

## **REAP Application**

### **L1 Biology at the University of Glasgow Institute of Biomedical and Life Sciences**

#### ***About the Class:***

The first year Biology course at the University of Glasgow consists of two modules, Module 1X and Module 1Y, with typically 650-700 students annually. The modules are a requirement for students intending to progress into Level-2 Biology, but they can also be taken as optional modules by any student on a degree programme at the University of Glasgow. There are no entry requirements for these first year modules.

Module 1Y, which runs over a period of 12 weeks, is designed to provide students with a broad-based understanding of the basic concepts of Biology at the whole organism and population level. It also give them an opportunity to experience many of the Biological subjects in which the University of Glasgow offers Honours degrees; this enables students to make informed decisions about their Level-2 curriculum. The course also encourages the acquisition of general scientific skills relating to the systematic assembly, critical analysis, interpretation and discussion of factual information and data.

Module 1Y comprises 40 one hour lectures, delivered at 4 per week for 10 weeks, and 3 skills workshops. Students are also required to attend 2 tutorials, 7 practical laboratories and 3 discussion sessions during the course. For several years they have also been required to complete a group exercise in which up to 8 students work together to create a poster and also take part in a biological debate. The initial topic for this exercise was AIDS, but over the last 6 years the topic has been 'Lifestyle'.

Students are graded using two paper-based objective question assignments (15%), a laboratory report (15%), the Lifestyle Project (20%) and a 2-hour end-of-course examination (50%) comprising MCQs, short essays, calculations and sequencing questions.

#### ***Current Group Exercise: The Lifestyle Project***

The majority of students studying Level-1 Biology at the University of Glasgow are interested in following programmes in human or whole animal biology. The Lifestyle Project was therefore designed to compare the lifestyles of humans in different countries and to investigate and evaluate the lifestyles of species other than humans. It was also designed to encourage students to develop team-working skills, acquire oral and visual presentational skills and to undertake independent research on topics of interest.

All of these are essential to success at university, whichever course a student decides to pursue in subsequent years. A peer marking component was included in the Group Exercise in response to student feedback in a previous years, as a way to identify "passengers" in the group.

The Lifestyle Project is currently divided into three sections:

- (i) students work in groups to produce a poster which compares the lifestyle of a typical UK resident with that of a typical resident of another country
- (ii) groups of students select a species and argue for the extinction of their chosen species from the planet, on the basis of its destructive lifestyle, and for the retention of their opponents' species in a head-to-head debate
- (iii) students research and complete a problem, individually (8%)

Apart from two scheduled meetings, groups are expected to interact in their own time, and they do so in a variety of ways (email, text, face-to-face, in the pub). As there are only two sessions for the group activities scheduled into the course timetable, many groups must meet outwith designated sessions. The diverse backgrounds of the Level-1 students in terms of other commitments (work, family, travel etc.), mean that many students cannot attend such meetings. This is a significant weakness of the current arrangements, which can limit the extent of the interaction of group members.

The group tasks (i) and (ii) are marked by two members of staff. The staff assess the quality of the debate presentations for and against each species, and also the ability of the groups to field questions at the end. The posters are marked against a number of defined criteria. The marks for the debate and the poster carry equal weighting and form 12% of the final mark for the module. In addition, students are asked to mark the other members of their group on the basis of their individual contributions to the debate and poster and according to a list of criteria agreed by the individuals in a group.

The method of peer marking currently used for the Group Exercises has evolved each year over the lifetime of the exercise (Cogdell *et al.*, 2004). In 2005-06 students allocated marks to the other members of their group on a confidential webform. Students were also asked to assess their own contributions to the group tasks and to write a short paragraph justifying this mark. In these ways our evaluation methodology does in some cases engage students in their own self-assessment, but only in an *ad hoc* manner.

Although the peer marking for most groups was processed automatically, without the need for manual intervention, in some cases the peer marking showed no clear pattern and in these cases group leaders and deputies would be consulted for further comments. This process of checking group marks and identifying unusual marking patterns is extremely time-consuming.

