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# Evaluation of Teaching

A Physical Sciences Practice Guide

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Figures referred to in the text can be found at the back of the guide.

# What is Evaluation?

It is the means by which a course or a curriculum change can be monitored to see if, in fact, it is what it claims to be and if it achieves, in students, the intended outcomes. For an evaluation to take place in any measured way, the purposes of a teaching innovation and the expected outcomes in terms of student learning and attitude changes must be specified. A lot of what has passed for evaluation has been anecdotal and based on statements such as, 'the students seem to like it', or 'the attendance at labs is better'. There is nothing wrong with either statement, but in themselves, they do not constitute an evaluation. They may be dimensions within an evaluation, offering pointers, but they fall short of any scientific measurement.

# What is to be Evaluated?

As implied above, student enjoyment and apparent interest are some of the factors we need to look at, but the range is much greater and must arise out of the *declared purposes* of the innovation. As Mager pointed out many years ago[1] “If you don't know where you are going, you are likely to end up some place else and not know it”.

The factors or dimensions we use for the evaluation can span a wide range including:

- Improved student learning (measured in new or conventional ways)
- Students' attitudes to a course in terms of ease or difficulty, pleasantness or unpleasantness, work load, teacher performance, methods of presentation and so on
- Ease of organisation
- Staff commitment
- Economy of resources and time
- Type of examination and ongoing assessment
- Employers' reactions
- Standards acceptable nationally or internationally.

The list could be extended a long way, but the range of evaluation is potentially very wide.

# How to Evaluate?

Here again the range of methods is very large and, for practical purposes, has to be curtailed. However, it is certain that no one method will suffice to evaluate multiple dimensions. Many of the things needing to be evaluated are attitudinal in nature and there is ***no absolute*** way of measuring attitude. What is meaningful is ***attitude change.*** This implies a series of measurements at different time intervals, but less obviously, it also implies sets of complementary measurements. For example, one might apply a questionnaire at intervals to measure ***what changes*** have taken place, but simultaneous interviewing of a subset of the student sample is necessary to answer the ***why*** questions about any changes in student response. A questionnaire (like multiple-choice questions) indicates the students' choices, but does not tell us the reasoning behind the choices. We need face-to-face interviews with individuals or groups to fill out the picture. If the latter is missing, we can make deductions from the results of a questionnaire that may be invalid.

# Response to Evaluation

Seldom does an evaluation give a wholehearted endorsement to any innovation. However, we as innovators have put something of ourselves - our time, our ingenuity, our beliefs about learning - into the production of a new course or the use of a new computer program. It is against the grain of human nature to accept criticism of our pet ideas without a feeling of hurt, resentment and even hostility. We feel almost personally attacked if students do not respond in the way “we were sure they would”. This is less than scientific, but entirely natural and understandable.

Teachers sometimes have a knack of confusing their own enthusiasms with those of their students. This has been evident in so many of the changes in the teaching of science over the last 25 years when the changes, among other factors, have caused students to vote with their feet and leave science. They have been trying to tell us something! This is a tough form of evaluation.

In our panic to reverse this trend, we have either changed nothing (in the hope that students would see sense and return to the fold), or have continued to innovate without clear learning guidelines to inform these changes. The effect may have been to exacerbate rather then ameliorate the situation.

If ever honest evaluation was needed and heeded, now is the time, before we dissipate more energy and innovation in fruitless pursuits!

The simple message is, “If you don't want to be hurt, don't try to evaluate, but if you want to save yourself in the long run and serve your students well, conduct and accept evaluation in a scientific and honest way”.

# Evaluation in This Guide

It would require a substantial book to cover all the dimensions of evaluation and how to measure them. For the purposes of this guide, we shall confine ourselves to a few methods and use them as exemplars of the more general principles of evaluation. The methods described will be of the pencil and paper kind; some of which are amenable to computer processing while others are rather more subjective.

