

# DEVELOPING BADGE ECO-SYSTEMS TO SUPPORT ENGAGEMENT IN CLASS-BASED AND ONLINE LEARNING

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## Abstract

Badges enable academic and non-academic learners to collect and display their achievements and to enhance their training and qualification repertoire. To support engagement in class-based and online modules we have introduced badge ecosystems backed up by University quality assurance procedures.

This paper presents two case studies which exemplify the application of badges at the University of Derby and the possibilities for future developments of badge ecosystems.

**Class-based: Forensic anthropology/Osteology**

A sequence of badges in the Forensic Anthropology module implemented to support students as they develop their understanding of osteology and bioanthropology. In this context, the implementation of badges relies on the use of learning outcomes that support learning and the assessment of practical knowledge as well as student's ability to observe key features in the subject.

**Online MOOCs**

The University of Derby (UoD) have incorporated badges in a series of Massive Open Online Courses (MOOCs) including: "Bridging the Dementia Divide: Supporting People Living with Dementia (2015); Digital.Me: Managing your Digital Self (2015); Operations Management (2016); a re-run of Supporting People Living with Dementia (2016) and Autism, Asperger's and ADHD (2016). Badges were used to reward degrees of completion and have an association with a favourable average completion rate across four of the MOOCs.

The UoD has incorporated badges to provide recognition for the learning, achievements and contributions of our class-based and MOOC learners, and the credibility of our badges will increase further as we move towards further implementation by academics and departments through the use of the badge framework. This could allow our digital credentials to be used by partners and other educational institutions and will act as an incentive for the UoD to continue its focus on badge development, quality and credibility.

Keywords: Badges, ecosystem, engagement, deep learning

## 1 Introduction

The use of badges at the University of Derby has been led by academic staff and the Academic Innovation Hub as part of a Badges Working Group. The innovative approaches to badges and badge ecosystems have been supported by the development of a University infrastructure for badge development including:

- Schema to back-up micro-credentialing
- Quality assurance processes and
- University badge server

The implementation of badges has taken a developmental approach and interestingly most of the interest, as seen in this paper, has been in the use of badges to support engagement through microcredentialing with badges for discrete elements of learning and achievement leading to awards and coursework grades. The badges then are seen as an integral part of the learning strategy alongside the development of high quality learning materials by academic staff, the University of Derby Online Learning (UDOL) team and the Academic Innovation Hub.

This paper looks at two examples of how badges have been incorporated into the student learning experience, from how the badge schemas were developed, followed by implementation and the early findings and student feedback from the two different learning environments; the Forensic Anthropology module running in a laboratory face-to-face setting with online and class-based tests and the the University's Dementia and Digital.Me Massive Open Online Courses (MOOCs).

## 2.1 Case Study: Forensic Anthropology

### 2.1.1 Aims and objectives for badge implementation

The overall aim of using of a sequence of badges in the Forensic Anthropology module was:

- To support students as they develop their understanding of osteology and anatomy and the bioanthropological techniques that are used to determine sex, stature, age and ancestry.
- To support students through the stages of added difficulty and complexity building up understanding and confidence in anatomical, osteological, dental and forensic/physical anthropological techniques and knowledge.
- The tests leading to the badges and the badge levels themselves were designed help students understand what they have learnt so far and through testing and re-testing lead to deep learning.

This also supported the intended objectives:

- Encouraging flexible learning through student being able to move through the materials at their own pace with faster learners able to move on to more complex material knowing they have consolidated their basic knowledge or in some circumstances prior learning.
- Enabling students to access support e.g. from peers, tutors and in online resources (Blackboard) when and where it is needed.
- Designed to support tutors with developing student's mastery of the subject through testing and feedback so students and tutors are aware of a student's progress or lack of progress on the module.

### 2.1.2 Developing the badge schema

The Forensic Anthropology module has always been phased from learning about names of bones, then parts and being able to identify small pieces of bones before moving on to techniques for estimating sex, age, stature and ancestry as part of a bioanthropological profile, then in the second half of the module writing a skeletal report. The badge schema then followed the same progression using learning outcomes to define each level of learning. Table 1 shows the learning outcomes for Osteology: Post-cranial bones. The progression can be seen in the increasing difficulty of the outcomes from Level 1 through to Level 3. The documentation for this schema could be adopted or adapted by other University's running similar modules.

Table 1. Learning outcomes for each level of badges for Osteology: Post-cranial bones.

