# Anatomy of Assessment

# Year One Summer project

**Faculty: Natural Sciences**

**Department: Physics**

**Module name: Statistics of measurement and the summer project**

**Module leader: Prof. Yoshi Uchida**

**Format: Laboratory-based group project**

**Level: Year 1**

**Approximate number of students: Full cohort (About 250 students)**

**Duration: Six weeks (Third term)**

**Weighting and credit: 70% of final credit**

**Module ECTS: 7.5**

**Insights colour key**

**Educational Developer**

**Inclusivity**

**Learning Designer**

**Registry**

**Careers**

**Educational Technologist**

Watch these videos on giving students choice:
1. The value of giving students choice
2. Disadvantages of giving students choice

## Assessment overview

The first-year project is a group-based assessment, applying skills acquired in the core year 1 undergraduate physics laboratories to independently follow open-ended questions. Under the guidance of an academic, postdoc or PhD student, each four-student group develops their own idea into a project. There is considerable flexibility permitted in the scope of the projects, which can be anything from purely experimental to purely computational, or somewhere in between these two. The projects are presented to a wider audience of parents, academics and school leavers at an Open Presentation Day where students are required to record a video of up to 10 minutes serving as a fully standalone presentation of their project.

Yoshi Uchida summarised the assessment in this video, which was given out to students (as a remote lecture during COVID restrictions).

## Design decisions

### Rationale for the choice of methods

The project runs over the duration of term 3. The assessment is first introduced to students, with assessment criteria and learning objectives provided, in February, giving the students time to form groups of four and proposing an idea.

> The principle of allowing choice in assessment is a good one for several reasons: it makes for a more student-centred approach to assessment; it is more inclusive by empowering students to work on topics of importance to them; and it fosters independence. A caveat is that the extent of the choice needs to be considered carefully depending on the level of ability of the students. If students have less insight into the subject or discipline area, or are at an earlier stage in their learning, choice may feel overwhelming. In this case, it can be useful to provide a level of pedagogical scaffolding, for example by giving some examples of the sorts of choices students have made in previous years.

Each group is then assigned an academic with a level of expertise the covers the group's idea. Over the course of several weeks, each group meets with their supervisor once a week for one hour. The rationale is to simulate a less scripted research environment that core laboratory studies, which allows students to explore their own questions, and to experience the collaborative and creative aspect of cutting-edge research. A major objective of the project is to convey the fun involved in research to students without micromanaging them and constraining their approach, hence a trial-and-error approach to the project is emphasized and encouraged. Watch this video on the pros and cons of group work.

The project is eventually assessed via a 10-minute educational video, introducing the project and the process behind it.

> The production of a 10-minute video links to skills required in science communication jobs. Being able to summarise what students are doing and deliver that summary to a specific audience, be it the management team, or in this case school leavers, is reflective of skills needed in the workplace.

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The video is meant to be on the level of a school-leaver (i.e. someone at the GCSE to A-level transition phase of their education) with an interest in STEMM, and makes up the main component of the assessment. Additionally, the students must provide a write-up, which containing factual statements about the project; this is to provide supporting material for the marker, since the video is meant to be a stand-alone item. It is meant to contain an easily readable description of the decision-making processes taken during the project's development. It also permits the marker to better follow videos which may have sections of poorer quality AV. In addition to the core assessed components, the department provides awards to groups who submit particularly creative or technically presented videos.

## Alignment with learning outcomes

Since students have already acquired the basic skills of scientific work in first-year laboratories, the summer project is meant to allow more open-ended room for trial-and-error studies of original ideas. By creating a structure that is reasonably lightly supervised by a professional, students can follow up an idea in an environment similar to a research group. This means the students are meant to work collaboratively and provide evidence of good teamwork. The aim of the project is not to produce high quality results without any mistakes on a first attempt. More emphasis is put on exploring different paths and showing a trial-and-error approach. This emphasis tries to simulate a research environment, where there is always a degree of uncertainty on whether a certain idea will lead to the results anticipated.

> For methods that assess oral presentation skills or ability to communicate something efficiently orally it is always good to have a learning outcome that captures those skills.

