Putting a Science Course Online

QLD193

Topics

A detailed research document with things to consider when putting a science course online.

Funding Acknowledgment

This project was made possible through funding from the National Vocational Education and Training (VET) E-learning Strategy (the Strategy). The Strategy is a joint initiative of the Australian and state and territory governments, designed as a three year program of action with a series of ongoing business activities reflecting its strategic objectives. The Strategy will play a key role in enabling the Australian training sector to take advantage of the roll out of the National Broadband Network (NBN) to make major advances in the achievement of government training objectives. Coordinated action to develop sector-wide capability in using the new technological environment will at the same time, stimulate innovative approaches to increasing participation in training and work and improving the skills levels of the Australian workforce (http://flexiblelearning.net.au).

NATIONAL VET E-LEARNING STRATEGY

Australian Government

Department of Industry, Innovations, Science, Research and Tertiary Education

Edition May 2013

Things to Consider when Putting a Science Course Online

Acknowledgement:
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THINGS TO CONSIDER

After spending the last three years putting math and science courses into the online environment and teaching these courses via the online classroom there really are things that work and things that don't work. Science and math courses have definite needs within an online environment; sometimes those needs can be very challenging. Science courses in a face-to-face environment have lots of hands-on activities and laboratory practicals, so how can you capture this experience in an online classroom. This is where it gets challenging. You need to have lab activities and experiences that mirror a face-to-face course so that the student still gets the same practical experience and comes away with the same skill set as students in the face-to-face environment. Saying it doesn't necessarily make it happen. To make an online course equivalent in content and rigour as a face-to-face course you will need to have at the very least the following components:

1. Interactive content
2. Lecture notes
3. Tutorials
4. Discussion boards
5. Hands-on activities
6. Progress tests

There is another list that is also important – this is the list of things you should not do:

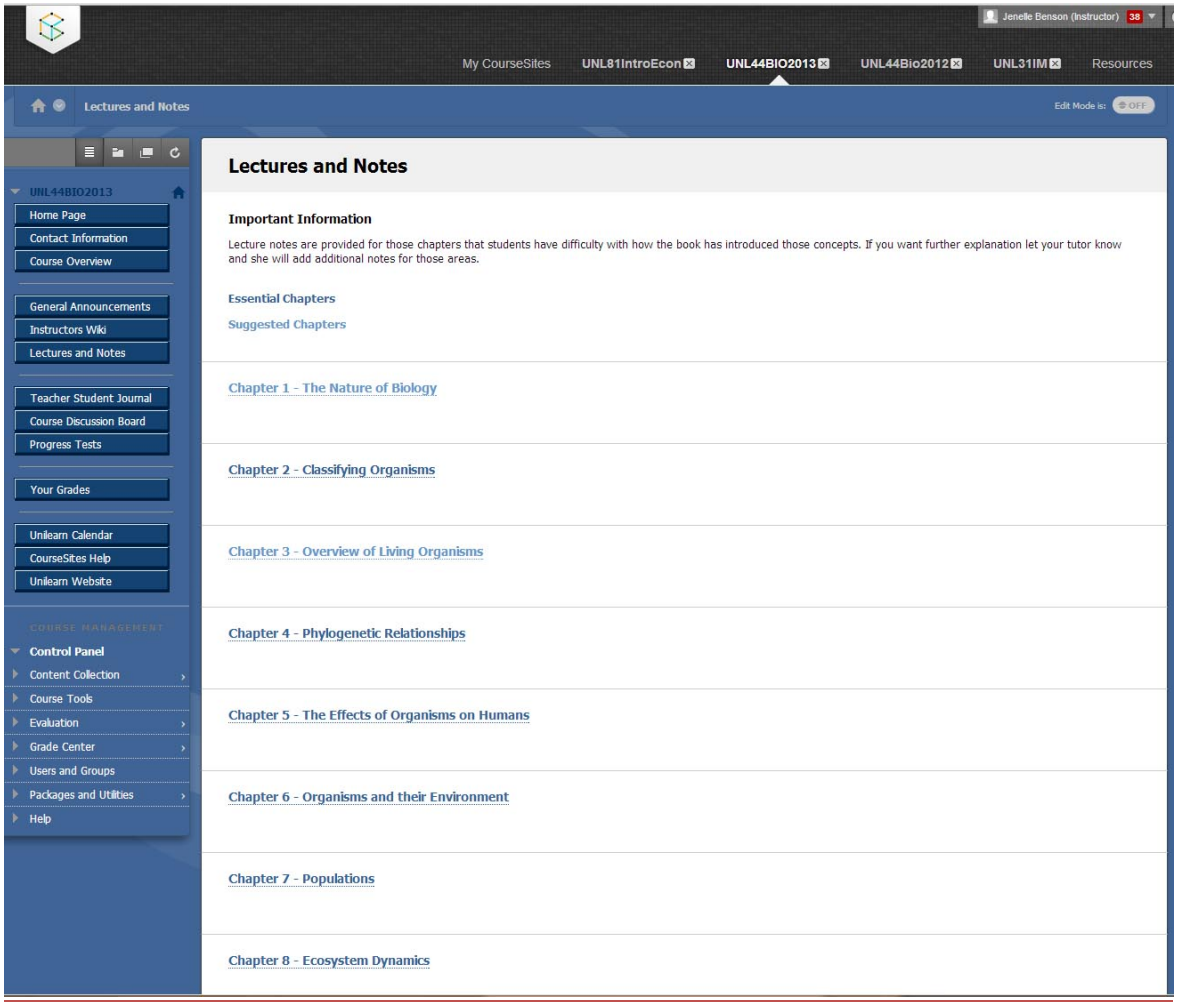
1. Don't put the textbook into the online classroom. Students want hardcopy text to flip through and refer back and forth to drawings and diagrams etc… (at a recent expo we asked students what type of learning materials they preferred - an overwhelming 77% wanted their learning materials in hardcopy format.)
2. Don't put really long videos, movie clips or activities in the online classroom. They are large and difficult for students to download
3. Don't have a complex homepage were students can't find what they are looking for. Be clear and concise.

