Poultry production online: Where broilers and layers encounter virtual pedagogy

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Programs traditionally offered through distance and/or residential models of delivery are being challenged by the value and accessibility of online learning. For the Australian Poultry CRC, the opportunity to both upgrade its foundational units and shift the delivery mode to enhance unit accessibility resulted in funding being allocated for conversion of those units to online delivery. This paper provides the background to the project, the rationale for the development paradigm, the delivery model that emerged through interactions between content and educational specialists and the outcomes of an evaluation conducted over Semester 2, 2008. The project reinforced the value of applying established online learning frameworks to the transformation of educational resources, the importance of subject matter experts collaborating with educational design specialists and the potential for specialist models such as Three-Phase Design (3PD) to facilitate emergent learning opportunities. The project also addressed three key challenges –conversion of face-to-face practical exercises to the online context, changing from a content-rich to an activity-intensive environment and building a functional online course within a short time-frame.

Keywords: poultry production, online learning, higher education, continuous improvement

Introduction

Two core poultry-based units offered by the University of New England (Poultry Production and Poultry Physiology) were targeted by the Australian Poultry Cooperative Research Centre (CRC) for conversion to online delivery from their existing distance education mode. The units, originally introduced in 2005, are in demand with the local industry as well as poultry producers overseas; however, enrolment has typically been low due to the delivery model, which included mandatory attendance at a four-day residential school and which was not always suitable for students employed in the industry or based overseas. This paper documents the processes and strategies employed to convert one of those units (Poultry Production) and the means by which the revised design would also meet the long-term plans of the CRC to develop short introductory and refresher courses for the Australian poultry industry.

Poultry Production is a 6 credit point unit designed to introduce students to critical factors of poultry production, particularly as they relate to the commercial poultry industry, and is offered at both 300 and 500 levels. The unit was designed to provide students and clients completing a Certificate or Diploma in Poultry Science with further understanding of commercial poultry production, and was originally offered in distance education (external) mode. Poultry Production was targeted at people currently working in the poultry industry or those seeking to enter the industry in order to develop a sound foundation of professional competencies. The unit has been sponsored by the Australian Poultry CRC and one of the broad goals of the Australian Poultry CRC's Education and Training Program is to achieve an increased level of skills for all sectors of the industry. To achieve this goal, it was crucial that the education and training related to the poultry industry be offered on a basis that would allow students to study while still continuing to work. While the external mode offered that option, the potential for flexibility and increased enrolments made the online option attractive.

The existing unit was based on nine modules (see Table 1 following) covering different aspects of poultry production. These modules were unequally weighted, both in terms of content and assessment, with the first introductory unit contributing 5% of the unit load while the module covering nutrition contributed 30%. The majority of learning materials were delivered to students in hard-copy, with the exception of

material kept on the library's eReserve. The delivery of the unit was based on self-study, with minor guidance from the unit coordinator and unit handbook, as well as compulsory attendance at a residential session which included formal lectures and hands-on practical sessions. Assessment included reports from the practical sessions, formal papers and a final exam worth 50% of the final assessment.

Within this environment, the challenge to implement an online unit was constrained by three factors. First, the University of New England is recognised as a leader in distance education, and while programs continue to rely on traditional models, the drive to integrate online teaching and learning strategies is strategic. However a constraint to achieving this goal is that few academic staff have been trained in the core educational skills to develop curriculum for online delivery, especially in the sciences, even though probationary milestones for new academic staff can include formal certification through the Graduate Certificate of Higher Education. Additionally, as many units in the sciences are team-taught, it remains problematic to provide targeted staff development for all participating staff. Therefore the first factor to address was to ensure that a component of the development process include professional development for the contributing academic staff, which was resolved by engaging an experienced educational developer whose role was to provide design and development expertise while working with academic staff as well as running formal professional development sessions.

The second factor related to the system which would be used to deliver the new online unit. Until 2008, the University of New England had used WebCT for online delivery of its units. However, at the commencement of the 2008 academic year, two new platforms were introduced: Blackboard (Bb), as an updated version of WebCT and Sakai, as an open-source application. The attraction to Sakai was based on its constructivist and collaborative framework, key components of effective online learning environments (Sims, 2008). However, as all students would be required to enrol formally through the university, the choice of delivery platform was restricted to Blackboard; this meant that design decisions were informed by the functionality of this learning management system.