## Practicalities and pandemic

### Timeline of the project

The first-year summer project underwent major changes during the pandemic, first being forced to adapt at short notice due to cancellation of in-person activities in spring 2020 and thence continuing with some of the more successful aspects of project style and assessment when in-person teaching resumed. The summer project, as it ran in 2022, involved several working stages, with the students working in the environments suitable for conducting their projects (i.e. laboratories, computer suites, occasional outdoor work, or a mixture of these) for several weeks and then being able to present their project in a public session.
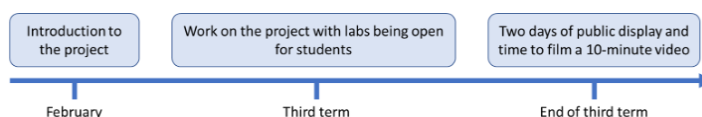


*Figure 1: The timeline over which the students carry out the summer project*

The project was first introduced in February. An introductory talk was provided by the module lead, laying out the assessment criteria and the main format of the project. This gave the students enough time to organise themselves in groups of four and submit a proposal for their project. Groups were then assigned an academic guide, whose knowledge and expertise was suited to the group's chosen topic, to work with during the duration of the project.

As summer term approaches, the students then get started with their project. In their first meeting with their supervisor, the students propose how they will spend their next weeks and define their timeline. Another important aspect of this first meeting is filling out their risk assessment. As the students will be possibly working in labs, or occasionally outdoors, assessing the hazards and dangers of their work is a key to ensuring safe and successful work. In the following weeks, the students continuously work on their project and meet about one hour a week with their supervisor. The role of the supervisor is to encourage the students to follow different paths and to point them in ways that helps them avoid blind alleys and wasting time.

The undergraduate laboratories are normally open (and always staffed by technicians) for about 10 hours per week. Students were not expected to be in labs all the time, and the students were expected to work some hours outside the labs as well. This gives some perspective on the amount of work the students were expected to do. At the end of their project, there was a two-day public display of their projects, open to students, teachers and family. While the students were able to showcase their work, they

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were also expected to film a ten-minute video during these two days. This video then is used as the primary component for assessment. Watch the video on how it was introduced to the students.

**Preparing students for assessment**
There are sessions dedicated to the project that outline the aims, conditions of group work and assessment criteria.

Allowing students some time to get to know each other, with a scaffolded requirement to negotiate ground rules is excellent practice. All too often the academic pressure is added straight away without time to form as a group! To enhance this formative process, and take advantage of the groups' intentionally diverse nature, students could be encouraged to consider the inter-cultural learning potential when negotiating ground rules – e.g. how are values around group working and contribution and practical approaches influenced by background and culture, as well as previous experience? Could each student offer a ground rule that reflects their values, to be refined as a group? Setting ground rules should go beyond practical considerations and take into account the crucial emotional dimension of learning. e.g. what enables individuals to feel confident and comfortable enough to contribute to a discussion or decision-making? Is turn-taking a good idea initially? Negotiated ground rules could them be used to inform peer assessment of group working. Watch these videos:
1. Different ways of assessing group work
2. Advice when implementing group work

When introducing group work consideration needs to be given to how students with specific learning needs can be successfully participating in group interactions. All students involved should benefit from inclusive practice, meaning inclusivity considerations can be embedded within standard practice around preparing students for group work. This can be done through discussion around the allocation of roles and better understanding how others, including those with specific learning needs such as dyslexia, autism, dyspraxia etc learn and communicate. Individuals should be mindful of that and think about the delegation of individual tasks that are appropriate to what individuals can do. Part of preparation for group work is considering how others can be mindful and empathetic towards other group members.

In any module that relies heavily on group work it is important to establish common ground rules around group work as well as to be alert to where a tutor might need to step in and reassert rules of engagement.

The students are briefed on best practices with lab safety including the etiquette of working collaboratively in a lab setting. This included an emphasis on using English as the only language. This emphasis is primarily for to safety reasons ensuring there is clear communication between team members and amongst group to react quickly if any issues arise, and secondarily to emulate the usual practice in laboratories where English is used; we highlight to students that this is even the case in some countries where English is not an official language.