## Evaluation of a course

In gathering student views of a course, we have to look at technical things as well as matters of style and presentation, which are functions of personality.

a) *Construction of an evaluation instrument*

Let us first consider technical things such as:

- Can the lecturer be heard?
- Can blackboard work be read at the back of the hall?
- Are OHP transparencies visible and are they left long enough on the projector?
- Is the lecture room too hot?
- Is the lighting in the room adequate?

These can be answered directly and objectively by the students.

However, there are questions about lecturers' delivery such as:

- Is the presentation interesting?
- Do they display a sense of humour?
- Can you learn easily from them?
- Are the ideas clear?
- Is the lecturer confident, giving the student a feeling of confidence?
- Do the demonstrations work and teach me anything?

and so on.

All of this can be dealt with in a questionnaire in the form of a set of statements with which the student has to agree or disagree along some scale. However, students can go down a questionnaire column mindlessly ticking boxes, such as 'agree' or 'neutral' and make the 'measurement' valueless.

To overcome this, two strategies are used. The ***first*** is to change the polarity of the statements so that sometimes the 'desired' response is 'strongly agree': and in others 'strongly disagree'. The ***second*** is to test the same dimension twice in the questionnaire, using different words, and then look for a strong correlation between the two response patterns.

With the kind permission of Dr Peter MacGuire, University of Glasgow[2], a questionnaire, gathering information about lectures, is shown to illustrate the points made above (Figure 1).

**Part A** is seeking general information about the course. You will notice the changes in polarity in which Questions 1 and 4 are in one direction while Questions 2, 3 and 5 are in the opposite direction.

**Part B** deals with the course content and the lecturer characteristics. You will observe the 'technical' questions such as 11, 18 and 20 and 'personality' questions such as 12, 14, 19 and 22.

**Part C** is a free response section giving the students a feeling of not being confined by the fixed response questions in Parts A and B.

**Parts A** and **B** are mark-sense markable.

You will also notice that dimensions are being sampled twice. For example, Questions 6 and 15 form a pair, Questions 19 and 22 are paired and of opposite polarity, Questions 12 and 15 go together. You can find other pairings throughout the questionnaire.

Unlike many physical measurements, this kind of measuring instrument has to be designed and calibrated before measurements can be made with any confidence.

b) *Using the data from an instrument*

It must be clearly understood that data are, at best, ***ordinal*** and ***not cardinal***. There is no way of knowing if the interval between 'neutral' and 'agree' is the same as that between 'agree' and 'strongly agree'. If we number 'strongly agree' as 1, 'agree' as 2, and so on to 'strongly disagree' as 5, these numbers cannot, with any confidence, be added, subtracted or averaged to give anything meaningful. It has to be admitted that such pseudo arithmetic is commonly applied, even in otherwise reputable journals! A moment's reflection will show the drawbacks. If the class were to respond to any question in the form of a normal distribution of frequencies, the pseudo arithmetic would give an 'average' value of 3. However, if the class were split equally between 'strongly agree' and 'strongly disagree' the *'average' value* would still be 3. The same value would arise from any symmetrical distribution of response frequencies. To carry out this 'averaging' is to lose the vital data which can be seen only by inspecting the whole frequency distribution. Another illogical outcome of the pseudo arithmetic is seen when one asks if 'disagree', *labelled 4*, is twice as great as 'agree', *labelled 2*. Clearly they are not. The numbers seen in the specimen questionnaire are just labels.

A further nonsense occurs if any attempt is made to compound 'scores' across all or some of the questions if the questions are measuring different dimensions. This is about as meaningful as adding the number of doors in a car with the number of wheels and the mileage on the odometer. You will get a number, but it will have no meaning!

The only way to make sense of the data from this kind of questionnaire is to look at the distributions of the frequencies to each response. This will show trends, skews and polarities, all of which are useful. If one dimension is being checked by more than one question, the response validity can be found in the correlation (visual or calculated) between distributions. In the validation of his questionnaire, MacGuire, using 150 students, checked the correlations between each question and every other question in the sheet to see if, in fact, 'pairs' correlated highly.

