Why offer final-year projects?

E J Wood

The Centre for Bioscience

The Higher Education Academy

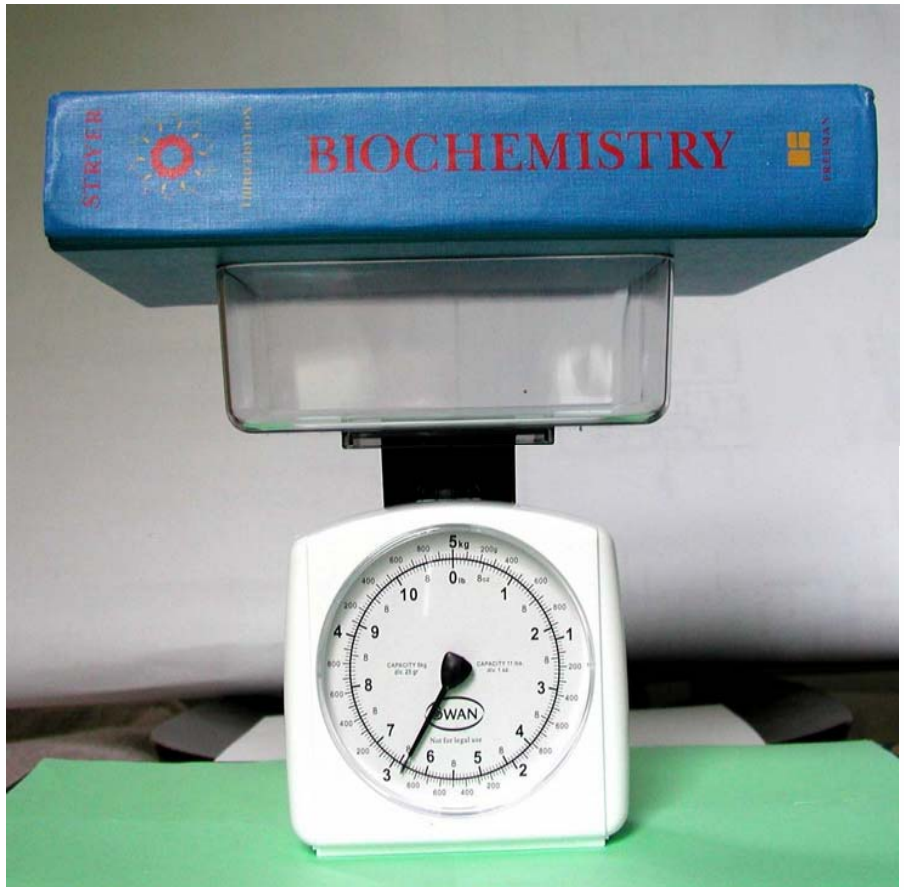
University of Leeds, LS2 9JT

e.j.wood@leeds.ac.uk

The Higher Education Academy Centre for Bioscience

Bioscience is a body of knowledge

The information that is in text books is there as a result of observation, experimentation, and analysis . . .



Bioscience is a body of knowledge

The information that is in text books is there as a result of observation, experimentation, and analysis . . .

. . . coupled with interpretation, generalisation, and engagement in controversy, by a multitude of scientists over many years.

Bioscience is a body of knowledge

The information that is in text books is there as a result of observation, experimentation, and analysis . . .

. . . coupled with interpretation, generalisation, and engagement in controversy, by a multitude of scientists over many years.

Not many students know that!

Training the future bioscientists

- **We have a responsibility for training the next generation of scientists who will be our replacements – no one else can do it.**

Training the future bioscientists

- **We have a responsibility for training the next generation of scientists who will be our replacements – no one else can do it.**
- **But how many of our students will not go on to careers in science?**

Training the future bioscientists

- **We have a responsibility for training the next generation of scientists who will be our replacements – no one else can do it.**
- **But how many of our students will not go on to careers in science?**
- **Should they be required to do lab projects? And if not what are the alternatives?**

Purposes of practical work

- ***Content*** **– illustration of the lecture material**

Purposes of practical work

- ***Content*** **– illustration of the lecture material**
- ***Application*** **– technical skills, use of instrumentation, safety**

Purposes of practical work

- ***Content*** **– illustration of the lecture material**
- ***Application*** **– technical skills, use of instrumentation, safety**
- ***Method*** **– planning, evaluation, presentation**

Purposes of practical work

- ***Content*** **– illustration of the lecture material**
- ***Application*** **– technical skills, use of instrumentation, safety**
- ***Method*** **– planning, evaluation, presentation**
- ***Philosophy*** **– how scientific enquiry is conducted, critical appraisal**

Progression in laboratory training

Years 1/2

- **Illustrate the lecture course – biological phenomena, investigative techniques**

Progression in laboratory training

Years 1/2

- **Illustrate the lecture course – biological phenomena, investigative techniques**
- **Learn simple manipulative skills, handle biological materials, work safely**

Progression in laboratory training

Years 1/2

- **Illustrate the lecture course – biological phenomena, investigative techniques**
- **Learn simple manipulative skills, handle biological materials, work safely**
- **Observe, record, process data, present results**