Some guidance on the choice of the topic is also offered. The project needs to be geared towards quantitative conclusions, allow plenty of trial-and-error studies, and contain content which is suitable to explain to the target audience a school-leavers. As a result, projects investigating extremely challenging or esoteric physics topic are not encouraged.

Having a brief check and approval from the academic guide is useful, as this can help to make students feel secure in their choices and also enables the academic guide to check that students will be able to meet the ILOs with their selected material.

Project ideas are initially submitted to the course lead. This is to ensure that students do not start by pursuing an inappropriate topic, to offer them advice and help develop and idea and to assign an appropriate supervisor. This initial submission of idea includes the following:
• Names of team members
• The rough practical/ computing ratio
• A short working title/ topic and a sentence or two with additional thoughts/ concerns
• Any possible special requirements

Similarly, students receive a briefing on the final output – the video created at the Open Day presentation, which is a record of their work on the project.

Scaffolding a relatively new assessment type, such as video, that can potentially be quite daunting for some students is important. Explicitly discussing the format

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...and what is expected from the video should be an inherent part of preparation for assessment. Ideally, students would be provided with a formative opportunity to practice the skills assessed in the video submission. If that is not possible, what students could benefit from is seeing past examples of videos from previous years that achieved different grades to help them internalise the criteria and the expectations.

It is important to ensure that all students are clear about the expectations when it comes to the final video output. Making a video can be a steeping learning curve when it comes to filming and editing so it is important that preparation is put in place at one point in the programme to help students develop these skills. Also it would be useful to embed opportunities for additional support every time such method is repeated.

A pre-recorded video presentation of any kind is always a good inclusive alternative to a live presentation as it benefits students who have issues with processing speed. The flip side of having it as the main method is that some students might find video as a barrier. It is useful, therefore, to offer alternatives to this assessment method in the spirit of inclusivity. Alternatives that could be considered is a written piece, such as a transcript for example (if presentation skills are not tested) or an audio version (podcast).

The students are instructed to include introductory information and speak at a level that a school leaver would understand. The video should focus on the results and conclusions as these are the principal parts that the audience usually wants to learn from the project. Each video should be 10 minutes in length and each team member should contribute to the video at a roughly equal level. The students are provided with some important things to consider when planning their video such as:

- Deciding on the main message – What information do you want your visitors to walk away with?
- Thinking about the audience – it is a requirement that the content is comprehensible for school leavers
- Ensuring that the display is well designed – having a clear title, using appropriate graphics, ensuring positive first impressions
- Ensuring there is good flow of logic – thinking carefully about the structure (background, methods, results, summary), accessibility, using content and props to help reach an audience from a variety of backgrounds

Students are advised to use the first day of the Open day as practice, discussing their work with the audience and shoot their video on the second day talking to the camera as if they were the visitors. There is also some guidance around the use of images with a warning around copyright material.

The final guidance relates to the project write up, advising it should be written up before the video deadline and contain additional information that allows the submissions to be assessed as an academic project. The purpose therefore is different to a standard lab report and a template is provided as the basis for their write-up.

**Team forming**
Students are given freedom to form their own team and choose their project topic as a team. It is emphasised during the briefing sessions that a productive team facilitates its members to bring complementary abilities to the project. Hence it is not encouraged for students to go for their best friends.

It is important to make time for students to form their groups and to discuss how to work in a team especially if a substantial element of group work in introduced in Year 1 when students are transitioning from secondary school to university learning. To help students with team forming it can be useful to incorporate some activities facilitating the development of specific skills related to team working. This case study contains some useful examples of how this was achieved in other parts of the College.

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Peer assessment can be a very useful turn when it comes to assessing the process of group work. Students have much more insight as to what the actual contributions were in relation to the project hence incorporating an element of peer assessment is useful as it gives insider insight. This, however, needs to be carefully executed with appropriate articulation of what is expected, tutor moderation as well as formative points where undesirable contributions can be called out and some opportunities for adjustments to those behaviours can be made.

