TEAMWORK

DEFINITION

Teamwork is the collaborative effort of a group to effectively coordinate the performance of multiple individuals to achieve a common goal or to complete a task in the most efficient and effective way. Working in teams teaches students to hold themself and their peers accountable.

TEAMWORK IN COMPUTING

Teamwork is the norm in the computing professions, often involving global, interdisciplinary teams. Integrating teamwork within the computing education context helps students prepare for future careers that demand teamwork. This can be done by requiring students to work collaboratively, share and accept ideas, learn from diverse perspectives and work towards common goals.

PEDAGOGICAL APPROACHES TO IMPLEMENT TEAMWORK

- Create diverse teams based on skills needed, expertise, content familiarity, and students' culture, gender, and so on, to bring together various perspectives that enrich the learning experience for all.
- Create a structure of support by delegating facilitation of teamwork to graduate teaching assistants and undergraduate peer teaching assistants (selected / volunteers from the class).
- Prevent students from "social loafing" (relying on other team members to do all of the work) by teaching team management.
    - Define on the syllabus explicit directions about: team agreement, project goals, and importance of teamwork to the learning experience, in addition to tools, timelines, and a rubric to set expectations.
    - Provide guidelines for non-participating members.
    - In case of a non-participating team member, the team can be given an extended timeline to address the missing work. The team must be required to communicate in advance with the instructor about such situations.
    - To prevent team failures, help students create a team agreement using a template (DEAP Team Agreement Template) that includes:
        - Terms for how team members will communicate among themselves and the instructor, and their roles and responsibilities.
        - Terms to deal with non-performing members directly by the rest of the team.
- Large classes -Be prepared to address team issues, conflicts, and team members challenging each other. This is normal and part of the learning experience. Resolving conflicts and working together gives real-world teamwork experience.

ASSESSMENT APPROACHES FOR MEASURING THE OUTCOMES OF TEAMWORK

- Assess the team agreement at the beginning to ensure students understood the guidelines.
- Assess teamwork based on team communication and project/assignment outcomes.
- Use a self and peer assessment tool (DEAP Self and Peer Assessment Template) or rubric to engage students in giving feedback to other students in their team. You might use a carefully constructed formula to award individual points – however, there can be drawbacks to students focusing on points, including inflating ratings for expected levels of performance. . Online systems such as CATME (https://info.catme.org/) allow students, instructors, TAs, and mentors to create and access data, which aids in scaling up.
- Provide formative feedback to the team as a whole and to individual members (especially those who are having difficulties) in a timely manner to allow the team to adjust.

THEORETICAL PERSPECTIVE

Teamwork promotes collaboration that involves active learning and co-construction of knowledge through social interaction with other team members while solving a problem (van der Meij et al. 2011). Inquiry learning, problem solving, and critical thinking are promoted since students explain their thinking, verbalize it, and engage in joint elaboration on their decision making (Harding et al., 2017; Kirschner et al. 2018). Team members share the cognitive load or the total working memory capacity required to complete a complex learning task (Leahy and Sweller 2011). Training through lectures and

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hands-on practice helps students learn to give feedback and assess team performance (Berry et al., 2022). Teamwork also helps students develop dispositions crucial to the workplace, such as confidence, and being humble and respectful.

Teamwork during in classroom activities

Learning Setting
Students complete tasks in teams of 2-4 formed among adjacent students and the number depends on classroom layout and furniture.

Scenario
Prof Xavier explains what debugging is and the need for the debugging skill in industry. She highlights the connection to the real world by highlighting that these activities are performed in pairs or small teams in the industry and that collaboration is common in the workplace. She then demonstrates how to debug a code using the line tracing method.

Students then form groups and begin working on the task. Prof Xavier moves around the class to ensure that all the students are participating in discussions and performing the activities. By asking questions Prof Xavier assesses team progress and also helps teams that are struggling.

Teamwork in small or semester-long projects

Learning setting
Diverse teams of 3-5 students created by Prof Xavier

Syllabus defines the team project, expectations about teamwork, and purpose of the team agreement.

Students develop conflict management, active listening, presentation, and interpersonal skills. They learn to assess the contribution of self and others using a rubric.

Scenario
Prof Xavier explains the goals of the team project at the beginning of the semester. The University's student body publishes a biweekly newspaper that reports news around the university. They wish to create an app for their newspaper that can deliver news in small bytes and can host different kinds of media that a print paper cannot offer such as videos and podcasts. For this project, the university has invited proposals for possible app designs and the best design that meets the needs would be chosen by the Student body. They have been given a copy of this month's newspaper for reference.

Prof Xavier guides the student teams to create team agreements through meetings in the class or outside of regular class hours. Teams define overall team goals, and each members' roles and responsibilities. Prof Xavier grades the team agreements to ensure that students have flexible and inclusive expectations to establish a comfortable environment for all members to share ideas and feelings. She then helps teams focus by asking them to break larger project goals into smaller, achievable steps, to reduce confusion with project related tasks.

When conflicts arise, Prof Xavier takes a hands-off approach encouraging team members to resolve, negotiate and refocus, while being supportive of their efforts. At the end of the project teams showcase their app designs to the rest of the class.

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Teamwork in a year-long capstone project

Learning setting

Diverse teams of 4-5 created by Prof Xavier

Prof Xavier provides sufficient in-class time for team discussions.

Prof Xavier meets teams regularly to assess team dynamics, monitor their progress, provide constructive feedback, and encourage them as a team.

Scenario

Capstone projects are preferred to be industry sponsored. The project problem statement is given by the company that is sponsoring it. Teams present their project goals and outline when the projects are initiated. They are also required to share team progress in a biweekly team presentation. Each team gets feedback from peers and Prof Xavier.

Where possible, industry collaboration through guest lectures or visits to workplaces can be included. Prof. Xavier positively affirms team efforts to build stronger teams. Novice students may be both excited and anxious about their teamwork experience and will need more instructor support. Experienced students may be able to collaborate more, resolve conflicts, and start evaluating their processes and productivity.

Students are encouraged to appreciate each other's efforts during team presentations, share diverse perspectives and learn from each other. This translates to meaningful communication, willingness to share ideas and willingness to ask for help leading to knowledge co-construction.

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