Ten easy ways to put research and inquiry into courses

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Perhaps you're thinking about engaging your students in some form of research and inquiry but don't know where to begin. For people who haven't thought of courses in this way before, here are some hints about how you can change your units or parts of your units to develop students' research skills and competencies. There are ten simple suggestions to get you going that you can adapt to suit your particular context. Of course, these are not the only ways to engage students in research and inquiry. Sometimes knowing where to start is the difficult bit particularly for students' early years. The examples here are not new and they are not intended to be exhaustive. But hopefully they will give you some ideas to start with and stimulate you to think of other things you can do that are appropriate to your disciplinary context.

10 easy ways

1. Change an assessment to an inquiry
2. Change a laboratory class to guided discovery
3. Engage students in gathering or working with data
4. Turn your unit of study into a conference
5. Arrange for students to interview researchers
6. Invite students and staff to research speed-dating
7. Get students to write an abstract
8. Change essays into academic articles
9. Turn the class into a hypothesis-generating forum
10. Create a competition

1. Change an assessment to an inquiry

Students come to university with things in their heads that they want to know. Chances are they are doing a particular course with some questions about the subject they would like to know the answers to. Why not arrange for them to investigate their questions? Even first year students can engage in a simple inquiry of relevance to the subject. So, for example, one biology lecturer I was talking to said that one of his first-year students asked: "Why is a leaf green?" This is a good basis for an internet search. You could set the assignment up so that students have to write a report distinguishing "good evidence" and "poor evidence". Alternatively, the students could do a critical bibliographical review. Each student could investigate their own question.

Importantly, you need to frame the assessment as an inquiry; to make it clear to the students that what they are doing in terms of research: e.g. learning to distinguish good and poor evidence; writing critically; carrying out a bibliographical search, etc. Make sure you

link this explicitly to what researchers do, so that students know why they are being asked to engage in this activity.

Examples

First year Pharmacy students individually develop an interview schedule to be used to interview a friend or relative who has experienced a significant 'health event' in their life. Material from the lectures, a book of readings and tutorial class discussions are used to formulate the interview schedule (University of Sydney, Australia).

Students are presented with an article from a popular magazine such as New Scientist. They research the original article on which this popularised version is based and write a report on the way the media has presented the research. They may contact the original author(s) to explore their perceptions of how their research has been represented by the media (University of Plymouth, UK).

First year students of classical mythology, carry out research on a god or goddess and write a Homeric Hymn to it. They are required to research what a Homeric Hymn is and they have to demonstrate the results of their research both of ideas about the god or goddess and about the nature of the Homeric Hymn in the Hymn that they write. Appropriate footnotes have to be included. (University of Sydney, Australia)

2. Change a laboratory class to guided discovery

In many science laboratory classes, students follow a set procedure to achieve a known outcome. But what if the outcome is known, but the stages required to achieve that outcome are unknown? Perhaps a problem is set and students have a few pieces of equipment and have to work out how to achieve the desired outcome. There may be an initial discussion but the instructions may ask questions rather than providing procedures. Of course you will need to ensure that what the students do is safe. It won't do to have students mixing volatile chemicals that are likely to explode!

Changing a laboratory class into a guided inquiry session is not a new idea. There is stacks of literature in the scientific community indicating why change is needed for the twenty-first century scientist.

Example

As a development of a traditional laboratory class, each first-year biology student is given a Petri dish and they each collect the fungal spores in the atmosphere in their back yards. There are 1000 students in the class living all over the city. Students bring the samples back to the lab, grow them and write a report on their findings. The results are mapped onto a geophysical map generating new knowledge for publication in scientific journals. (University of Sydney, Australia).

In a first year undergraduate computer science course, students engage in the design of computer software which requires simulation of a complex system, for example, planning and managing checkouts in a supermarket, managing a biodiversity survey, managing information for an entertainment advisor, managing the data for a school timetable or managing a product inventory for a computer vendor. Students begin by working on a simple problem and learn how to work in teams. They then, in groups, research their chosen topic and the computer code needed to develop the simulation. Each simulation requires that students collaboratively write a small core of essential code and then develop that so that the simulation can cope with ever more complex situations (University of Sydney, Australia).

3. Engage students in gathering or working with data

Data is all around us. In practically any subject there are numerous ways in which students can engage in collecting and working with data. Perhaps you have a research project on the go that requires more people to collect more data, to observe a phenomenon, to record samples, for example, or to examine a particular species in a given geographical area, or to find out how people in society think about a particular issue. The possibilities are endless. Data can also be gathered through internet searches of course.

On the other hand, there is the use of existing data sources. From linguistics, to accountancy, students can work in analysing data to understand particular phenomena. Discussions of how to analyse the data collected or worked on can help students understand and critically evaluate theories.

Remember that if students help you to collect data that you subsequently publish, you must acknowledge their contributions in your published work. Also remember that collecting some forms of data may need ethical approval.

Examples

First year Pharmacy students investigate the way different pharmacist shops are laid out. They pool their responses and in doing so learn about important aspects associated with the practice of pharmacy (University of Sydney, Australia).

