

The University of Dublin

**Assessing the value of a digital badge credentialing system to improve student awareness when developing key skills in post-primary education.**

Aideen Reddy BSc (DIT)

A Meta project/dissertation submitted to the University of Dublin, in partial fulfilment of the requirements for the degree of Master of Science in Technology & Learning

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## ABSTRACT

### Can a Digital Badge Credentialing System improve student awareness when developing Key Skills in Post Primary education?

Soft skills, the intra- and inter-personal skills essential for personal development, social participation and workplace success are proven to predict meaningful life outcomes. A version of these skills, referred to as Key Skills, have recently been embedded within the new Junior Cycle Post Primary curriculum in Ireland.

Unfortunately, there is a clear struggle in the area of assessment and accreditation of these vital skills. Standard achievement tests miss or, more accurately, are not capable of adequately capturing the relevant information.

This project proposes the use of Digital Badge Credentialing System (DBCS) in answer to the clear need outlined above. In general, digital badges will act as online credentials representing an individual's skills, interests, and achievements and backing this up with embedded meta-data as proof of the students work towards the award.

Digital badges have the capability and flexibility to be an alternative or supplement to traditional credentials such as diplomas, certificates and degrees etc. Considering the digital badges ability to recognise alternative learning formats, or situations i.e. non-formal or informal contexts they can reflect a finer-grained and nuanced reflection of a person's skills, experiences and dispositions.

The ongoing segmentation and ever-changing society of the 21st century makes great use of the humanistic approach and constructivist approach. The humanistic approach to education understands the self as constantly changing. It establishes reliable support mechanisms within the learner avoiding the ever shifting environment. By doing so the learner has personal power (autonomy) to create better meaning and establish connections with others in this constantly changing modern life. Similarly, constructivist learning theory sees the learner responding to their sensory experiences and constructing in their own minds, schemes or cognitive structures which constitute the meaning and understanding of their world, as they understand it. Again making the experience very personal and individual. Both pedagogical approaches tied with student-centred learning are perfect underpinnings for this study

**Key words: micro-credentialing, digital badges, open badges, learning pathways, soft skills, 21<sup>st</sup> century skills, student-centred, humanistic, constructivist**

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# 1 INTRODUCTION

## 1.1 BACKGROUND

Soft skills, the 'intra- and inter-personal skills essential for personal development, social participation and workplace success' (Kechagias, 2011, p. 33) proven to predict meaningful life outcomes (Jencks, 1979, p.22-30; Murray, 1938, p.132-215) have recently been embedded within the new Junior Cycle Post Primary curriculum in Ireland. The National Council for Curriculum and Assessment (NCCA) believe these skills necessary to help learners face the numerous challenges presented to them in today's modern world.

Unfortunately, there is a clear struggle to assess and accredit these vital soft skills within the curriculum (Gibb, 2014, p.455-471). Standard achievement tests miss or, more accurately, are not capable of adequately capturing these soft skills (Heckman and Kautz, 2012, p.451-464). Leaving teachers developing these skills in their students but without the necessary infrastructure to assess or accredit their students' achievements. Students therefore are left oblivious to the soft skills, considered so vital in modern life (ref), they have been working so hard to develop.

This project proposes the use of digital badges in answer to the clear need outlined above. In general, "A badge is a digital credentialing that represents an individual's skills, interests, and achievements. Among other uses, badges can convey an individual student's core academic content knowledge, as well as other twenty-first century competencies that cannot be measured by traditional assessments." (ALL4ED, 2013, p.2) i.e. soft skills.

Digital Badges have been garnering a lot of interest in the field of educational research. According to the Badge Alliance, thousands of organizations offer digital badges (Richies, 2016). Increasingly, educational organizations and industry are offering badges to recognize both skill and professional development acquisition especially in the area of medicine (Doherty & Sharma, 2015, p.596-598; Anderson & Staub, 2015, p.18-23).

Badges can be used as both a pedagogical and credentialing tool. As a pedagogical tool it provides learners a visualization of their individual learning path, "serving as a series of guideposts toward understanding" (Ahn et al., 2014, p.4). Badges used as credentials "signal potential knowledge and skills to others" (Ahn et al., 2014, p.4) i.e. peers, other educators, potential and current employers and more. Badges have the capability to be an, "alternative or supplement to traditional credentials such as diplomas" (Ahn et al., 2014, p.4) considering its ability to recognise alternative learning formats, or situations i.e. non-formal or informal contexts (Ahn et al., 2014, p.4). Badges also have the ability to, "reflect a finer-grained and nuanced reflection of a person's skills or experience" and dispositions, "stakeholders can therefore gather a nuanced picture of a person's skills through a collection of smaller credentials." (Ahn et al., 2014, p.5), something which is lacking from

traditionally offered diplomas.

## 1.2 RESEARCH QUESTION

Can digital badges provide an effective means of soft skill accreditation for students in the new Junior Cycle curriculum.

## 1.3 RESEARCH AIM

This project will attempt to use digital badges, as a credentialing system, to bridge this gap in assessment and accrediting of soft skills. In doing so, it is hoped that student self awareness of the soft skills they are developing will be raised.

## 1.4 RESEARCH OBJECTIVES

The design objectives of this artefact are:

1. The establishment of student created learning pathways in the area of soft skills.
2. Provide an environment/develop specific mechanisms to recognize and reflect a students personal learning pathway in the development of soft/key skills.
3. Investigate whether the use of a Digital Badge Credentialing System (DBCS) can assist learners in their understanding/acknowledgement/awareness of the soft skills they are developing within the school curriculum.

## 1.5 ROAD MAP

A literature review exploring constructivism and humanistic pedagogies will be presented describing their importance in a hybrid approach to successfully accredit/develop soft skills (Shunck, 1990, p.71-86). describing how it can promote and refine innate soft skills within learners through collaboration, problem solving and social interaction (Vygotsky, 1978, p.79-91).

The design chapter outlines the key features of a humanistic constructivism hybrid approach to a digital badge credentialing system. The design implications for this artefact e.g. connecting Moodle to Mozilla Open Badges. The instructional design theory, which underpins the design of this system, is again a hybrid of two design infrastructures The Smith and Ragan (Instructional Design) Model and The Body Framework, to assist prospective badge issuers in the design and development of Open Badge ecosystems (Devadzic & Jovanovic, 2015, p. 603-620). This chapter then moves on to outline the structure of the learning experience i.e. topics covered, technology used and the underpinnings pedagogy.

The methodology chapter will outline the rationale in choosing an exploratory case study approach to answer this project's research question. The data collection tools and sets used within this study will be both divided and examined here. Data analysis methods, implementation steps and ethical procedures followed are also included within this chapter.

Illustrated in the findings chapter are the data results, reached by running the data sets through the data analysis methods outlined in the methodology chapter, and conclusions garnered. The results reached are then considered in light of the context outlined within the literature review chapter. This chapter will conclude by highlighting limitations of this study and possible areas of future research leading from this study.

## 1.6 CONCLUSION

A Mozilla Badges plugin was added to the school's Learning Management System (LMS) Moodle to be used with conjunction with a humanistic/constructivism pedagogical approach to assess the usefulness of a digital badge credentialing system to improve students awareness of soft skills developed within the curriculum.

## 2 LITERATURE REVIEW

### 2.1 INTRODUCTION

Certain developments arise through education which might not be clearly stated in the syllabus (Caruana, 2011, p.1-2). These developments are usually referred to as soft skills, the 'intra- and inter-personal skills essential for personal development, social participation and workplace success' (Kechagias, 2011, p. 33) proven to predict meaningful life outcomes (Jencks, 1979, p.22-30; Murray, 1938, p.132-215).

It is widely accepted that the current education system is undergoing a seismic shift from a current model focused on inputs (topics taught, who teaches whom) to a model based on outputs (skills and abilities of graduates) (Matkin, 2012, p.10). This shift ties in nicely with Weedon and Tett's (2013, p724-740) suggestion that a more coordinated and sustained effort is required to develop soft skills, one which involves reward and reinforcement in realistic settings where soft skills will be exercised.

Seeing the importance of soft skills for modern day learners; high demand in the labour market; and the need for reward and reinforcement of these skills, this project will focus on the use of technology, specifically digital badges, to support teachers and students in development, validation and accreditation of these skills. This is fully in line with the view of the European Commission Framework for Education and Training 2020 (2015).

Micro-credentials, described by Mozilla and Mac Arthur as 'an online record of achievements' at a granular level, are gaining traction in the education sector as evident from its position on the Gartner Hype Cycle, where it has been lagging for the past two years (Lowendahl, 2015). In this educational model (non-degree format) the focus is aimed at a provision of relatively inexpensive learning structures which lead to certification via micro-credentials and/or badges verifying the attainment of specific learning objectives (Young, 2012; Matkin, 2012, p.10).

In an interview with Bill Gates, J. Young queried if we, as a society, can transform the current credentialing process? Mr Gates suggested that 'the ideal would be to separate out the idea of proving your knowledge from the way you acquire that knowledge' (Gates, B. 2012 interview with Young, J.) which relates again to a shift from the model of inputs.

The micro-credentials/badges are not to be viewed as rewards but rather milestones legitimising student learning achievements and also providing students with a timeline of their learning i.e. a learning pathway. This approach is in line with the game reward system, a design aimed at ensuring motivation is intrinsic by avoiding the overjustification effect (Easley, 2013, p.359).

## 2.2 SOFT SKILLS

Soft skills relate to communication skills, creativity, motivation, optimism etc., personal attributes which have been proven to predict meaningful life outcomes (Jencks, 1979, p.22-30; Murray, 1938, p.132-215). In educational terms 'soft skills' are often referred to as transversal (cross-curricular) competences, i.e. cross-disciplinary and not subject-specific. Psychology studies provide evidence that these skills predict meaningful life outcomes (Jencks, 1979, p.22-30; Murray, 1938, p.132-215) and have been shown to support development of cognition (Heckman and Kautz, 2012, p.451-464).

Cruana (2011, p.1-2) believes that the purpose of education is, at its core, the development of self and yet curriculum clearly struggles to assess and accredit these vital soft skills (Gibb, 2014). Standard achievement tests miss or, more accurately, are not capable of adequately capturing these soft skills (Heckman and Kautz, 2012, p.451-464), which evolve early in life, long before formal education. This project proposes that, to some extent, technology can aid in the process through the use of a micro-credentialing system consisting of open badges, also referred to as digital badges. These badges can help identify and accredit skills which had previously been missed in traditional grading. There are already a number of projects focussed on this approach (Devedzvic and Jovanavic, 2015).

|                      |   |
|----------------------|---|
| The GRASS Project    | <ul style="list-style-type: none"> <li>• EU funded</li> <li>• Serbia, Sweden, Ireland, Croatia</li> <li>• 3rd Level, 2nd Level and Further Education</li> </ul> |
| ICT-Go-Girls Project | <ul style="list-style-type: none"> <li>• EU funded</li> <li>• 2nd Level</li> <li>• Supporting girls in developing IT skills</li> </ul>                          |
| ENACT Project        | <ul style="list-style-type: none"> <li>• EU funded</li> <li>• Lifelong Learning</li> <li>• Development of negotiation and communication skills</li> </ul>       |

**Table 1. – EU funded projects with a focus on soft skills and technology**

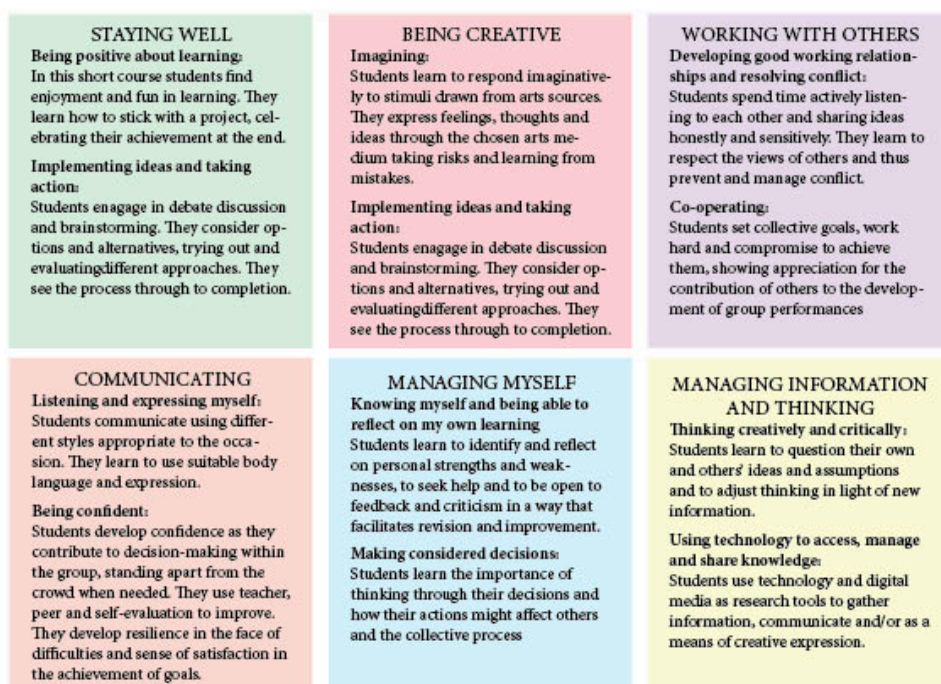
The European Commission issued a document in 2012 stating that "in the future, creativity, the ability to think laterally, adaptability and other 'transversal' skills will be valued more than the specific bodies of knowledge that schools have traditionally taught." As a result, it is important that educational institutions consider this recommendation and transform their curricula to better develop and enhance learner's soft skills and, by doing so, prepare them better for future careers (Bowles et. al, 2001, p.1137-1176; Murti, 2014, p.32-36). A

consideration which appears to have been shown during the design of the new Junior Cycle curriculum in Ireland.