On completion students will be able to ...	
Level 1	Identify all the bones of the post-cranial skeleton, including naming bones from their shape (morphology).
Level 2	Identify and name the specific parts of the bones that support identification including; anatomical orientation, siding (Right/Left) and positioning within a group of bones (e.g. carpal/tarsal bones) and sequencing with ribs and vertebrae.
Level 3	Recognise bones from small parts and pieces of bone including naming, anatomical orientation, siding, and position given any limitations due to size of bone fragments. For example; comparing shaft of tibia with shaft of femur, curvature of femoral and humeral heads.

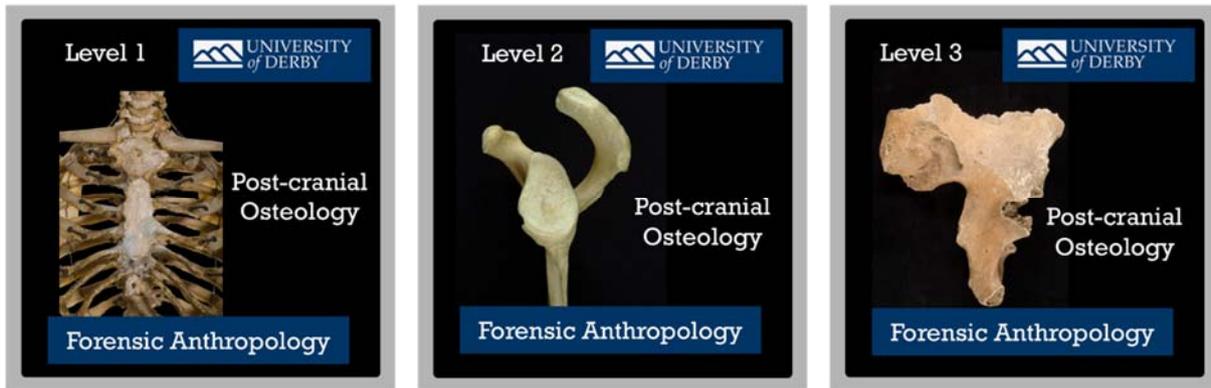


Figure 1. Badges for Post-cranial osteology Levels 1, 2 and 3.

### 2.1.3 Implementation

After developing the schema tests were developed from the learning outcomes using Easygenerator (<http://www.easygenerator.com>) these were exported as SCORM packages then imported and linked to the University's Virtual Learning Environment's grade centre. From this pass sheets were printed for students so physical and virtual badges could be collected.

The use of a series of badges, termed microcredentialing, in this module can be seen both in the way the levels build up and also in the coverage of specific aspects of the learning i.e. Osteology: Post-cranial badges (Fig. 1), Osteology: Cranial, Odontology and then Bioanthropological Profile with microcredentialing badges for Sex, Age, Stature and Ancestry. Students recorded their achievement of these using a collection sheet with black and white images, see Fig. 2. The collection sheet allowed students to apply the colour stickers, see Fig. 3, according to whether they have or haven't achieved a mastery score in the online and practical class-based tests assessing the learning outcomes.

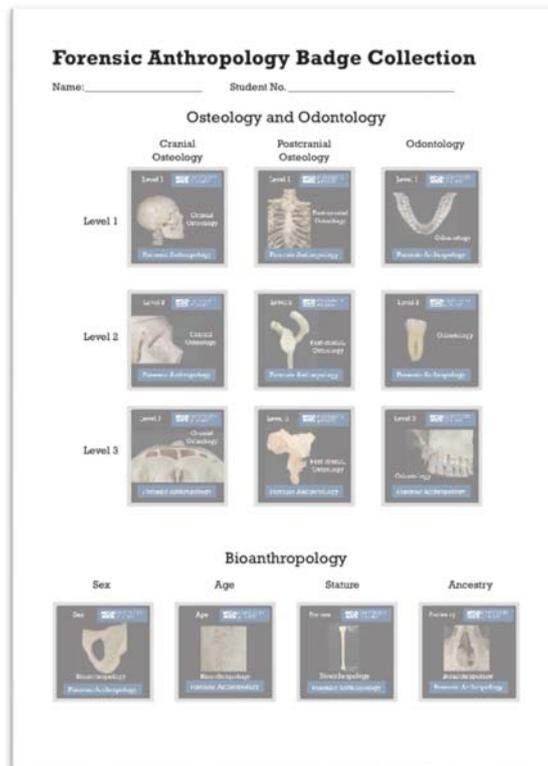


Figure 2. Forensic Anthropology Badge Collection Sheet



Figure 3. Students applying stickers to the Forensic Anthropology Badge Collection sheets.

