ENSURING INDIVIDUAL ACCOUNTABILITY IN AUTHENTIC TEAM-BASED ASSESSMENTS

Edward Causton

Department of Engineering, Nottingham Trent University

ABSTRACT

Effective teamwork is a critical skill for engineering graduates to demonstrate both during their studies and in their future careers. The requisite personal attributes, skills and behaviours may be cultivated through structured teamwork activities applied to authentic scenarios. However, team-based assessments may be perceived as failing to reflect individual contributions, leading to concerns about fairness and disengagement. This paper presents an approach to authentic team-based assessment designed to develop professional skills while ensuring individual accountability within a team context. Foundation Year students collaborated over four weeks to design a product addressing an accessibility need and create a business plan for a start-up company producing and selling the product. The inclusion of an individual component based upon assigned roles together with peer assessments and progress tracking motivated engagement of all team members. Survey feedback indicated students valued the opportunity to demonstrate personal contributions, and improved pass rates suggested increased engagement.

KEYWORDS

Authentic Assessment, Active Collaborative Learning, Team-Based Learning, Experiential Learning, CDIO Standards: 1, 2, 3, 4, 5, 7, 8, 11.

INTRODUCTION AND LITERATURE REVIEW

The ability to work effectively in a team is a crucial skill that engineering students must develop and demonstrate (Chowdhury & Murzi, 2019; Ercan & Khan, 2017; Herrera et al., 2017; Kimpton & Maynard, 2025). Many universities incorporate team-based learning to foster collaboration and promote deeper understanding of engineering concepts and their application (Sousa & Fontão, 2025). Reported benefits include improved test performance, greater conceptual understanding, and enhanced engagement and interest (Swanson et al., 2019). Team-based learning also appears particularly effective in supporting students with lower entry-level attainment (Sena-Esteves et al., 2024). Accrediting bodies reinforce the importance of teamwork development; for example, AHEP 4 in the UK specifies that graduates should "function effectively… as a member or leader of a team" (Engineering Council, 2020, p.31). Furthermore, employers increasingly demand more than technical expertise from graduates: they must be able to work collaboratively and communicate effectively, attributes consistently identified as essential for employability (Baird & Parayitam, 2019; Hirudayaraj et al., 2021). The required personal attributes, skills and behaviours are not innate but may be actively cultivated through structured, purposeful activities that require students to exercise and refine these capacities in authentic contexts (Kimpton & Maynard, 2025; Orih et al., 2024).

Authentic assessment requires students to demonstrate their knowledge and skills through the performance of tasks reflecting real-world situations or professional practice (Gulikers et al., 2004; Wiggins, 1990). These tasks typically demand the integration of a range of technical and interpersonal competencies. By simulating professional practice, these may be developed within a structured project environment, fostering teamwork, communication and project management capabilities (Villarroel et al., 2018). In an engineering context, authentic team-based assessments may be used to engage students in collaborative activities that require them to identify and define a problem, design a viable solution and communicate their ideas effectively. This approach aligns with the CDIO framework, particularly its emphasis on the ability to conceive and design real-world products in a team-based context, reinforcing both technical and interpersonal competencies (Kozanitis et al., 2009). Despite these benefits, team-based assessments may be criticised for failing to adequately reflect individual contributions. This may lead to perceptions of a lack of fairness in assessment or to disengagement as students become dependent on the most active team members (Hall & Buzwell, 2013; Michaelsen et al., 2004, p.16; Rasooli et al., 2025). While peer assessments may be used to address this issue, they may be influenced by personal biases, friendship networks, or a limited awareness of the contributions of other team members (Stonewall et al., 2024).

This paper aims to present and evaluate a case study of a Foundation Year project implementing an approach to authentic team-based assessment designed to improve engagement, perceptions of fairness and assessment outcomes, and aligned with the CDIO framework. Central to the assessment design was the inclusion of an individual component requiring students to produce role-specific output documents in addition to team deliverables. Students were also required to organise and conduct weekly team meetings outside scheduled teaching and to record individual progress and actions using structured meeting minutes. Combined with peer assessments, these measures enabled students to demonstrate personal contributions and promoted individual accountability while maintaining shared responsibility for project outcomes. Following completion of the project, students were invited to complete a survey examining perceived development of teamwork and presentation skills and whether the assessment enabled them to effectively demonstrate their personal contributions, alongside open-ended feedback on the project overall.