When asking students to create more creative outputs such as a video, it is important to have clear marking criteria that establish what is actually being assessed and to what extent the production and presentation parts of the video play a role in assessment. When deciding whether to include the quality of an output in assessment criteria, it is useful to go back to the module level ILOs. If creativity is embedded in them then one way of assessing is via a creative output.

If team working is an important part of the programme that will be picked up on in other years and modules, it can be useful to incorporate a small task into the assessment, whereby students either reflect on how their group worked together and/or they produce a short document detailing how each member contributed. By making this explicit as part of the assessment, this can help to set expectations from the outset and stimulate some discussion about what constitutes a 'good' team and feeds forward to the next stages.

**Assessment and feedback**

The video is meant to provide the entire narrative of the project and the decision-making that went alongside with it. It works as standalone item, with an introduction to the project, work description and conclusion. The level of video is aimed at a school-leaver and all relevant physical concepts had to be explained. The main assessment criteria are as follows:

- A Video Presentation that, as a standalone item, a school-leaver should be able to follow, with a well-stated starting point, project work description, and conclusions
- Clear descriptions of the trial-and-error studies and decisions that shaped the project
- The quality and quantitative nature of the result
- Evidence in the video and write-up of a fair distribution of work across all team members
- The video does not go exceed a duration of 10 minutes; in any cases that the video is longer than 10 minutes anything that goes after will be disregarded

What the assessment does not focus on is aesthetics of the Video Presentation and slickness / quirkiness of production etc., what matters is what the students are able to communicate; and technical issues that do not affect the comprehensibility of the video and audio. The assessment criteria.

While watching, markers filled out a feedback form, rating the video in several criteria between one and six stars. Then they were asked to justify their rating with one or two sentences per category. The editing and formatting of the video are not assessed as different students have various levels of experience with editing, which should not impact their final score. Yet the assessors can nominate projects for awards and honourable mentions if they feel that a project was outstanding in a certain aspect which does not necessarily have to align with the learning outcomes. Further to the video, each group had to provide a write-up between three and four pages. This write-up was meant to work as a factual statement documenting the working process and describing what work was carried out by whom at what time. Although the write-up does not directly contribute to the mark, a statement by the supervisor of about half a page is provided once they have read the write-up, which judges explicitly the teamwork across and flags any issues or inaccuracies if there were any.

The criteria by which the video was judged, included how the video worked as standalone item and its understandability. The video should provide clear documentation of trial-and-error studies carried out and the decision-making process during the project. Additionally, the quality of results was judged as well as evidence for good teamwork. It is possible to assign different team members different marks if clear disparity in level of input is evident, although this rarely occurs. While it should be possible to judge the nature of the collaborative work directly

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from the video, the statement of the supervisor can help with this aspect of the assessment. Eventually, each marker can flag up possible factual errors, suggestions of plagiarism or misinformed statements made by the supervisor. Each assessor is meant to take 30 minutes per video and judges eight to nine videos. Fairness and equality between the marks is ensured by each video being assessed by four people and each person marking several videos.

## Changes implemented due to COVID

The first-year summer project has been a component of the core undergraduate physics for for over 15 years. It was required to undergo some pronounced changes in 2020, which have since been retained, with three consecutive year 1 cohorts experiencing the new format, albeit in slightly different forms. Initially, the projects were due to be assessed in-person in a poster presentation in a public display of all the projects, alongside a formal scientific report. When COVID caused significant restrictions making the poster presentations difficult to realise, an online adaptation had to be put in place, and the assessment was changed to a 10-minute video. This change was implemented just before Easter break. Following favourable student and staff feedback various aspects of this change, the 10-minute has been retained.

In 2022, in person open days resumed, so the live presentation to attendees aspect of the project resumed, but retaining the 10-minute video continued as the primary component of the assessment. The video permits a consistent and fair marking procedure; staff who had been involved in the course for several years felt assessing the video made it both easier to make sure they were assessing the learning outcomes of the project, and easier to assess objectively than the previous system of assessing a group poster plus an individual report.