Now that we have our lists how do we go about implementing these concepts into an online classroom. Let's look at the even numbers from the list above. These are the easier areas to develop.

LECTURE NOTES

These can be PDF's, word documents, content typed directly into the online classroom, PowerPoint, hand drawn pictures, diagrams/charts and graphs. In a science class, graphs, charts, diagrams and pictures are very important tools for conveying information. We need to make sure that what we post has a reason and that the reason is clear to the student. Titles are very important. Here is an example of an okay title, "Cellular Respiration Diagram". The title is helpful but it could be better. Here is a better title, "Detailed explanation of Cellular Respiration as shown on page 245". This lets students know what they can expect and where in the book it refers to. Remember that you should not be reproducing the book in your lecture notes, but offering additional explanations or going beyond what the book provides for a more in-depth understanding.

Figure 1. Example of grouping lecture notes by chapter



DISCUSSION BOARDS

Discussion boards can be good and bad. They should be designed in a way that would reflect a face-to-face classroom discussion. You usually don't have one straight discussion, you break it up into sections and topics during the lecture and during the week. You need to make sure that students understand how to use the discussion boards.

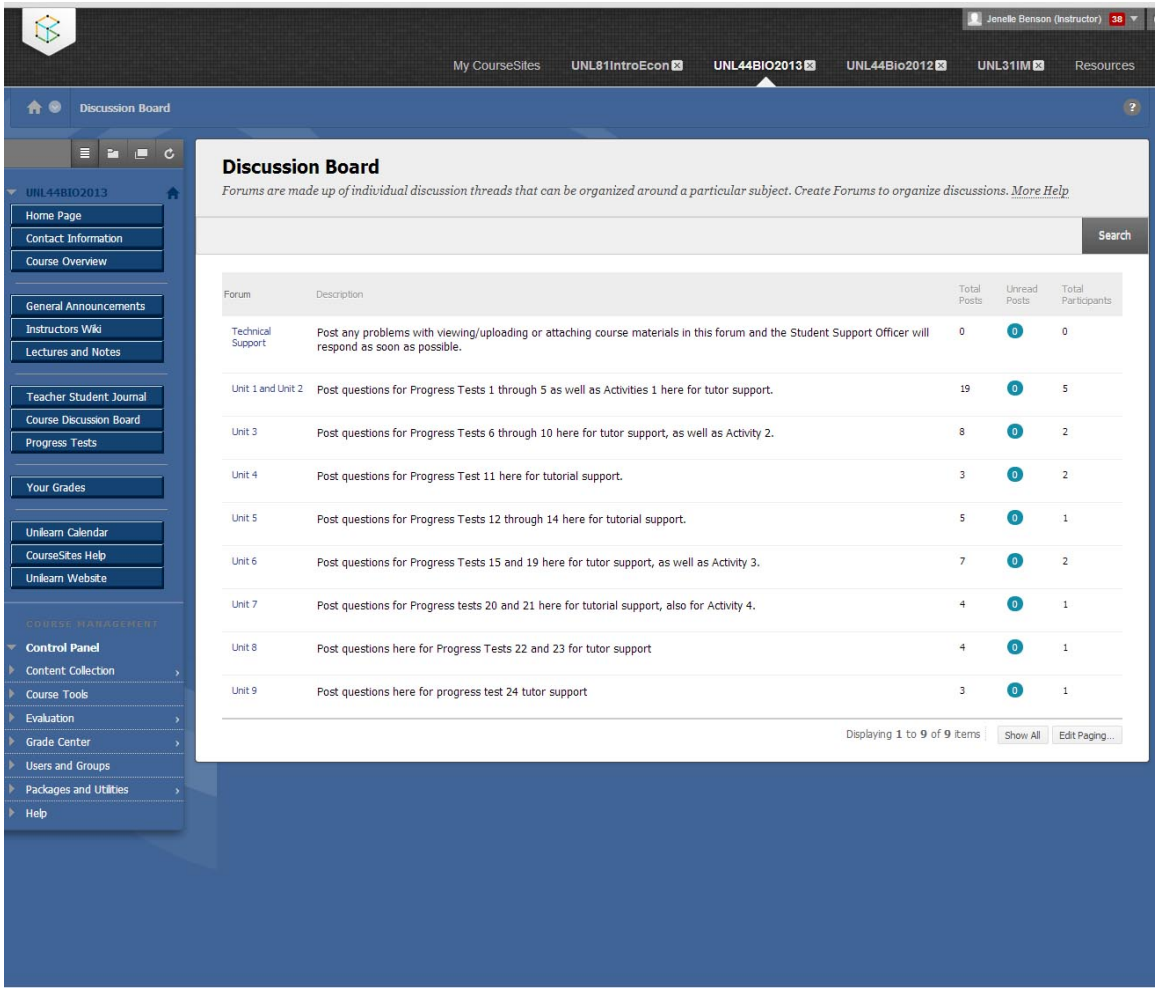
Here are some things to consider when designing your discussion forums.

- Are the forums for answering questions that you post and grade or for just discussion any topic or issue?
- Is there a specific format students need to use to answer the questions?
- What if a student has a question about something else?
- Where do they ask this question?

Make sure to break your discussion boards into threads or subjects so students clearly see where they need to discuss specific topics. I usually break it up by chapter and then I also have lab activities, general questions and our tech support officer also has a thread inside the classroom. Within each chapter I create threads for chapter questions, review questions, and progress test questions. This way the threads don't get too long and unmanageable. I also like to use hierarchy in the thread structure so you can see who is answering which questions. Discussion forums are great,

but make sure that students understand the classroom etiquette for posting in the discussion forums.