The collection sheet, see Fig. 2, was divided into two sections Osteology and Odontology and Bioanthropological Profile and completion of each of these sections led to badges for overall achievement. On asking for feedback from students they all agreed that they would like cloth badges to go with these achievements that they could put onto their lab coats, see Fig. 4.

As can be seen from the collection sheet in Fig. 2 students had to complete all three levels, 9 badges with their associated learning outcomes, for Cranial Osteology, Post-cranial Osteology and Odontology before gaining the cloth badge for Osteology and Odontology and all 4 areas and their associated learning outcomes for the Bioanthropology badge.



Figure 4. Cloth badges for Osteology and Odontology and Bioanthropology.

#### 2.1.4 Mastery learning

To encourage learning at a higher level of achievement for the learning outcomes the pass rate for the tests and badges was set at 75%, rather than the University's minimum grade 40%. Students could take the tests as often as they wanted and indeed this was encouraged as part of their learning as testing and retesting leads to deep rather than surface learning. The tests were designed to automatically present different questions from a pool so testing a wider range of material. Indeed, many students not only repeated the tests until they obtained mastery at 75% but carried on until they gained 100% and some even repeated beyond that as they realized the tests were supporting their learning. As one student commented in the freeform part of the feedback questionnaire about what they liked "The online tests that allow you to retry them and helps with reinforcing learning."

To incentivize and support progress, learning was sequenced into levels to support moving from basics to more advanced material. The aim of the tests and badges was that they could also support personalized learning by students. If they had confidence that they had accomplished the learning for the Osteology and Odontology badge they could then safely move on to the Bioanthropology aspects of the module. The tests also allow for slower students to take more time and for tutors to know from the test scores which students need more support in the classroom. The one warning at the start of this module is that students will need to learn a large number of new words.

## 2.2 Findings

As part of the findings it is important to take into consideration what stayed the same and what changed with the implementation of the badging schema. In this and previous years of running the module student learning has used a flipped approach and been supported using the University's VLE with videos and screencasts, a Laboratory Work book including 27 learning activity sheets and tutorial support during the practical class-based sessions.

The difference between the running of the module in 2015-6 compared to 2014-15 was the addition of the tests and the badges. Students were introduced to the badges and the tests in Week 3 giving them time to gain an awareness of the teaching methodology and the online resources before their introduction.

Student's views on the module were obtained using the University's standard student survey. In the years before and after implementation there were 3 statements that were the same and that give the students feedback on the changes. The responses to statements in the questionnaire are based on a Likert scale with 1 being 'Definitely agree' through to 5 being 'Definitely disagree'.

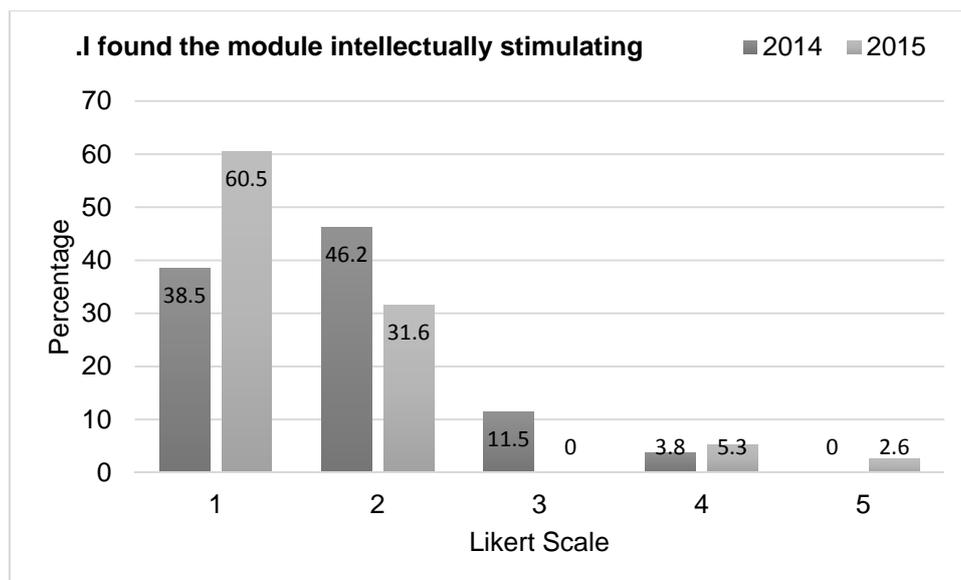


Figure 5. Graph showing responses to the statement "I found the module intellectually stimulating." expressed as a percentage of students responding to the survey (2014 n= 26, 2015 n=41) using a Likert scale (1 Definitely agree through to 5 Definitely disagree).