It is a good thing that there is no specificity provided on the tools that may be used for the video recording and collation of marks and feedback, as there are so many possibilities available depending on what the module leads may want from the exercise. When selecting do be mindful of whether the tools you choose are College supported or not, as that will affect what assistance you can get from the Ed Tech and other teams.

## Implementation of the assessment

Since changing the assessment in 2020 the project lead has estimated a total of over 300 work hours in the first year that went into adapting and improving the assessment. Additionally, 270 work hours went into further enhancements to the course. Additional enhancements are currently being made.

The are several things to consider in running the assessment, with the majority of work taken on by the project lead. This involves organisational tasks, scripting and making the appropriate web pages – of course these tasks could be divided between a few colleagues. A second component is formed by the supervisors (usually full time academic or academic-related staff), who will work with one undergraduate team each, for approximately one a hour a week, and then, following submission of videos, typically mark eight or nine of them.

There is also the requirement for physical space, with the need for space for students to carry out computational activities, but also, more pressingly, the requirement for laboratory space during hours with technicians on hand. The project currently runs with 10 laboratory hours per week available for students to use.

## Reflection on the assessment

Following the adaptations of the assessment made during the pandemic, with the requirement for an online format, the first-year summer project has one of the least conventional assessments in the physics undergraduate curriculum. From staff side, the assessment has been seen to provide a very enjoyable factor to the students, appropriately conveying the enjoyable aspects of working in a research environment. Although the poster presentation has been continued as a non-assessed component of the exercise, there is an argument for re-introducing a grade for it, the rationale being that poster presentations of research work are a common feature of contemporary science conferences, and this would be a good time to start preparing students for this type of exercise.

## Advantages of the assessment type

- Team working can help students develop useful employability skills. Learning how to deal with conflict within groups and understanding

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the different mechanisms for collaboration is important.
- Allowing students an element of choice allows them to work within their interests which might lead to better engagement.
- The ability to tailor communication style to a specific type of audience is an important skill that the employers are looking for.
- The assessment is authentic in nature as it simulates an environment that some students might be entering at a workplace.
  Watch these videos on authenticity:
  1. What is authenticity?
  2. Designing authentic assessments
- A pre-recorded video presentation of any kind is always a good inclusive alternative to a live presentation as it benefits students who have issues with processing speed.

## Limitations of the assessment type
- When students have to produce more creative outputs, such as a video, they might spend inappropriate amount of time on the stylistic aspects as opposed to focusing on the content and the skills that are being assessed. It is therefore important to reinforce the message around what is and what is not assessed.

## Advice for implementation
- It is essential to carefully lay out the assessment criteria. If the learning objectives are well defined, the assessment criteria should follow easily from that.
- Reinforce what the expectations are in relation to the video and what within it specifically will be assessed. It might be useful to provide students with some exemplars of what is expected as this will help them understand the criteria better.
  Watch these videos on exemplars:
  1. What are exemplars?
  2. Pros and cons of using exemplars
  3. Strategies on how to successfully use exemplars
- Availability of staffed laboratory time and space is of paramount important in determining the breadth of topics students can explore for experimental projects.
- If students are given freedom as to the choice of the area of investigation it is useful to put some mechanisms in place to ensure that their choice is

suitable.
- Ensure that students are appropriately prepared to work in groups by allocating time in the briefing sessions to establish some ground rules around team working.
- Making students aware of how specific learning needs might affect group work should be part of any group work preparation.
- It is always useful to provide some suggestions as to the tools that students can use to make and edit videos. It is important to give them freedom to use what they feel comfortable with, but having some suggestions is useful for students who have less experience in the area.
- Drawing on the point above, those suggestions should align with College supported technologies. Faculty specific Ed Tech team can advise on that.
- It's useful to consider incorporating elements of peer assessment when it comes to assessing the process of group work. This might help highlight group members who contributed unequally.
- It is good for the learning outcomes to reflect key aspects that are being assessed such as communication and/ or creativity if they are an important part of student learning on the module.

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