Figure 2. Example of groupings for discussion forums

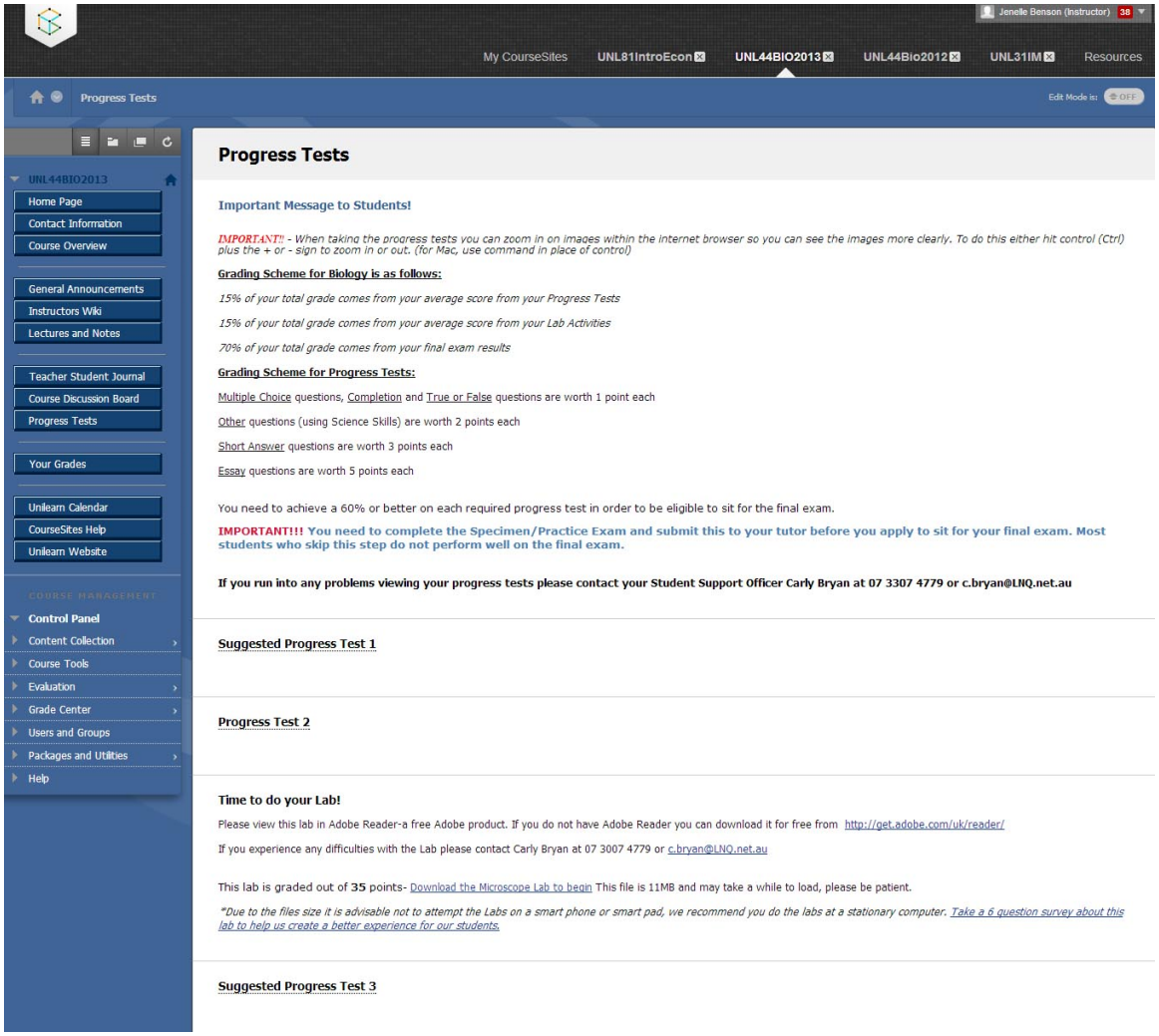


PROGRESS TESTS

It is always a good practice to develop practice tests with a variety of question styles so students have the opportunity to demonstrate course acquired knowledge. Just as if you were in a face-to-face classroom, students have to have the ability to demonstrate knowledge in a variety of ways. We do not ask students to take one multiple choice test and base their grade on that one test. We must provide them with the opportunity to demonstrate their knowledge in a variety of ways that does not exclude any specific learning style. This means that teachers have to grade online tests and provide feedback.

We cannot just make self-grading tests and expect students to “get it” from the generic feedback that is provided. Tests must have areas that students are able to submit workings, write essays, show their thought process so we can determine what they know and what they don’t know. Teachers need to reflect upon what they would expect a face-to-face student to demonstrate in order to show mastery of a subject. This is especially tricky in science courses were they need to demonstrate practical skills, along with theoretical knowledge.

Figure 3. Example of progress test area with labs and activities



An easy way to do this is to separate the tests into sections, multiple choice, short answer, essay, activities, and labs. I usually put multiple choice, short answer and essay in one test and leave the lab and activities to be individually handed in and graded. You can also separate tests into multiple choice, short answer and essays to chunk up the test process for students. This helps students organize what they need to do and which parts they need to complete offline. Any assignments, tests, or activities that you require the student to complete you will need to provide a grading rubric so students understand what criteria they are being graded against.

We cannot expect students to succeed if we don't let them know what success looks like. I like to provide exemplars of what good work and poor work looks like. Remember, the students are not standing right in front of you so you need to consider all of the things you would normally do or say in a face-to-face classroom. Once you do this, you will need to create documents, blogs, MP4s or wikis with all of this information so students are able to access it and get the same information as if they were standing right in front of you. This is an asynchronous environment so we want the information available for students so they do not have to wait to learn.