### 2.2.1 KEY SKILLS REFLECTING AND 21ST CENTURY LEARNING

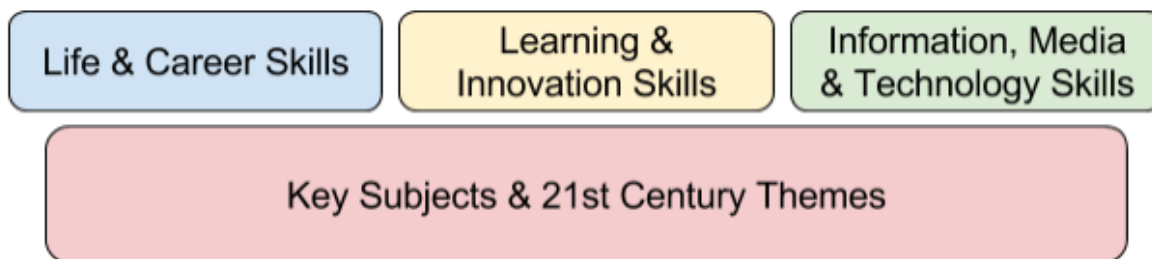
A detailed array of soft skills have been embedded within the new Junior Cycle Post Primary curriculum, referred to as ‘Key Skills’. The National Council for Curriculum and Assessment (NCCA) believe these skills necessary to help learners face the numerous challenges presented to them in today’s modern world. These are considered general skills believed to assist learners in their personal, social and work environments. It is anticipated that as learners develop these skills in an integrated way they will become better learners.

The six key skills of junior cycle are Staying Well, Being Creative, Working with Others, Communicating, Managing Myself, and Managing Information and Thinking. The use of digital technology forms part of each of these skills (NCCA, Key Skills of Junior Cycle).



**Fig. 1 Junior Cycle Key Skills**

These key skills are similar in many ways to the framework developed by the Partnership for 21st century skills (P21). Skills required to thrive and develop in this ever changing and technology centred world (Trilling and Fadel, 2009, p.47-48). The framework outlined below describes the P21 “21st century student outcomes”, skills, knowledge and expertise which it is believed will support students to succeed in 21st century living.



**Fig. 2 Framework for 21st Century Learning (P21)**

P21 believe that ‘when a school... builds on this... entire Framework with the necessary support systems... students are more engaged in the learning process and graduate better prepared to thrive in today’s global economy’ (P21, 2012).

Third Level education, in Ireland, are making inroads in this area. Several universities have been focusing on initiatives on a university-wide scale to explicitly address the skills and other attributes of graduates. A noteworthy project is Generation21 in Dublin City University, a programme of initiatives with an ethos of shaping their graduates into well-rounded individuals, prepared to make contributions to society and the industry. The project provides not only opportunities for work placement and study abroad but also credits excellence in extra-curricular engagement. Clearly acknowledging areas of non-formal learning which has previously gone unrecognised in accreditation of the vital skills earned in such areas.

Perhaps this can be considered smart education. Extra-curricular activities have the capacity to develop hugely important skills. Skills which can be referred to as soft skills, key skills or 21st Century skills. The point is that these areas of non-formal education are happening and rather than restrict teachers, already burdened with large curriculum to cover, with even more frameworks and learning outcomes why not acknowledge the student’s skills already developed thanks to their involvement in extra-curricular activities. Similarly, to the credits awarded in the American education system? It removes unnecessary restrictions and provides more time, creativity and flexibility to teachers. The problem lies with the development of teaching and learning and the provision of a better level of this provided to students. Students should be viewed as individuals and development in a holistic manner to create well-rounded graduates the aim.

The proposal being made is that a framework focused on development of soft skills, which most likely have been previously developed without requirement, is important. It provides educational institutions and teachers with a consistent, transparent and uniform requirement. However, perhaps the best approach is to extent the framework to the many areas of non-formal education regularly ongoing within all educational institutions.



Both, 21st Century Skills and Junior Cycle Key Skills, encompass an extensive list of knowledge, skills, work styles and personal traits all of which believed to be extremely important in order to succeed in the world today, most significantly in the present-day technology driven workplace (Griffin et al., 2012, p.109-116).

The importance of soft skills is also highlighted by the European Commission's Framework for Education and Training 2020 in the joint report issued November, 2015. Of the six priorities highlighted in the report one, very clearly, aligns with the aim of this project:

- Transparency and recognition of skills and qualifications to facilitate learning and labour mobility;

Another two priorities support the approach taken towards the aim of this project:

- Open and innovative education and training, including fully embracing the digital era;
- Relevant and high-quality knowledge, skills and competences developed throughout lifelong learning, focusing on learning outcomes for employability, innovation, active citizenship and well-being;

### 2.3 HUMANISTIC AND CONSTRUCTIVIST LEARNING THEORY

The ongoing segmentation and ever-changing society of the 21st century (EC, 2015) makes great use of the humanistic approach. Previously, more settled societies made use of traditional knowledge and skills, conventional authoritarian teaching approaches worked well for learners. Learners' held stable positions in society, ready to be claimed on completion of study. However, our modern world does not provide the same stability. Societies and relationships with others lack certainty and change at a rapid pace. In this type of society even the sense of a personal self can be complicated and conflicted. The humanistic approach to education understands the self as constantly changing and unique to each learner. It establishes reliable support mechanisms within the student avoiding the ever shifting environment. By doing so the learner has personal power to create better meaning and establish connections with others in this constantly changing modern life. (Sinnott, J., 2008, p. 56-57).

Piaget's (1976) constructivist perspective on learning believed knowledge to be neither static nor transferable, but constructed in its inception and developed upon, perfectly describing the development of soft skills and collection of accreditation badges, completely personal and unique to each learner. Meaning individuals discover their own personal reality by constructing their understanding of it [reality] with reference to their individual pre-established cognitive framework and beliefs. Creating connections and paths similar to the learning pathways available in the micro-credentialing system created for this project.

## 2.4 MICRO-CREDENTIALS

The approach, a concept of micro-credentials, developed from the 'digital badging' movement and has been led largely by Mozilla Open Badge and Mac Arthur foundation. Micro-credentials, also sometimes referred to as digital badges and/or open badges, are described by Mozilla and Mac Arthur as 'an online record of achievements'.

### 2.4.1. GRANULARITY

Micro-credentials follow the model of granularity the division of a larger domain into smaller knowledge and skill components. Micro-credentials can specifically be referred to as fine granularity, meaning the level of detail, or depth of penetration is high. To explain this within the education sector it is the extent that larger qualifications can be subdivided into smaller subsets of knowledge, skill and experience e.g. micro-credentials/badges.

The digital affordances of micro credentials can provide a much larger array of much more granular accreditations. As a result, third parties (e.g., employers, educational institutions) interested in your accomplishments will be provided with a far more detailed view of your abilities. For example, a BSc in Computer Science tells employers one thing; however, knowledge of the specific networking security techniques you have mastered tells them much more. Micro-credentials 'disaggregates the monolithic transcript into smaller credentials that allow learners to present employers with a much more detailed and nuanced view of their capabilities' (Wiley,?)

## 2.5 BADGES

History has shown a long lasting interest in badges as far back as the Middle Ages (Halavais, 2012, p. 357-359). As with other parts of our lives, the badge has migrated from the tangible to the virtual, establishing a strong online presence (Halavais, 2012, p.355-356)

This project intends to focus on the use of badges, specifically digital badges, in acknowledging and legitimising student development of soft skills in a similar way to merit badges awarded to boy scouts (Scheidlinger, 1948, p. 740)

### 2.5.1 DIGITAL BADGE BEGINNINGS

Digital badges, first coined at the Mozilla sponsored international Open Ed conference in Spain 2010, have emerged in recent years as a response to the many affordances of the digital age (Brandon, 2013) to make implicit learning goals explicit (Linder-VanBerschoot & Summers, 2015, p.6). The advances in technology combined with the large level adoption rates has provided the perfect environment and acceptance of online learning, and by default, the accreditation of such learning through digital badges.

The badge, now an intangible digital image, has its roots in the area of social networking and gaming (Antin and Churchill, 2011; Easley and Ghosh, 2013, p.215-260). The use of game principles and design in an educational context began emerging as a trend in educational technology as far back as 2005 (Hurst, 2015) and perhaps even before. In more recent times, the digital badge has been used in the education sector to reflect a learning product (Gasevic, Dawson & Siemens, 2015, p.64-70), to increase motivation (reference) and track the learner's progression (Hurst, 2015, p.182-189) e.g. Khan Academy, Duolingo, Coursera, EdX, Audible and MOOCs.

Two types of these intangible learning badges exist, Digital and Open Badges. The literature, in general, refer to these intangible badges as digital rather than open. Although both terms seem to be used interchangeably the difference between them lies in the area of verification, specifically the use of metadata.

#### 2.4.2 GAMIFICATION

The use of badges in education can be linked to their use in gamification, as "the use of scores, levels, and points as ways to motivate players to continue in a game." (Ahn, Pellicone, & Butler, 2014, p.3). Badges can motivate continued participation and engagement. However, the question of intrinsic and extrinsic motivation must be considered.

Gamification a phenomenon which has come to the forefront in recent years in areas such as business, social life and leisure. Gamification is described as- the use of game mechanics in traditionally non-game activities (Groh 2012, p.39-47; Jagoda 2013). Not surprisingly gamification seems especially widespread within education, through gamified apps. However, history has shown education to include sensory-motor, symbolic play and rule-based games (Jagoda et. al, 2015, p.75).

Varieties of educational play increased during the late 19th and early 20th centuries (Urban and Wagoner 2009; Montola, Stenros, and Waern 2009, p.137-158). Since then, play has been widely accepted as a mode to enable adaptation, socialization, learning, and growth (Jagoda et. al, 2015, p.75).

Unfortunately, the 21st century has been responsible for stunting this growth through national policy which has compromised play in the educational setting by focusing on dictatorial standardized academic outcomes (Jagoda et. al, 2015, p.76).

James Paul Gee (2007, p.175-223) contends that all learning involves a process of understanding a procedure, rules, and values i.e. "learning to play 'the game'". School, in itself, could be referred to as a large scale game, if thought of in a metaphorical context. It

involves a set of rules, artificial conflicts, goals, alternative outcomes, and a contained time and space.

Another example of the clear correlation between games and traditional educational contexts is via gamified systems which focus on points, leaderboards, levels and achievements. Typical educational settings follow a similar approach with grading, awards, points system, diplomas, certificates and degrees. Education in many ways reflects a gamified system as it stands.

However, it must be pointed out that play can exist dependently of gamification, insofar as role playing, world making, and collective storytelling all of which tend to be minimized or excluded from gamified systems perhaps due to the lack of competition they encourage, something which is not inherent in play or games. Competition can and should be removed from play, games and education.

Games, such as these, operate as a very different metaphor and focus on play, improvisation, social interaction, and intrinsic motivation. As suggested by researchers, we might do well to view games as opportunities of situational learning rather than targeted interventions serving as information delivery mechanisms (Gee 2004, p.55-97).

At present the area of digital badges/micro-credentials is positioned at the peak of inflated expectations on the Gartner Hype Cycle, and has been lagging in this position for 2 years thus far. At EDUCASE 2014 the topic (digital badges) drew a lot of attention and was widely discussed in relation to competency based education. Digital badges received even more support in 2014 from a survey completed by Extreme Networks. The survey of 1,900 participants indicated that 60% believed that digital badges would either be used in combination with current versions of diplomas and certificates or replace them completely. This attention has continued into 2015 where Gartner have identified open micro-credentials as one of the top 10 business trends impacting education (2015, 5., p.9).

|              | Social | Motivational | Academic/Skills |
|--------------|--------|--------------|-----------------|
| Udacity      |        |              | ✓               |
| Audible      |        | ✓            |                 |
| Khan Academy |        |              | ✓               |

|                        |   |   |   |
|------------------------|---|---|---|
| Headspace              |   | ✓ |   |
| Foursquare/<br>Swarm   | ✓ | ✓ |   |
| Edmodo                 | ✓ | ✓ | ✓ |
| Mozilla Open<br>Badges | ✓ | ✓ | ✓ |

**Table 2. – List of applications using digital badges for social, motivational and academic purposes**

### 2.5.3 OPEN BADGE VERSUS CLOSED BADGE SYSTEM

Technically speaking open badges are digital badges which, specifically, track meta-data of the individual’s work completed to achieve each badge. For example, as a student masters a new computer language the specific piece of code created by the student becomes a digital artefact which in turn is attached to the open badge. Should the student decide to share this online, others will have the ability to view not only the badge but the work undertaken by the student in order to achieve said badge.

The term Digital Badge and Open Badge are used so interchangeably that one may be forgiven for considering them the same. The difference lies in the area of verification. An Open Badge contains meta-data to verify its award. Basically speaking all Open Badges can be referred to as a Digital Badges but not all Digital Badges can be referred to as Open Badges. The following are definitions of the two term from the Mozilla Badge Alliance:

#### Digital Badge

*‘A ‘Digital Badge’ is an online record of achievements, tracking the recipient’s communities of interaction that issued the badge and the work completed to achieve the badge. Digital badges can support connected learning environments by motivating learning and signaling achievement both within particular communities as well as across communities and institutions.’* (badgealliance.org)

#### Open Badge

*‘An “Open Badge” is a digital badge that “allows you to verify your skills, interests and achievements through credible organizations and attaches that information to the badge image file, hard-coding the metadata for future access and review...Badges can be*

*displayed wherever earners want them on the web, and share them for employment, education, or lifelong learning.'* (badgealliance.org).

Open Badges, richly encoded with data, when compared to a picture of a badge or word alone, provide authority and value, allowing others to clearly understand the skills the badge represents and how it was achieved. Open Badges can provide all of this and yet maintain the 'fun' gaming aspects that may have encouraged an individual to pursue the award in the first place (Hurst, 2015, p.183-185).

It is clear that digital badges hold a number of advantages over their physical counterpart, for example: they are both easily displayed and searchable (transparency and flexibility); they can hold much more information relating to their award (personalisation); and they can also contain expiry dates for retraining; (Brandon, 2013; Selingo, 2012)

#### 2.4.4 EDUCATIONAL DATA AND ETHICAL ISSUES

As is the case with most IT systems, interactions are captured and stored. With the high levels of IT now in use within the educational sector this is also the case for students and their technological learning interactions. The digital traces (data) can be used in a number of ways to identify learning patterns, behaviour, success and much more in the area of learning analytics (Siemens & Gasevic, 2012, p.1-2).

While it is often thought education is brimming with data, little is associated with capturing the conditions for learning (internal and external) (Gasevic, Dawson & Siemens, 2015, p.64-70).

External conditions: instructional design, social context, previous learning history with the use of a particular tool, and revisions in the course content.

Internal conditions: achievement goal orientation, cognitive load, or epistemic beliefs.

All of which are yet to be fully understood in relation to the collection and measurement of trace data within the field of learning analytics (Gasevic, Dawson & Siemens, 2015, p.64-70). Perhaps micro-credentials can go some way towards bridging this gap with the more personalised metadata.