The third factor related to the time constraints in relation to transforming the unit from its traditional external study mode to one completely online; due to delays in funding and staff allocation, the educational developer and subject matter experts had restricted time to complete the project. To resolve this, a specific set of tightly-monitored milestones were established and an online design methodology (Three-Phase Deign or 3PD, based on Sims & Jones, 2003) was implemented to ensure the unit would be available for delivery for the commencement of Semester 2, 2008 (July 28th). Initial design discussions commenced in mid-February 2008 and the unit was implemented and functional by mid-May 2008.

This transformation project therefore involved the design and implementation of an online unit to replace its distance education/external predecessor, to utilise the features of the Blackboard learning management system, to integrate staff development in online learning and to complete the development within a three-month time-frame. This paper provides an analysis of the design process and teaching strategies, a review of evaluation data collected and perspectives on follow-up stages for ongoing enhancement of the unit.

Three-phase design

Underpinning the educational design process was a strategy to create functional course delivery components, with evaluation and improvement activities integrated with scaffolding (support) for the academic staff to provide a dynamic and effective online teaching and learning environment in which resources or strategies could be developed or modified during the actual delivery stage. This process is integral to Three-Phase Design (Sims & Jones, 2003) and its iterative development philosophy, where functional units are built for implementation while acknowledging ongoing review and evaluation will contribute to unit enhancement, as represented in Figure 1. The model itself was specifically created for the higher education context, taking into account the development environment, the delivery environment and the demand for continuous improvement (through ongoing formative and summative evaluation) of programs and their constituent units.

In the first iteration or phase, online components are created to display functional delivery with the necessary elements for effective online teaching and learning. This was a critical focus for the project as there was a significant time constraint – ensuring a robust environment was a priority. In the second phase, which will occur following formal evaluation, the unit will be modified and enhanced in terms of both resources and activities. The enhancement process can continue for multiple iterations until the unit is considered fully operational, after which it will be subject to ongoing maintenance as required. The value of this model is the integration of evaluation as the critical change agent and the focus on pedagogical effectiveness (functionality) rather than glamour of the media resources.
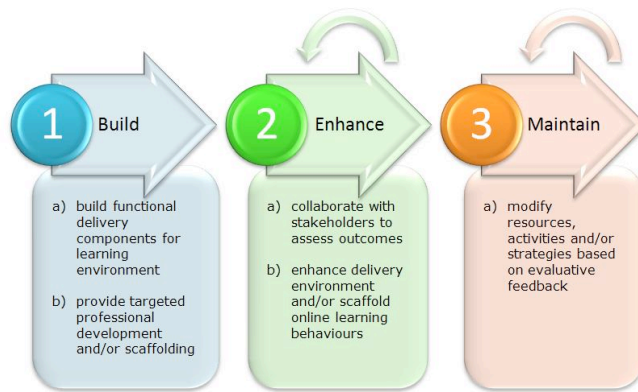
Figure 1: Iterative structure of three-phase design (adapted from Sims & Jones, 2003)

In addition, the Three-Phase Design (3PD) model is founded on a team approach, integrating the three main skills required for effective online course development (design, subject matter, production) into an organic rather than disparate targeted and effective team. For the Poultry Production project, the design and production competencies were assigned to the educational developer (with extensive experience in creating online learning using Blackboard and considerable expertise in teaching and learning) while the key subject matter advice came from two academic staff. While this particular project was designed for completion and evaluation in a single academic year, according to the Three-Phase Design model these teams could stay formed for an extensive period, potentially over a number of semesters.

Importantly, by reinforcing a team-based approach, the application of 3PD enabled scaffolding (through professional development) of academic staff with no prior experience of online pedagogy or teaching. In the case of the Poultry Production project, the interactions between members of the project team resulted in the development of a shared understanding of the processes underpinning formal educational design and the most appropriate strategies that could be used when implementing online teaching and learning resources. Using 3PD as the development model for the project, the implementation of an effective online pedagogy was enabled, and the key elements of the development and transformation of Poultry Production into an online unit are documented in the following sections.