Another thing to think about is making sure that an equation editor is built into the online classroom. This is important for creating progress tests, giving feedback on the progress test and assignments, or feedback within the discussion forums. Equation editors are handy and many times

are screen reader friendly. Equation editors are necessary for any type of course where equations and symbols will be used when creating a problem. You will need to have directions or a tutorial available for students so that they know how to use the equation editor. If you are not sure whether the online classroom has an equation editor you can ask the help desk for that online classroom.

You may also want to find out where else the equation editor can be used. Can you use the equation editor for the following?

- creating questions
- giving feedback
- in the wiki area; in the discussion forum area
- can students use the equation editor

All of these are important questions that you will want to get answers for so you know what tools are available for you and your students.

Don't worry if you don't get it right the first time. It can takes years of tinkering to get all the information just right, and you will still have students that go astray. This is what continuous improvement is all about.

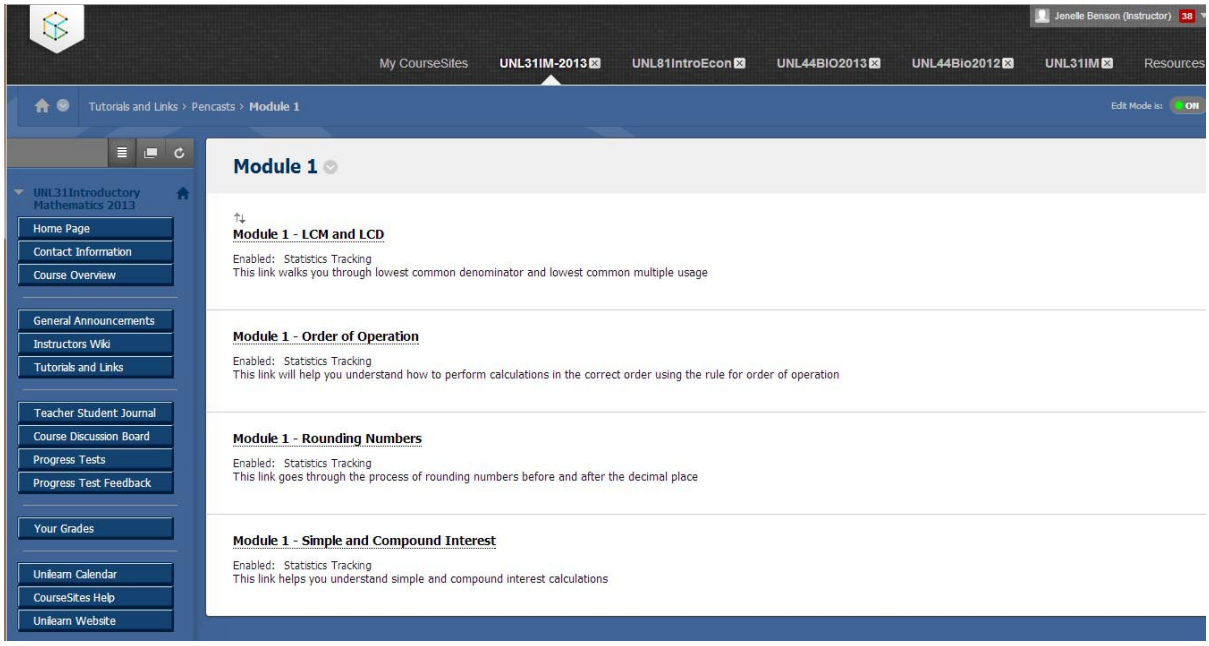
Now let's look at 1, 3 and 5, the odd numbers. This includes interactive content, tutorials and interactive labs. For a science course this is the meat of the course. If you get this right, students will have a rich and fulfilling experience.

INTERACTIVE CONTENT

We will look at interactive content. So what is interactive content or interactive learning content? There are three commonly agreed upon definitions of what constitutes interactive learning content. These are learner-content, learner-teacher, and learner-learner. The first type of interaction happens between the learner and the content. The next type of interaction happens between the learner and the instructor. The last type of interaction happens between the student and another student. In our online classroom interactive content that occurs between the student and content can be videos, lecture MP4s, PowerPoint's, or interactive PDF's. Examples of student-teacher and student-students can be discussion forums, blogs, wikis, and journals.

What does this really mean? Students have links, audio, and video embedded into the document or within the classroom to help them better understand what is in the textbook. This is the stuff you would talk to students about and use the board in the front of the class to show examples and discuss. This is where the bulk of the teaching experience occurs. This can be done as a lecture video on YouTube, other interesting sites on the internet, podcasts or using Smart Pens to create interactive PDF's of difficult content that students can follow along with. This provides the personal touch for students.