Micro-credentials in the form of digital badges use metadata (specialised and embedded code) to provide the relevant information associated with the attainment of said badge. Metadata is 'data about data' providing basic information about data, 'components such as the information needed to determine its validity, authenticity, source and value' (Finklestein, J., Knight, E. and Manning, S., 2013). Examples of metadata include: time and date of creation, creator, location (on computer network), standards used, file size.

## 2.6 LEARNING PATHWAYS OF A DIGITAL BADGE CREDENTIALING SYSTEM

Systems which make badges visible to the learner serve as a means to visualise learning pathways, which include activities and content. Traditionally badges in scouting programs are used in this way, roadmaps of possible activities and achievements. Providing scouts an awareness of available achievements to pursue and the freedom to choose Jarman, 2005, p.1-24). Badges can serve as a series of guideposts towards understanding (Joseph, 2012, p.185-193).

A number of educational institutes are exploring the possible use of micro-credentials to improve transparency of the numerous learning pathways available to students (Hurst, 2015, p.185). Kevin Carey (2012) describes a badging system best in *The Chronicle of Higher Education* (2011) as not 'just a transcript, CV, and work portfolio rolled together into a cool digital package. It's also a way to structure the process of education itself. Students will be able to customize learning goals within the larger curricular framework'.

The 'Key Skills' outlined in the new Junior Cycle curriculum provide very clear learning objectives for learners to aim towards. These objectives when used with granular model to create the above mentioned micro-credentials, provide learners with a clear and transparent learning pathway.

An affordance of micro-credentials is the numerous and flexible learning pathways which open up to students as a result. Since there are a number of badges for students to complete, they are provided with a choice of which to complete, when and in what order. The availability of alternative learning pathways provides an opportunity for learners to develop autonomy and self-regulate their learning, areas which have been shown to be highly predictive indicators of successful student performance (Pintrich and De Groot, 1990, p.33-40). Students will not be expected or required to complete a course in a linear fashion but, rather, they can now manoeuvre their way through the course based on interest and the personal connections they see between each area. The autonomy provided to students as a result of this approach creates active participation in the learning process and as a result increased motivation (Goligoski, 2012).

Learners are now the creators of their own learning strategies and pathways, suggestive of dynamic processes initiated during learning (Gasevic, Dawson & Siemens, 2015, p.64-70). To understand such dynamic processes, the process quality of learning must be considered and learning represented as a procedure of building on the current knowledge from the fields such as graph theory, process mining and granularity (Reimann, Markauskaite & Bannert, 2014).

### 2.6.1 TRANSPARENCY

The move, in education as in other sectors, is toward universal transparency (Matkins, 2012, p.10). One of the most important advantages associated with open badges is the increased transparency it affords learners. Guzman (2014) puts it perfectly 'if resumes are a bunch of claims, badges are a bunch of evidence'. Open badges are far from simple digital images, they contain metadata about the accreditation, information such as the date it was issued, a description of the accreditation, the issuing organisation, in some cases even a link to the work completed by the learner to attain the badge. Clearly these open badges, and the metadata attached, provide a much more transparent level of certification. Any qualification, even an advanced degree, can be broken down to a micro-certification level and perhaps it should. (Davies, Randall, West, 2015, p.151-163)

Learners will be capable of tailoring the way in which badges and the associated metadata will be viewed by the world. 'Students won't just earn badges -- they'll build them, in an act of continuous learning (Kevin Carey, 2012).

### 2.6.2 FLEXIBILITY

#### Learner Flexibility

For the learner there is the possibility of great flexibility surrounding the use of micro-credentials. Learners, as previously defined (Winnie, 2006), are active agents in their learning path. Learner agency implies that even when learners receive the same instructional conditions, they may choose to adopt alternate study methods or learning pathways (Gasevic, Dawson & Siemens, 2015, p.64-70).

Moving on from the work of Winne (2006, p.5-17), Lust, Elen & Clarebout (2013, p.2013-2021) view the attainment of micro-credentials a self-regulated learning approach whereby the decisions a student takes about the specific micro-credentials will be based on (internal) conditions and individual learning goals. In essence the student will be navigating their own learning pathway.

#### Institutional Flexibility

Since open badges are built on open source technology they can easily be tailored to suit each institution and organisation's needs, even integration into existing technology already in use providing efficiency within the certification management system e.g. Brigham Young University (Davies, Randall and West, 2015, p.88-95). Connections between each micro-credential can be controlled and the combinations needed to attain larger awards. Another flexible affordance of open badges is the ability to defer the awarding of some badges to other organisations, once the issuers awarding the badges do so with rigor and attention to the outlined criteria. This will mean that much of the work will be completed by the authorized issuers, in some cases also providing the necessary training to students. This division of labour model (also known as crowd sourcing) can reduce constraints on time



and funding. In effect franchising can exist for lower level skills, basic knowledge and or experience, possible creating feeder institutes to Universities again returning to learning pathways.

This will not only allow students the flexibility of choosing which institutes/organisations to use for different badges but it could also create closer relationships between the numerous educational institutes and by doing so a more cohesive approach to awards, criteria needed and acceptable pass levels etc.

### Time Flexibility

Another flexible adjustment on offer within a badging system is the time frame for education. The common assumption is that the use of IT will always substantially save time, leading to a reduction of time in educational institutions. However, it may just as reasonably be viewed that some IT solutions, specifically a badging system in this case, can extend a degree program over a learner's lifetime, providing them the opportunity to remain in the learning environment over a longer stretch of time, creating a culture of flexible lifelong learning (Kumar, 2012, p. 627-628)

### 2.6.3 FEEDBACK

Another huge advantage of badges is the instant feedback on their learning progress, confirming their ability to reach their goals and by extension building their self esteem. "Students will be able to... integrate continuing peer and faculty feedback about their progress toward achieving goals' (Carey, K., 2012). As Shunck (1990, p.71) explained, "When students perceive satisfactory goal progress, they feel capable of improving their skills; goal attainment, coupled with high self-efficacy, leads students to set new challenging goals". This is in stark contrast to current course design which only credit the student when all assignments are completed, providing more opportunities for disillusionment and disengagement of the student. Badges have the ability to recognise each milestone students achieve. Research in the area of badging is still relatively new, however, theoretically speaking, self-regulated learning, student autonomy, and student intrinsic motivation would indicate that the additional choices (via learning pathways) and formative on offer could likely provide considerable benefits (Randall, Harrison and West, 2013, p.88-95).

### 2.6.4 CREDIBILITY AND RIGOR

According to David Wiley (2013) "badges have democratized credentialing," the awarding of credentials has now become an option for all. However, this calls into question the credibility of such credentials and the rigor of standards being used.

Similarly, to the Open Directory Project (ODP), a group of human beings who volunteer to categorize all websites (Perugini, S., 2008, p.910-930), there will be a need to similarly vet

all the credentials begin offered. Previously this has been possible by means of educational bodies. However, 'the democratization of credentialing means that we will soon be in a place where no group of humans can possibly vet all the credentials being offered' (Wiley, D., 2013). The only option may be an algorithmic approach e.g. PageRank (BadgeRank ref) – will become a necessity.

Standards and accreditation have protected learners to date, but has this been to the detriment of constructively unorthodox models, limiting innovation and experimentation (ref). The now democratized credentialing process will open the floodgates to millions of new credentials with a similar quality range as that of blog posts. While previous approaches for quality vetting will be incapable of processing the quantity of badges around the world, someone somewhere will undoubtedly create a badge ranking algorithm to help us find high-quality, relevant credentials. Just because we cannot imagine the solution yet, it is not a cause for concern 'it is a characteristic of the best solutions that they co-evolve organically with the problem' (David Wiley, 2013).

A vital feature of a digital badging system lies with the establishment of an accountable and credible issuer, be that an institution, organisation or individual. A badge, or any certificate, can only be as good as the rigor of its implementation, and thus organizations need to develop strategies and principles for utilizing the technological affordances that the platform provides for rigorous assessments (Davies, Randall and West, 2015). This will provide a level of reliable authenticity to the badge and the acquired skills which the badge represents (Hurst, 2015, p.184).

## 2.7 CONCLUSION

It has been argued that the micro-credentialing/badging system will cause a paradigm shift within education, a possible disruptive technology (Davies, Randall and West, 2015). Staton (2014) explained, "education... is in the midst of dramatic, disruptive change. It is, to use the language of innovation theorists and practitioners, being unbundled".

A badging system need not interfere, as such, with the current system of educating students. Its disruptive power as an innovative certification tool for learning has the potential to develop into an extensively used process over time. "We need to reconsider how students are deemed proficient in terms of the skills and knowledge they develop outside the standard classroom environment" (Collins and Pea, 2011, p.22-23).

The effectiveness of these open badge implementations is in the initial stages of research (Davies, Randall, West, 2015). Unfortunately, there is a clear lack of research on the potential strengths and weaknesses of open badges, none-the-less it has been recognised that they may be a disruptive technology for reforming education by means of alternative assessment validation for learners (Collins & Pea, 2011). Not long ago, Guzman Seattle

Times writer (Guzman, 2014) quoted Catalano, “The model of granularity in music purchases has moved us from the album to the song... the model of granularity in proving skills or expertise is going to move from the certificate or degree to the badge.”

### 3 DESIGN

#### 3.1 INTRODUCTION

The focus of this chapter is the artefact, a micro-credential badging system, and the creation justification, to provide learners with more individualised, flexible and transparent learning pathways. Firstly, the aim and objectives of the design will be elaborated upon. The underlying pedagogy which informed the design of the study and the instructional design model used will then be explained. Finally, a depiction of the implementation process will be provided. The artefact, in question, involved installation of the Mozilla Open Badge plugin for Moodle (Learning Management System) where both the creation and issuing of badges, to recognize development of soft skills, took place and subsequently linked to the student's Mahara (ePortfolio System) where the collection and display of badges took place.

#### 3.2 DESIGN AIM

The aim of this project is to assess the value of using micro-credentials in the form of digital badges to recognise the attainment of soft skills while providing a transparent learning pathways for students in a post-primary setting.

#### 3.3 DESIGN OBJECTIVES

The design objectives of this artefact are:

1. The establishment of student created learning pathways in the area of soft skill via digital badges.
2. Provide an environment/ develop specific mechanisms to recognize and reflect a student's personal development of soft/key skills.
3. Investigate whether the use of a Digital Badge Credentialing System (DBCS) can assist learners in their understanding, acknowledgement and/or awareness of soft skills they are developing within the school curriculum.

#### 3.4 PEDAGOGY

As highlighted in the literature review, soft skills (also referred to as Key Skills and 21<sup>st</sup> Century Skills) are vital skills necessary for learners in modern society. The the pedagogy underpinning this project, focused on the credentialing of soft skills, is a humanistic and constructivist approach.

The humanistic approach to education understands the self as constantly changing. It establishes reliable support mechanisms within the learner avoiding the ever shifting environment. By doing so the learner has personal power to create better meaning and establish connections with others in this constantly changing modern life. (Sinnott, J., 2008, p. 56-57). This pedagogical approach ties beautifully with the constructivist approach, defined by Saunders (1992) as "the notion that learners respond to their sensory experiences by building or constructing in their minds, schemes or cognitive structures

which constitute the meaning and understanding of their world" (p. 136). Constructivist theorists (Dewey 1925, p.490; Kolb 1984; Kolb and Kolb 2005; Piaget 1976), propose learning to be multifaceted involving the person as a whole including alternate states of thinking, feeling, behaving, and perceiving. Clearly showing constructivism to be a personal and individual experience with obvious connections to humanistic psychology.

### 3.5 INSTRUCTIONAL DESIGN

One area believed to be extremely important during the planning stage was the use of technology, ensuring it only assists and enhances the content. The content was considered and learning objectives were decided upon well in advance of considering possible technologies to enhance the experience and encourage communication and provide a level of student autonomy - to provide feedback; steer and create.

Instructional design "a philosophy, methodology and approach used to deliver information" (Merrill, 1991, p45-53). Although Instructional Design processes differ greatly "most use the traditional instructional design model with its phases of analysis, design, development, implementation and evaluation" (Lee & Owens, 2004, p.XXIV).

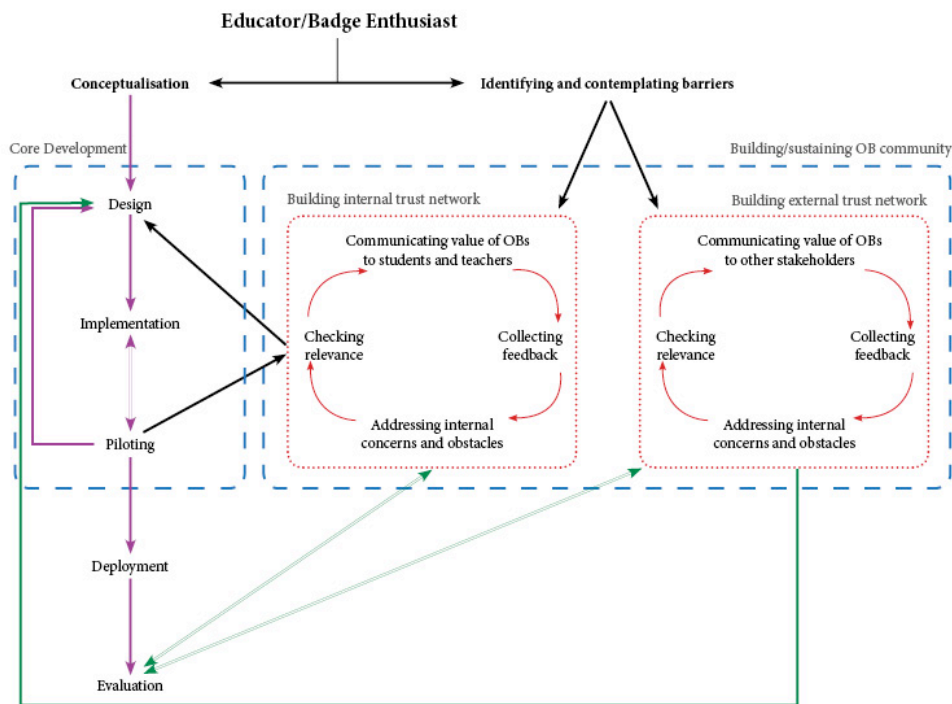
The pedagogy, being humanistic, student-centred and constructivist in nature, caused some difficulty when choosing an instructional design model. Since the pedagogical underpinnings leaned towards a holistic approach, seeing students as a whole, the chosen ID model was The Smith and Ragan Model. Smith and Ragan (2005, p.20-22) define ID as "the systematic and reflective process of translating principles of learning and instruction into plans and products for instructional materials, activities, information resources and evaluation."