Student responses to the Lifestyle project are ascertained from a specific questionnaire that they complete during class time.

### ***Drivers for Change***

The main driver for change is to increase student motivation in Level 1 Biology, and thereby increase examination performance and also retention of students in the subject through first and subsequent years. This will be achieved by enabling the students to be more actively involved in their own learning, and to participate in a greater range of group activities which allow the possibility of discussion, reflection, peer assessment and support.

It is our intention to implement the group activities through online discussion forums within Moodle, which has recently been adopted by the University of Glasgow as its main Virtual learning Environment (VLE). Moodle is particularly appropriate for the proposed pilot project on group activities as it is designed to promote a “social constructionist pedagogy” (collaboration, activities, critical reflection, etc), and contains dedicated Forum modules.

The main driver for embedding the activity within Moodle is that it provides a more accessible forum for group interactions than previously available, and will therefore:

- improve the students’ learning experience
- allow students to participate in the group discussions regardless of the timing or other commitments (family, travel, work etc.)
- avoid any problems arising from student absence and ‘no shows’, since all students in a group will have access to material ‘posted’ in the forum
- provide a permanent record of the group interactions for both students and staff

There will be a ‘cost to change’ in performing the pilot project, but on its completion systems and procedures will have been established for performing group exercises on-line. These will offer the possibility for efficiency gains thereafter. This will apply both to students, who will be able to interact more efficiently using the on-line forums, and also to staff, by providing savings in the staff time required to set up and monitor these exercises, and to investigate problem cases. These savings will allow us to consider using these on-line group activities more extensively through the whole year, without a further impact on staff time.

In summary, the proposed project is pedagogically appropriate, will lead to improved practices and will deliver efficiency gains.

### ***Outline of Pilot Project***

The planned pilot will build on the current ‘Lifestyle Project’ in L1 Biology that already has the following features:

- skills tasks (poster and debate)

- participation of students in groups
- individual responses contributing to group discussion
- final agreed version of a deliverable that is used in poster and debate
- the “passenger” effect is dealt with by a confidential peer marking scheme

We wish to redesign these exercises to make it more explicit that they involve active engagement of students in their own learning, group interaction, self-assessment criteria, cyclical development and progression. We also want to introduce more effective tutor interaction and feedback, and to further develop the existing peer assessment procedures.

These exercises will capture study time and effort outwith the timetabled course programme, and will be embedded in a technological system (Moodle) which will act as an appropriate and effective on-line vehicle for these student-centred group activities.

The benefits of transferring the exercises on-line will be:

- to provide consistent structured information
- to increase student autonomy and provides the with more extensive opportunities for active involvement in defining criteria. If students engage in determining the assessment criteria, then the number of problem cases may be reduced
- to allow difficulties with students and groups to be identified early
- to provide a way for additional engagement by students in reflection
- to provide a sense of taking charge of their own learning, making the university course seem different to their experiences in school
- to provide an efficiency gain in staff time

### ***Implementation of Pilot Project***

Implementation of the pilot project will involve the following steps:

1. Create an on-line structure within Moodle of closed forums for private interactions of group members (~80 forums with 8 members per group), and also an open forum for general interaction of all students and teachers
2. Pre-load instructions into the Moodle open forum, and direct students to these. This will make instructions consistent for all groups
3. Release tasks progressively along a timeline, and define the ‘time on task’ allowed for each
4. Request a series of defined deliverables to specific deadlines (which represent the identified on-line milestones)
5. Make these deliverables available to class tutors
6. Encourage students to reflect at each stage (formative assessment)
7. Give motivational feedback to whole class at intervals, via the open forum (in order to keep mutual contact)

For each exercise the student groups will:

- decide on the marking criteria they will use to distribute their group mark, by picking from a list presented or by choosing their own
- post this on their Moodle forum to be the agreed group criteria
- decide on their choice of topic(s) from the options offered. For the poster exercise this will be the country to compare with UK, and the aspects of their economies and lifestyles to include. For the debate exercise this will be the species chosen to argue for retaining on the planet, together with the reasons for this choice.
- post a brief rationale for their choices on their Moodle forum
- decide on the group leaders and the division of tasks (research, synthesis of ideas, presentation)
- post a brief summary of their presentations on their Moodle forum
- participate in the real event (create poster; participate in debate)
- After receiving their group mark, all group members assess their peers against their own agreed criteria
- Return marks for other group members, and a mark for themselves together with a statement of justification, through a secure webform
- reflect on the exercise afterwards, and re-evaluate their marking criteria
- post a revised criteria list on their Moodle forum

The timing of these events is shown in Gantt Chart 1.

### *Assessment Methodology*

The elements that will be available for evaluation of the performances of the groups are all the deliverables they will produce through the group exercises. The following will be requested at regular intervals:

- list of peer-marking criteria
- rationales for choosing the topics for the poster and the debate exercises
- summaries of the group material for the poster and debates
- the poster
- group performance in the debate
- allocation of peer marks, with justification
- list of revised peer marking criteria

The timing of these events is also shown in Gantt Chart 1.

Some of these deliverables are necessary for the marking processes and for the allocation of group marks. Others (rationales, summaries) have the main objective to causing the group members to reflect on the processes in which they are engaged. Potentially, however, these will also provide information to teachers that can be used to provide feedback, and to help shape teaching. Collation of these various deliverables will be

facilitated by them being available to the staff monitoring the forums in defined on-line locations and in a standardised form.

Methods for calculating individual marks following the peer-marking process will be adapted from current procedures, but will involve asking for peer marks to be given as a percentage of a fixed sum, and by using median values in the calculation of an individual's mark from the peer marks received. Collaboration with the Department of Statistics is ongoing to develop these methodologies.

The peer marking component of the present group exercises does, to some extent, encourage self- and peer-evaluation, as students are asked to assess their own contributions to the group tasks and to write a short paragraph justifying their mark. However, in the pilot project these will be made more explicit, and will be embedded more clearly in the time line of the group exercises.

### ***Evaluation of the Pilot Project***

The outcomes of the pilot project will be evaluated in relation to the drivers for change, namely the improvement of both student motivation and performance, an enrichment of their learning experience, and the convenience and effectiveness of the on-line forums for group interaction. This evaluation will be achieved in the following ways:

- inspection of the deliverables produced by the student groups
- sampling of the on-line group activities (social interactions, task-based discussions)
- comparison of the performance of individual student in the Group Exercises with their overall examination grade
- an analysis of the student responses in the Lifestyle Project Questionnaire in comparison to the results of the same questionnaire used in the previous session (2005-06) – thus providing a 'before and after' comparison
- focus group sessions run by REAP in conjunction with the GU Learning and Teaching Service
- interviews with the GU staff involved in the pilot project conducted by REAP

The timing of these events is shown in Gantt Chart 2.

**Gantt Chart 1. Group Exercises**

Project Week	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Semester Week	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20	Week 21	Week 22
Deadline for Moodle submission: 5pm	29/01/2007	05/02/2007	12/02/2007	19/02/2007	26/02/2007	05/03/2007	12/03/2007	19/03/2006
INSTRUCTIONS	CRITERIA	CHOICES	DATA GATHERING	ENCOURAGEMENT	SUMMARIES	PRESENTATIONS	MARKING	REVISE CRITERIA
GROUP DELIVERABLES	POSTER	Discuss country	Choice of country and justification	Clarify the THREE chosen topics**	Submit data to Moodle	Final summary of poster	Submit poster	
	DEBATE	Proposed species and 2 reserves	Choice of species (for and against)* and justification for "for extinction" choice	Submit data to Moodle (for and against species)	Submit more data to Moodle (for and against species)	Final summary of debate	Take part in debate	
	GENERAL	Elect leader & deputy leader. Get to know your group	Division of roles & responsibilities. Finalise marking criteria				Peer marking via webform	Revise marking criteria
MONITORING	Check that groups are active	Collate criteria	Collate choices	Check tasks for completion	Collate summaries	Mark groups	Check marks & identify problems	Collate revised criteria
		*staff put this on Moodle	**possible intervention if 3rd topic is not biological					