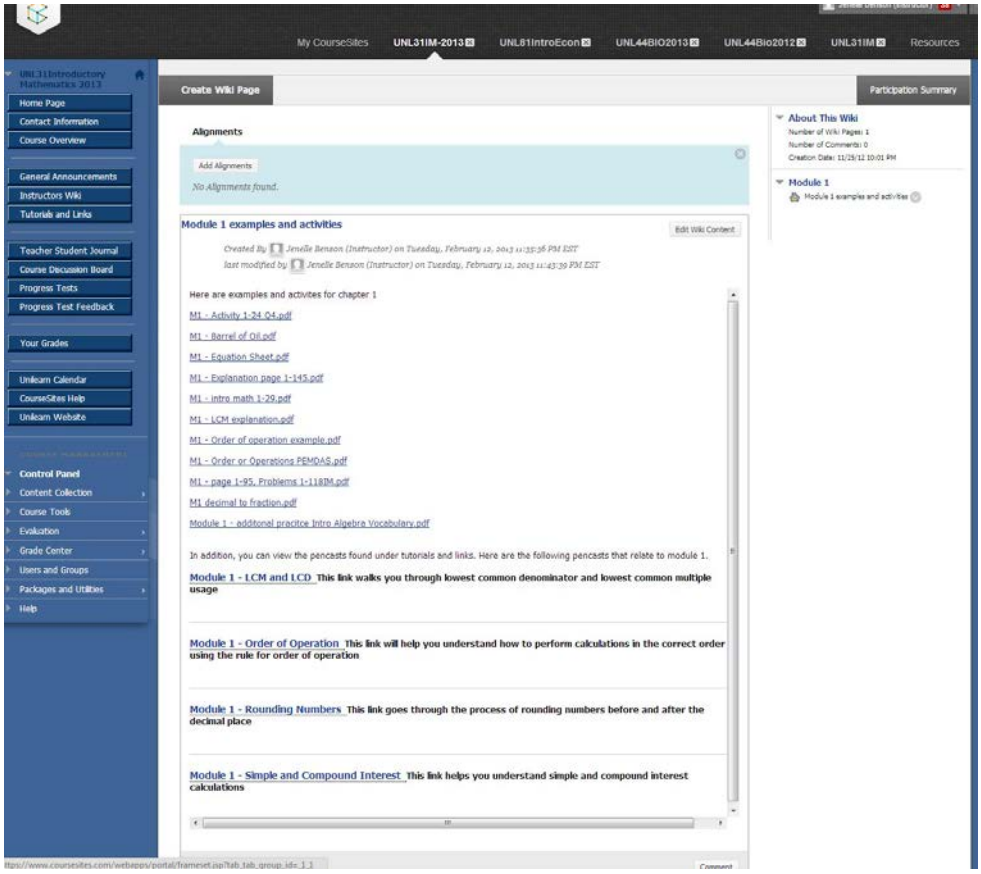
Figure 4. Example of pencast grouping



TUTORIALS

Tutorials are a very important part of teaching students and your library of tutorials will continue to build as your course moves along. Areas that students keep asking the same questions for help should be made into tutorials.

Figure 5. Example of tutorials as either PDFs or pencasts



The easiest way to create a tutorial that allows the teacher to capture what they write and what they say is using Smart Pen technology. This should be used just as if the student is sitting in a desk in your classroom and asks you a question and you use the board to help explain. This is when the teacher uses class time to reviews homework or class work to find out where students lack knowledge. Teachers can still do this by looking at what questions the students have posted in the discussion forums or emailed to the teacher. This is where the student needs help and more individualized learning is required. Remember that tutorials are not the same as lectures. Tutorials should be used to walk a student through a problem or assignment that they are having problems with.

HANDS-ON ACTIVITIES

Finally, we have interactive labs or activities. This is the part that can be tricky. The need to provide science students with the ability to perform hands-on labs is essential and needs to be included in any online class to reinforce theoretical concepts introduced in science. There are many excellent free simulations along with other tools that can be licensed for use in an online classroom.

Figure 6. Example of interactive lab and answer sheet

I like to stick with the free simulations as anyone can use these. Various Universities, many of which reside in the United States, have created most of the free simulations or interactive components.

This is handy, because in the United States they make all of this material available for students and teachers to use in order to enhance classroom learning. As long as you use these simulations for educational purposes and not to package and resale you are free to use them to your heart's content. In some instances, middle school and high school teachers may have already designed a lab around the simulation and many times this information is also available.

If the simulation does not come with any lab design then you will need to thoroughly investigate how the simulation works and create a tutorial for students. This included creating a lesson plan for how the simulation will be used and what the student must do in the simulation. This is a typical lesson plan that you would use in any face-to-face lab. In this instance, instead of face-to-face, the students will complete the simulation for the practical component of the lab in the online classroom.

You will have to decide what parts the students can write into an electronic document and what parts they may need to draw by hand or use a screen capture and then scan or take a picture of to support the hands-on activity. For instance, I require students to draw pictures of the slides they observe under the virtual microscope they use. Students need to scan or take a picture of these drawings and attach them to the lab form in the online classroom. You will need to discuss these last few options with whoever is designing or building your online classroom. Having someone who is handy with online classroom design is a necessary component for creating and maintaining your online classroom.