CONTEXT

The Integrated Cross-School Foundation Year at Nottingham Trent University (NTU) aims to equip students with the required skills, knowledge and personal attributes for successful progression to Year 1 of their undergraduate degree. The cohort includes students intending to study engineering, computer science, mathematics, physics, chemistry and forensics degrees. In the academic year 2024-2025, the cohort consisted of 348 students including 137 engineering students from across engineering disciplines: mechanical, aerospace, electronic & electrical, biomedical and sport engineering.

Table 1: Content and schedule for the module Practical & Professional Skills

	Teaching Week	Content	Assessments / Projects
Semester 1	1-3	**Unit 0: Introduction** Problem solving, teamwork, research and referencing, MS Office, professional behaviour.	
	4-6	**Unit 1: Sustainability & Technology** Sustainability & technology, UN's SDGs, renewable energy, integrating sustainability	**Project:** Sustainable Design
	7-9	**Unit 2: Evolution of Technology** History of technology, technology today, the future of technology	**Project:** Evolution of Technology Report
	10-12	**Unit 3: Information and Communications Technology** The internet & websites, html, telecommunications	**Project:** Science Website
	Christmas Break		
	Half-Year Exam Period		
Semester 2	19-23	**Unit 4: Technology and Business** Reflecting on feedback, business & marketing, effective presentations, statistics for business	***Group Presentation Assessment***
	24-26	**Unit 5: Technology and Computers** How computers work, VR & AR, Smart technology, artificial intelligence	**Project:** C Coding
	27-28	**Unit 6: Dissecting Technology** Making technology, operating technology, how technology fails	**Project:** Reverse Engineering
	Easter Break		
	31	**Unit 6: Dissecting Technology (cont.)**	
	32	**Progression** Final submissions for Project Portfolio & reflective journals, progression to Year 1	***Project Portfolio & Reflective Journals***
	End of Year Exam Period		

Alongside core technical modules in mathematics, science and engineering, all students complete the year-long module Practical & Professional Skills which aims to bridge theoretical learning with practical application and to support the transition into higher education through the development of professional and related skills. The module is delivered through a combination of lectures and laboratory sessions across the year and incorporates a range of individual and team-based projects. Table 1 outlines the module content and schedule.

While most projects are assessed through a portfolio submitted at the end of the academic year, students also complete a **group presentation assessment** at the start of the second semester. This evaluates their ability to collaborate effectively on a project combining design development with creation of a detailed business plan, while demonstrating strong presentation and communication skills, reflecting key professional competencies expected of engineering graduates. By simulating a product development process and business pitch, this provides an authentic team-based assessment mirroring real engineering practice. Details of this assessment as implemented in 2024/2025 are provided in the following section.

ASSESSMENT DESIGN

The cohort was divided across six laboratory groups based upon progression degree, with each laboratory supported, where possible, by a lab leader from the same academic department. During the first laboratory session, students were placed in teams of 5 or 6 students. They then had four weeks to design a product and produce a business plan for a proposed start-up company producing and selling the product. The product was required to relate to the theme *Accessible Design*: a product, app or service that ensures all users, regardless of age, disability or other characteristics, are able to live and/or work without restrictions to their everyday activities.

Table 2: Timeline for Group Presentation Assessment

Week	Content
1	• Team forms, assigns roles, sets up Microsoft Team and generates ideas. • Initial research performed. • First team meeting arranged by teams and documented with team meeting minutes form.
2	• Finalise design concept. • Begin preparation of individual documents. • Second team meeting.
3	• Complete individual documents. • Begin preparation of presentation. • Third team meeting.
4 / 5	• Submission of individual and group documents. • Delivery of presentation. • Submission of peer assessments.

Table 2 shows the timeline for the project. At the beginning of the project, students assigned themselves roles within their team: Designer, Head of Operations, Head of Finance, Market Researcher, Market Strategist, Risk Analyst. Teams subsequently discussed these roles with the lab leader to ensure each student was aware of the requirements of their role and how the roles related to one another. An output document was associated with each role (see Figure

1). Each student had individual responsibility for production of their document while ensuring that all documents were consistent.