Applying online pedagogy

Transformation

The resource materials for the existing external unit included a textbook, unit guide, which included notes and readings on selected topics, a practical manual, video, and eReserve readings. The unit was divided into nine modules (as shown in Table 1), and as part of the discussions and negotiations between subject experts and the designer, it was determined that components from existing Modules 5 and 8 could be combined with existing Module 3, while existing Module 9 could be integrated across all modules. This results in a revised unit comprising seven discrete modules, as shown in Table 1. One of the reasons this integration of topics could be achieved is that the original unit had been written around a specific textbook, with chapters forming the basis of the study modules for the unit.

However with intense review of the learning outcomes (as discussed below), it became apparent that the modules assigned for study could be modified without affecting the overall unit outcomes. In addition, this process resulted in a renaming of selected modules to make their intent more transparent to prospective learners. The structure also met the needs of the Australian Poultry CRC to provide industry-based short courses, as each of the online modules identified in Table 1 can be re-purposed into stand-alone modules.

An active-reflective strategy

From a design perspective, the challenge to transform a distance education unit (using a self-paced model with readings, major assignments and residential sessions) into online delivery meant applying and implementing established online models and strategies. Willis' (1995) recursive, reflective design and development model (R2D2) provided one of these frameworks. Focusing on revisiting course content or

Table 1: Transformation and renaming of unit topics

Original unit topics	Transformed online unit topics
1. Introduction to the Poultry Industry	1. The Poultry Industry
2. Poultry Genetics	2. Genetics and Breeding
3. Broiler and turkey production	3. Production, Management and Welfare
4. Bird Health	4. Health and Diseases
5. Poultry management, welfare & behaviour, environmental issues	
6. Nutrition, Choice Feeding	5. Nutrition
7. Microflora of gastrointestinal tract	6. Microbiology and Production
8. Layer production, quality and safety of poultry products	7. Product Quality and Safety
9. Current Industry Issues	

components at different times, reflection based on peer and teacher feedback, non-linear approaches and participatory design (where the learner is an integral contributor to the educational environment), theimportance of emphasising the learner's role in the course and the value of reflection became crucial components in the online design for Poultry Production. Similarly, the work of Laurillard (2002) in defining a four-component conversational framework for teaching and learning was instrumental in creating the overarching pedagogy for the unit, integrating *discussion* between teacher and learner, *adaptation* to the environment, *interaction* with the environment and *reflection* on performance. A second R2D2 model (Bonk & Zhang, 2006) was also applied to the design, incorporating *reading*/listening, *reflective*/writing, *displaying* (content creation) and *doing* (active) components.

Using these frameworks and other online learning techniques (e.g. Salmon, 2002) in conjunction with the existing design and delivery components, an online strategy was developed that focused on active elements of the learning process. This strategy included *reading* and researching key resources, *responding* to specific questions relevant to the topic, *discussing* issues arising from the readings and responses, *completing* relevant activities or assignments where appropriate and *reflecting* on and *self-assessing* learning (Appendix A provides an example of this design strategy for one of the modules). While these six components were not applied to or appropriate for all learning modules, the basic strategy of *read-discuss-reflect-assess* was agreed as a viable strategy for the initial implementation of Poultry Production Online.

As noted, one of the factors that influenced the project was the comparatively short time-frame for delivery. The project was activated in February 2008 and, because of outstanding commitments from members of the project team, a working product within Blackboard was scheduled for mid-May 2008. While the new online unit was implemented on time, largely due to the design strategy applied, effort was not applied to the development of complex media components or alternative design strategies, with the expectation that evaluation would identify specific media resources to enhance the unit, Similarly, advice from the teaching staff was that relevant existing resources were not available or appropriate.

Content or activity

One of the key success factors of online units relates to the interactions that take place between all participants and the role those participants take in activities relevant to the unit outcomes (Salmon, 2002). In the distance/external delivery of the Poultry Production unit, the major interaction had come through the residential sessions. However, for the online environment, emphasis was placed on consistent engagement with the unit content, participants and activities. To achieve this meant making significant modifications to the unit in terms of current statements of objectives and the accompanying assessment strategies. With respect to the stated unit objectives it became evident to the development team that many of the objectives were at the *remember* level of Bloom's Taxonomy (Anderson & Krathwohl, 2001) and that it would be more appropriate for these to be expressed at a more complex level, such as *apply*. In addition, it was agreed that the online learning environment for the Poultry Production unit would provide students with the opportunity to apply, evaluate or analyse the ways in which the content base, derived primarily from the unit textbook, had an impact on their own poultry production practice or experience. Consequently the existing unit objectives were revised and expressed in terms of unit outcomes – examples of which are shown in Table 2 following.