Figure 7. Example of online interactive microscope lab

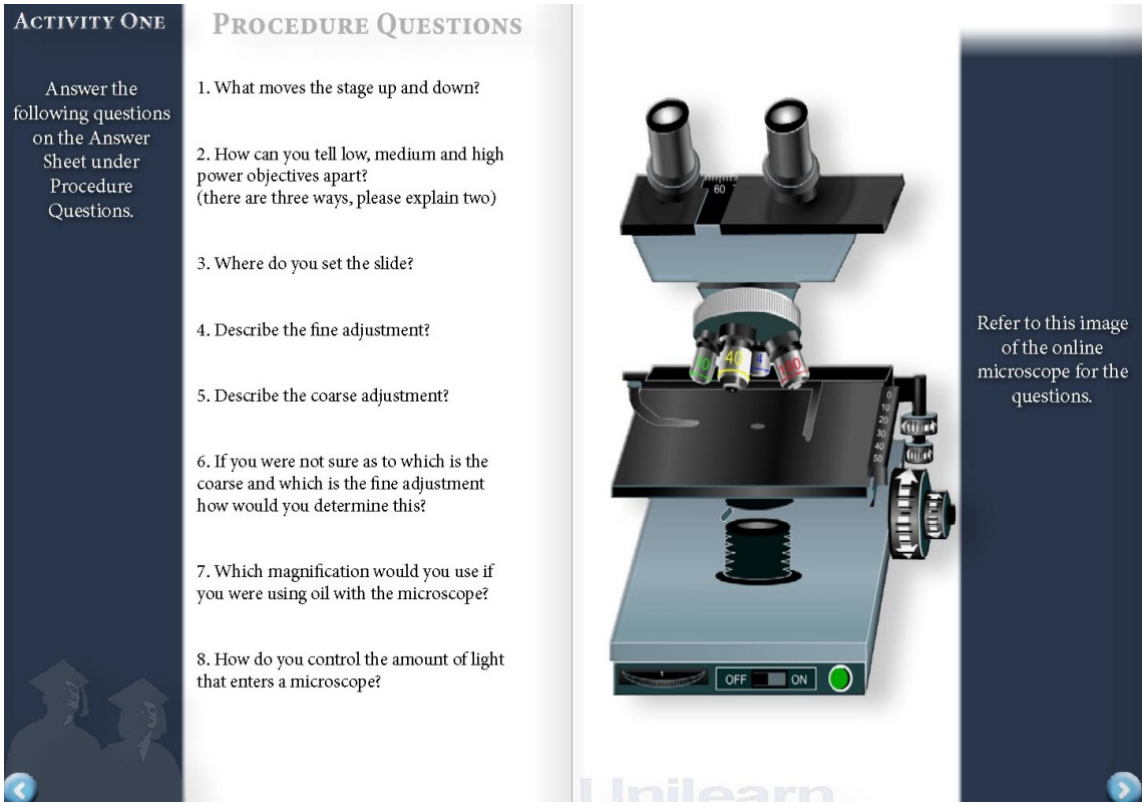
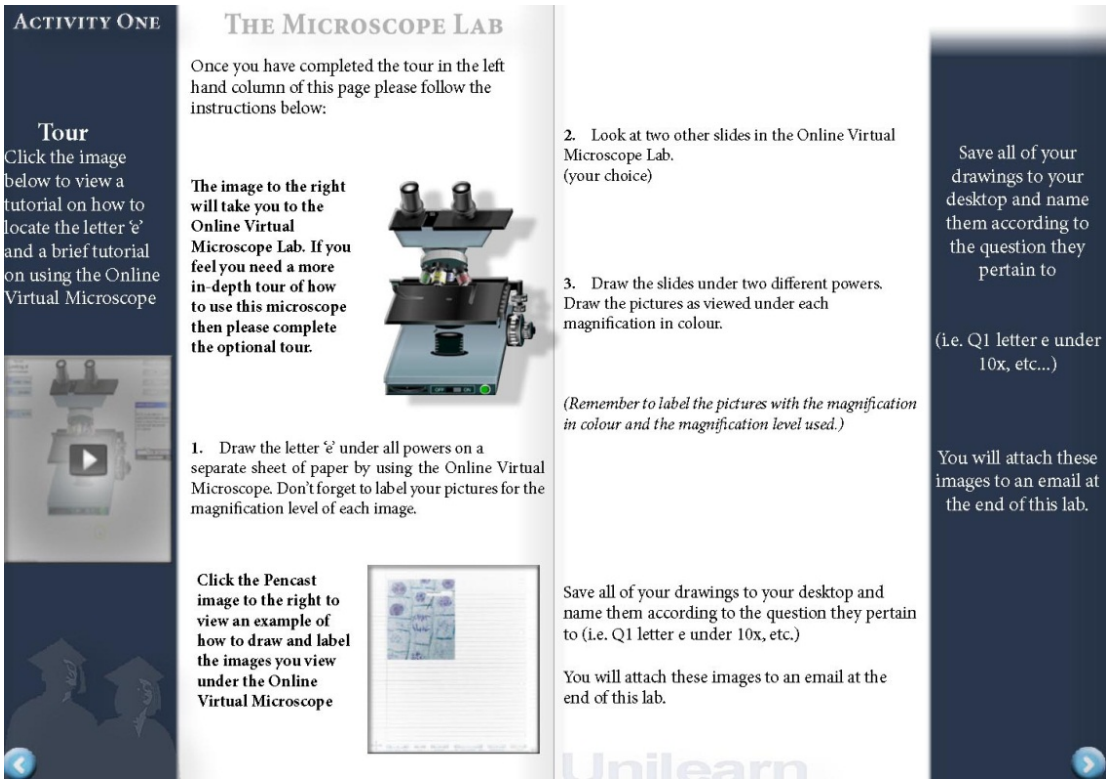


Figure 8. Example of links and tutorials embedded into the interactive lab



COMMON MYTHS ABOUT TEACHING ONLINE

A common myth about teaching online is "I will spend less time teaching in an online classroom".

Many teachers think that if they move their course into the online classroom that they will have less work. Contrary to popular belief, you actually spend more time teaching and interacting then you do in a face-to-face classroom. You will need to type all of your responses in the discussion forums or in your response to emails, so if you are not a speedy typist this will take time. You will need to create tutorials and other support materials in a variety of versions to determine which format works best. You will need to think about your responses to ensure that they are clear and concise and don't create more confusion. Sometimes you can answer one question and end up getting ten more because you were not clear in your response.