During subsequent laboratory sessions, students worked in their teams, with targeted activities set by the lab leader and aligned to the project timeline. The lab leader circulated between teams to monitor progress and team functioning, note engagement issues where observed, and provide formative feedback on project work.

In addition to attending scheduled teaching sessions, teams were expected to independently organise and conduct a weekly team meeting. These were documented using a templated meeting minutes form, capturing team progress, individual contributions and agreed actions for the week. Teams were also expected to create a dedicated Microsoft Teams space for communication and document sharing. These measures ensured students took responsibility not only for the project outputs but for effective management of the team and the project.

Using their individual documents as a basis, each team prepared and delivered a 10-12 minute PowerPoint presentation outlining their product design and associated business plan to their lab leader acting in the role of a potential investor. All students were expected to contribute except in cases where a student had an accessibility need affecting their ability to present, in which case alternative arrangements were made. The presentation was followed by a question-and-answer session in which the assessor examined aspects of the design and proposed business. The television programme *Dragon's Den* was used as an illustrative example to help students understand the format and expectations.

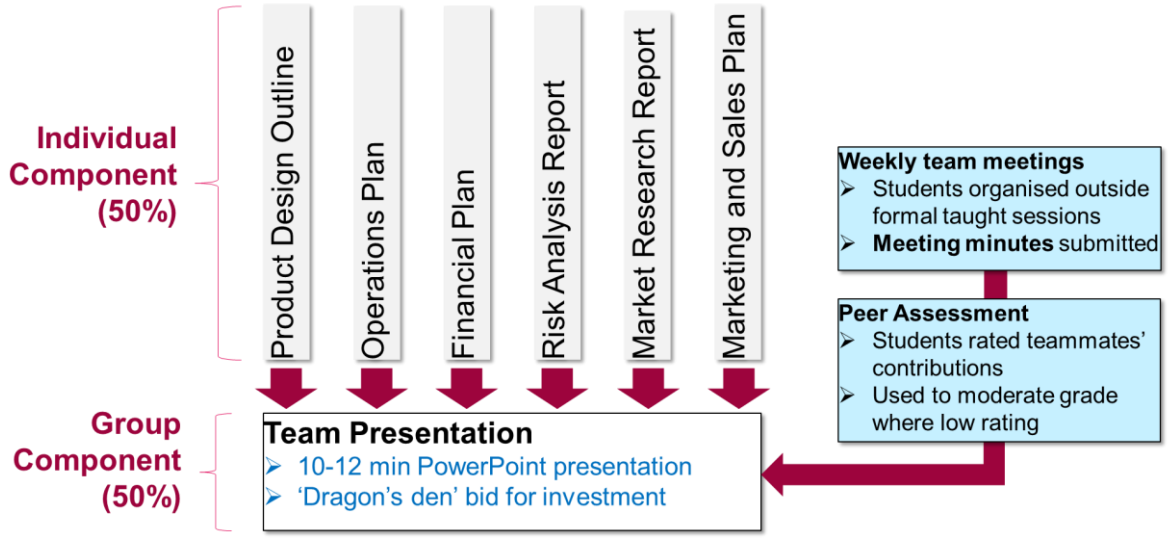

Figure 1: Group Presentation Assessment components

Figure 1 shows the components of the assessment. Individual output documents accounted for 50% of each student's grade and were awarded individually i.e. they did not depend upon the work of other students in the team. Furthermore, if a student did not achieve a passing grade for the individual component, their overall grade was capped at that of their individual component. This ensured each student must engage with the project and contribute to the team. The remaining 50% of the grade was awarded to the team as a whole: 10% for the team meeting minutes, 20% for the presentation quality and 20% for the overall quality of the project including the design concept and business case put forward. Upon completing the project,

students undertook peer assessment to evaluate the contributions of other team members. Where peer assessments consistently indicated limited contribution, meeting-minutes, attendance records and notes recorded by the lab leader on student engagement were examined for supporting evidence. Affected students were asked to provide evidence of their contributions. Where this could not be demonstrated, their group-component grade was moderated downwards, including zero credit where no contribution was evidenced.