**Gantt Chart 2. Project Milestones**

	January	February	March	April	May	June	July
STUDENTS	Form on-line Moodle groups	Group activities & deliverables	Poster & debate. Peer marking	Complete Lifestyle Project Questionnaire	Attend focus groups		
GU STAFF	Release instructions progressively Monitor group activities Collate deliverables		Assign Group marks. Calculate individual marks	Analyse Questionnaire & compare with questionnaire from previous session	Compare project marks with degree performance. Prepare Case Study	Prepare Report	Submit Report & Case Study
REAP STAFF	Provide pedagogical advice to GU staff			Interview GU Staff	Organise student focus groups	Advise on deliverables	

### ***Principles addressed***

This project addresses the super principles of engaging students in their own learning (Gibbs and Simpson, 2004), by 1) providing additional 'time on task' outwith the lecture/lab timetable, providing clear instructions and spreading the tasks evenly, and 2) by empowering students to be involved in their own assessment through peer-assessment procedures, and by a reflection process to stimulate self-assessment.

### **Super principles (Gibbs and Simpson, 2004)**

1. Capture enough study time
2. Spread work (time) out evenly along the course timeline
3. Use time productively for learning – deep not shallow
4. Communicate clear and high expectations

They also comply with the seven principles of good feedback practice (Nicol and Macfarlane-Dick, 2006) and thus provide empowerment steers.

### **Seven principles of good feedback practice (Nicol and McFarlane-Dick, 2006)**

1. Criteria: clarify what represents good performance
2. Self-assess – facilitate reflection and self-assessment
3. Provide usable information from external experts – that enables students to self correct
4. Interactive dialogue about feedback and learning – with peers and/or tutors
5. Motivation – self-esteem, self-efficacy – promote these through assessment. Positive attribution so students believe they can change performance
6. Close the loop: opportunities to apply the lessons learned, eg. to repeat the task after feedback
7. Learning and teaching provides information for modifying the teaching based on student learning

The ways in which the project objectives address these super principles and principles of good feedback practice are indicated below [*in italics*] in the structured description of the proposed group exercises.

## **Principle 1: Activities [The ‘engagement’ super principle of Gibbs and Simpson, 2004]**

### **Preliminaries: Group formation and defining of tasks, criteria and deliverables**

- Group members log in to their private forum, and establish social interaction
- Information about the exercises, including deadlines for group deliverables, is posted to the forums regularly and progressively [*clear goals – principle 1*]
- Lists of possible marking criteria posted by staff to forum [*high quality information – principle 3*]
- Groups decide on their own marking criteria, and post their agreed list to forum [*criteria – principle 1*]

### **Exercise 1: Poster: Present a poster that compares the lifestyles of people living in two different countries**

- Students attend Workshop on principles of poster design [*clear goals - principle 1*]
- This includes exemplars of posters produced by previous student cohorts [*feedback – principle 3*]
- Groups choose countries to compare on poster – by on-line discussion on Moodle Forum [*self-assessment – principle 2*]
- Reach consensus [*dialogue – principle 4*]
- Groups post choices to forum [*encourages positive motivational beliefs and self esteem – principle 5*]
- Divide up leadership role, research tasks and the construction tasks [*dialogue – principle 4*]
- Assemble and balance the information
- Create the end product – final poster [*motivational – principle 5*]

### **Exercise 2: Debate (two groups head-to-head): Argue for eliminating one species from planet, and against eliminating another**