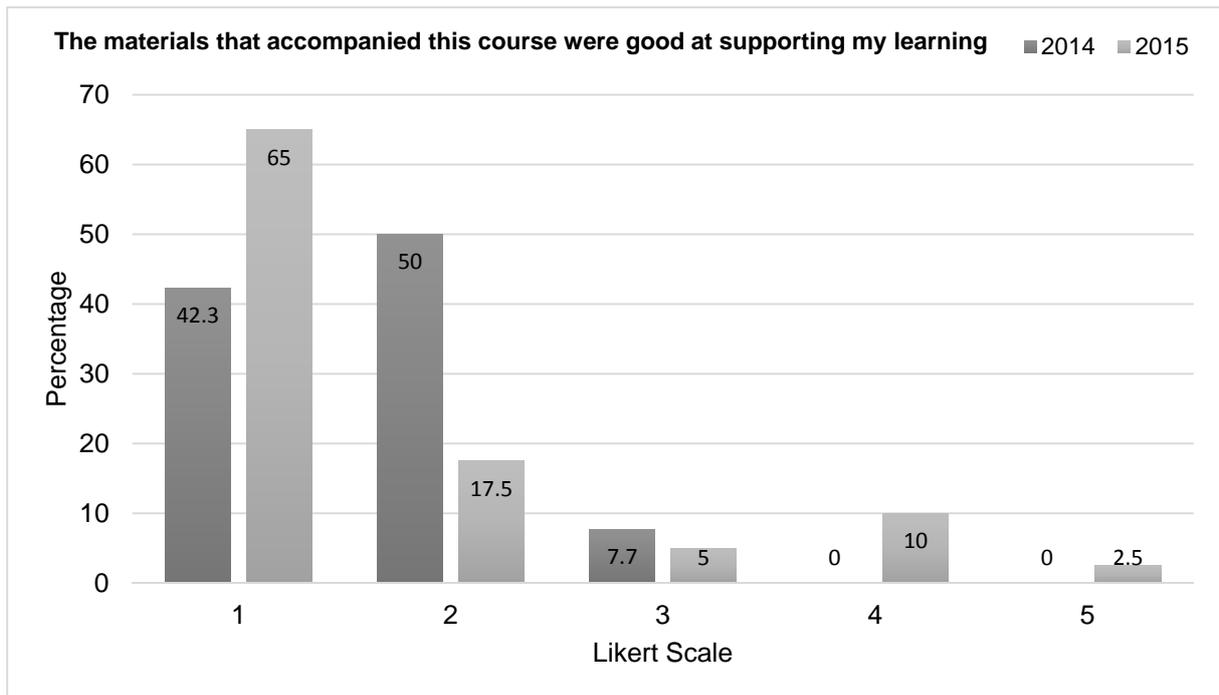


Figure 6. Graph showing responses to the statement “The materials that accompanied this course were good at supporting my learning.” expressed as a percentage of students responding to the survey (2014 n= 26, 2015 n=41) using a Likert scale (1 Definitely agree through to 5 Definitely disagree).