RESULTS

Figure 2 shows examples of student designs. A passing grade was achieved by 89% of students in 2024-2025 versus 79% in 2023-2024. Cohort size and composition in 2023-2024 were similar to 2024-2025, as was the assessment design; however, an individual component was not included. Therefore, improvements in pass rate occurred despite a reduction in students' ability to rely on the contributions of teammates and thus increased rigour of the assessment. The majority of fail grades (9% versus 19% in 2023-2024) were due to students not submitting any work. This suggests a marked improvement in student engagement with the assessment.

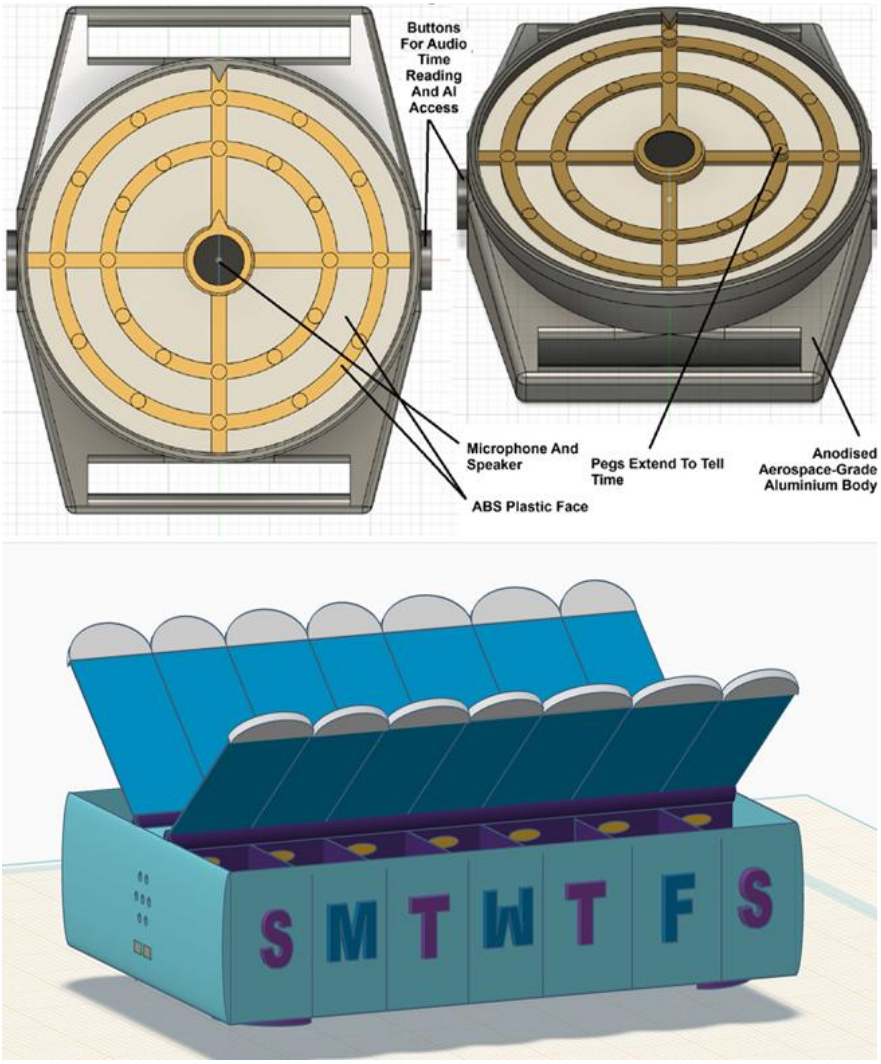

Figure 2: Examples of student designs. *Top:* 'NovaDot' accessible watch for the visually impaired. *Bottom*: 'PillProd' smart pill dispenser.

