

The Challenges of Curriculum Design in a Large Enabling Pre-nursing Open Access Course

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Abstract:

At the University of Newcastle (UoN), an increasing proportion of mature aged students completing an enabling program are choosing to study undergraduate nursing. Results of previous research indicated that the academic outcomes of these students in first year undergraduate nursing were lower compared to students who had no prior enabling education. These findings were used to inform the design of a new science course to address the specific learning needs of mature aged students.

Student feedback from the inaugural 2013 course offering indicated that whilst some elements of the course were meeting student needs, there were aspects of the course that presented unexpected challenges. As a result, the course was re-designed for its second offering in 2014. Contrary to the traditional constructivist approach used for traditional teaching in the sciences, the chemistry and the mathematical concepts were embedded within the course.

Introduction:

Each year over 1000 mature aged students enrol in the University of Newcastle (UoN) Open Foundation program and undertake studies either through part-time or full time study in order to gain entrance to an undergraduate course. As reported previously by Burgess & Relf (2014), over the last 5 years an increasing number of these mature aged students are choosing to enter undergraduate nursing. However, compared to students with no prior enabling education, these students had a lower grade point average (GPA) and student progress rate (SPR) and a higher university attrition rate (UAR) (Burgess & Relf, 2014). We concluded from this study that the general chemistry and life sciences (EPCHEM) course previously offered to these students was not adequately preparing them for their first year in undergraduate nursing (Burgess & Relf, 2014). As a result, we designed a new course, EPHEALTH, to specifically address the learning needs of these mature aged students aspiring to enter undergraduate nursing. The EPHEALTH course objectives were to increase students' confidence about studying science, to increase their scientific knowledge and their skills in accessing university services.

This study is a follow-up to that presented by Burgess & Relf (2013) and aims to describe the challenges and innovations arising from designing and delivering a course to pre-nursing students in an Open Access adult education program. This study will also assess if those students entering first year undergraduate nursing after completing this new course felt more confident and academically prepared for their tertiary studies. Two challenges and their subsequent innovations will be discussed:

1. Challenge 1: the design of a course to address preparing the needs of students who wish to enter first year undergraduate nursing, and
2. Challenge 2: the re-design of this same course after its first delivery to align the content of the course more accurately to students learning needs, in both open access and undergraduate programs, and the innovations that have arisen from this.

Methodology:

A mixed methodology was used for this study.

1) Quantitative Methods:

a. Online anonymous survey

Recruitment.

127 students from the 2013 EPHEALTH cohort who had successfully completed semester one of undergraduate nursing at UoN were invited to respond to a voluntary anonymous online survey. The survey was developed to investigate the extent to which the EPHEALTH course which they had completed in 2013 had prepared them for their first semester of study in undergraduate nursing in 2014.

Survey Data Collection

The online survey was in the form of a questionnaire and was initially checked by performing a small pilot study to ensure content validity. The survey contained 12 questions rated on a 5 point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). There was one additional open ended/free response question where participants were asked to add any further comments about their experience in first year undergraduate nursing having completed an EPHEALTH course.

Data Analysis

To assess the internal consistency and reliability of the survey, Cronbach Alpha was performed using SPSS (v20).

Respondents' survey results for the Likert scale items were analysed using SPSS (v20).

b. Institutional Surveys

Student Feedback on Course (SFC) scores were compared for the 2013 and 2014 EPHEALTH course offerings.

2) Qualitative methods:

Qualitative data came from reflective journal entries by the Bronwyn Relf, anonymous student mid-semester feedback (MSF) comments, verbal and written personal communications and open ended questions from the SFC and anonymous online surveys.

a. Online anonymous survey

Thematic analysis was performed on the open ended response questions from the online survey, using the process described by Braun & Clarke (2013) which allows for themes and patterns in the data. Each data item was given equal attention in the coding process. Themes have not been generated from a few vivid examples (an anecdotal approach), but instead the coding process has been thorough, inclusive and comprehensive. All relevant extracts for each theme have been collated and themes have been checked against each other and back to the original data set.