Earlier in this guide, we noted that we would expect to see a strong correlation between Questions 6, 12 and 15. MacGuire reports correlations of +0.85, +0.84 and +0.95 in this cluster, but much lower correlations with other questions. Questions 19 and 22 correlate at -0.87, showing a strong relationship and a change in polarity (indicated by the negative sign). However, one does not need to go to the trouble of calculating correlations. Inspection of frequency distributions is, in most cases, a perfectly adequate check.

Once the questionnaire is designed and internally validated, it can be used many times for a large variety of courses. Minor changes in wording can make it suitable for lectures, tutorials, problem-solving sessions and computer programs.

Having obtained the data, what does one do? Decisions have to be made, in the light of departmental policy, about who sees the results. In all fairness, the teacher must see them but perhaps someone else, such as the course coordinator, should also see them. In some departments, questionnaires are made public so that the students can also see that their responses are being taken seriously and staff members can have some indication of how they stand in comparison with their peers. In any case, students should be made aware that their views are being heard and acted upon. On the 'technical' matters, they should see improvements almost overnight. When student views are negative, it is sometimes because they don't see the point of something they are being asked to do. This does not mean that the teacher is at fault, but that some explanation of the overall plan should be shared with the students.

Questionnaires of this kind give useful snapshots of student reaction, but for the evaluation of innovation, it is good to have an album of snapshots.

The first application of the instrument is used to establish a baseline, applied to the situation either before the innovation is begun, or applied to the early version of the innovation. Later applications of the same instrument can then show changes and trends that tell a more reliable story about the innovation. Almost all innovations carry a 'halo' that affects the initial student reaction. If the teacher is the innovator, then enthusiasm will show through and affect the students. If the teacher is not the innovator and has had the changes imposed 'from above', then lack of enthusiasm (or even antagonism) shown by the teacher will affect the student responses. To get a fairer and more realistic picture, the instrument must be applied to later cohorts of students when the teacher 'halo' (either positive or negative) has lost its glow. Few innovations survive intact in the hands of the innovators and even fewer survive in the hands of other teachers. We need a set of pictures over a longish time base to do a complete evaluation.

## The special case of practical work

The questionnaire shown in Figure 1 is adaptable to most teaching situations, but the laboratory poses different teaching and learning strategies, warranting a separate questionnaire. An example of a laboratory questionnaire (designed using the same principles as the previous one) is shown in Figure 2. Again the designer is MacGuire.

These two questionnaires can be used, with due acknowledgement to their author, or they can be used as templates on which you can base your own design.

# Another Kind of Evaluation

Sometimes a less detailed evaluation is required in order to investigate long-term effects on the students' attitudes to learning in general. Does a whole course, or even a whole university experience, move the students to a mature view of learning and knowledge and to a position of self-sustaining and responsible scholarship?

To tackle questions of this kind, some model of student learning and maturation is needed to help us to design instruments for evaluation. One model currently in use in this country comes from Entwistle and his colleagues[3]. In this, they describe students as shallow learners, deep learners and strategic learners. Using their test material it would be possible to detect movement in a class from shallow to deep learning or other shifts.

Another model that has gained some currency among chemists[4,5] is based upon the work of Perry[6]. Perry's Model is developmental in nature, attempting to trace the stages in maturation during a period of learning. He claimed to observe nine stages between that of a naive student wishing to be spoon-fed and to regurgitate and, at the other extreme, a mature student who is committed to self-driven learning and whose views of knowledge have moved from black and white to contextual and who could truly be called a scholar. Perry's work was done by interviews with students over the whole period of a degree.

Attempts have been made to convert Perry's ideas into a questionnaire form with varying degrees of success. Simplification has been necessary, reducing the number of categories from nine to three or four, and reducing the factors to four or five.