The Smith and Ragan Model is based on a conditions model of learning (Gagne) but with a move from a supplantive version to a generative version (Smith & Ragan, 1994, p.3-5). The ID model provides a balance between learner and instructional strategies in the variable areas of task, context, and learner. The proposition offered by Smith and Ragan is a clear connection between supplantive instruction and learner-initiated actions. Where the design aids the desired cognitive process (Smith and Ragan, 2005, p.52-65).

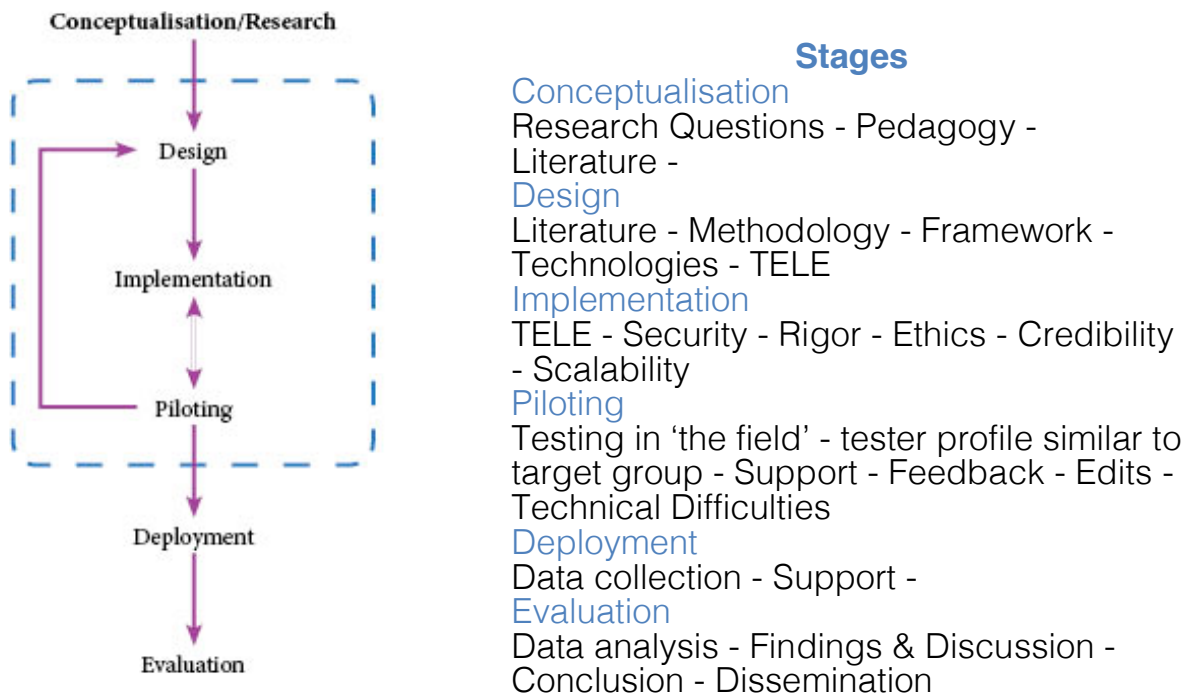
Smith and Ragan do not advocate the use of any one ID model over others. Rather, they suggest an understanding of the guiding principles of design. They maintain a strong foundation in theory, models, and design principles will provide the infrastructure needed to choose and tweak components from an assortment of models. They encourage others to use their model as a mental framework to guide when preparing to "build your own model," (Smith & Ragan, 2005, p. 11) which is exactly what this researched did by combining both the Smith and Ragan model with The Body Framework (Devedzic and Jovanovic, 2015, p.?) a model created to assist prospective badge issuers in the design and development of

Open Badge ecosystems.

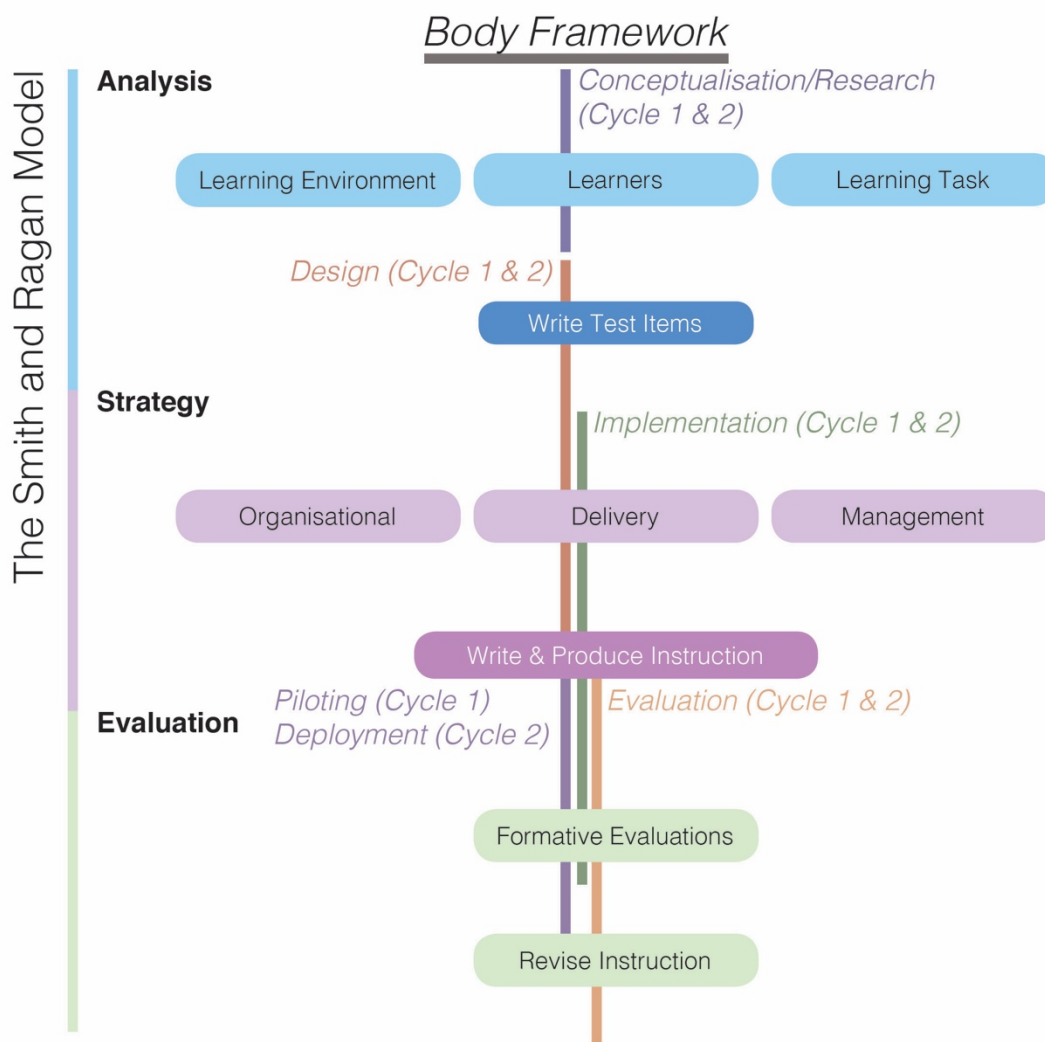
It is the belief of the researcher that this tailored ID model works well in an environment focused on the development and credentialing of soft skills in learners through the use of Open Badges.



**Fig.3 The Body Framework (Devedzic and Jovanovic, 2015)**



**Fig.4 Design Stages Developed from The Body Framework**

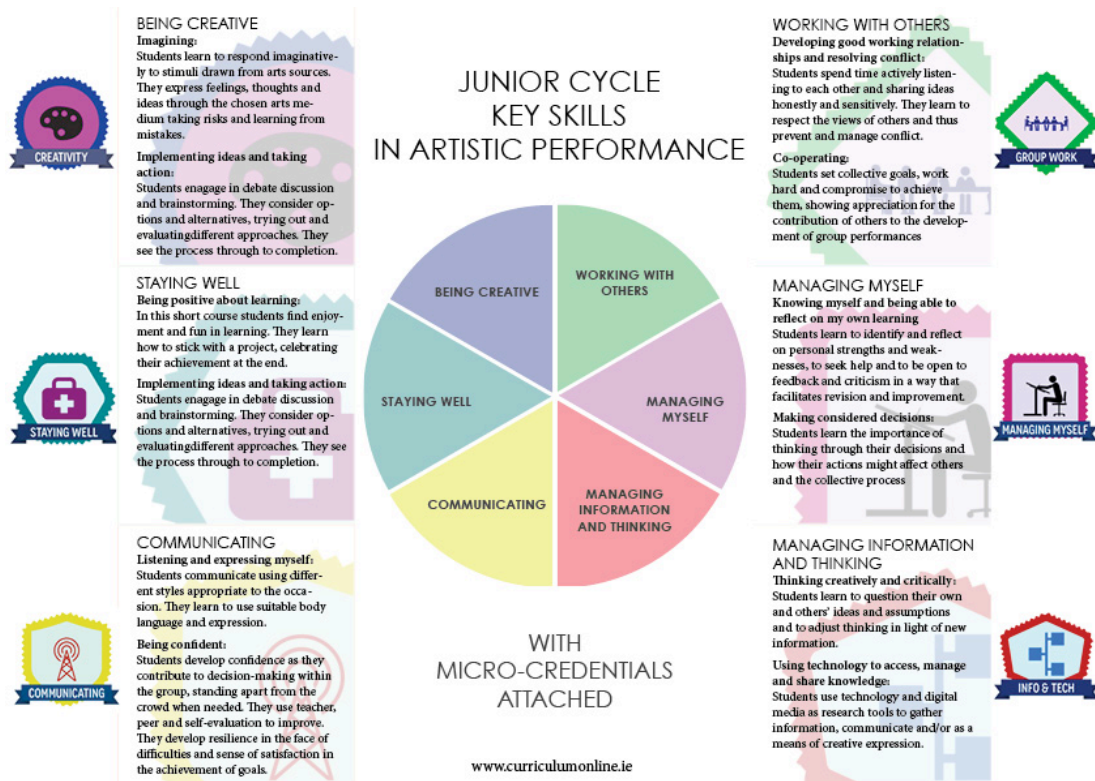


**Fig.5 Hybrid of the Smith and Ragan ID model and The Body Framework**

### 3.6 THE ARTEFACT

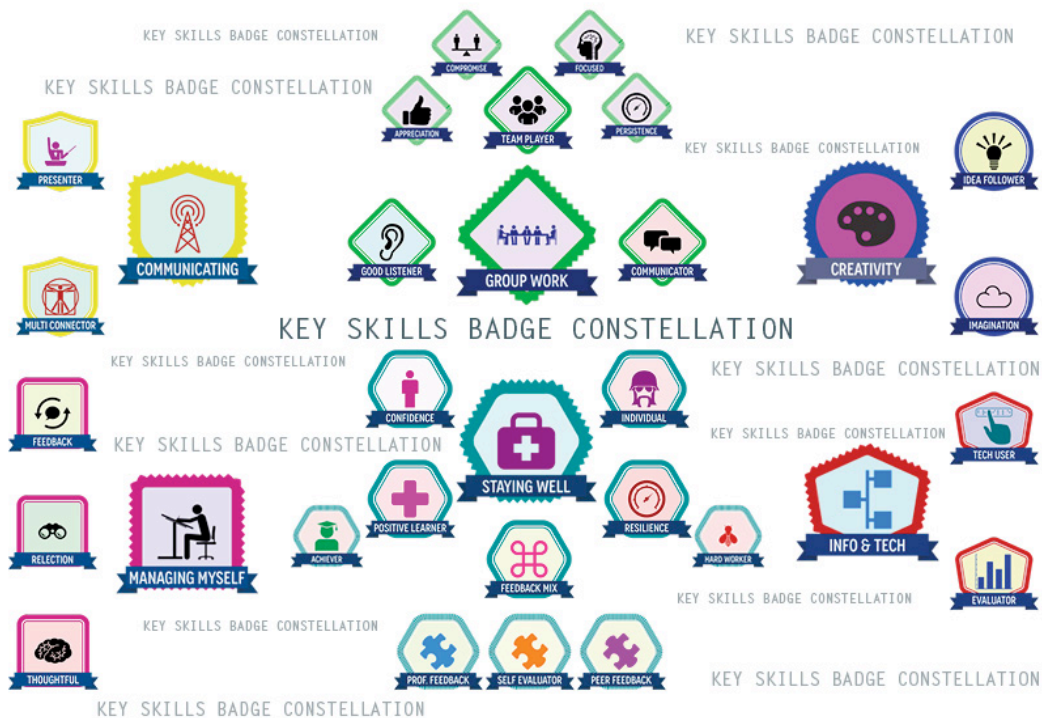
The artefact is made up of a Mozilla Open Badge plugin installed on the school's Learning Management System (LMS), Moodle. Moodle is an open source LMS meaning it can be hosted on the school's server providing a high level of security. This means any school can modify Moodle with no license fees. The LMS, in this study, is linked to the school website and referred to as 'the learning space'. The Moodle site, in question, has been modified to ensure consistent branding providing a coherent experience for the student.

The researcher began by assessing all Key Skill documentation and creating visuals based on the learning outcomes and over arching Key Skills (Fig.6).



**Fig.6 Junior Cycle Key Skills with Micro-credentials attached**

This then led the researcher to build a badge constellation (Fig.7) showing clear connections and weightings to the badges and the attached learning outcomes (Appendix 3.).



**Fig.7 Digital Badge Credentialing System (DBCS)– Badge Constellation**

Assessing the value of a digital badge credentialing system to improve student awareness when developing key skills in post-primary education.