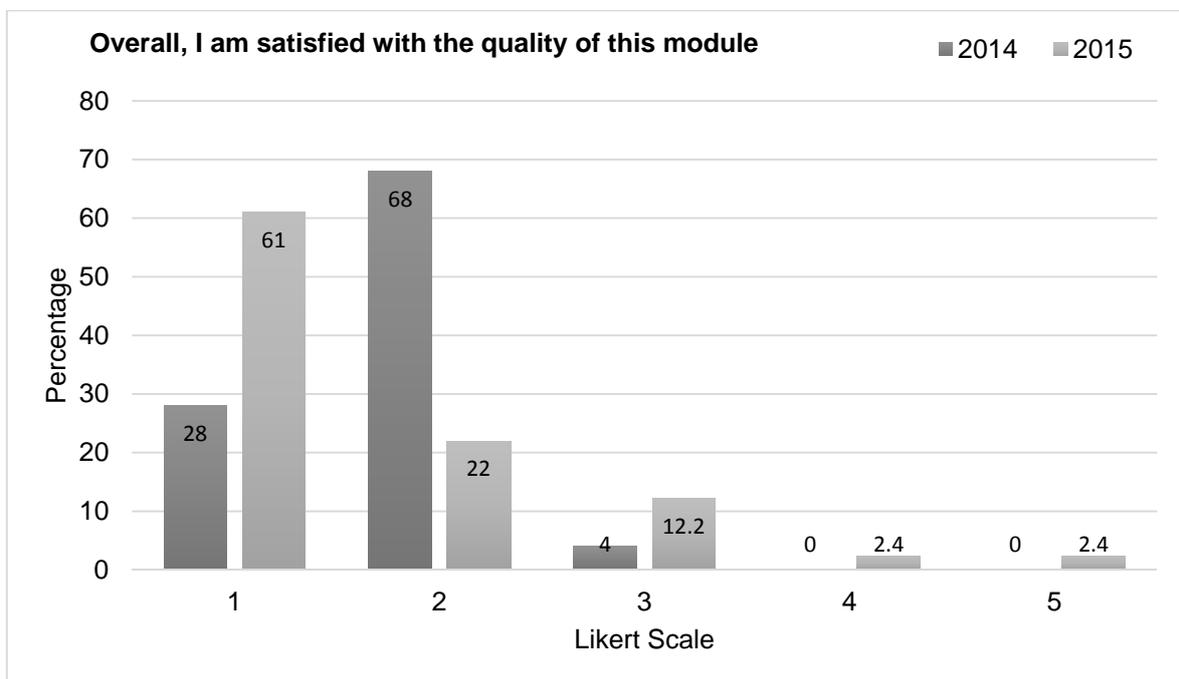


Figure 7. Graph showing responses to the statement “Overall, I am satisfied with the quality of this module.” expressed as a percentage of students responding to the survey (2014 n= 26, 2015 n=41) using a Likert scale (1 Definitely agree through to 5 Definitely disagree).

## 2.2 Case Study: Dementia and Digital.Me MOOCs

The investigation into the use of badges by the Academic Innovation Hub was part of their strategy of developments. The Massive Open Online Courses (MOOC) Project led by the Academic Innovation Hub supported; Brand Awareness, Pedagogical Innovation, Driving learners on to fee paying courses, Social impact and Experimenting with non-traditional delivery methods

### 2.2.1 Online MOOCs

The University of Derby (UoD) have incorporated badges in a series of Massive Open Online Courses (MOOCs) that include: "Bridging the Dementia Divide: Supporting People Living with Dementia (2015); Digital.Me: Managing your Digital Self (2015); Operations Management (2016); a re-run of Supporting People Living with Dementia (2016) and Autism, Asperger's and ADHD (2016). Throughout these, badges were used to reward degrees of completion to see if their use could increase the completion rates for the MOOCs.

Hadi and Gagen [1] believe the traditional methods of retention calculation are obsolete in the context of MOOCs due to the free and drop in dropout nature of some of these courses. A great deal of learners who log on to MOOCs do learn but don't have the time to complete a typical six to eight weeks course. We need to develop tools and mechanism around MOOCs to record these micro learning achievements.

The modular design for the use of badges in the Dementia MOOC, where units are linked to learning outcomes and indicative activities, can be seen in Table 3 and the associated digital badges in Fig. 8.

Table 3. Modular design for units, learning outcomes and indicative activities for achieving badges in the Dementia MOOC.

Unit	Unit title and theme	Unit learning outcomes (These will not be visible to students)	Indicative activities may include
1	<b>Introduction to dementia</b> What is dementia and why is it important?	Students will demonstrate a critical understanding of dementia. Students will challenge the myths and stereotypes surrounding dementia Students will demonstrate critical awareness of dementia in the global context.	In the discussion boards, introduce yourself. Outline your reasons for undertaking this course; do you have personal experience of dementia? Write a short reflection on the challenges facing society in meeting the health and social needs of people with dementia. Remember to be reflective in your thoughts; use an example to illustrate how this directly applies to your situation. Formative Quiz
2	<b>Communication and Compassion</b> Why is effective communication important and how can you show compassion?	Students will evaluate the main theoretical perspectives applicable to the study of 'compassion' in care. Students will demonstrate a critical awareness of enhanced communication skills to enable them to better communicate with people with dementia.	Share a website related to communication or compassion, which could be a government organisation or charity, from your own context. Create a mind map [support and definition will be given] of techniques you could use to help carers of people with dementia to communicate their needs. Share your mind map on the discussion board. You could create your mind map digitally or draw it on a piece of paper and then photograph the image with your smart phone or scan it. Formative Quiz



Figure 8. Digital Badges awarded for completion of Units 1 and 2 of the Dementia MOOC, see Table 3.