One version of Perry's work that has proved of use is set out in Figure 3. In this, four dimensions have been chosen to make up the horizontal rows. These are:

- Student role
- Lecturer’s role
- View of knowledge
- View of examinations.

In the vertical columns three types of student have been described. Any experienced teacher will have met examples of these 'typical' students.

- **Students in position A** see their job as one of committing to memory what they are taught. This is an uncritical operation because they are confident that the teacher will give them exactly what they need for the exam; no more and no less. In the sciences especially, they see knowledge as made up of black and white, incontrovertible facts, which have to be reproduced for the exam. Understanding is not really a necessity. Exams that facilitate this black and white view (i.e. multiple-choice) are welcome. Any problems should be of an algorithmic nature, which they have met many times. 'Unseen' problems are unwelcome.

- **Students in position B** seem to be in a less happy position. They now know that their job is not just to swallow information in an uncritical way, but they are unsure about what they should be doing. Whenever the teacher suggests that there is more than one way of looking at things, they accept this, but try to find out which the teacher favours so that they can be sure of giving that view in the exam. They are beginning to realise that the teacher may not know all the answers and that makes them feel very insecure. When it comes to the exam, they write all they know and leave the teacher (as examiner) to pick out what is relevant. You will recall marking papers like this!

- **Students in position C** have moved from the insecurity of Students in position B and now display a confidence in their ability to learn for themselves, seeking meaning and pattern in knowledge. Knowledge is no longer black and white, but its interpretation and use depends upon the context. For example, the best method of synthesis of compound X, from a laboratory point of view, may not be the best when considered from an industrial or from an environmental stance. Students in position C realise that there are sources of knowledge besides the teacher: books, programs, other teachers, peers or even themselves. Exams are not occasions to spout received information, but are opportunities to show a considered response and to exhibit lateral thinking. This type of student dislikes multiple-choice testing.

In terms of confidence, Students in position A are confident in the ***system***: the teacher, the lecture, and the exam. Students in position C are confident in ***themselves*** and in their ability to learn on their own or in a group or by whatever method they find congenial. Students in position B, however, sit in a trough of uncertainty and low self-esteem.

Recent research has shown that the developmental picture in the Perry Model is not a simple linear progression from A to C or even along all nine Perry stages. Students can revert to earlier levels depending upon their perception of what is required of them for 'success' in a course. On the other hand, the teaching and learning ambience can help students towards the highest levels.

Perry's Model has recently been used to measure the effects of a massive change in teaching from a lecture based 'cram' course in medicine to a Problem-Based Learning (PBL) course[7]. The avowed intention of PBL is to encourage the growth of Student C behaviour and measurements reveal that this has occurred for most students in terms of their view of the nature of knowledge, of their perception of themselves as learners and their teachers as facilitators. However, their view of examinations has stuck firmly in Student A behaviour. This proves that teaching and learning changes have ***not*** been reflected in the methods of examination. This evaluation has driven the innovators to switch their attention to the examinations so that they support the direction of the teaching and learning.

## Longitudinal Attitude Measurement

Evaluation in this area requires considerable refinement, but the basic principles mentioned in the earlier exemplars remain. More than one measurement is required and all pencil and paper data have to be supplemented by interview. There has also to be a time base to allow a set of 'snapshots' to be taken to look for changes and trends. Figure 4 shows one of the instruments that can be used. The array in Figure 3 is scrambled and offered to the students to impress their own pattern. If all A, or all B, or all C type responses are chosen, then it is easy to categorise the students as A, B or C; but in reality, mixtures occur which suggest intermediate or transitional behaviour. However, if the second 'snapshot' shows a change in some direction we can now consider valuable differences in response rather than absolutes. For example, a student showing AABB on the first occasion may change to ABBC showing a drift towards C.

It may be, of course, that C is not the desired goal for a given course, but so much of what is said in educational, political and industrial circles would suggest that C should be the goal.