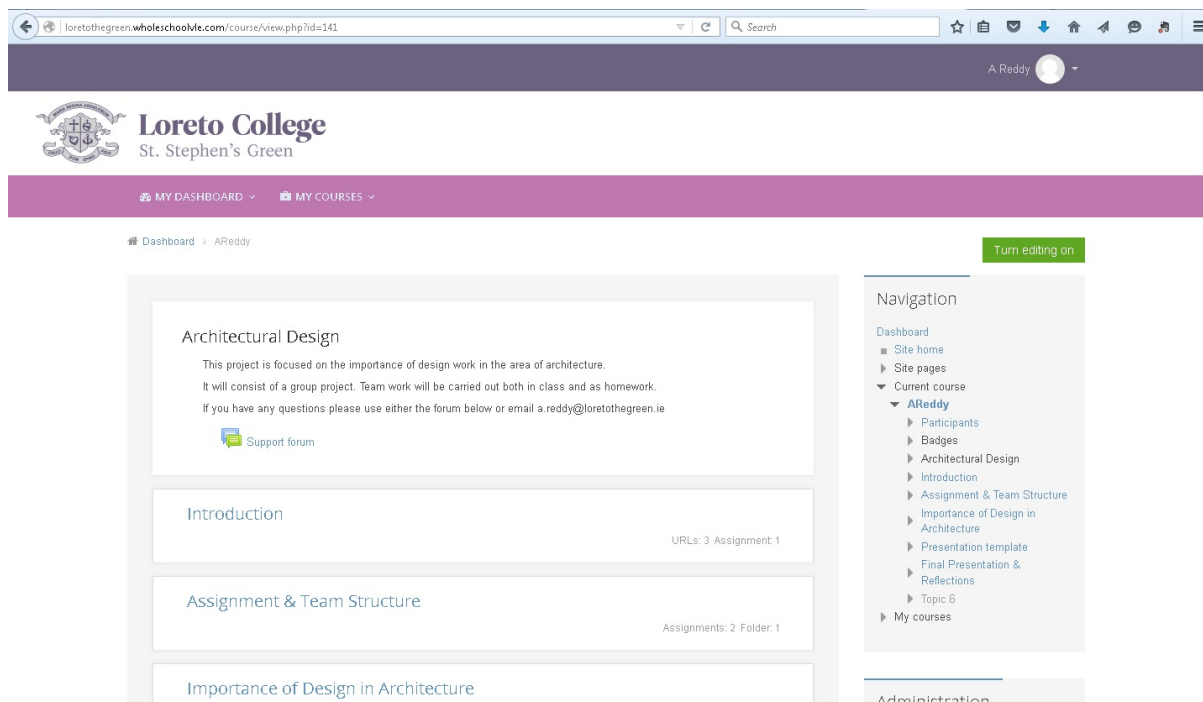
Once the badge constellations and badges had been created using Credly (a digital badging app). The Moodle course was built highlighting the possibly badge awarding sections as follows:

#### COURSE DESIGN

Title: The Importance of Design in Architecture  
 Class size: 18 students  
 Age range: 12-14  
 Ability: Mixed  
 Subject: Art

| <b>ARCHITECTURAL DESIGN</b>                             |                        |
|---|------------------------|
| <b>Main Heading</b>                                     | <b>Entry Type</b>      |
| Support forum   | Forum                  |
| Questionnaire   | Questionnaire          |
|   |                        |
| <b>Topic 1 - Introduction</b>                           |                        |
| WORLDCRAFT - Architecture should be more like minecraft | Video                  |
| What is Architecture?                                   | Video                  |
| Homes of the Future 2066                                | Assignment             |
|   |                        |
| <b>Topic 2 - Assignment &amp; Team Structure</b>        |                        |
| Project Assignment                                      | Assignment             |
| Team Contract Submission                                | Assignment             |
| Templates   | Templates              |
|   |                        |
| <b>Topic 3 - Importance of Design in Architecture</b>   |                        |
| Architecture and Storytelling                           | Video                  |
| Good Design is CareFUL(L) Bad Design is CareLESS        | Video                  |
| Use of Research in Design                               | Video                  |
|   |                        |
| <b>Topic 4 - Presentation template</b>                  |                        |
| Design Presentation Template                            | Google Slides template |
| Design Presentation Submission for Peer Review          | Assignment             |
| Final Presentation & Reflections                        | Assignment             |
|   |                        |
| <b>Topic 5 - Assignment Presentation</b>                |                        |
| Evaluation Templates                                    | Templates              |
| Reflection (Group)                                      | Assignment             |
| Reflection (Individual)                                 | Assignment             |
| Exit Questionnaire                                      | Questionnaire          |

**Table 3. – Moodle course layout ‘Architectural Design’**



**Fig. 8 – Screenshot of Moodle course ‘Architectural Design’**

The badges were then uploaded to the Moodle course and finally they were made active.

Each student is set-up with a Moodle account when joining the school. The participants in this study have some experience of using the LMS in other subjects.

The researcher added the students to the course, designed specifically for this research project, along with a co-teacher. The course is laid out in topics, 6 in total. Each topic is hidden and revealed as needed in order to ensure students are not overwhelmed.

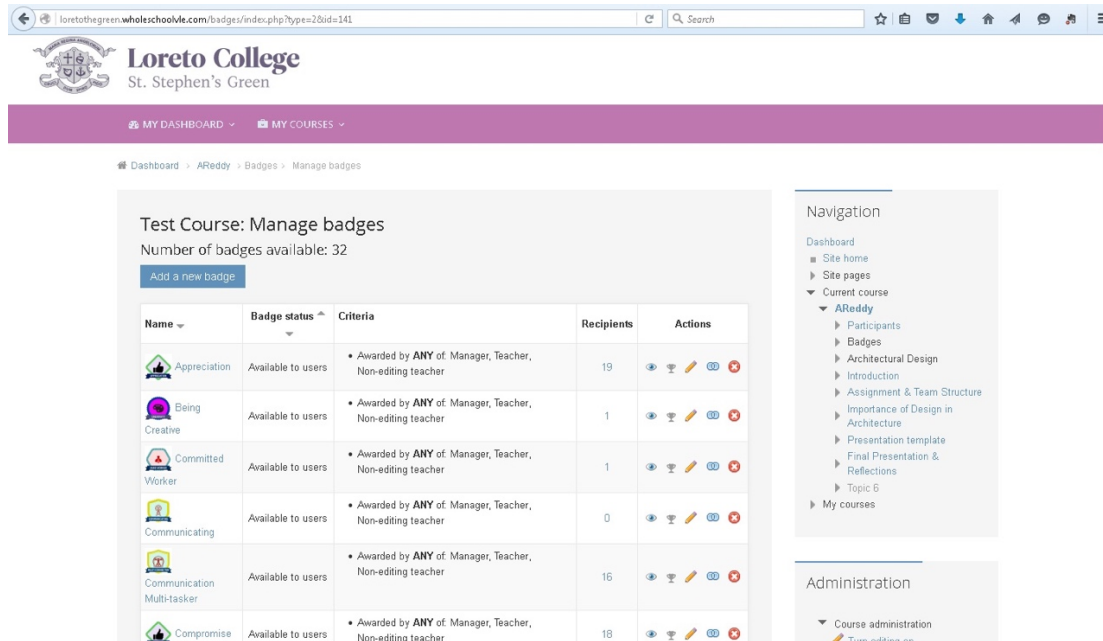
### 3.7 THE LEARNING EXPERIENCE

The learning experience was designed to make use of the artefact outlined in section? The course is divided over sixteen 40 minute lesson periods (see Table. 3). The work is group based, specifically worked in to the design of the course, the aim being to provide more opportunities for students to display, develop and experience Key Skills outlined above. The groups were assigned by the teacher in order to get a good mix of different abilities in each group.

The first lesson required the students to complete the pre-learning experience questionnaire, ensure they can all access the Moodle course on their iPads and then a divergent thinking exercise in order to engage students in the topic and experience some group work.

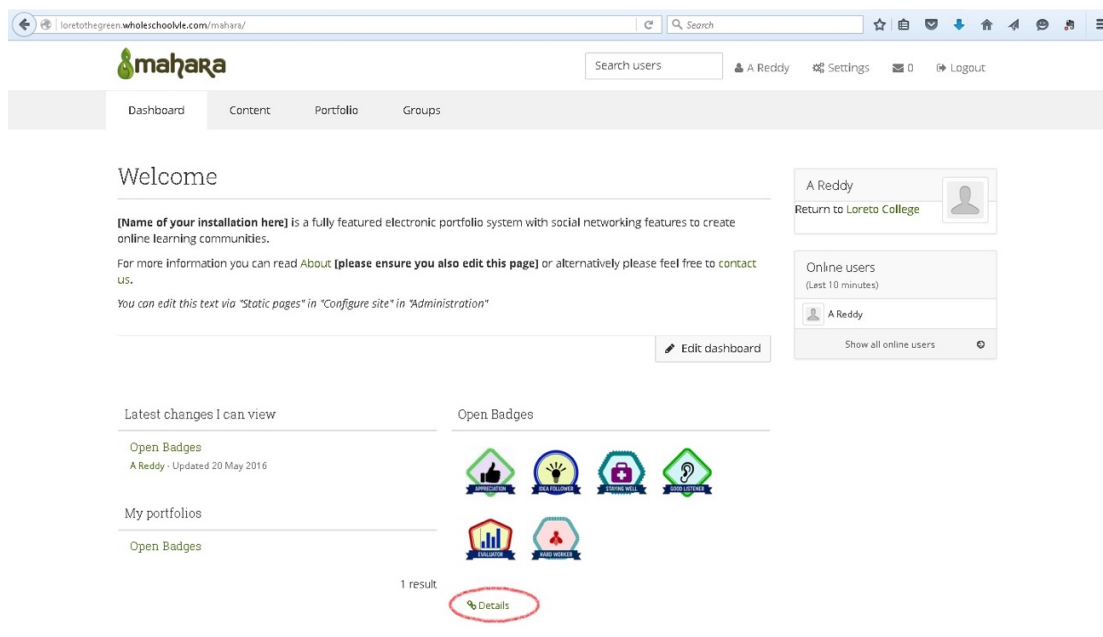
The subsequent lessons followed the Moodle course, as laid out above. This involved the watching of videos, discussion on team roles, team contracts, site visits, research,

sketching and finally the building of models, preparation of presentation and lastly final class presentation. Each of these lessons was designed to provide the learners with an opportunity to display Key Skills. As the students were constantly being observed, and notes taken, the display of Key Skills was captured and the awarding of badges to credit their ability was awarded after each lesson.

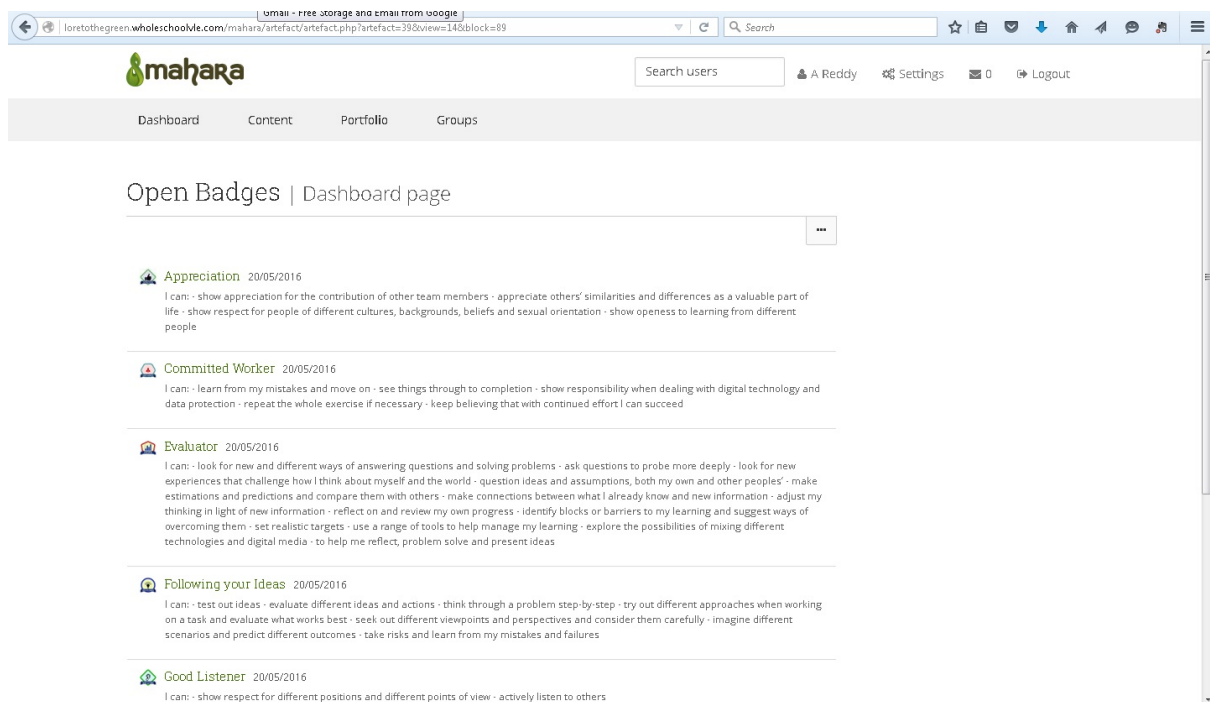


**Fig.9 – Digital Badges available within the Moodle course ‘Architectural Design’**

The students also had a Mahara ePortfolio linked to their Moodle account where their badges were synced and viewable. This provided the students an opportunity to make the badges visible to the public should they so choose using an online Curriculum Vitae or ePortfolio display, something which students do use in Transition Year within this school.



**Fig. 10 – Mahara Dashboard – displaying Digital Badges awarded in Moodle**



**Fig. 11 – Detailed list of Digital Badges awarded through Moodle and visible within the ePortfolio Mahara site**

### 3.8 DESIGN LIMITATIONS

In order for Credly to sync to the Mozilla open badges backpack the badges had to be made public. Unfortunately, due to the students ages this was not possible. Child protection issues arose and this part of the study had to be deserted. It is something to look at with learners over 18 years of age, possible Third Level education.

## 4 RESEARCH METHODOLOGY

### 4.1 INTRODUCTION

The aim of this chapter is to provide the reader with an understanding of the methods used in this exploratory case study aimed at assessing the value of a digital badge credentialing system developed around a hybrid humanistic and constructivist pedagogical approach.

### 4.2 APPROACH

The approach chosen for this project is an exploratory case study, a very useful design when attempting to provide a holistic understanding of a situation since it focuses on extensively exploring and understanding rather than quantifying and confirming (Kumar, 2011, p. 127). Exploratory case studies examine what people do, and how they use artefacts within a particular setting (Creswell, 2008). A case study design involves the 'case', chosen, investigated in a very thorough, holistic and in-depth manner (Gilbert, 2008, p.36).