Table 2: Transforming objectives into outcomes

Original objective	Transformed outcome
Describe the development of the Australian poultry industry and explain the global importance of the industry	Contextualise your own poultry production enterprise within the global poultry industry
List the major diseases of poultry and their causative agents	Explain the cause of infectious and non-infectious poultry diseases and their impact on poultry production

Restating the objectives as outcomes was significant for the subject matter experts. Rather than viewing objectives as reflecting the ability to report content from the major unit resource (such as a textbook), it became evident that focusing on unit outcomes required the teacher to think about how students might apply that content. For the online context this also shifts the thinking towards the learner's role and context in the course, rather than the teacher as subject expert (Sims & Stork, 2007).

A second element for transformation related to the assessment strategy, which originally consisted of three semester assignments and an end-of-unit exam. Given the importance of maintaining student involvement in an online unit, an assessment protocol was implemented whereby each of weeks 1-14 were allocated a percentage for discussion participation and activity completion (a total of 70%) with the final 30% being applied to a final paper (which varied for the 300 and 500 level students). Underpinning this strategy was the philosophy that learning would emerge from the interactions between learners and teachers (unit participants) and that reinforcing this interaction as an assessment component would enhance the overall delivery and engagement of course participants.

This strategy represents the type of shift that academic staff must make when implementing online learning environments. Rather than using what might be called traditional assessment and use the final examination as the major item, it becomes challenging to conceive of regular interactions with the students and, as a result of those interactions, assigning a grade or score to the student's performance. Such a shift relies on students actively participating in the unit, which also requires clear specifications of unit expectations and assessment criteria (which were integrated into the online structure) – as well as relying on the teachers to participate more actively in the work being submitted by their students.

Practical activities

In addition to the content and assessment, one of the interesting challenges faced by the development team was the conversion of existing practical activities into comparable and viable online exercises. A frequent assumption in education is that hands-on activity is the most effective in achieving learning outcomes; however, recent research (Pyatt & Sims, 2007) has shown that the simulated environment can achieve equivalent outcomes to the 'wet' laboratory. While the practical components for Poultry Production were not explicitly laboratory focused, it became clear through the design phase that effective alternatives could be implemented through situated simulations.

The five existing laboratory practical exercises were converted into three activities for the online environment, with the reduction being justified from two perspectives. The first was that students would be able to use the knowledge and skills gained through the online interactions to apply to the real-world environment and second, that the activities themselves would allow the students to achieve the same learning outcomes. For example, the practical where students were to conduct a post-mortem inspection on chickens was converted to an exercise where students were asked to diagnose poultry-related diseases by inspecting images and to communicate their conclusions through a report.

As a transformational exercise, this process challenged current and accepted practice. Because a unit has been assessed or delivered in one way does not mean that is the only way, especially if delivery is online. More importantly, the process allowed academic staff to consider whether existing assessment items actually supported the desired outcomes, and whether those outcomes might be achieved in ways other than the traditional methods. The experience with this project is that many strategies can be used to achieve the desired unit outcomes, and that in the case of the practical activities undertaken at residential, the use of online alternatives would not impact on the actual learning outcomes.

Emergent practice

A secondary but equally important outcome of the 3PD process is what can be termed emergent design (Irlbeck, Kays, Jones & Sims, 2006), whereby a unit can be developed with broad outcomes that allow the students to interact and develop solutions which may not have been achievable with more specific objectives or outcomes. In this particular case, the discussion and completion activities were designed to allow student to present solutions for their own workplace context solutions that both emerge from the discussions and which may identify new, alternative or modified approaches to those that are presented in the unit resources. Providing opportunities for students to apply their learning to their own context is a well known learning theory (Driscoll, 2005), and in the online environment the opportunities to cater for the individual learner is considered critical to achieving successful outcomes (Sims & Stork, 2007).