Progression in laboratory training

Years 3(/4)

- **Plan experiments, write protocols, be critical of data (their own and those of others)**

Progression in laboratory training

Years 3(/4)

- **Plan experiments, write protocols, be critical of data (their own and those of others)**
- **Find information**

Progression in laboratory training

Years 3(/4)

- **Plan experiments, write protocols, be critical of data (their own and those of others)**
- **Find information**
- **Pose worthwhile questions, hypotheses, reason logically, problem-solve**

Progression in laboratory training

Years 3(/4)

- **Plan experiments, write protocols, be critical of data (their own and those of others)**
- **Find information**
- **Pose worthwhile questions, hypotheses, reason logically, problem-solve**
- **Communicate results (orally and in writing)**

Progression in laboratory training

Years 3(/4)

- **Plan experiments, write protocols, be critical of data (their own and those of others)**
- **Find information**
- **Pose worthwhile questions, hypotheses, reason logically, problem-solve**
- **Communicate results (orally and in writing)**
- **Function as a member of a team**

Final-year projects

- **Enable students to get a real feel for research**

Final-year projects

- **Enable students to get a real feel for research**
- **Enable the student to be both self-reliant and to work as a team member**

Final-year projects

- **Enable students to get a real feel for research**
- **Enable the student to be both self-reliant and to work as a team member**
- **Develop a number of skills in addition to lab-based skills:**

reading the literature
criticising data
presenting data
planning experiments
writing protocols
spreadsheets, statistics

Format of final-year projects

- **12–20 weeks, number of lab-days or hours specified**

Format of final-year projects

- **12–20 weeks, number of lab-days or hours specified**
- **Initial discussion with supervisor to agree work, literature survey, initial aims**

Format of final-year projects

- **12–20 weeks, number of lab-days or hours specified**
- **Initial discussion with supervisor to agree work, literature survey, initial aims**
- **Supervision by/working with post-docs and postgrads**

Format of final-year projects

- **12–20 weeks, number of lab-days or hours specified**
- **Initial discussion with supervisor to agree work, literature survey, initial aims**
- **Supervision by/working with post-docs and postgrads**
- **Final report in the style of a scientific paper**

Format of final-year projects

- **12–20 weeks, number of lab-days or hours specified**
- **Initial discussion with supervisor to agree work, literature survey, initial aims**
- **Supervision by/working with post-docs and postgrads**
- **Final report in the style of a scientific paper**
- **Oral presentation, poster, viva**

Some observations of student reactions

- **How long it takes to make up one solution**

Some observations of student reactions

- **How long it takes to make up one solution**
- **Experiments need repeating – and how do you know you've got the right answer?**

Some observations of student reactions

- **How long it takes to make up one solution**
- **Experiments need repeating – and how do you know you've got the right answer?**
- **Laboratory activity – hard work, frustration, but also rewards and satisfaction**

Some observations of student reactions

- **How long it takes to make up one solution**
- **Experiments need repeating – and how do you know you've got the right answer?**
- **Laboratory activity – hard work, frustration, but also rewards and satisfaction**
- **Writing up – hard task, data incomplete, learning how to write, satisfaction, rewards**

Some observations of student reactions

- **How long it takes to make up one solution**
- **Experiments need repeating – and how do you know you've got the right answer?**
- **Laboratory activity – hard work, frustration, but also rewards and satisfaction**
- **Writing up – hard task, data incomplete, learning how to write, satisfaction, rewards**
- **Realistic decisions about career**

QAA Benchmark statements

The QAA Benchmark statements for both Bioscience and Agriculture etc. emphasise the importance and desirability of offering final-year projects.

"All honours degree students are expected to have some personal experience of the approach, practice, and evaluation of scientific research (for example within a project or a research-based assignment)."

Projects are expensive

- **Projects are expensive in time and money**

Projects are expensive

- **Projects are expensive in time and money**
- **Few departments provide the full economic cost for reagents, etc**

Projects are expensive

- **Projects are expensive in time and money**
- **Few departments provide the full economic cost for reagents, etc**
- **Poor, or poorly-motivated students may just be throwing expensive chemicals down the sink**

Projects are expensive

- **Projects are expensive in time and money**
- **Few departments provide the full economic cost for reagents, etc**
- **Poor, or poorly-motivated students may just be throwing expensive chemicals down the sink**
- **And is what they learn useful in spheres other than science?**

What about students who do not wish to continue with a career in science?

- **Offer taught courses instead?**

What about students who do not wish to continue with a career in science?

- **Offer taught courses instead?**
- **Offer ‘literature review’ projects?**

What about students who do not wish to continue with a career in science?

- **Offer taught courses instead?**
- **Offer ‘literature review’ projects?**
- **Offer “computer” projects**

What about students who do not wish to continue with a career in science?

- **Offer taught courses instead?**
- **Offer ‘literature review’ projects?**
- **Offer “computer” projects**
- **Offer “community” projects**

What about students who do not wish to continue with a career in science?

- **Offer taught courses instead?**
- **Offer ‘literature review’ projects?**
- **Offer “computer” projects**
- **Offer “community” projects**
- **Are there other “research-based” assignments that might be used?**