Challenges and Innovations:

1) Challenge 1: Design a course to improve the confidence and academic outcomes of enabling students entering first year undergraduate nursing.

Prior to 2013 students wishing to enter undergraduate nursing were part of a larger cohort studying a general chemistry and life science (EPCHEM) course.

Students in the EPCHEM course studied chemical, anatomical and physiological concepts (Table 1). Topics covered included scientific notation, concentration, atomic structure, acid and bases, pH, the periodic table, chemical bonding and chemical reactions. SFC results for the EPCHEM course were excellent, consistently scoring above 4 out of 5. Assessments in EPCHEM were based upon multiple choice quizzes and exams (Table 1). Students experienced laboratory work once each semester (Table 1).

Table 1: Content and assessment items for EPCHEM and EPHEALTH courses 2013

EPCHEM		EPHEALTH 2013	
Content	Assessment	Content	Assessment
Scientific Notation	Online quizzes (MC)	Scientific Notation	Online quizzes (MC)
Chemical structure	Mid-semester test (MC)	Chemical structure	Groupwork case study
Acids,bases, pH	End of semester exam (MC)	Acids, bases, pH	Essay
Chemical bonding and reactions	Practical Laboratory Sessions (X2)	Chemical nodding and reactions	End of semester exam (MC, SA, LA)
Concentration		Concentration	
Homeostasis Cells structure & function		Medical radiation	
Levels of organisation		Homeostasis Cell structure and function	
Biochemistry		Levels of organisation	
Study of body systems		Pharmacology & drug action	
		Study of body systems	

MC = multiple choice, SA = Short answer, LA = long answer

Innovation 1: Offer a specific science enabling course targeting the needs of students aspiring to enter first year undergraduate nursing.

Course Design:

Principles of first year transition pedagogy, adult education and the needs of learners from low SES backgrounds were used to inform the design of the new course. Research both in the UK and Australia has identified the need to design appropriate curricula to engage students from an increasingly diverse backgrounds entering higher education (Kift, Nelson, & Clarke, 2010; Devlin, Kift, & Nelson, 2012; Thomas, 2012). Strategies for supporting students from these increasingly diverse backgrounds include supporting a sense of belonging, making provisions for the establishment of collaborative group activities that enhance a student's feeling of belonging in higher education whilst delivering knowledge, skills and confidence to study in a manner that is relevant to their hopes and aspirations. (Kift, Nelson, & Clarke, 2010; Thomas, 2012). The first year experience (FYE) transitional pedagogy as articulated by Kift, Nelson, & Clarke (2010) was aimed at the increasingly diverse range of students entering first year undergraduate studies in Australia. However, the principles contained within this pedagogy are also relevant for students entering enabling programs, such as Open Foundation at the University of Newcastle, where an extremely diverse range of students entering the programs because of its open access nature.

UoN is unique in how it prepares students for tertiary education by embedding non-academic skills development in content specific topics aligned with the degrees students wish to study in undergraduate years. Students generally take subjects that align with a number of degrees not one specific degree such as nursing or midwifery.

EPHEALTH Course Curriculum 2013:

The initial design of the EPHEALTH course was based upon the structure of the EPCHEM course, with a focus on delivering course content in relation to a healthcare setting. The

course was developed in consultation with the nursing faculty and biomedical departments at UoN. Discussions with the UoN Nursing faculty and our previous study (Burgess and Relf, 2014) highlighted the need for a course focussed on developing a student's understanding of the basic chemical, anatomical and physiological scientific principles that underpin clinical reasoning in nursing. UoN Nursing faculty staff also asked that the application of these principles be taught in relation to healthcare and that students develop their literacy and numerical skills as applied in the nursing context.