Implementation

As shown in Figure 2 following, the initial implementation was completed and the unit available for access from Semester 2, 2008. More specifically, the Table of Contents highlights the language that is used to prompt the student as to their role in the learning process. Often design layouts present a series of links such as "Activity 1, Activity 2 ..." whereas in this design the links state clearly, and in an active voice, the learner's task is for the corresponding module.

Figure 2 also illustrates the different threaded discussions designed to enable students to apply the content to their own context as well as compare and contrast that application with the contributions of other students. A key component of this design was establishing a voice or tone to enhance the establishment of a strong social presence within the online learning community (Preece, 2000), thereby allowing students to develop a sense that the interactions and discussions associated with the different modules are key to their ultimate knowledge of the poultry production and the associated industries.
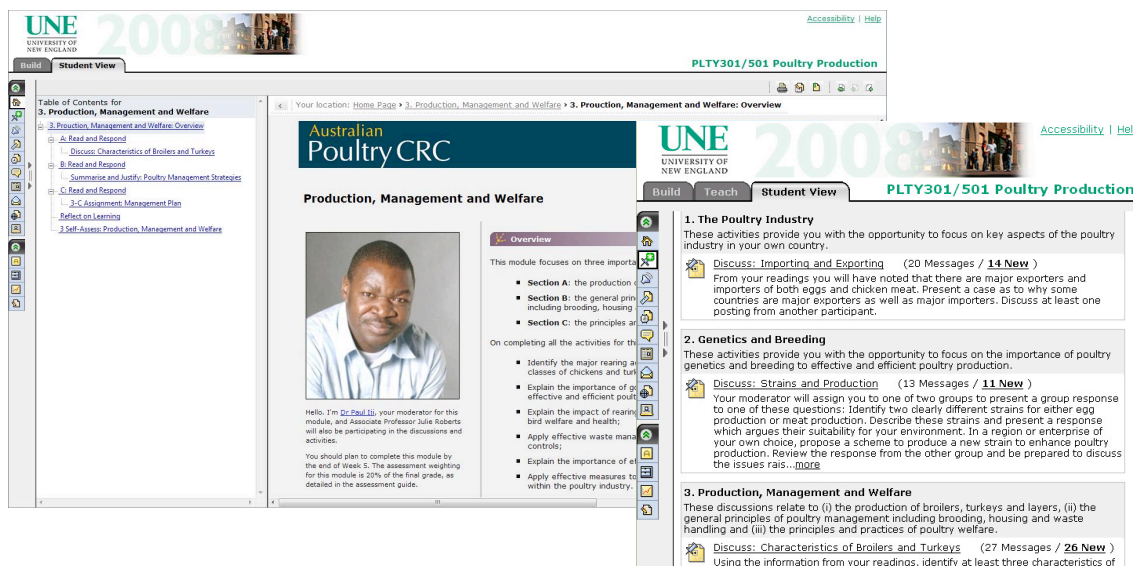

Figure 2: Active learning strategy and associated content

Evaluation

Regardless of the effort made to align design strategies with learning preferences, it is not until actual implementation can the dynamic between design and learner and teacher be fully assessed. For this project, and as a key component of the project structure, funding was included for the review and on-going development of the unit. The first phase of this evaluation was to elicit feedback from learners and the unit coordinator to assess responses to both the shift to online implementation and the value perceived from that shift.

The student's perspective

Enrolments at the census date (7) were consistent with previous offerings, and five of those students provided feedback through a combination of email communications and responses to a 10-item online unit evaluation. The survey consisted of seven items requesting a rating from Strongly Agree (5) to

Strongly Disagree (1) and three items requesting open-ended responses; the ten items are listed below and the average responses for the first seven items are presented in Figure 3.