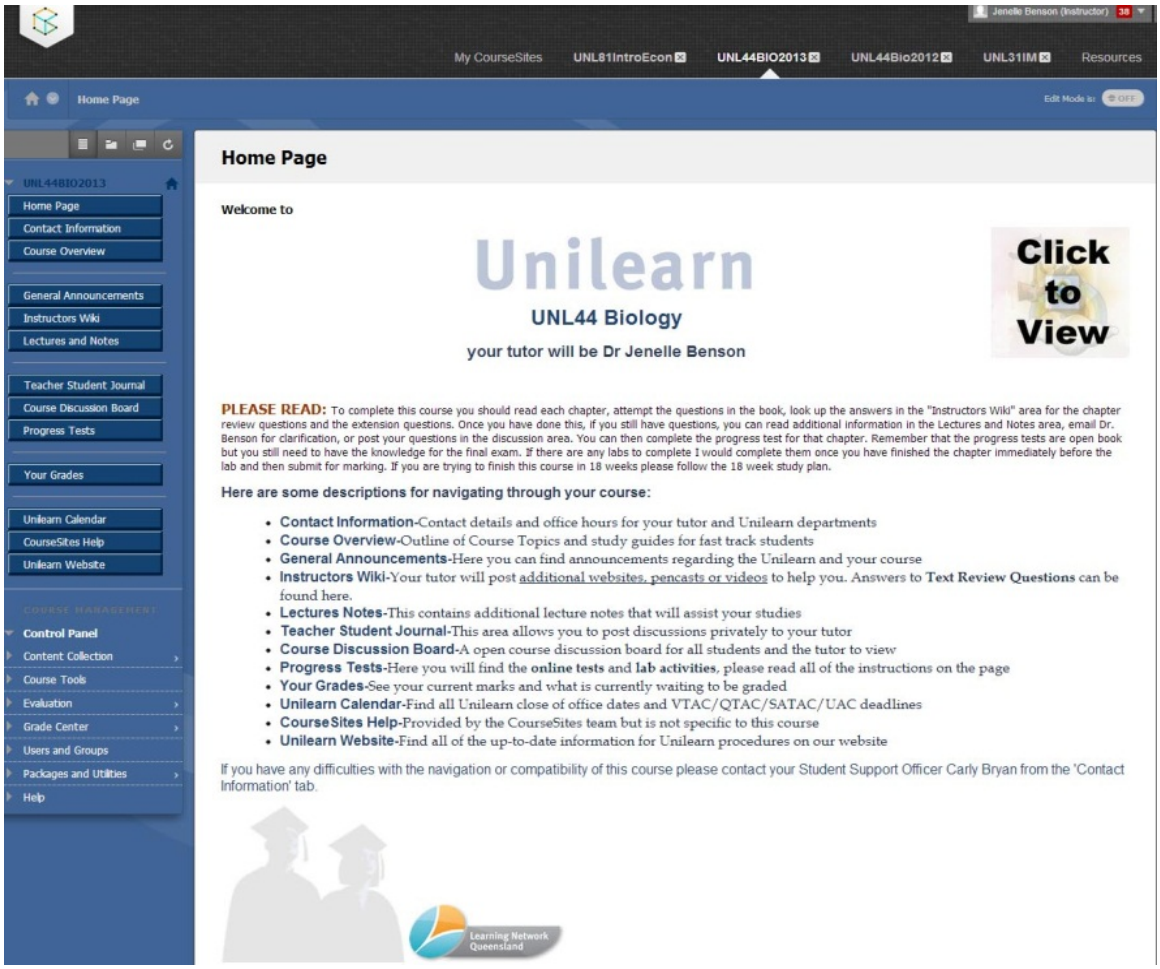
It is always good to have someone else look over what you are creating. The more feedback you get the better the course will be. Remember to ask for student feedback. Sometimes you will get some really good suggestions that will make your life and the students better. Always remember to ask students for any simulation or helpful applications that they run or are using for their mobile media devices.

Think of teaching online similar to when you first started teaching and you needed to prepare constantly as you learned the content. You had to think of ways to teach the materials and using best practises to improve the delivery of the content. You will need to do the same within your online classroom. As you begin teaching your science courses online, you will begin to see what works and what doesn't and how best to deliver the material you are teaching.

HAVING PRESENCE IN THE ONLINE CLASSROOM

You need to make sure that you are visible in the online classroom so students know that you are

Figure 9. Example of homepage with instructions for students



monitoring what they are doing. This doesn't mean that you need to have your picture posted throughout the entire site, but the students do need to see that you have been in the classroom.

Do you make yourself visible in and online classroom?

As a rule, I log in every other day at a minimum and see what is going on in the classroom. I look at discussion boards, add comments, and look at student progress. I also may post information to wikis and blogs in response to those students who have asked for help. I try and respond to students within a 48 hour period. It is important that students see that the teacher is interacting in the discussion boards and it is not just other students answering the questions. This gives students a sense of connection for the course and the teacher. Students who feel connected are more likely to succeed and comlete the course.

Post at the beginning of the discussion boards information about response times for posts, emails and grades. I also put this information on the front page and in any page were posting is possible. I put information as a PDF attachment or directly onto the page about web etiquette for posting responses to student questions. You need to make it a safe environment so that students will actually ask the questions.