The content of the EPHEALTH course was developed incorporating basic scientific and mathematical concepts (Table 1). Basic chemistry concepts, chemical reactions, acids, bases, pH, concentration, electricity, medical radiation, cell structure and function, levels of organisation, pharmacology, drug action, and study of selected body systems were delivered using examples relevant to nursing. The order of content delivery mirrored that of the EPCHEM course.

Students' achievement of the course objectives were assessed through essays, groupwork case studies, online quizzes and end of semester exams. The value of assessments increased incrementally across the semester to allow student skill development without academic penalty (Taylor, 2008).

Institutional surveys, formal and informal feedback and reflective practice were used extensively in the first year of the EPHEALTH course to identify if the course was contributing to a positive student experience and meeting student learning needs.

Results and Feedback for the 2013 EPHEALTH Course offering:

Student enrolments:

The overwhelming challenge at the start of the course was the number and diversity of students. When the EPHEALTH course was proposed it was expected that approximately 320 students would enrol in the course. Over 500 students chose to study EPHEALTH in 2013, almost twice the number of students expected.

Introduction of Mathematical and Chemical concepts:

The second challenge emerged in Week 2 of the course when the mathematics skills needed for the course were introduced. Maths was introduced at this point to underpin the next topics in the course, chemistry and concentration. Although the maths concepts were introduced in a nursing context, the students had difficulty understanding the content.

As I wrote on slide 17 notes page of my Week 2 lecture notes:

"From this point on the students got confused.....large numbers of students were confused about the powers of 10 (I asked for a show of hands who understood...).....The other thing the students got confused with was moving the decimal place and the importance of the zero's" – (Personal communication, 11th March, 2013)

Students particularly had trouble understanding scientific notation and the information contained in the position of the decimal point in a number. Many students (over half the class) were unsure about the information the decimal point told them about a number and were mathematically naïve about the basic parts of the number. As a response to this, the pace of the following lectures was changed to suit the learning needs of the students.

Paradoxically, the students appreciated the change in pace of deliverance of course content but saw this as a lack of adherence to the lecture schedule and that they were "falling behind" in their course work.

"She explains things clearly. Goes over certain things a couple of times if we don't understand" – Student comment, MSF, April 2013.

"The lecturer explained this well and also used many examples to help people understand to the best of their ability" "Explains most issues slowly and quite thoroughly" – Student comments MSF, April 2013.

"Stick to the lecture plan" "Lectures falling behind" "running behind in lectures" – Student comments, MSF, April 2013.

As I wrote in my reflective journal on 28th March 2013 (Week 4 of lectures):

"After the problems with introducing scientific notation in Week 2, coupled with the ability of the student cohort, I have realised that I need to cut down the amount of material I am presenting – particularly in the 1st few weeks of semester 1.....The problems I have encountered with EPHLTH170 have made me seriously reconsider the approach I need to take.....- I think I will turn the course on its head and see if we can go "big picture" down to identify what the students need to learn".

Although the chemical concepts were presented in relation to nursing, and the pace of the lectures had been adjusted to meet students learning needs, the students still found it challenging to learn chemical concepts and appeared to have trouble transferring new knowledge to unseen situations. As I wrote in my reflective journal on May 1st, 2013:

"New concepts are still very hard for them – and linking concepts is hard – making logical leaps."

Student comments from the EPHEALTH 2013 SFC survey and MSF indicated this:

"The quantity and depth of chemistry concepts is at times overwhelming and I'm struggling to feel confident that I know it as well as I should. Whilst I understand this all relates to a career in nursing, at times it felt like the chemistry was never going to end!"

"....hard learning chemistry in very short time span"

"Feels too rushed. Finding it hard to keep up and understand"

"I think we need more time on chemistry"

"Sometimes hard to understand methods/application (Maths/chemistry) explanations"

"When it comes to the difficult things like maths or chemistry....."