1. I usually had a clear idea of where I was going and what was expected of me in this course.
2. The staff made it clear right from the start what they expected from students.
3. The teaching staff normally gave me helpful feedback on how I was going.
4. The online discussions helped me apply principles covered in this unit to poultry production practice.
5. Relevant learning resources were accessible when I needed them.
6. The study materials were clear and concise.
7. This unit developed my confidence to investigate new aspects of poultry production.
8. Please let us know what you especially liked about this online unit on Poultry Production.
9. Please let us know how you think this online unit on Poultry Production could be improved.
10. If there are any other observations you have about this online unit on Poultry Production, please make them here.
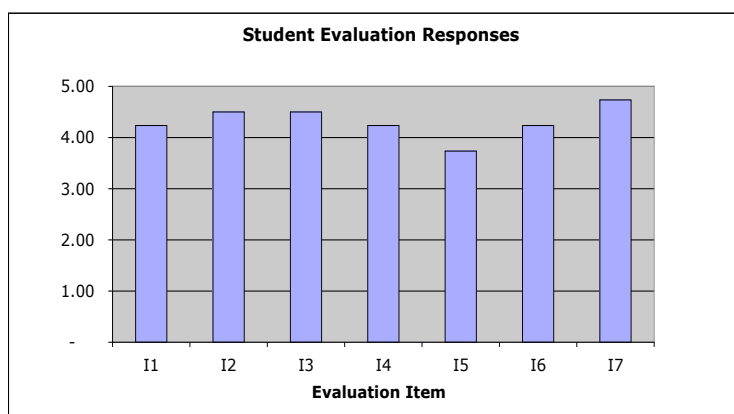
Student Evaluation Responses

Evaluation Item	

Figure 3 shows a bar chart titled "Student Evaluation Responses" with the y-axis ranging from - to 5.00 and x-axis labeled Evaluation Item showing bars for I1 through I7. I1 ≈ 4.25, I2 ≈ 4.5, I3 ≈ 4.5, I4 ≈ 4.25, I5 ≈ 3.75, I6 ≈ 4.25, I7 ≈ 4.7.

Figure 3: Average rating scores for student evaluation survey

Overall, the students were positive about their experience with the unit, with the lowest rating (3.75) assigned to the availability of resources. While all resources were available from a specific link on the home page, this response may reflect the following written responses (for Items 8 and 9) which requested more face-to-face contact during unit delivery.

Item 8: Please let us know what you especially liked about this online unit on Poultry Production.

> helped in learning the aspects the poultry field … developing the skills needed for making market research reports … gaining vital knowledge about poultry production

> The module asks questions and presents discussion topics which requires students to research the answers … in researching I have learnt more than just the particular points of discussion … in short I just learnt more

> I like online discussions as people share their experiences, discuss their view points on a particular topic. Reflecting on the current theoretical aspects with what is happening in the field is something I find interesting. I believe this is what students should try to accomplish after completing this unit … Another thing I like is the feedback from the facilitators. They're able to comment and guide students back on track … or give corrections on any issue raised. Not the least but important is that the facilitators' comments motivate students to participate more

Item 9: Please let us know how you think this online unit on Poultry Production could be improved.

> First, every fortnight one class should be conducted as it can help an individual to improve in every assignment or discussion. Second, many are not comfortable with discussions which are conducted online, therefore assessment should be done not only on the regularity of discussion postings but also by seeing the quality of material posted. Thirdly, at the end of the course, every student should be asked to present the learning for the poultry production by giving a presentation … Also, one or two practical sessions or an industrial tour should be conducted to help understanding the subject

> An orientation face to face class prior to the actual online semester may be worthwhile

From the lecturer's perspective

The initial enrolment (n=12) was considered positive, representing the highest number since the unit was introduced in 2005, and all but two responded that they had read and understood the unit expectations. However, activity within the first two weeks was limited, prompting reorganisation of the assessment weighting for the first two modules. In addition, students were advised to devote at least 3 hours to the unit each week in order to cope with the discussion and assessment items. However, by the end of this period five students had withdrawn and although no-one cited a specific dislike for the unit, they indicated that they were unable to manage the time frame allocated for each module.

It also appeared that the 500-level students coped better with the pace than 300-level students, endeavouring to initiate and respond to discussions more rapidly and regularly. Despite frequent reminders of the importance and value of timely engagement with the discussions, the tendency, particularly from 300-level students, was to commence discussion towards the end of the time scheduled for the module. This did not augur well for response from the teaching staff or their peers. On reflection, the work load may have been too heavy for the students, and therefore one modification being considered to enhance and sustain interest and motivation is to alternate activities and discussion and emphasise the self-assessment quizzes available for each module.