Other measuring instruments can be used as variants of the one shown in Figure 4.
Some researchers have taken individual statements, such as those in Figure 4, and have asked students to agree or disagree with each statement on a five-point scale. This raises problems. If students disagree with an A statement, are they displaying a B or a C attitude? If other students consistently disagree with B statements are they displaying an A or a C attitude? To get some measure of where the student’s attitude lies, a laborious analysis of a large array of responses over all the statements is required and this becomes so cumbersome that it is not recommended as a workable tool.

Another version which yields rich information, but which is not amenable to machine processing, is shown in Figure 5. This is just a small portion of the total questionnaire, but it shows the method. Each student is asked to agree or disagree with a series of statements and then to write a sentence or two to justify the choice. If students disagree with an A statement (as shown in the first example), the justifying sentence makes it clear if their attitude is B or C. Again this is a laborious process, but the rich yield of information may well justify the effort.

Yet another version[8], which is machine markable, and which substantially overcomes the problems of the versions mentioned above, is shown in Figure 6. Here the students are presented with two statements, one A and one C, on the same attitude dimension. Between the statements are five boxes and the students are asked to shade the box nearest to their view. There is a range between strongly agreeing with the A statement, agreeing with it, strongly agreeing with the C statement, agreeing with it and, in the middle, is a neutral position which subscribes to neither pole and so may be identified with the B position. These responses can be rapidly scanned by a mark-sense reader to produce information about individuals or about a class as a whole. If this is applied on more than one occasion, trends can be observed in the differences between snapshots. Treating results as absolute measures can be misleading and should be avoided.

Whatever version is adopted, the choice of students for interview is basically the same. Valuable information can be obtained by interviewing those who have made a large change towards position C and those who have regressed. In the Figure 4 version, students with a particularly interesting comment and justification would be worthy of interview.

All of these versions may appear to be very laborious, but the instruments in this guide may be copied or modified (with due acknowledgement*) and will yield data which will give valuable insights into the effects of course design and enable logical changes to be made to rectify any deficiencies.

In the same way as student assessment can give diagnostic help to the student and the teacher, so evaluation, of the kind set out in this paper, can illuminate and give direction to our efforts to improve our teaching and our students' learning. By offering a systematic approach, evaluation will, in the long-run, save time and bring scientific realism to bear upon our efforts.

*

| | |
|---|---|
| Figures 1 and 2 | Dr P R P MacGuire |
| Figure 3 | Prof A H Johnstone |
| Figures 4 and 5 | Dr A M Mackenzie |
| Figure 6 | Dr D B Selepeng |

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Figure 1

# UNIVERSITY OF GLASGOW

## Centre for Science Education

STUDENT EVALUATION OF TEACHING

This questionnaire is seeking information about your experience of ***this*** course and ***this*** lecturer.

Please answer each question accurately. If you feel you cannot answer a particular question, leave it and go on to the next question. Your responses are anonymous.

Please use an HB pencil. Mark the boxes like this ▬ . Rub out errors thoroughly.

## PART A

1. Relative to other courses I have done, this course was

   very easy [1] easy [2] reasonable [3] difficult [4] very difficult [5]

2. Relative to other courses, the workload for this course was

   very heavy [1] heavy [2] reasonable [3] light [4] very light [5]

3. For me, the pace at which this course was presented was

   too fast [1] fast [2] about right [3] slow [4] too slow [5]

4. Overall, I would rate this course as

   very good [1] good [2] satisfactory [3] poor [4] very poor [5]

5. Overall, I would rate the lecturer as

   very poor [1] poor [2] satisfactory [3] good [4] very good [5]

## PART B

Please indicate the extent to which you ***agree*** or ***disagree*** with each of the following statements by filling in the appropriate box.