Pharmacy students examine research evidence from a research project where a mystery shopper posed as a member of the public with a particular ailment and went into a number of pharmacies to examine how the pharmacist explained about the particular medication (University of Otago, New Zealand).

Students in an early childhood unit are all asked to take photos of "Childhood" that they notice around them, in the street, on noticeboards, wherever they happen to be. The students take hundreds of photos and then display them all together. The unit then consists of students analyzing this data utilizing the different theories of

childhood which is the focus of what they have to learn (University of Northumbria, UK).

4. Turn your unit of study into a conference

A conference or showcase is a great way for students to demonstrate what they have learnt. So why not turn the whole course into a conference process. Students can develop useful organisational skills and skills of critical judgement by being involved with academics and others in its organisation. For example, deciding and organising location, timing, catering and even what the program is going to look like. To prepare for their research they might begin by developing an abstract which sets out what they want to investigate, how they're going to do it and how they will demonstrate their learning. You may allow them to choose their topic, or you might set a broad topic within which each student is free to choose an area to focus on. You will then need to provide feedback on their abstract and this will give you a chance to judge whether the topic and methods of research they have chosen to do is appropriate. Students will then carry out their own research. How much guidance they are given in this will depend on the level of the students, the subject and the level of structure and guidance that you consider is needed. Each student will need to write some kind of report on what they have found and at this stage the conference organising committee may decide which students will give spoken presentations at the conference and which students will present posters and/or demonstrations depending on what has been decided. The organising committee can then plan the program. Further research may be necessary before the presentations are ready. You can add in further assessment stages as required.

As a variation on this idea, depending on the subject, the endpoint might be an exhibition or a series of exhibits.

Example

In a unit about new multimedia, students choose a topic, write an abstract for the topic they wish to research. They get feedback and approval from the lecturer. They carry out the research and write a report. They present it at a conference towards the end of the semester. The conference is organised by the students. The quality of the reports is used to decide which students will give spoken presentations at the conference. Other students give poster presentations. The exam is focused on topics their peers researched and which they heard about in the conference in order to ensure their participation is also a useful learning experience. Some employers and other guests are invited to the conference. (University of Southampton, UK)

5. Arrange for students to interview researchers

If you're in a big department with lots of research covered, a great way to get the students interested in and knowledgeable about the range of subjects covered in the

discipline is to provide a strategy for students to interview members of staff. Research on students' knowledge of research in their university shows that undergraduates are generally ignorant of the research being done in their university and are often unaware that any research is taking place at all.

Academics love to talk about their research and having a small group of people asking intelligent questions about it, is bound to put smiles on a lot of faces. It's important that students prepare for their meetings by reading some of the work of the individual staff member that they are going to interview and devising some interesting questions. They could research the articles of the chosen member of staff in their own time with class time used to discuss questions. Or some questions could be prepared for them. But the important point is that students should show some basic knowledge and ask intelligent questions. It's a good idea for students to be in small groups when they interview the member of staff in order to avoid awkward moments in the encounter. This also gives students a chance to experience working in teams.

You should provide a way for students to prepare a report on what they have found and to share this with their peers. This is a great way for the class to get a feel for the subject that they are about to study overall and is a useful inquiry process for early in their course.

Example

Students in teams of five first read three research papers by a staff member and then, when they have discussed and agreed a series of questions, interview the staff member about their research. Each student individually writes a report on what they have found (University College, London, UK).

6. Invite students and staff to research speed-dating

With the support of the whole department, you can extend the idea of student interviews, so that all can participate in a sort of 'speed-dating' lunch. To ensure that students get the most out of the experience, you could ask them to focus on particular questions, or you could focus the event around, for example, future research developments. There are endless possibilities.

Depending on the venue and the numbers of students and staff, the students could rotate around the tables or the students could stay put and the staff could rotate around.

Example

All students in the cohort are invited to lunch with all academics in the department. Students get their lunch and sit down in groups of two or three. Academics join their table one at a time and students ask the academic a series of questions about their research. A bell rings and the academics rotate around the groups (University of Queensland)

7. Get students to write an abstract

Students frequently write essays or reports and they are often involved in reading academic papers. But they often don't make the connections. To teach students to write coherent, cogent essays and articles, one way to start is to encourage them to write good abstracts. Abstract writing is an important skill for academics to learn but the ability to precis an argument is essential in whatever profession students undertake.

You could preface the activity with a class session where students brainstorm what they think are the qualities of a good abstract.

Examples

Students are given a paper which the tutor has written, but from which all references to it (journal name, volume, page numbers, author name) have been deleted. The students then write an abstract for the paper. The exercise is used in tutorials to develop the skills of writing, critical analysis, summarising information and research design and planning (Plymouth University, UK)

In a development of this approach the teacher collects the abstracts and puts them in a common format and chooses the best four or five which are then put with the original abstract. Students vote for 'best abstract'. Then the teacher reveals which is the author's abstract often to the surprise of the students! (Brigham Young University, USA).

8. Change essays into academic articles

Essays are the very best way to teach students how to write in an academic way. They are excellent training for writing academic articles. But it's clear from research on students' awareness of research that they often don't make the connection between what they are doing in writing an essay and what academics do when they do research.