Figure 10. Example of contact information

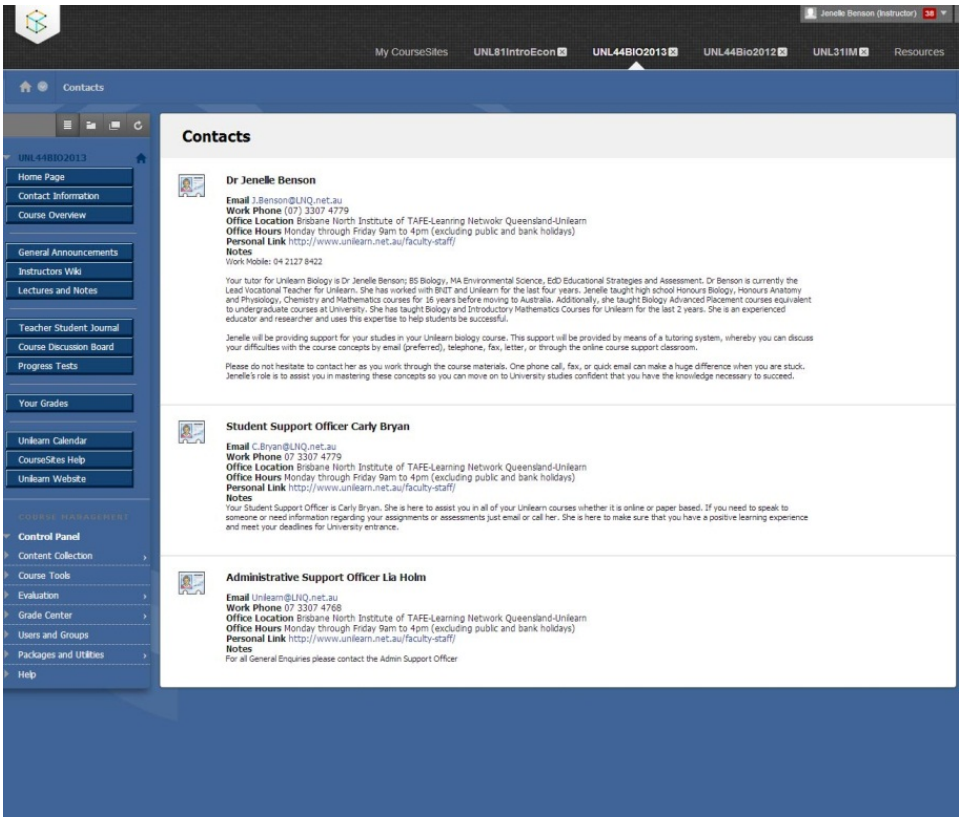
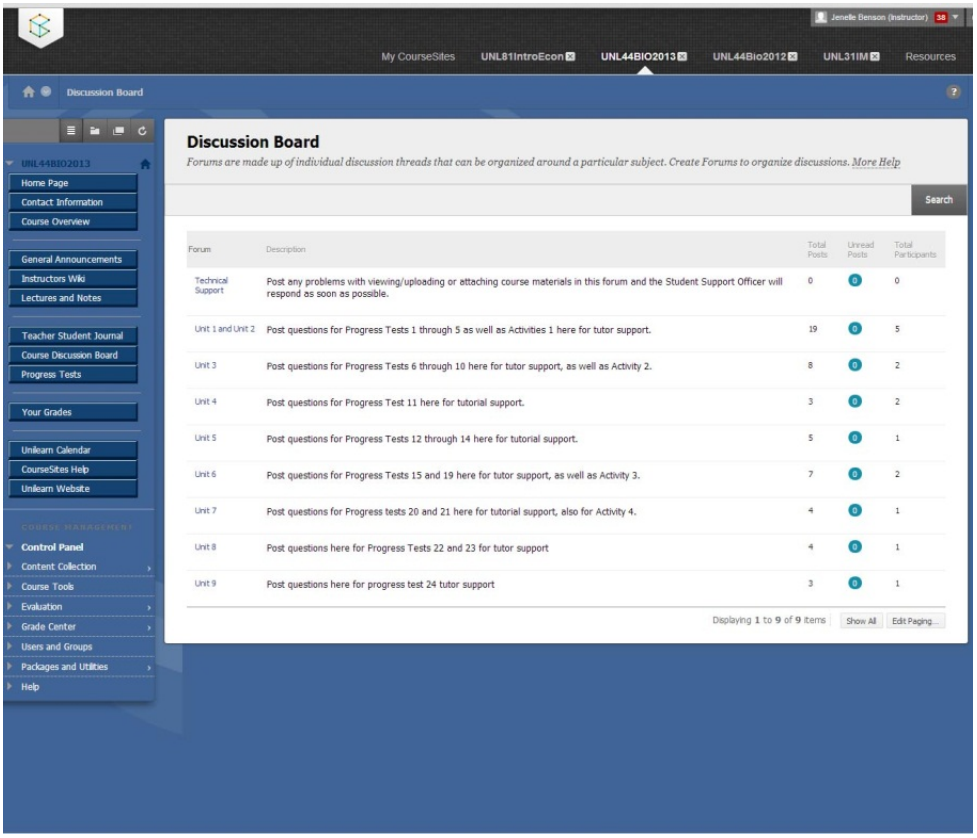


Figure 11. Example of discussion boards



If I have students email me questions instead of posting it in the discussion forum, I will email the response back to the students and I will post the body of the question and response in the classroom so other students can benefit from this information. All of this adds to the students feeling of being connected to the classroom and to the other students.

WHAT DO STUDENTS WANT TO LEARN AND HOW?

At a recent Tertiary Expo we conducted surveys to determine what areas students are interested in studying. We also asked how they liked to receive their materials, contact their teachers, be contacted by their teachers and what type of course format did they most prefer. Students were asked to check all boxes that applied as students may have more than one interest or like studying in more than one mode. Our findings indicated the following

Areas of interest were divided into nine groupings

Area of Interest	Percentage Interested
Science related studies	65%
Mathematics related studies	11%
Language and Business related studies	33%
Arts and Humanities related studies	25%
Social Sciences related studies	18%
IT related studies	9%
Health and Medicine related studies	31%
Education and Teaching related studies	9%
Trades	11%

We asked students how they liked to study and how they liked to be contacted. This is what they had to say.

Preferred Format of Course Materials	Percentage Response
EBook	32%
Hardcopy	77%
Online	8%
Video	<1%
Preferred way to Contact your Teacher	**Percentage Response**
Email	61%
F2F – in classroom	53%
Phone/Mobile	15%
Online (Skype, Facebook)	8%
Preferred way for Teacher to contact you	**Percentage Response**
Email	57%
F2F – in classroom	16%
Phone/Mobile	41%
Online (Skype, Facebook, forum)	4%
Text Message	3%
Preferred Course Format	**Percentage Response**
F2F – classroom	85%
Online Classroom	32%
Correspondence course	4%

IN SUMMARY

Remember to plan out your approach to teaching in an online classroom. Just throwing up a textbook into the online classroom is not teaching. This is no different from what you needed to do when you first started teaching in a regular classroom. Remember that this is asynchronous learning so you need to consider all the different learning styles and try to provide assignments and activities that take this into account. You also need to think about all of the common questions that face-to-face students ask and provide these in the classroom. As your course matures, the information that you provide will become more fine-tuned. No one likes to learn in isolation, but for many it is the only option they have to improve their education and improve their current life situation. It is our job to create an engaging flexible learning environment that allows these students to grow their knowledge.

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