| | Strongly agree | Agree | Neutral | Disagree | Strongly disagree |
|---|---|---|---|---|---|
| **COURSE CONTENT** | | | | | |
| 6. I understood the subject matter | [1] | [2] | [3] | [4] | [5] |
| 7. Course co-ordination was very poor | [1] | [2] | [3] | [4] | [5] |
| 8. I found the course was challenging | [1] | [2] | [3] | [4] | [5] |
| 9. Course content was well prepared | [1] | [2] | [3] | [4] | [5] |
| 10. I learned something valuable | [1] | [2] | [3] | [4] | [5] |
| 11. Recommended readings contributed to my understanding of the course. | [1] | [2] | [3] | [4] | [5] |
| **LECTURER CHARACTERISTICS** | | | | | |
| 12. Effective communicator | [1] | [2] | [3] | [4] | [5] |
| 13. Enthusiastic about teaching the course | [1] | [2] | [3] | [4] | [5] |
| 14. Teaching style held my interest | [1] | [2] | [3] | [4] | [5] |
| 15. Gave clear, lucid explanations | [1] | [2] | [3] | [4] | [5] |
| 16. Made note-taking difficult | [1] | [2] | [3] | [4] | [5] |
| 17. Stimulated my interest in the subject | [1] | [2] | [3] | [4] | [5] |
| 18. Used OHP (and/or blackboard) well | [1] | [2] | [3] | [4] | [5] |
| 19. Friendly and approachable | [1] | [2] | [3] | [4] | [5] |
| 20. Well organised | [1] | [2] | [3] | [4] | [5] |
| 21. Confident and self assured | [1] | [2] | [3] | [4] | [5] |
| 22. I would not go to this lecturer for help | [1] | [2] | [3] | [4] | [5] |

## PART C (optional)

What improvements to the course, or to the teaching, could you suggest? Write your comments below:

Thank you for answering this questionnaire. Please return it as directed.

DRS Data & Research Services Plc/H27900190/JOCG

# UNIVERSITY OF GLASGOW

## Centre for Science Education

Figure 2

## STUDENT EVALUATION OF LABORATORY WORK

Title of Course: ______________________ Date: ______________

This questionnaire is seeking information about your experience of the present laboratory course.

Please answer each question accurately. If you feel you cannot answer a particular question, leave it and go to the next question. Your responses are anonymous.

Please use an HB pencil. Mark the boxes like this ▬ . Rub out errors thoroughly.

---

## PART A

1. Relative to other laboratory courses I have done, this course was

   very easy ▭ easy ▭ reasonable ▭ difficult ▭ very difficult ▭

2. Relative to other laboratory courses, the total workload for this course was

   very heavy ▭ heavy ▭ reasonable ▭ light ▭ very light ▭

3. For most experiments in this course, I found the time allotted was

   too short ▭ rather short ▭ adequate ▭ rather long ▭ too long ▭

4. For most experiments, the necessary equipment and materials were

   readily available ▭ easy to find ▭ available ▭ hard to find ▭ unavailable ▭

5. For most experiments, the help I received from laboratory staff was

   excessive ▭ ample ▭ limited ▭ insufficient ▭ minimal ▭

6. Overall, as a learning experience, I would rate this laboratory course as

   worthless ▭ of little value ▭ worthwhile ▭ very valuable ▭ outstanding ▭

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## PART B

Please indicate the extent to which you ***agree*** or ***disagree*** with each of the following statements by filling in the appropriate box.

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| 7. The lab work trained me to interpret data. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 8. The lab work taught me some basic skills. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 9. The lab work helped me to understand some of the topics covered in the lecture course. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 10. Doing the lab work has made me more interested in the subject. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 11. The purpose of each experiment was clear to me. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 12. In some experiments, I was only following the instructions - just like a recipe. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 13. In some experiments, I found it difficult to make any deductions from my observations. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 14. The demonstrators offered effective supervision and guidance. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 15. Experimental procedures were clearly explained in the lab manual. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 16. It was easy to follow the lab manual because it was well organised. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 17. I needed more instructions as to how to write up my lab reports. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 18. I think the assessment of my lab reports was fair. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 19. | ▭ | ▭ | ▭ | ▭ | ▭ |
| 20. *(Statements 19-22 will be chosen* | ▭ | ▭ | ▭ | ▭ | ▭ |
| 21. *from the list overleaf. You will be told which 4 statements to use)* | ▭ | ▭ | ▭ | ▭ | ▭ |
| 22. | ▭ | ▭ | ▭ | ▭ | ▭ |