"I think there's a lot of chemistry involved, needs more time to understand it"

Many students did not see the "buy in" for learning maths and chemistry and how it related to the human body or nursing until much later towards the end of the course, even though it had been presented in a nursing context.

"the funny thing I have notice there are lots of connection with each body system and cells. It really blows me away how our bodys (sic) work." – (Personal Communication, 5th November 2013).

Although there were problems with the course the students recognised that the teaching in the course was good, rating teachers highly.

After reflecting on the feedback provided by the students in the 2013 EPHEALTH course, the course was re-designed.

Challenge 2: Re-design of the EPHEALTH course to meet the learning needs of the students enrolled in the Science for Nursing and Midwifery Course:

Innovation: Embed chemical and mathematical concepts within anatomical and physiological concepts.

For 2014, course topic order was rearranged to allow a gentler transition to university, allowing students more time to begin developing their academic and study skills.

In 2014, the course began with a focus on the body and how disease occurs. Chemistry concepts were embedded within the relevant body system. For example, acid, base and pH concepts were embedded within respiratory system content. It was hoped that when course material was presented this way students would be able to immediately see the relevance of chemistry to the functioning of the human body.

A large number of students who choose to study EPHEALTH also choose to study the Open Foundation EPMATH course.

In 2013, students may have struggled with the mathematics in the EPHEALTH course because we introduced mathematical concepts in advance of the EPMATH course, making it more difficult for the students to understand the EPHEALTH content.

When EPHEALTH was re-designed for 2014, introduction of mathematical concepts needed in EPHEALTH were aligned with the relevant topics in the EPMATH course. This allowed students to be introduced to the mathematics concepts in the EPMATH course before they needed to use them in EPHEALTH.

Results and Feedback for the 2014 EPHEALTH Course offering:

Teaching the 2014 EPHEALTH course has been vastly different this year. Although large numbers of students still enrolled in the course (over 560 students), students have reported finding the course content easier to understand this year.

Students have still found the chemistry content challenging. However, having the chemistry embedded within the anatomy and physiological content has made their understanding of course material better. Most importantly, repeat students have enjoyed the new structure and found the course more enjoyable than last year.

"It flows better this year.....it's not so intense, not bam, bam, bam..... I think last year all the hard topics were at the start and the easier topics were at the end.....I'd never done chemistry before, so last year was like a slap in the face – you have to learn this, just learn it" - (Personal communication, 22nd September, 2014).

"Even though it's the same content, the way in which it is presented is easier to understand. For people who haven't studied for a while it was easier..... this year eased us into uni life before getting hit with the chemistry" - (Personal communication, 22nd September, 2014).

"Last year it felt like you were teaching chemistry as a chemistry teacher but this year it's like you are teaching it from a nursing perspective" - (Personal communication, 22nd September, 2014).

The satisfaction of students with the course is reflected in the improvement of SFC scores from 3.8 for the 2013 course offering to 4.4 for the 2014 offering.

Did the 2013 EPHEALTH course adequately prepare students for undergraduate study, despite the challenges?

We hypothesised that the EPHEALTH course delivered in 2013 would provide the students moving into undergraduate study in 2014 with:

1. An increased confidence to undertake difficult tasks in their first semester of undergraduate study,

2. A deeper understanding of the concepts in the Human Biosciences (HUBS), and
3. An increased skill level with university systems and ability to access support services.

A survey undertaken by students who had successfully completed EPHEALTH in 2013 and were now enrolled in 1st year nursing, indicated that although the students had found the course challenging in 2013, they had developed both academic and non-academic skills allowing them to pursue their subsequent undergraduate studies with confidence.

Survey Results:

The survey had a response rate of 33%, with 42 of the 127 invited students responding. Cronbach's alpha had a high internal consistency $\alpha = 0.88$.

Over 92% of the survey respondents agreed or strongly agreed that studying EPHEALTH gave them more confidence to undertake difficult tasks in undergraduate study and helped prepare them for the self-directed learning required in undergraduate study (Question 2, Table 2).