After the assessment had been completed, feedback was collected through a Microsoft Forms survey comprising several Likert-style questions and space for further comments about the project. The survey was approved by the School of Science and Technology non-invasive ethics committee and was conducted during a taught session after assessment completion to encourage engagement, while making clear that participation was entirely voluntary and had no impact on assessment outcomes. Responses were pseudonymised to allow participants to withdraw their data. Responses were received from 26 students including a mix of male and female students and diverse ethnicities. Of these, 70% agreed or strongly agreed that the project helped develop their presentation skills, 73% agreed or strongly agreed that it helped develop their teamwork skills and 77% agreed or strongly agreed that it allowed them to demonstrate their contributions to the team. Due to the small number of respondents, no demographic patterns could be identified. Feedback comments received indicated that students valued the addition of an individual component to the assessment:

> "Overall the individual project idea was excellent as there are people who have done more work than others"
>
> "I liked the fact that there was an individual element so that my work can be judged on its own as well as with regards to my contribution to the team."
>
> "The Individual output being the majority of the grades has made me confident that I will receive a pass grade, however the team assessed aspect makes me less confident in getting a high grade because some team members didn't contribute as much"

As indicated in the last comment above, students still had reservations about the teamwork component. Several referred to issues relating to teamwork:

> "Attendance of team mates was a reoccurring issue."
>
> "… stressing because team members haven't turned up or done anything to contribute"
>
> "I prefer solo projects as working with a team is difficult when nobody is free all at the same time and you can't work at your own pace"

It appears, therefore, that while inclusion of an individual component went some way to alleviating student anxiety regarding fair evaluation of their contributions, this was not eliminated and students continued to find issues with teammates frustrating, especially lack of attendance and contribution.

DISCUSSION AND CONCLUSION

This paper demonstrates how individual accountability can be embedded within authentic assessment without undermining collaboration in a team-based context, supporting the effective use of integrated learning and active engagement (CDIO Standards 7 and 8). The inclusion of an individual component within the assessment required all students to engage meaningfully with the project and mitigated the risk of individuals relying solely on the contributions of others. Improvements in pass rates and assessment completion and performance suggested increased engagement. Student feedback further indicated the inclusion of an individual component was perceived to result in fairer assessment of contributions.

Individual outputs were subsequently used as a basis for team presentations, supporting a balance between individual accountability and collective responsibility for the project. This was further reinforced using peer assessments to moderate grades. By requiring teams to establish their own communication channels and organise regular meetings outside of scheduled taught sessions, students were encouraged to take responsibility not only for project outputs but also for the management of the team and the project, thus integrating assessment of personal and interpersonal skills with disciplinary knowledge (CDIO Standard 11).

Despite these benefits, several challenges were identified. The inclusion of an individual component significantly increased the marking workload as individual submissions were assessed alongside team presentations. This was partially mitigated through the use of relatively prescriptive criteria for individual documents enabling short marking times for each. Feedback was primarily provided at the team level.

In many cases, students continued to report frustration with the lack of contributions of teammates and difficulties in communication. While this can provide a valuable preparation for future university and professional teamwork, the lower engagement levels typical of Foundation Year cohorts may compound the problem and, in some cases, led to a single student assuming responsibility for the production of most team outputs. Although this was reflected in marks awarded, frustration with the process remained. While students did perceive assessment to be fairer, additional mechanisms may be required to identify low engagement students early and enable timely intervention.

Finally, the assessment criteria required careful planning to ensure an appropriate balance between individual and team components. The additional complexity of this assessment approach necessitated clear communication of criteria and expectations to students to maintain transparency.

In conclusion, use of multiple assessment mechanisms within this innovative authentic team-based assessment supported individual accountability while maintaining collective responsibility for the project. In particular, the inclusion of an individual component appears to have been effective at improving student engagement and perceptions of fairness. However, more effective monitoring strategies may be required to address disengagement at an earlier stage.

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REFERENCES

Baird, A. M., & Parayitam, S. (2019). Employers' ratings of importance of skills and competencies college graduates need to get hired: Evidence from the New England region of USA. Education & Training, 61(5), 622–634. https://doi.org/10.1108/ET-12-2018-0250

Chowdhury, T., & Murzi, H. (2019). Literature review: Exploring teamwork in engineering education. In Proceedings of the Conference: Research in Engineering Education Symposium, Cape Town, South Africa (pp. 10-12).

Engineering Council. (2020). Accreditation of higher education programmes (AHEP 4). London: Engineering Council. https://www.engc.org.uk/media/isdl1tem/the-accreditation-of-higher-education-programmes-ahep.pdf

Ercan, M. F., & Khan, R. (2017). Teamwork as a fundamental skill for engineering graduates. In 2017 IEEE 6th International Conference on Teaching, Assessment, and Learning for Engineering (TALE) (pp. 24-28). IEEE.