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***This questionnaire is continued overleaf. Please turn over for PART C.***

*DRS Data & Research Services Plc E61100793/TOCX*

Figure 3

| | Student in Position A | Student in Position B | Student in Position C |
|---|---|---|---|
| ***Student Role*** | Passive acceptor. | Realises that some responsibility rests with the student. But what? And how? | Sees student as source of knowledge or is confident of finding it. Debater, making own decisions |
| ***Lecturer's Role*** | Authority, giving facts and know-how. | Authority. Where there are controversies, wants guidance as to which the lecturer favours. | Authority among authorities. Values views of peers. Teacher as facilitator. |
| ***View of knowledge*** | Factual; black and white; clear objectives; non-controversial; exceptions unwelcome. | Admits 'black-and-white' approach not always appropriate. Feels insecure in the uncertainties this creates. | Wants to explore contexts; seeks interconnections; enjoys creativity; scholarly work. |
| ***View of exams*** | Regurgitation of 'facts'. Exams are objective. Hard work will be rewarded. | Quantity is more important than quality. Wants to demonstrate maximum knowledge. | Quality is more important than quantity. Wants room to express own ideas, views. |

Figure 4

UNIVERSITY OF GLASGOW

**TEACHING AND LEARNING SERVICE**

**Please enter your matriculation number:** ❑ ❑ ❑ ❑ ❑ ❑ ❑

***Please read carefully the statements on the following pages and answer each question as accurately as possible (but without agonising over your answers!). Thank you for your time and co-operation.***

**SECTION A**

The statements below are about your views of knowledge and learning. In each case, choose *ONE* statement which ***best fits your view at present*** and tick the appropriate box.

1. **My job as a student is:**
(*tick one box only)*

To accept the information given to me without question and to learn it. ❑

To accept that some responsibility rests on me for learning, but I am not sure what is expected of me about what or how to learn. ❑

To accept what is given, but to think about it critically, to check other sources for myself and take responsibility for what and how I learn. ❑

2. **I think that the job of members of staff is:**
*(tick one box only)*

To give me all I need to know but where there is more than one way of looking at things, it should be indicated clearly which way is preferred. ❑

To provide me with information but I realise that members of staff are not the only source of information and that I can find things out for myself to supplement what they have given. ❑

To give me all I need to know and to avoid any extra non-examinable material. ❑

3. **I think that knowledge is:**
*(tick one box only)*

A collection of unchangeable facts which are either right or wrong. I dislike uncertainties and vague statements. I am uncomfortable if I am asked to think for myself. I prefer to be given the facts. ❐

Complex and by no means all black and white, but I find this exciting and stimulating. It makes me want to explore things for myself. ❐

Not just a collection of black and white facts but that there are shades of grey. Things may be right or wrong depending on circumstances and context. This uncertainty makes me feel uncomfortable. ❐

4. **My job in assessments and exams is:**
*(tick one box only)*

To give back the facts I have learned as accurately as possible I prefer questions with single clear-cut answers rather than open long questions. ❐

To answer the questions, including what I have been taught and what I have found out for myself from reading or other sources. I dislike questions which force me into a fixed answer (such as multiple choice) and prefer open questions in which I have room to show my own thinking. ❐

To give back all I know about the topic and leave the marker to give me credit for the relevant bits. I quite like open-ended questions, which allow me to show how much I know. ❐

Please tick the appropriate box if you *AGREE* or *DISAGREE* with the following statements. Please justify each answer in a sentence or two.