Reflecting the difficulties experienced in delivering the mathematics content of the course, only 65% of survey respondents felt that EPHEALTH had improved their mathematics skills (Question 6, Table 2). This question also had the highest percentage of students who disagreed with the statement (12.2%) or who were undecided (21.95%) about whether the course had improved their mathematics skills (Question 6, Table 2).

Table 2. Mean (M) and standard deviation (S.D) for questions 1-12 and percentage of students who strongly agreed/agreed (S.A/A), strongly disagreed/disagreed (S.D/D) and neither agreed or disagreed (Neut).

Question	M *	S.D	S.A/A (%)	S.D/D (%)	Neut(%)
1. Studying Ephealth helped me to develop the time management skills required in undergraduate study.	4.53	0.64	90.47	0.00	9.53
2. Studying Ephealth gave me more confidence to undertake difficult tasks in my undergraduate study.	4.43	0.594	92.68	2.44	4.88
3. Completing the group work in Ephealth helped me to understand the importance of working as a team.	4.10	0.841	78.9	7.32	14.63
4. Studying Ephealth has given me a deeper understanding of Human Biosciences (HUBS)	4.58	0.747	87.8	4.88	7.32
5. Completing Ephealth has improved my mathematics skills	3.75	0.869	65.03	12.2	21.95
6. Completing Ephealth has helped me with Library skills	4.15	0.863	85.37	7.32	7.31
7. Completing Ephealth has helped me to carry out my own research.	4.25	0.669	92.69	2.44	4.88
8. Completing Ephealth has helped to improve my communication skills	4.15	0.769	82.50	2.5	15.00
9. Completing Ephealth has improved my writing skills	4.20	0.822	85.37	4.88	9.76
10. The Ephealth course helped to understand how to access support services.	4.15	0.769	75.61	2.44	21.95
11. The Ephealth course helped to understand how to use the university computer systems.	4.38	0.667	87.8	0.00	12.2
12. The Ephealth Course prepared me for the self-directed learning required in Undergraduate study.	4.50	0.784	92.69	4.88	2.44

*N=42

However, over 87% of students responded that studying EPHEALTH had given them a deeper understanding of Human Biosciences (HUBS). This question also had the highest mean score of 4.58 (Question 4, Table 2).

Open ended comments from 27 out of 42 respondents were coded under three main themes of 1) preparation for HUBS, 2) skill development and 3) confidence and support (Table 3).

Table 3. Data Extract with codes applied.

Data extract	Coded for	Number .
Feel strongly that it prepared me for HUBS	Preparation for Human Biosciences (HUBS)	11
It has prepared me for University Life	Skills preparation	10
Gave me confidence and made it less stressful	Confidence and support	6

The first theme to emerge from the responses was the increased confidence in the Human Biosciences subject studied in undergraduate nursing for example. Comments such as: *“This course has been an enormous advantage going into my degree. I had never studied chemistry or biology before EPHEALTH and I was able to achieve a HD for HUBS in my first semester of my degree.”*

Coded under the theme “Skills development” there were comments such as:

“I would never have been able to manage in my first year having to learn about the uni systems, the services available, how to use Blackboard, Turnitin, how to reference etc.”

The third theme “Support and Confidence” contains comments such as:

“I was provided with a huge amount of support and given constant feedback about my progress which in turn had a huge impact on my confidence and ability to work independently.”

The thematic analysis indicates that the preparation for the Human Biosciences was the predominant theme amongst the respondents who completed the open response question on the survey.

Discussion:

A course designed for mature students must take into account the learning characteristics and needs they bring to the tertiary environment (Knowles, 1980). At UoN, generic academic skills are embedded within discipline specific content for students. This focus on preparing students through embedded content for their future degree is consistent with best practice andragogical principles (Knowles, 1980). Students also need to have an effective transition to higher education. This occurs when students are engaged with the material, feel a sense of belonging to the institution, and begin developing knowledge, skills and confidence to be a successful student in higher education (Kift, Nelson, & Clarke, 2010; Thomas, 2012).