An advantage to choosing a case study design is the fact it is 'characterized by a very flexible and open-ended technique of data collection and analysis' (Grinnell, 1981, p.302) this allows the researcher a wide scope to tailor a methodology design to suit the study in question (Kumar, 2011, p.127).

One restriction to a case study design is that although it can provide an overview and in-depth understanding of a case(s), processes and interactional dynamics within a unit of study but cannot claim to make any generalisations to a population beyond cases similar to the one studied (Kumar, 2011, p. 127).

#### Advantages

- Flexibility
- Holistic view

#### Disadvantages

- Limited findings
- Higher chance of bias in findings

Yin describes the factors of exploratory case studies as dealing with the 'how' and 'why' particular phenomena occur (2011, p.12-15) thus enabling an understanding of complex social phenomena (Yin, 2011, p.21-37). Therefore, an examination of 'why' these learners needed accreditation for Key Skills coupled with 'how' they interacted with the LMS and classmates via a collaborative learning project seemed to clearly match the research design of an exploratory case study.

The main reasons for choosing an exploratory case study methodology in this study were flexibility and depth of understanding. The flexibility made available to the researcher in an exploratory case study design meant that the time restrictions and 'case' could be tailored to fit. It simply would have been too difficult to disseminate the technology to a larger sample of students within the time frame of this study. Depth of understanding was the second reason to support the exploratory case study design since it would aid a more in-depth understanding of the complex phenomena under consideration.

#### 4.3 RESEARCH BIAS

The researcher is employed in the school the research was carried out. As such, the researcher may have had previous interaction with the students resulting in the possibility that some of the respondents may have responded to questions with a willingness to please the researcher. However, this was highlighted by the researcher prior to carrying out the study, while seeking consent. As a result, it is hoped that the students, aware that such an approach would skew the results, provided a completely honest response, as requested.

There was a conscious decision on the part of the researcher to avoid prior knowledge of the class and students involved in the project. The rationale for this was avoidance of bias and prevention of awarding badges based on previous work or known capabilities. This allowed the researcher to ensure a more controlled research project with less variables to consider.

#### 4.4 PARTICIPANTS

This project was run with a 2nd Year Art class. The subject provided the researcher with flexibility to develop a short project, focused on Key Skills, within the curriculum. The class size totalled 18 students, all of which participated in the study. The year group were very familiar with the use of I.T. in the learning environment, being the first year group in the school to have individual iPads. Since an exploratory case study design requires the choice of a case (participant group) based on one which can provide as much information as possible to understand the case in its totality, the 'case' must be well considered (Kumar, 2011, p.127).

#### 4.5 DATA COLLECTION

Several sources of data were utilized in this research study. The data covered both qualitative and quantitative. The aim of this approach was to ensure a higher level of reliability by establishing a triangulation of measurement processes between the five data sets (Kumar, 2011, p.178-181).

#### 4.6 DATA COLLECTION TOOLS

Although the use of a single method is acceptable, the use of multiple methods to collect data is considered an important aspect of a case study, specifically examples include in-depth interviewing, secondary records, observations, focus groups and group interviews. Several sources of data were used to carry out this study. Covering both qualitative and quantitative research approaches. The aim of this was to ensure a higher level of reliability by establishing a triangulation of measurement processes between the three data sets (Kumar, 2011, p.177-186).

However, it must be remembered that at the time of analysis the case is always considered as a single entity (Kumar, 2011, p.127).

| Method        | Participants                    | Data Type                    | Purpose  |
|---------------|---------------------------------|------------------------------|--|
| Questionnaire | Students                        | Quantitative and Qualitative | Before-and-after design. Compare responses from questions prior to intervention with those after.  |
| Observation   | Researcher<br>Teacher           | Qualitative                  | <ul style="list-style-type: none"> <li>To establish any changes in behaviour</li> <li>Awarding of badges at relevant points.</li> </ul>  |
| Reflections   | Students (Group and individual) | Qualitative                  | Looking for comments relating to key skills, self awareness and changes due to the collaborative project undertaken.   |
| LMS           | Students                        | Quantitative                 | <ul style="list-style-type: none"> <li>Data on the number on log-ins</li> <li>Interaction with feedback</li> <li>Interaction with classmates via LMS</li> </ul>                    |
| Focus Groups  | Students                        | Qualitative                  | Four specific questions<br>A Priori and Emergent coding<br>Looking for comments relating to key skills, self awareness and other key concepts highlighted in the Literature Review |

**Table 4. – Data Collection Tools**

##### 4.6.1 QUESTIONNAIRES

A constructed list of questions, answers to which are recorded by the respondents (Kumar, R., p. 145). Best practice was followed for this study by ensuring:

- The questions are clear and easily understood
- The questionnaire is pleasant to the eye,
- The questions are in a logical sequence

- The questionnaire has an interactive style - presented in a way that respondents feel as though they are being spoken to.  
(Kumar, 2011, p.145).

The questionnaire for this project will be carried out by collective administration, being the quickest way of collecting data and ensuring a very high response rate (Kumar, R., 2011, p. 148). The researcher, having a captive audience (pupils in a classroom), will use the opportunity by requesting the students complete a pre questionnaire at the start of the first session. Providing the researcher an opportunity to explain the purpose, relevance and importance of the study and respond to any queries from students. The post questionnaire will then be completed at the end of the final session, again by collective administration.

#### Advantages

- Low expense
- Less time consuming
- Offers greater anonymity - important in protecting student anonymity.

#### Disadvantages

- Respondent limitations:
  - Response to a question may be influenced by the response to other questions
  - A response cannot be supplemented with other information such as in the case of an interview.

#### 4.6.1.1 QUESTION TYPE

Both closed (Yes/No) and open-ended questions were used in the questionnaires to capture the student's prior knowledge of soft/key skills and their knowledge of said skills post study. The aim of the post questionnaire will also aim to capture the student experience with the digital badge credentialing system.

#### 4.6.2 OBSERVATION

Non-participant controlled (classroom setting) observation carried out by both the researcher and teacher, in a cross-over method, providing a broad view of the phenomenon as it takes place. The teacher, being much more familiar with the students, could easily identify any unusual reactions as a result of the stimulus – digital badge credentialing system.

Both observers carry out their observations in a cross-over method, one running the class and the other carrying out non-participant controlled observation. This observation is in a narrative format - taking brief notes during the session. After completing the observation, the observers created more detailed notes in narrative form.



Advantages:

- It provides deeper insight into the interaction.

Disadvantages:

- Possibility of researcher bias. Hopefully overcome by the additional observational recordings of the teacher.
- Possibility of some part of the interaction not being recorded as a result of focus being on another observation and vice versa observations may be missed as a result of focus being on recording. In the case of this project both the researcher and teacher will be non-participant observers and as a result most observations should be captured.

#### 4.6.3 LMS DATA

Data from Moodle, Learning Management System (LMS), will be collected and analysed to provide some insights in relation to the participants interaction with the course, badges awarded and frequent use of the system. Data sets will include: usage times, number of badges awarded and queries submitted to the forum section.

#### 4.6.4 REFLECTIONS/EVALUATIONS

As researcher, in design of the mini project, I will request the students to narrate their experiences by evaluating their work both individually and as a group. It has been shown that narratives have a therapeutic impact; that is, sometimes simply telling their story may help a person to feel more at ease with the event.

The recording system chosen by the researcher is a written submission. It is believed the student may feel more comfortable in this context and the accuracy has been confirmed since the student has both written and submitted the reflection.

#### 4.6.5 SEMI-STRUCTURED FOCUS GROUP INTERVIEWS

A strategic opportunity to explore attitudes, perception or opinions of students toward the learning intervention through free and open dialogue involving the researcher and group members. The discussion, not fully controlled or directed, is stimulated by questions posed or issues raised by the researcher.

Rationale: The degree of specificity and focus of issues discussed is much higher than group interviews. The questions and issues are, to an extent, pre-determined by the researcher, as opposed to group interviews, where group members are permitted to discuss whatever they want.

Advantages:

- Low cost
- Low time commitment

- Detail rich information
- Opportunity to cover a vast variety of issues

Disadvantages:

- Narrowed opinion sets resulting from dominant participants
- Pre-existing group dynamics may be an issue since participants know each other well

A semi-structured focus group interview took place during the final period assigned to this project. The focus group comprised of 15 participants. It is recommended that group interviews be used in situations where “interaction among the interviewees will likely yield the best information and when the interviewees are similar to and cooperative with each other” (Creswell, 2008), clearly highlighting the approach as appropriate for this setting and these particular participants the optimal environment to encourage quality discussion (Ranjit, 2011, p.128) while ensuring an opportunity for additional relevant issues to emerge. Both Priori coding (predetermined set of codes) (Johnson & Christensen, 2012) and emergent coding (codes established during data analysis) (Stemler, 200) were used. The coding can be seen in Appendix.16.

In the case of this project it is expected that the focus groups will provide the researcher with very rich summative feedback.

#### 4.7 PILOT SESSION

The researcher understands the necessity to carry out a pilot test on the learning experience with similar group of people to the research population and within similar field conditions. The aim of the pilot test is to identify possible difficulties the respondents may encounter, such as clarity around the understanding of questions, technical difficulties and other unexpected problems. Any difficulties highlighted during the pilot test phase should be rectified prior to the data collection phase. Smith and Ragan argue that, although time consuming, effective learning results from quality formative evaluation creating, in the end, a more profitable product (Smith and Ragan, 1999, p.106). These group evaluations provide the designer an opportunity to test out revisions. Attitude, performance and time data should be collected these group evaluations in order to revise instruction before field trials.

This study ran a pilot text with a Transition Year Art Class. Some areas on concern raise during the pilot phase was technical issues, design layout, terminology, timing of learning materials, time allowed for model building etc.

#### 4.8 DATA ANALYSIS APPROACH

The results of the questionnaires and semi-structured group interview were analysed as part of answering of the research question.

A statistical data analysis of user interaction with the LMS was carried out using Moodle site statistics. This data was then also analysed.

Observation of participants' interaction with each other and the artefact took place continuously throughout the project, by both the researcher and the class teacher. This was of great assistance to the researcher when examining and comparing data from other collection instruments.

| Qualitative Data   | Quantitative Data  |
|--|--|
| <ul style="list-style-type: none"> <li>• Observations</li> <li>• Questionnaires</li> <li>• Reflections</li> <li>• Semi-structured focus group interview</li> </ul> | <ul style="list-style-type: none"> <li>• Questionnaires</li> <li>• LMS data</li> </ul> |

#### 4.9 VALIDITY

Validity being the ability of an instrument to measure what it is designed to measure (Kumar, 2011, p.176-181) was certainly given appropriate consideration when designing the methodology used for this study. Validity also defined as 'the degree to which the researcher has measured what he/she has set out to measure' (Smith et. al, 1991, p.106). It is hoped that the researcher has completed this expectation through carefully chosen and designed methods.

#### 4.10 IMPLEMENTATION

The semi-structured group interview was audio recorded and then coded and themed for relevant information in answering the research question. Detail of this analysis is available in Appendix.16. The group interview was structured around four questions (Appendix.16), with the aim of facilitating clear and easy analysis of participant's responses. The literature indicates best practice being the use of audio recordings since it provides the researcher the opportunity to focus on interaction fully preventing distraction by minor details (Gibbs, 2008). While this approach appeared to make clear sense, it soon became apparent that the analysis of said interview yielded much more rich detail through transcription followed by coding. Providing a much more accurate analysis of this data. The approach used when examining the interview data was A Priori and Emergent coding system, gleaning themes with direct links to the research question (O'Dwyer, 2004). The sample involved 18 students from a 2nd Year Art Class aged between 12 and 14 years of age. The learning experience ran over 4 weeks, amounting to sixteen 40-minute class periods. Two questionnaires were completed by participants both prior to and post learning experience. The questionnaires aimed to investigate student awareness of soft skills, specifically the Key Skills outlined in the new Junior Cycle curriculum. Each participant was automatically assigned to the Moodle course set-up specifically for this study. The students had previously used Moodle and had accounts created for them when joining the school. However, the Mahara section was a new addition and since it was integrated with the school's Moodle site the student

accounts were migrated over allowing for a very seamless set-up from the student perspective. This also provided adherence with the school I.T. "Acceptable Use Policy" and ensured a "safe space" was created in which only the specific students and teachers on the course could view the materials and interactions. A breakdown of the lessons in this learning experience has been provided in Table.3: Breakdown of Learning Experience Lessons.

The research was carried out over four weeks, involving 16 class periods (40 minutes each). All sessions were carried out in the students' usual classroom.

The school is a fee paying post primary all girls school with a strong academic reputation. As such, the students involved, 2nd Year, are very focused on their school work and, the majority, excelling in all learning environments.

#### 4.11 ETHICS

Ethical approval for this project was granted by Trinity College Dublin Ethics Board (Appendix. 12). The Information Sheets and Consent Forms for the school's Board of Management (Appendices. 10-11) Parent(s)/Guardian(s) (Appendices. 6-7) Students (Appendices. 4-5) and Teacher (Appendices. 8-9) are available to view.

Consent was sought from the Board of Management of Loreto College St. Stephen's Green and granted (Appendix.17). As the students involved were under the age of 18 years consent was required from a parent/guardian and in each case was obtained prior to the intervention taking place. Information regarding the study was provided to all participants before asking them to sign consent forms stating their willingness to participate. The message that participation in this study was voluntary and that participants could leave the study at any time, without penalty, was clearly conveyed to all.

#### 4.12 SUMMARY

This research project aims to assess the impact of a digital badge credentialing system within a school's LMS. The study looks at the enhancements a digital badge credentialing system can provide students when developing Key Skills. As a result of the focus of the study the researcher decided to use an exploratory case study design with the aim of establishing an in-depth and holistic view of the learning intervention. The in-depth and holistic view in question will be established through questionnaires (pre and post learning intervention), LMS data, observations of each session by both the researcher and teacher and lastly through students' personal reflections of the project set with specific focus on developing Key Skills. The next chapter will take a detailed look at the findings captured by these measurement tools.

The methodology used in this exploratory case study allowed the researcher to answer the research question through analysis and triangulation of data from multiple sources. The

LMS data, pre and post questionnaires, observation and semi-structured group interview, provided the researcher with both qualitative and quantitative data. The next chapter will present the reader with an analysis of the above mentioned data and discussion in relation to the findings.