Gulikers, J. T., Bastiaens, T. J., & Kirschner, P. A. (2004). A five-dimensional framework for authentic assessment. Educational technology research and development, 52(3), 67-86.

Hall, D., & Buzwell, S. (2013). The problem of free-riding in group projects: Looking beyond social loafing as reason for non-contribution. Active Learning in Higher Education, 14(1), 37-49.

Herrera, R. F., Muñoz, F. C., & Salazar, L. A. (2017). Perceptions of the development of teamwork competence in the training of undergraduate engineering students. Global Journal of Engineering Education, 19(1), 30-35.

Hirudayaraj, M., Baker, R., Baker, F., & Eastman, M. (2021). Soft skills for entry-level engineers: What employers want. Education Sciences, 11(10), 641.

Kimpton, C., & Maynard, N. (2025). Factors shaping teamwork skills development in tertiary engineering education: a systematic literature review. European Journal of Engineering Education, 50(2), 253-280.

Kozanitis, A., Fortin, C., Forest, L., Sellens, R., & Hermon, P. (2009). Designing And Using Authentic Assessment Of Student CDIO Skills. In 4th International CDIO Conference 2008.

Michaelsen, L. K., Knight, A. B., & Fink, L. D. (Eds.). (2004). Team-based learning: A transformative use of small groups in college teaching. London: Routledge.

Orih, D., Heyeres, M., Morgan, R., Udah, H., & Tsey, K. (2024). A systematic review of soft skills interventions within curricula from school to university level. In Frontiers in Education (Vol. 9, p. 1383297). Frontiers Media SA.

Rasooli, A., Turner, J., Varga-Atkins, T., Pitt, E., Asgari, S., & Moindrot, W. (2025). Students' perceptions of fairness in groupwork assessment: validity evidence for peer assessment fairness instrument. Assessment & Evaluation in Higher Education, 50(1), 111-126.

Sena-Esteves, M. T., Ribeiro, M., Morais, C., Brás-Pereira, I., Guedes, A., Soares, F., & Leão, C. P. (2024). Beyond Scores: Early Findings on TBL's Impact in Engineering Education. In International conference on technological ecosystems for enhancing multiculturality (pp. 407-415). Singapore: Springer Nature Singapore.

Sousa, M., & Fontão, E. (2025). Team-based learning—An approach to enhance collaboration and academic success in engineering education: A comprehensive study. In Forum for Education Studies (Vol. 3, No. 1, pp. 2239-2239).

Stonewall, J. H., Dorneich, M. C., & Rongerude, J. (2024). Evaluation of bias in peer assessment in higher education. International Journal of Engineering Education, 40(3), 543-556.

Swanson, E., McCulley, L. V., Osman, D. J., Scammacca Lewis, N., & Solis, M. (2019). The effect of team-based learning on content knowledge: A meta-analysis. Active learning in higher education, 20(1), 39-50.

Villarroel, V., Bloxham, S., Bruna, D., Bruna, C., & Herrera-Seda, C. (2018). Authentic assessment: Creating a blueprint for course design. Assessment & Evaluation in Higher Education, 43(5), 840-854.

Wiggins, G. (1990). The case for authentic assessment. Practical assessment, research, and evaluation, 2(1).

BIOGRAPHICAL INFORMATION

Edward Causton is a Senior Lecturer in the Department of Engineering, Nottingham Trent University. He is Engineering Education Research Group Lead and chairs the School of Science and Technology's Foundation Year Forum. He is a Senior Fellow of the Higher Education Academy and holds an MA in the Philosophy of Education from UCL's Institute of Education and a PGCE in science education from the University of Leeds. He holds an MPhys from the University of Oxford and an integrated MSc and PhD in theoretical biophysics from the University of Leeds. He has extensive experience teaching across secondary, post-secondary and tertiary education. His research interests include the use of mixed reality and artificial intelligence for engineering education, Active and Collaborative Learning approaches, and innovations in mathematics and statistics education for engineers.

Corresponding author

Edward Causton
Nottingham Trent University
Department of Engineering
Clifton Lane
Nottingham, UK
NG11 8NS
edward.causton@ntu.ac.uk