Summary

The evaluation highlights both the challenges and opportunities which arise from *moving online*. From the student's perspective the added value from regular interaction and discussion contrasted with the effort required to access and engage with the online resources and activities as well as the perceived importance of face-to-face sessions. From the lecturer's perspective working actively and regularly with students, as well as developing the unit to vary the discussions and activities were identified for ongoing review and revision. Based on these outcomes, one recommendation emerging from the development and implementation process has been to revise and re-contextualise the unit within a poultry production simulation, such that the sequence of activities will allow students to engage with the different processes and issues that confront the poultry producer. Through sequenced and linked tasks such as establishing an enterprise, addressing environmental conditions, ensuring appropriate feed and nutrition, monitoring health, controlling disease, production and marketing the potential for enhanced engagement and interaction may dispel the initial challenges faced by teachers and students alike.

Conclusions

Going online is by no means a new phenomenon, but for many disciplinary areas the value of the online context is now determining their ongoing program delivery strategy. In the case of the Australian Poultry CRC, catering for the current needs of students as well as opening study opportunities for a broader student cohort meant that *online* was a logical solution. By using a development model specifically designed for higher education, subject matter expertise from the poultry industry and specialist instructional design input, a project was implemented to transform an existing distance education/external unit into Poultry Production Online. This process revealed three critical challenges for the development team. First, the need to have in place a set of achievable milestones and curriculum design processes to ensure the unit would be available on time for the semester start. Second, the openness to accept different ways of undertaking teaching and learning to take advantage of the online learning context, including the way in which content is employed and assessments used to measure learning outcomes. Third, recognising the importance of professional development to engage with the concepts of online learning and the implication of those concepts for unit delivery.

Overall these challenges were met, and the communication and collaboration between the team resulted in an on-time delivery of Poultry Production Online, demonstrating that Three-Phase Design, as a continuous improvement model, can effectively be used to create a functional online course within a relatively short timeframe of three months. At the same time, the restructure and modularisation of the unit provided a framework whereby the discrete unit modules might be offered as individual professional development modules.

With the majority of universities now enabling online teaching and learning, using a continuous improvement model such as Three-Phase Design not only ensures the efficient production of a function unit but also the procedures by which that unit can respond and change through evaluative feedback. Poultry Production has now been successfully implemented and delivered – the ongoing challenge is now

to develop and enhance the unit to utilise the affordances of online learning (interaction, flexibility) and meet the needs of a diverse student audience.

Acknowledgements

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Appendix A: Module design document

Module 2: Genetics and Breeding			
Moderator	Dr Paul Iji		
Delivery	Week 02		
Weighting	5%		
Overview	This module focuses on the importance of genetics to the effective and efficient breeding of chickens and turkeys, specifically within the context of your own poultry business.		
Learning Outcomes	• Discuss the general goals and principles of breeding programs in poultry production. • Apply your knowledge of poultry genetics and breeding to the broiler and layer industries.		

Activities	*Research*	Read Chapter 4 of the textbook (Scanes, Brant & Ensminger, 2004)
		Read the article by Fred Seers
		Find current articles or web sites that focus on poultry genetics and breeding
		As you read through these materials, address these questions:
		    • Why are there so few poultry breeders in the world?
		    • Consider your own experience in the poultry industry. What effect might genetic development have on your stock?
		    • What are some of the key characteristics that you might want to breed for to enhance your poultry enterprise?	

	Discuss	• Your moderator will assign you to one of two groups to present a group response to one of these questions:
		    o Identify two clearly different strains for either egg production or meat production. Describe these strains and present a response which argues their suitability for your environment.
		    o In a region or enterprise of your own choice, propose a scheme to produce a new strain to enhance poultry production.
		• Review the response from the other group and be prepared to discuss the issues raised by the response.
		
		Assessment: This activity contributes 5% to your final grade. The criteria for contributions to discussions can be found in the Syllabus.	

	Reflect	• Based on your research and interactions with other participants, document your achievements in terms of the learning outcomes for this module. *Assessment*: Your reflections from each module will be consolidated and submitted with an analysis (see criteria in the Syllabus) after the final module is completed. For 300-level students this consolidated report will account for 20% of your final grade; for 500-level students it will account for 5% of your final grade.	
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Self Assessment	You can assess your learning by completing the Self-Assessment for this module, which will be available from 00:01 on the Sunday of the week the module concludes.		