## 5 FINDINGS AND DISCUSSION

### 5.1 OBSERVATION REFLECTION

Students at first appeared daunted by a group project, since they had previously worked solo in this subject, but quickly a level of excitement accompanied by a dynamic atmosphere appeared in the classroom. The teams were allocated by the teacher in order to provide a consistent mix of ability and personality, since the teacher knows the students well and could provide that level of student analysis.

The sessions though very well prepared for had their glitches with timing. The student interaction was wonderful and insightful at times. Students were extremely engaged and as a result it proved difficult to keep to schedule without cutting them off. I believe it was the right choice and although it caused a run over into additional lessons it allowed a much deeper level of learning and skill development. The sessions were certainly all the more enhanced as a result.

The question of why the students appeared so engaged in the sessions is something I have pondered during my observation sessions and while carrying out the data analysis. I have a number of ideas, such as the conducive space; the team work; the use of a selection of technology; the sharing of power with the student in leading the learning; the open, comfortable and interested dialogue. Any of these points and possibly more could explain the positive dynamic achieved throughout the project.

Other observations of the class-run project:

- Students appeared very comfortable using technology.
- The vast majority of students displayed confidence and comfort when speaking to the class.
- The class appear to have a vast vocabulary and understand words such as 'bigamy' in architectural terms.
- The students have travelled and can comment on famous architectural pieces from first hand experience..
- The project was very well received. Students showed a lot of excitement and interest. Even during a trip to the site for investigation they did not appear to get distracted and actively expressed ideas, came to question constraints, highlighted possible problems and took photos on their iPads to assist their designs.

The project designed undoubtedly provided a number of opportunities to develop Key Skills. The response from students in class was very positive.

### TEACHER OBSERVATIONS

The teacher's observations referred to previous knowledge of the students and an awareness of the groups strong abilities. However, it was noted in these observations that the student displayed unexpected levels of professionalism and detailed workings. The teacher noted their questions reflected very high order thinking. It was also noted in these observations that the agreed team roles and contracts assisted a number of conflicts.

## 5.2 QUESTIONNAIRES

The questionnaire consisted of five questions.

- Q1. Can you explain what Soft Skills (also called Key Skills) are?
- Q2. Are you aware of the specific soft skills you are developing through the school curriculum this year?
- Q3. If you answered yes above, please provide examples of these soft skills. If you answered no please guess what you think 'soft skills' might refer to.
- Q4. Are you aware of the term 'digital badges'?
- Q5. If you answered yes above, please provide additional information. If you answered no please guess what you think 'digital badges' might refer to.

### Q1. CAN YOU EXPLAIN WHAT SOFT SKILLS (ALSO CALLED KEY SKILLS) ARE?

The responses to their understanding of Soft Skills was varied and surprising (Table?). There was clearly a vague understanding already present which was interesting. However there understanding was much clearer after the project. It cannot be assumed that this was due to the project, badges awarded or the introduction to Key Skills, from the researcher, at the start of the learning experience.

| <b>Understanding of Soft Skills</b>                   |
|---|
| Peoples' feelings                                     |
| Skills that a crucial for the future                  |
| To communicate and interact with other people         |
| Things that you put towards working well with others  |
| The ability to use a computer or technology           |
| Skills needed for a certain task                      |
| Skills that you need to be able to work harmoniously. |
| Team work skills                                      |

**Table 5. Pre-learning experience questionnaire – Understanding of Soft Skills**

| <b>Understanding of Soft Skills</b>  |
|--|
| Skills that help in everyday life for the future                           |
| Soft skills are a personal attribute to a project to work well with others |
| Skills that help you during architecture project                           |

|                                 |
|---------------------------------|
| Personal and individual         |
| Skills that help with team work |

**Table 6. Post-learning experience questionnaire – Understanding of Soft Skills**

Q2. ARE YOU AWARE OF THE SPECIFIC SOFT SKILLS YOU ARE DEVELOPING THROUGH THE SCHOOL CURRICULUM THIS YEAR?

It was surprising to see even 43% of the class believed they were aware of the specific soft skills being developed through the school curriculum. It is possible that the students misunderstood the question or focussed mainly on the term skills without considering the soft element. It is possible that they were considering skills in the area of the subject they were in at the time, Art.

The post-learning questionnaire showed a shift in their understanding. Again this is surprising considering the students were only briefly introduced to soft skills/key skills at the start of the project. They were informed they will be accredited for their key skills during the project. Therefore, it can be assumed that the badges awarded were clearly related to these key skills and the students now felt they were aware of the specific key skills being developed within the curriculum. This is exactly the outcome the researcher was hoping for.

**Are you aware of the specific soft skills you are developing through the school curriculum this year?**



**Fig 12. Pre-learning experience – awareness of soft skills within the curriculum**

**Are you aware of the specific soft skills you are developing through the school curriculum this year?**



**Fig 13. Post-learning experience – awareness of soft skills within the curriculum**

Q3. IF YOU ANSWERED YES ABOVE, PLEASE PROVIDE EXAMPLES OF THESE SOFT SKILLS. IF YOU ANSWERED NO PLEASE GUESS WHAT YOU THINK 'SOFT SKILLS' MIGHT REFER TO.



As mentioned above and supported now by the comments below, the students seem to have understood the soft skills to be IT skills. However there is some students that did seem to understand the soft skills within the curriculum '*Communication skills, adaptability, problem solving skills*'. This was very interesting and something worth more investigation. The post-learning experience response to this question does not provide much more clarity and perhaps even less. There is a focus on team work and this may be due to the fact that the students had little experience with team work and as a result struggled somewhat. Considering this and the very recent project their responses highlighted the skills they are most consciously aware of working to develop.

| <b>Examples of Soft Skills being developed through the curriculum.</b> |
|--|
| Using iPads in school and computer class                               |
| Socialising with people  |
| Teamwork, co-operation   |
| Communication skills, adaptability, problem solving skills             |
| Computer software skills   |
| General skills you may learn   |
| Learning new things  |
| Skills that are needed for you to work well with someone or something. |
| IT skills (software)   |

**Table 7. Pre-learning experience questionnaire – Understanding of Soft Skills**

| <b>Examples of Soft Skills being developed through the curriculum.</b>      |
|---|
| People skills   |
| I think soft skills are skills that you easily pick up e.g. noticing colour |
| Life skills   |
| Well in this project, I learnt team skills which will help in future        |
| Skills you use in all areas of life   |
| To work well with others and compromise                                     |
| Team work   |

**Table 8. Post-learning experience questionnaire – Understanding of Soft Skills**

#### Q4. ARE YOU AWARE OF THE TERM 'DIGITAL BADGES'?

The students involved in this project showed a clear understanding of digital badges post learning experience, increasing from 20% to 62%. A possible reason some students may have been unsure of a digital badge could be due to the fact that the researcher purposely decided not to explain the term, simply specifying that they will receive accreditation for their soft skills during this project via Moodle. The reasoning behind the lack of explanation is the avoidance of any extrinsic mode of motivation, specifically the overjustification effect.

It is somewhat surprising and heartening to see that most of the class was aware of the term simply as a result of exposure to the badges.

**Are you aware of the term 'digital badges'?**



**Fig 14. Pre-learning experience – awareness of digital badges**

**Are you aware of the term 'digital badges'?**



**Fig 15. Post-learning experience – awareness of digital badges**

Q5. IF YOU ANSWERED YES ABOVE, PLEASE PROVIDE ADDITIONAL INFORMATION. IF YOU ANSWERED NO PLEASE GUESS WHAT YOU THINK 'DIGITAL BADGES' MIGHT REFER TO.

From the students explanations of digital badges, pre-learning experience, it is clear that although they may not be confident in their understanding of the term their guesses are based loosely around it's correct meaning. Perhaps this aided the students when they began to receive notifications of the badges awarded to them during the project. Simply increasing their confidence in their understanding of the term and explaining the increase in their awareness of the term in the question above.

| <b>Explanation of the term Digital Badge</b>                              |
|---|
| Having an Interest , skill or quality in the learning environment         |
| A way of rewarding people if they learn something new on an iPad/computer |
| Online based achievements   |
| Awards given online   |
| Digital badges are virtual things that show what you have accomplished.   |
| Merits of achievement in tech   |
| Award for doing something online  |

**Table 9. Pre-learning experience questionnaire – Understanding of Soft Skills**

In the post-learning experience questionnaire, the students clearly understood the term and related correctly to the badges awarded to them during the project. There may be some

confusion still present but overall the students seem to have created their own understanding of the term digital badges through first-hand exposure to the badges.

| <b>Explanation of the term Digital Badge</b>                                      |
|---|
| Badges earned online  |
| Badges we got on Moodle for working well with others, being creative e.t.c        |
| Badges are awarded for the soft skills I acquired during this project             |
| Things achieved during the project that are award for skill learnt during project |
| Merits rewarded to a student after developing a new skill                         |
| An online representation of a skill you have learned                              |
| The badges that appeared on my profile.   |
| Badges awarded for different skills you have achieved during the project          |

**Table 10. Post-learning experience questionnaire – Understanding of Soft Skills**

#### KEY FINDING

Both the pre and post learning experience questionnaires provided some interesting data. Clear increases in understanding of soft skills and digital badges were highlighted. This indicates that the learning experience somehow helped students become more aware of the soft/key skills being developed within the curriculum as well as the term and use of digital badges in the area of credentialing, specifically soft skills.

#### 5.3 LMS DATA

| Computed from logs since Tuesday, 30 April 2013, 4:30 PM.  |              |                                 |
|--|--------------|---------------------------------|
| <b>Activity</b>  | <b>Views</b> | <b>Last access</b>              |
| ForumSupport forum   | 19           | Friday, 13 May 2016, 9:33 AM    |
| Introduction   |              |                                 |
| URLWORLDCRAFT - Architecture should be more like minecraft | 46           | Friday, 22 April 2016, 9:26 AM  |
| What is Architecture?                                      | 55           | Friday, 22 April 2016, 9:26 AM  |
| Homes of the Future 2066                                   | 73           | Friday, 22 April 2016, 9:27 AM  |
| Questionnaire  | 24           | Friday, 29 April 2016, 3:12 PM  |
| Assignment & Team Structure                                |              |                                 |
| Project Assignment   | 67           | Friday, 6 May 2016, 9:24 AM     |
| Team Contract Submission                                   | 10           | Monday, 18 April 2016, 2:03 PM  |
| Templates  | 20           | Friday, 22 April 2016, 9:06 AM  |
| Architecture and Storytelling                              | 4            | Friday, 15 April 2016, 11:24 AM |

|  |    |                                |
|--|----|--------------------------------|
| Good Design is CareFUL(L) Bad Design is CareLESS | 4  | Friday, 22 April 2016, 9:16 AM |
| Use of Research in Design                        | 5  | Friday, 22 April 2016, 9:14 AM |
|  |    |                                |
| Design Presentation Template                     | 2  | Tuesday, 3 May 2016, 1:15 PM   |
| Design Presentation Submission for Peer Review   | 2  | Tuesday, 3 May 2016, 9:09 AM   |
|  |    |                                |
| Presentation                                     | 17 | Sunday, 15 May 2016, 5:25 PM   |
| Evaluation Templates                             | 11 | Friday, 13 May 2016, 9:35 AM   |
| Exit Questionnaire                               | 18 | Friday, 13 May 2016, 9:38 AM   |

**Table 11. – Activity log – Moodle course**

The data gleaned from the Moodle site show a very high interaction with the course. Considering the project was a group assignment and the group usually only used the one iPad in class to view items the activity numbers are very high. This indicates a high level of interest and interaction from the student. Again this is visible in the class observation where students were actively checking details provided in the course materials during the class group work.

#### 5.4 EVALUATIONS

Participants were required to complete three separate evaluations (self, group process and peer) available to view in Appendices. 18-19. The rationale for this, apart from the fact evaluation is good practice (ref) it was hoped that the response from students would highlight their self-awareness of soft skills as well as those displayed by peers.

On analysis of these evaluations it soon became clear that the self and peer evaluation forms (Appendices. 18-19) provided the most interesting responses:

#### *Self Evaluation Form for Group Work*

Question: My greatest strengths as a team member are:

Responses:

|   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• I listen to people</li> <li>• I do my share of the work</li> <li>• Incorporating everyone's ideas</li> <li>• Contribute a lot to the team</li> <li>• Working quickly</li> <li>• Co-operation</li> <li>• Taking initiative</li> <li>• Contributing good ideas</li> <li>• Organisation</li> <li>• Listening</li> <li>• Combining all ideas</li> <li>• Questioning</li> </ul> | <ul style="list-style-type: none"> <li>• Creativity</li> <li>• Ideas</li> <li>• Listening skills</li> <li>• Compromising</li> <li>• Listening</li> <li>• Contributing</li> <li>• Ideas</li> <li>• Leadership</li> <li>• Inclusive</li> <li>• Communication</li> <li>• Work ethic</li> <li>• Initiative</li> </ul> |
|---|---|

|   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Ideas</li> <li>• Construction</li> <li>• Caring</li> <li>• Work ethic</li> <li>• Construction</li> </ul> | <ul style="list-style-type: none"> <li>• Facilitator</li> <li>• Work ethic</li> <li>• Organisation</li> <li>• Team player</li> </ul> |
|---|--|

**Table 12. – Self Evaluation Form for Group Work - Strengths**

Question: The group work skills I plan to work to improve are:

Responses:

|  |  |
|--|--|
| <ul style="list-style-type: none"> <li>Talking more during the presentation</li> <li>Listen to other people</li> <li>Listening to others</li> <li>Being prepared</li> <li>Taking the time to fully listen to others ideas</li> <li>Confidence</li> <li>Share more ideas</li> <li>Speak up more</li> <li>Attendance/timekeeping</li> <li>Questioning/ Devil's advocate</li> <li>Clear communication – tasks</li> <li>Communication</li> <li>Attendance/timekeeping</li> </ul> | <ul style="list-style-type: none"> <li>Taking leadership</li> <li>Confidence with ideas</li> <li>Ensuring quieter team members are heard</li> <li>Timekeeping</li> <li>Ideas</li> <li>Initiative</li> <li>Planning</li> <li>Disseminating information to the team</li> <li>Ideas</li> <li>Confidence</li> <li>Independence</li> <li>Not to expect things from other people</li> <li>Team work</li> </ul> |
|--|--|

**Table 13. – Self Evaluation Form for Group Work – Skills I Plan to Work to Improve**

*Peer Evaluation Form for Group Work*

Question: What did you learn about working in a group from this project that you will carry into your next group experience?