- The choice of subjects (one species to retain, one to remove) is made by groups
- Divide up research tasks (in favour of eliminating one species and against eliminating the other) [*repeated cycle of topics and tasks – principle 6*]
- Assemble and balance the information
- Decide on presenters to propose and oppose the motions (one to several for each) [*dialogue – principle 4*]
- Participate in debate and respond to questions [*motivational – principle 5*] & [*provides information to teachers that can be used to help shape teaching – principle 7*]

## **Principle 2. Assessment [the ‘empowerment’ super principle of Gibbs and Simpson, 2004]**

- Assessors give marks and feedback to each group [*closes feedback loop – principle 6*]
- Members of the group assign marks to all group members by peer assessment [*development of self-assessment – principle 2*]

### ***Outputs of Pilot Project***

The outputs of the project will be a Report and a Case Study. These will be delivered by an agreed date (suggested mid-July 2007).

The Report will include a description of the execution of the pilot project; an analysis of student performance in the group exercises in relation to their overall examination grades; a ‘before and after’ comparison of the student responses to the group exercises, derived from the Lifestyle Project Questionnaires returns in the current session (2006-07) and those obtained in the session 2005-06; the responses of students to the value of group work as a learning aid, and to the use of on-line forums for group interaction (derived from focus groups and questionnaires). It will draw conclusions about the success of the project in meeting its objectives of improving the students’ learning experience, and enabling them to be more actively involved in their own learning. It will then address the future intent and identify how the philosophy, approach and methodology can be extended within the L1 Biology Course.

The Case Study will use the collated deliverables and the contents of selected group forums to illustrate the way in which the students engaged in each aspect of the group exercises, how their interactions developed over the course of the project, what they gained from these interactions, and how they subsequently acted in the peer-assessment exercises.

### ***Dissemination***

We intend to disseminate the results of this pilot project through talks presented to the GU Learning & Teaching Community at internal seminars, and to presentations at appropriate national conferences. A research paper will also be prepared for publication in an educational journal.

### ***Future Intent***

A decision has recently been made in the Biology Faculty at GU to re-order the two modules that comprise the L1 Biology course. This will happen in the session 2007-08, and provides an early opportunity to build upon the pilot project, since the group exercises will now take place towards the beginning of the academic year. We therefore

intend to embed the pilot project into the first module (Biology 1A), and also to extend it to other parts of the course, so that a programme of exercises of progressively increasing complexity and scale is developed spanning the whole first year. Possibilities include:

- Determine the profile of the group first at start of year (students make short statements about themselves). This also establishes a peer support network from the beginning
- An small initial social exercise, when the groups are first formed, which can also be linked to a skills workshop activity e.g., appreciation of the concept of 'plagiarism'
- The lifestyle group exercise, as developed from the pilot project
- The conversion of a report based on research into a topical aspect of 'Health Issues' within the lifestyle project from its current form of an individually assessed exercise to a group exercise
- A new exercise in the second module of the year (Module 1B), linked to such concepts as genetics or biotechnology.

### ***Deployment of Resources and Support Required***

The core course team (three University Teachers) will be involved in the course redesign, and other teaching staff involved in delivering L1 Biology will act as tutors to provide moderation and formative feedback if required. However, due to the scale of the project (~80 groups of 8 students) we seek further staff support to perform the task of monitoring participation in each forum, and to access the material and communications submitted by group members. Such information is also essential for interpreting the peer marking results, particularly if they are erratic.

In this application we seek pedagogical support from the REAP team, and also funding that will be used to develop the on-line vehicle for the exercises, to provide adequate moderation to monitor the activities of the large number of groups involved, and to obtain assistance in the evaluation procedures.

We estimate the level of assistance required to set up secure Moodle Forums and populate them with the student details is equivalent to 0.5 person month (full time equivalent) in January-February 2007. The person will have technical skills in Moodle programming. We estimate the level of staff support to be equivalent to 2.0 person months over the period that the group exercises run (February-March 2007). The persons will have skills in Learning and Teaching philosophies and methodologies. Assistance with the analysis of the results from the pilot, with the conducting of the focus groups and questionnaires and with preparing the reports is required for 3.5 person months.

## *References*

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