### 2.2.2 Findings

The tables below show the results from the Dementia and Digital.Me MOOCs in terms of meaningful learning, engagement and impact on retention and have an association with a favourable average completion rate across five of the University's MOOCs.

Table 4. Meaningful Learning in Dementia and Digital.Me MOOCs

Courses	% of Active Learners completing all six units of the course	% of Active Learners with at least one completed unit
Dementia	35.48%	57.8%
Digital.Me	15.64%	32.1%

Table 5. Level of engagement in Digital.Me and Dementia MOOCs compared to published results for other MOOCs.

Courses	Dementia MOOC (2015)	Digital.Me MOOC (2015)	Average [2]	Coursera [3]
% of Enrolled Learners	41.82%	20.45%	7.94%	5%
% of Active Learners	61.82%	37.10%	14.23%	9%

Table 6. Impact measured in terms of retention comparing results from University of Derby 5 MOOCs average against other published results from MOOCs.

	edX average [2]	Coursera average [3]	Various platforms average [4]	University of Derby MOOCs on data from 5 MOOCs
Completion rate (Enrolled)	5%	3%	6.5%	18.46%

Completion rate (Active)	8%	5%	10%	27.49%
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### 3. Discussion

#### 3.1 Case Study: Forensic Anthropology

The student response to the use of tests and badges shows a distinct improvement in response to each of the statements “I found the module intellectually stimulating”, Fig. 5, “The materials that accompanied this course were good at supporting my learning”, Fig. 6 and especially “Overall, I am satisfied with the quality of this module” Fig. 7 which shows a 100% improvement in Definitely agree from 28% in 2014 to 61% in 2015.

Using badges with 2<sup>nd</sup> year undergraduate students was a risk as most of the literature and examples are at a lower level of study or used to support the development of employability or study skills. However, one real finding was the enthusiasm for working on the tests and collecting the badge stickers, see Fig. 2, and the improvement in student’s self-belief as they moved up the levels in the online and class-based tests.

#### 3.2 Case Study: Dementia and Digital.Me MOOCs

Table 4 showcases that a significant percentage of learners would not have been rewarded for their learning achievements as courses typically only reward certificates for completion but the use of digital badges as award for micro-credentials had allowed the learning provider to provide recognition for micro learning. As each unit had its own learning outcomes as well as the learning outcomes on the overall course, we can say that these badges were rewarding meaningful learning.

Table 5 highlights the percentage of learners who have engaged or posted at least once in the MOOCs. This showcase again that use of badges in the University of Derby MOOCs have been a catalyst for greater engagement by the participating learners.

The award of badges also had an impact on overall completion rates as showcase from Table 6 as it provided incentives for learners to engage till the end. The retention rates achieved by University of Derby compared to sector average showcase that University of Derby MOOCs achieved significantly higher overall completion rates.

The results from the Case study showcase that Digital Badges when utilised properly can help achieve better engagement and overall completion in MOOCs which traditionally have had very low completion and engagement rates. This also showcase that Digital Badges are a useful tool for recognising learners micro learning credentials.

#### 3.3 Badges for learning at the University of Derby

The use of badges in face-to-face and online learning environments at the University of Derby has been managed through the Badges Working Group and has shown to be a very effective way of engaging students and effectively supporting progress so improving the student experience. The process has been managed and developed through schema to back-up micro-credentialing along with discussions and feedback from peers as part of quality enhancement processes and the use of the University’s own badge server.

### 4 Conclusion

The UoD has incorporated badges to provide recognition for the learning, achievements and contributions of our class-based and MOOC learners, and the credibility of our badges will increase as we move towards further implementation by academics and departments through the use of the badge framework. This could allow our digital credentials to be used by partners and other educational institutions and will act as an incentive for the University of Derby to continue its focus on badge development, quality and credibility.

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