The simplest way to change students' views about research is to frame the essay as a research activity. However since students don't always make the connection, it's important to explicitly refer to the similarity of essay writing and academic article writing, to talk about issues you have had when your articles have been reviewed, things like, unclear focus, argument not clear etc. You could change the assignments students have to do from "Essay on…" to "Academic research article on…." Or you could break up an essay into component parts for progressive assignments, e.g. write an abstract; write a conclusion to an article. You could give students an article from which the abstract or conclusion has been omitted and ask them to write an abstract (see Number 7). But remember always to make explicit in your instructions and feedback the link with research articles.

9. Turn the class into a hypothesis-generating forum

The key to good research is having good questions or good hypotheses. In some subjects finding good questions or hypotheses is a huge challenge. It is a also something many students struggle with – particularly when they have to find their own essay title, or when, as a doctoral student they are faced with the challenge of narrowing down their PhD topic. Being able to break a topic down into its component parts requires practice.

In class time it's a good idea to begin with a discussion about what constitutes a good question. An example of how a question can be broken down into its component parts is very useful in this context because often the questions students ask are much too general. If students have chosen an essay topic, for example, they could be asked to write down, say, five titles for essays they could write on that topic. This serves to show the need for breaking down questions, hypotheses, problems etc. into their component parts.

Example

In class time, Education students are invited to generate as many questions about how to improve the learning of their students as they can think of. They put each of the questions on a post-it note and put them on the wall. Then when all the questions have been exhausted, the class silently groups the questions according to type. Duplicate questions may be removed at this point. Further questions may be added. Headings may be added then or later depending on the students. This is used as a basis for forming groups of students interested to research similar areas. (University of Sydney, Australia)

10. Create a competition

Numerous national and international student competitions exist particularly in the Sciences, Mathematics and Engineering subjects and you may want to investigate what is available for your area. But you can also create a mini competition amongst your own students that will cause them to investigate a particular idea or formula. This is particularly useful where the work results in a practical demonstration that can be judged. For example, what about asking students to come up with the best solution to a specified environmental problem? You can also use poster presentations or short presentations such as are used for 'three-minute thesis' competitions if practical demonstrations are not possible, or if the competition is based on the best design rather than the implementation of it.

Example

Second year Engineering students research how to move a 10 kilogram block of ice through water powered only by candles. They then build a device to do this. A competition is held on a nearby lake. The winning device not only moves the ice furthest, it does so at least cost because cost is important in engineering design (University of Sydney, Australia).

An industrial organisation sets a task for students: to design a skating robot that can skate faster than the fastest speed skaters. The fastest robot is chosen for the first stage of manufacture. (University of Calgary, Canada)

Frequently asked questions

How can I make sure students learn the stuff they've got to know?

It's important that you think about what the students have to know and to do before you decide how to change the teaching and learning. The challenge you have is to find a way of engaging students in research and inquiry that means they can't avoid learning the things that you need them to learn. Choosing the task is your first challenge. Then you have to think about how to prepare students for what they are going to be asked to do, how you will structure the learning, and then how you will debrief the students afterwards. Note that the activities suggested here are not just for fun (although hopefully they will be fun!). They are serious ways for students to engage with essential course material.

When can I start introducing research into my units?

Students should be engaged in research and inquiry right from the very start of their degree. Some research may only be possible with large numbers of students and some may only be possible with small groups or individuals. These are contextual factors that critically influence what you are able to achieve. Click here for some more examples

Does this only work in small classes?

Many people tell me they can't engage in research-based learning because there are just too many students in the class. The challenge is not to think about the research that needs just a few helpers. Ask yourself, what research can you not do unless you have large numbers of people to help. There are some wonderful examples of crowd-sourcing research using social media. What does having lots of people available make possible for you in your research? Check out the examples for some ideas.

Won't students resist, after all only very few are likely to become researchers?

Engaging in research and inquiry isn't just for students who are going to become academics or researchers in industry. It's for every student who is going to have a professional career in any domain whatsoever. Every educated person needs to have the skills of critical analysis, the ability to investigate and to make decisions in the light of well-founded evidence and to make clear and cogent presentations. There are lots of problems in the world and we need to ensure that our students are prepared to contribute to solving them. The best way to do this is through engaging them in research and inquiry during their undergraduate years. The challenge for us is to make the research experience relevant to the profession we're preparing students for. So use the language of your discipline or profession when you present the research-based learning to them.

Why should I engage students in research and inquiry now?

There are lots of reasons for engaging students in various forms of research and inquiry. Engaging in research is one of the most effective ways to prepare students for the challenges they face as professionals in the twenty-first century workplace. Through research, students not only develop the

skills that employers say they want, for example, the ability to design and conduct experiments; to interpret, analyse and use qualitative and/or quantitative data discerningly; they develop higher order problem solving skills and the ability to think, reflect and reason critically and creatively; they also learn to work independently and cooperatively. Undergraduate research is not just for people who are going to be researchers or academics. The skills and knowledge that students acquire through engaging in research are what they need in the twenty-first century workplace.

How can I get further help?

Talk to the Learning and Teaching team in your Faculty

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