| Statement | *Agree* | *Disagree* |
|---|---|---|
| A good thing about medical sciences is the fact that everything is so clear-cut, either right or wrong. *Please justify your decision briefly.* ______ ______ ______ | ❑ | ❑ |
| There sometimes seems to be so many ways of looking at scientific subjects, I feel confused about what is right and wrong. *Please justify your decision briefly.* ______ ______ ______ | ❑ | ❑ |

**Please use this sheet if you would like**

**i)** **to expand on any of your answers in the questionnaire**

**ii)** **to add any comments about your learning experience, in general, as a first year medical student**
(eg *has first year been easier/more difficult/much as you expected it to be; with hindsight, in what ways if any would you approach first year differently; do you think you have changed your methods of learning or studying in any way this year, etc*)

______

# APPENDIX 1a

Figure 6

## UNIVERSITY QUESTIONNAIRE - Part 1

### UNIVERSITY OF GLASGOW

### Centre for Science Education

### Student Questionnaire

*Year of Study* 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

*Sex* Male ☐ Female ☐

*Matriculation Number* ☐

This questionnaire is about your approach to learning. you are provided with pairs of opposing statements with five boxes between. By shading ONE of the boxes you can indicate which statement you agree with and how strong your agreement is .

*Here is an example :*

*I must have background music when I study.* ☐ ☐ ☐ ☐ ☐ *I cannot stand any background noise when I am studying.*

If you shade the left box, it means you agree strongly with the left-hand statement. If you shade the second box, it means you favour the left-hand statement but less strongly. The middle shading would show that you are not fussy either way. The other two boxes on the right would show agreement with the right-hand statement.

There are no right answers, only YOUR view matters. Your response to this questionnaire will not in any way affect your academic record.

Mark the appropriate responses by filling in the boxes using an HB pencil, thus ▭
NOTE : AS = Agree Strongly; A = Agree; N = Neutral.

| | AS | A | N | A | AS | |
|---|---|---|---|---|---|---|
| In order to pass my course, I need to study just what the lecturer indicates or tells me. | ☐ | ☐ | ☐ | ☐ | ☐ | I do not have to rely totally on the lecturer. Part of my learning is to work things out myself. |
| I cannot be wrong if I accept what the lecturer says. If I question anything, I might end up failing. | ☐ | ☐ | ☐ | ☐ | ☐ | I do not believe in just absorbing what the lecturer says without question. |
| I believe it is the job of the lecturer to supply me with all the knowledge I need | ☐ | ☐ | ☐ | ☐ | ☐ | The duty of the lecturer is not to teach me everything, but to stimulate my own thinking. |
| I think a good lecturer should give all conflicting views on an issue and give his students a chance to evaluate them. | ☐ | ☐ | ☐ | ☐ | ☐ | A good lecturer is one who points out to students which is the one accepted view of an issue. |
| I think lecturers should avoid teaching material that they know students will find difficult. | ☐ | ☐ | ☐ | ☐ | ☐ | Lecturers should aim to provide challenges to their students by introducing difficult issues. |
| It is good to work with other students because, by listening to their points of view, I can evaluate my own. | ☐ | ☐ | ☐ | ☐ | ☐ | I prefer not to work with other students because then I stand less chance of picking up wrong ideas. |
| All one has to do in biology is to memorise things. | ☐ | ☐ | ☐ | ☐ | ☐ | Instead of just memorising things, it is more interesting to look for patterns and relationships among facts. |
| I do not believe that all scientific facts represent the 'absolute truth'. Students should try to understand arguments for and against existing knowledge. | ☐ | ☐ | ☐ | ☐ | ☐ | Science outlines a set of facts about what is happening in the world. A student needs to develop ways of memorising these facts. |

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Physical Sciences Practice Guides are designed to provide practical advice and guidance on issues and topics related to teaching and learning in the physical sciences. Each guide focuses on a particular aspect of higher education and is written by an academic experienced in that field.

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Alex Johnstone is a retired Professor of Chemistry and Science Education from the University of Glasgow . He has produced over two hundred publications in science education, which cover topics such as assessment, information processing, language in science and problem solving.