The EPHEALTH course was designed along these principles. Group work was included to give students a sense of belonging, and help them develop a social and academic network.

Although the chemical and mathematical content of the course in the initial offering in 2013 was presented in relation to nursing examples, the students found the chemistry and maths content hard and difficult. The order of course topics led to student disengagement in the first few weeks. This appeared to create a disconnect in the students about their expectations of the course, which left a large number of students feeling they were unable to be successful at higher education studies.

In 2014, the change to presenting anatomical and physiological concepts in the first weeks of the course engaged the students with material because the relevancy of the content they were learning was immediately obvious to how it could be used in their future careers as a nurse – they were getting a higher education experience that was relevant to their interest and future goals (Knowles, 1980; Thomas, 2012).

Why did this change in order of topic presentation improve the student experience of the course?

Traditional science based curricula adopts a constructivist approach, with students constructing meaning from their own understanding and knowledge of the world through experiencing things and reflecting on those experiences (Cakir, 2008; "Constructivism", 2004). This was the approach taken with the original design of EPHEALTH in 2013. The success of students constructing their own scientific knowledge in a course designed using a constructivist approach depends upon them having reached an understanding of the hierarchical system of interrelationships amongst knowledge learnt at school (Cakir, 2008). Many Open Foundation students have had disadvantaged educational experiences at school and may have not developed these knowledge frameworks, making it hard for them to construct their scientific knowledge in the way the 2013 EPHEALTH course was delivered.

Changing the presentation of topics to begin with anatomy and physiology presented first, and in relation to diseases, allowed the students to relate to the knowledge and concepts being taught in a way that reflected their everyday life and situations. It also allowed them to see how the knowledge being taught could be used in the nursing professions. This approach is based upon situated learning theory where students learn knowledge and skills in a context that the knowledge is used in real life situations (Anderson, Reder, & Simon, 1996; Smith, 2009).

Teaching students about the basic concepts of chemistry and then getting them to apply it later in the course did not allow the students to see the connection between chemistry and anatomy and physiology until almost the end of the semester.

Where to from here? Students completing the course in 2014 and entering undergraduate nursing will be surveyed in 2015 to assess if the re-designed course better meets their learning needs to be successful in undergraduate studies.

Conclusions

The original 2013 EPHEALTH course was designed to improve the scientific knowledge, skill development and confidence level of open access students wishing to enter undergraduate study in nursing the following year.

Personal observations identified several challenges in designing and delivering this first offering of the EPHEALTH course in 2013, including the difficulty students had in grasping the chemistry and maths content. Student surveys confirmed these observations. It appeared that one of the main causes for the difficulties in delivering the course was that even though the chemistry and maths were taught in a nursing context, the students' had difficulty in seeing its relevance as they had not yet learnt any anatomy and physiology that the chemistry would eventually be related to.

An outcome of analysing these personal observations and student survey results was the redevelopment of the course. The order of teaching was changed such that human biosciences were taught first. Chemistry concepts were embedded within the relevant body system. This resulted in students being able to see the immediate relevance of the chemistry and maths to their future nursing studies.

The more difficult chemistry and maths concepts were taught later in the course, resulting in the student being able to immediately relate these concepts to the Human Biosciences they had already learnt.

The survey results and analyses of responses from the 2013 cohort confirmed that although the students found the 2013 EPHEALTH course extremely challenging they were now able to reflect on the positive benefits they have obtained by completing the course. As they complete their first year of undergraduate study these students have a new appreciation of

the efforts required to learn new material but more importantly they have the confidence to persevere with the harder tasks. They also have a deeper understanding of the concepts in the Human Biosciences (HUBS) as well as an increased skill level with university systems and ability to access University support services.

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