gregory W. Hislop, Joseph J. Ekstrom, Heidi J.C. Ellis, and Sandra Gorka. 2012. Panel: Capstone Experiences for Information Technology. In *Proceedings of the 13th Annual Conference on Information Technology Education* (Calgary, Alberta, Canada) (SIGITE ’12). Association for Computing Machinery, New York, NY, USA, 111–112. <https://doi.org/10.1145/2380552.2380586>
- [3] Cyril Picard, Cécile Hardebolle, Roland Tormey, and Jürg Schiffmann. 2022. Which professional skills do students learn in engineering team-based projects? *European Journal of Engineering Education* 47, 2 (2022), 314–332.
- [4] Rose K. Pozos and Michelle Friend. 2021. “You Sound Like a Good Program Manager”: An Analysis of Gender in Women’s Computing Life Histories. In *Proceedings of the 52nd ACM Technical Symposium on Computer Science Education* (Virtual Event, USA) (SIGCSE ’21). Association for Computing Machinery, New York, NY, USA, 692–698. <https://doi.org/10.1145/3408877.3432433>
- [5] Rajendra Raj, Mihaela Sabin, John Impagliazzo, David Bowers, Mats Daniels, Felienne Hermans, Natalie Kiesler, Amruth N Kumar, Bonnie MacKellar, Renée McCauley, et al. 2021. Professional Competencies in Computing Education: Pedagogies and Assessment. In *Proceedings of the 2021 Working Group Reports on Innovation and Technology in Computer Science Education*. 133–161.
- [6] Christine Winberg, Mike Bramhall, David Greenfield, Patrick Johnson, Peter Rowlett, Oliver Lewis, Jeff Waldo, and Karin Wolff. 2020. Developing employability in engineering education: a systematic review of the literature. *European Journal of Engineering Education* 45, 2 (2020), 165–180.