Responses:

|  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• Not to be afraid to say my own ideas or disagree with other people's ideas</li> <li>• To accommodate everyone<br/>Not everyone can be up to your speed so explain things thoroughly</li> <li>• It is very important to communicate well and co-operate with each other</li> <li>• To listen and compromise with everyone in my group</li> <li>• Respect everyone's ideas<br/>Start project with a positive attitude</li> <li>• Accept different peoples strengths and weaknesses</li> </ul> | <ul style="list-style-type: none"> <li>• Learned that it is important to be 100% sure that everyone understands what is going on</li> <li>• Sometimes you just have to compromise and settle<br/>Easier when you assign things to the group members<br/>Easier when everyone fully understands what is going on</li> <li>• I need to communicate better and not get frustrated so easily</li> <li>• Not to worry about other people's responsibilities and focus on doing my own work well</li> </ul> |
|--|---|

|  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• To have ideas heard and to listen to others</li> <li>• Divide roles so they suit everyone's strengths</li> <li>• To speak up more</li> <li>• Learned that to work in a group you have to be patient and let everyone share their ideas</li> </ul> | <ul style="list-style-type: none"> <li>• If you work hard and get the work done you will not be stressed and you have time to fix your errors.</li> <li>• Ensure everyone is on the same page and completes work to best ability</li> </ul> |
|--|---|

**Table 14. – Self Evaluation Form for Group Work – Lessons to Carry to your next**

**Group Project**

KEY FINDING

The data collected from these evaluation sheets gleaned the most obvious examples of self-awareness in the area of soft skills. Students upon reflection displayed a strong understanding of their soft skills including there strengths and weaknesses in the area.

However the question must be raised 'Did the evaluation sheets make the students consider the soft skills' this data although highlighting student self-awareness cannot be tied to the Digital Badge Credentialing System (DBCS) in any way. Perhaps in future a more narrative reflection would be better suited in the hope that the badges may be mentioned to support their involvement in the process.

5.5 SEMI-STRUCTURED FOCUS GROUP INTERVIEW

Following the learning experience, and the post-learning experience questionnaire, a semi-structured focus group interview was conducted with the participants with the aim of gleaning additional data. The focus group was structured around four main questions:

- Q1.** Do you believe the digital badges awarded in this project clearly reflect your skills?
- Q2.** What benefits do you see for digital badges as credentials?
- Q3.** What difficulties do you see for digital badges as credentials?
- Q4.** How would you change the badging process used in this project?

These questions were pre-determined by the researcher as recommended and expected in a semi-structured group interview (Kumar, 2011, p.154-155).

**DO YOU BELIEVE THE DIGITAL BADGES AWARDED IN THIS PROJECT CLEARLY REFLECT YOUR SKILLS?**

The majority of participants expressed a positive response to this question. Upon a request to elaborate a student displayed a clear reference to self-awareness in response to the

badges awarded *'I thought the badges helped point out skills I hadn't even thought about... I didn't really notice. I think the badge just made me think about it.'*

When asked if they know why that might have happened the same student replied *'I think in group work there are very important things to help us work well as a team like being very clear when you communicate and compromising. I just think these don't usually get noticed and the badges helped me to focus on them and maybe realise their importance.'* This response showed a clear reference to self-awareness, humanistic psychology, student-centred and constructivist learning theory.

The negative responses seemed to stem from difficulties with a group. *'I think because it was a teamwork project you couldn't really see my work as an individual... Some people on teams worked harder and possibly deserved badges when others didn't.'* This may stem from team conflicts (highlighted in the group evaluations), rather than a true reflection of the rewarding system, since another student expressed the opposite opinion *'I feel the opposite. I contributed equally as well as the others in my group. The badges reflect this.'*

#### WHAT BENEFITS DO YOU SEE FOR DIGITAL BADGES AS CREDENTIALS?

*'it's always nice to be rewarded for your work. It made me want to contribute more.'*

When the researcher asked if that means the badges had been motivational there was very clear yes from students. Although the researcher has purposely tried to avoid influence on motivation through the use of these badges, it appears they still seem to have a motivational impact on some students. It raises the question 'Is this as a result of differing personalities and/or learning styles?' because another student said they had no motivational incentive from the badges *'They didn't really act as an incentive to me, I wasn't aware of them at the beginning of the project. Only about half way through.'* Again this possibly of differing personalities and learning styles is highlighted by another student *'I don't think the badges would motivate others as much as me.'*

Another area of interest highlighted by this area is the idea of learning pathways clearly linked to the humanistic and constructivist pedagogy, being created in an individual and personal manner *'You can also see what you have done so far... I think they show achievements and help keep track of your work.'*

#### WHAT DIFFICULTIES DO YOU SEE FOR DIGITAL BADGES AS CREDENTIALS?

The participant response reflected the area of credibility and rigor highlighted in the literature *'They don't mean as much. You can't physically hold them.'* Another similar

comment was *'They could be viewed as only labels... might not be considered as important [as] real certificates.'* Which they then elaborated more to say real certificates are *'more official and people take them more seriously'*

Taking a step further than the credibility and rigor issue, the students displayed a very mature and enquiring approach to online information/data

*'when something is online you're thought to question it because anyone can put something online so maybe that's the reason?'*

The students although suspicious in a healthy way of information/data online, are not opposed to a possible shift towards online credentialing in the future *'I think in the future this could change. Maybe badges will be normal as certificates and school reports.'*

#### HOW WOULD YOU CHANGE THE BADGING PROCESS USED IN THIS PROJECT?

Moving forward the students showed an interest in adding a more social element to the badges by making them *'more visible'* and *'connect more with other apps'*. There was also an interest gamifying and increasing motivation *'They could be more connected. Like levels in a game'*

#### KEY FINDING

Overall this semi-structured focus group interview displayed participant understanding the aim of the study, without full prior knowledge. It was further noted that the students appeared to enjoy the project and felt they were challenged, this credited to the design of the Moodle course (The Smith and Ragan model and The Body Framework) as opposed to the Digital Badge Credentialing System (DBCS). From the responses it is more than apparent that the project created in Moodle gave ample opportunity for students to display and develop Key Skills, in turn providing the researcher the chance to award the students for their skills. The students indicated a positive response to these rewards, with some indications toward motivation and learning pathways all of which arose in the Literature Review. Students self awareness of soft skills through a humanistic, constructivist and student-centred approach appears to have taken place in this learning experience highlighted through the a-priori coding and emergent theming of data recorded in the semi-structured focus group.

#### 5.6 UNEXPECTED RESULTS

The level of student engagement in the project was surprisingly high. On regular occasions the students delayed leaving the class, actively discussing the project even as they were walking out the door. It poses the question as to why this occurred. Some ideas in response to this is the group work element, the real world project, the variety of activities involved, the use of technology, the student autonomy provided to the groups etc. It could be one, some



or all of these elements and is certainly worth further investigation with different year groups. However it must be noted that the students raised to the challenge and produced exceptionally detailed and well thought-out designs. The soft skills displayed throughout the project were very strong in areas. Perhaps we underestimate their capabilities and should increasingly challenge them in this area.

## 5.7 SUMMARY

Upon triangulation of the data collected from several collection tools, indicated above, it can be agreed that there are some indications that a Digital Badge Credentialing System (DBCS), with a humanistic and constructivist approach, has the ability to facilitate student self awareness when developing soft skills. However, it is clear that more research and modified data collection tools will help confirm this with more reliability.

## 6 CONCLUSION

The purpose of this research study was to answer the question:

Can digital badges provide an effective means of soft skill accreditation for students in the new Junior Cycle curriculum.

The study also aimed to seek answers to the following sub questions:

1. The establishment of student created learning pathways in the area of soft skills.
2. Provide an environment/develop specific mechanisms to recognize and reflect a students personal learning pathway in the development of soft/key skills.
3. Investigate whether the use of a Digital Badge Credentialing System (DBCS) can assist learners in their understanding/acknowledgement/awareness of the soft skills they are developing within the school curriculum.

The main research question and sub questions, through the use of an exploratory case study, were answered.

### 6.1 ATTITUDES AND PERCEPTIONS

The students displayed a lack of knowledge in relation to soft skills at the beginning of this learning experience, as highlighted in the pre-learning experience questionnaires. However their knowledge of said soft skills increased by the end of the learning experience, again highlighted in the post-learning experience questionnaire.

The participating students are confident tech users and have been using an iPad throughout their secondary school education. However, they have rarely used the school LMS system, Moodle, and they also had no experience with digital badges prior to the learning experience, highlighted in the pre-learning experience questionnaire.

### 6.2 ANSWERING THE RESEARCH QUESTION

It can be clearly derived from the literature and research carried out during this dissertation that soft skills, although developed through curriculum is neither clearly assessed nor accredited in any standard way (Heckman and Kautz, 2012, p.451-464)

Students have been shown to respond well to grades when evaluating their learning (ref). Although grading may not be the best form of assessment and accreditation when dealing with the softer skills (ref). A digital badge credentialing system (DBCS) has provided the means by which students can not only be acknowledged for their soft skill development but allow student the opportunity to reflect upon these skills and develop an individual and personal learning pathway.

The student response to the DCBS during the learning experience was positive and seemed to create an awareness of skills which had previously gone unnoticed, as

highlighted in the focus group interview. This is also supported in the comparison of pre and post learning experience questionnaires, where students displayed a clear increase in understanding of soft/key skills and digital badges.

However, it should be noted that the researcher, conscious of the overjustification effect (Easley and Ghosh, 2013, p.215-260), purposely made a decision not to highlight the badges nor make them visible prior to award, it may be possible that some students were oblivious or less aware of them and by default of their soft skills. This finding raises concern and requires further study.

Observation by the researcher and teacher showed some differences. The teachers notes awarded badges at a much more frequent level. This may be as a result of prior knowledge of the students and their abilities colouring the teacher's response to the project. This is both advantageous in a real world setting and disadvantageous to a controlled study where bias may skew the results.

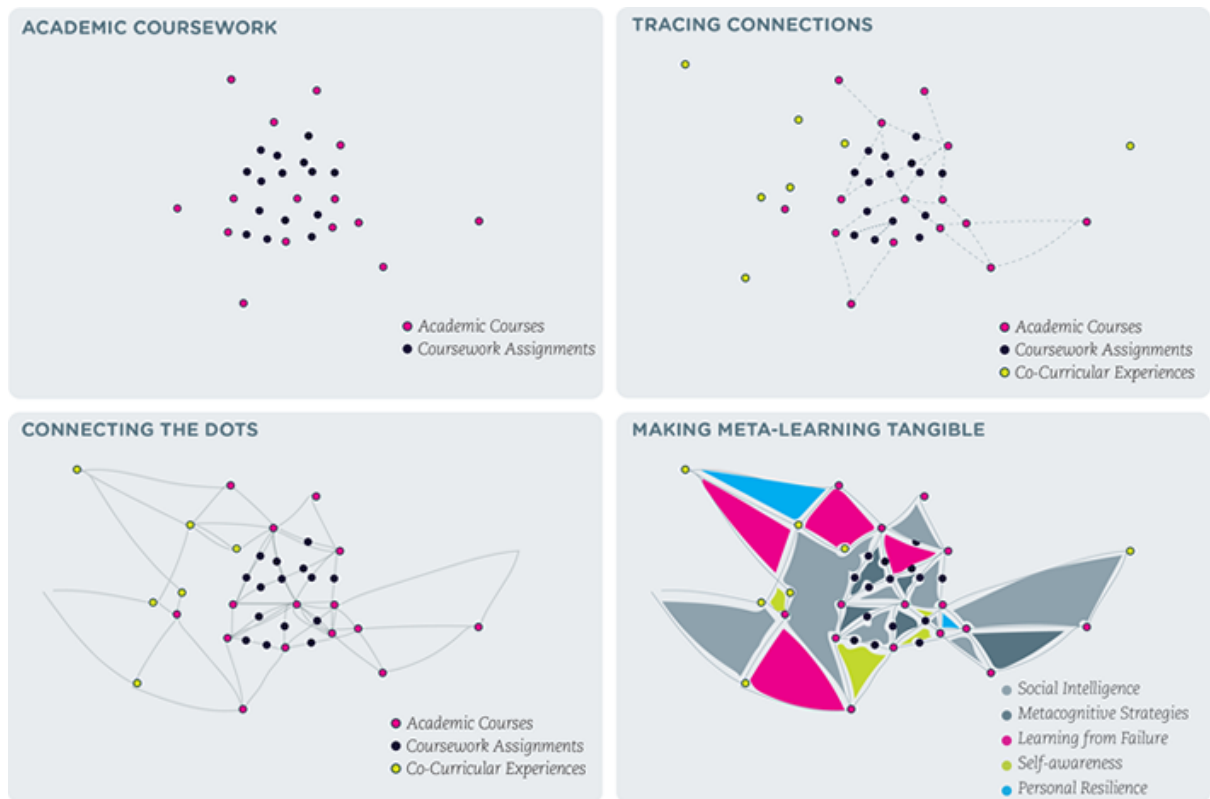
### 6.3 RESEARCH LIMITATIONS

This learning intervention involved under 18s. As a result, the ethic approval process proved difficult and time consuming. The delays incurred due to the ethics application had a knock-on effect on the timeline originally established for the project. The class time was greatly delayed and in turn the review of the data was limited.

### 6.4 FUTURE STUDIES

A broader exploratory study to incorporate a clear and transparent visualisation of learning pathways supported by the use of learning analytics and a digital badge credentialing system (DBCS) to capture all learning in a students day-to-day life e.g. formal, informal and non-formal

A DBCS has the capability, with some modifications, to facilitate dynamic personalized and agile learning design. In comparison to traditional credits in academia, represented by hours in class and grading by instructors, badges are both data-driven and learner-centred. These badges, as credentials, can only be earned when linked to concrete evidence that meets specific criteria. Unlike static college degrees these badges are organic, student owned and portable, providing them the ability to grow with the learner and be used in different contexts, joining with other badges in different ways and creating an intricate learning design (Chen, Grocott and Kehoe, 2016) which can be shaped and reshaped over time as the learner sees fit. Not just reflecting work completed these badges can also incorporate peer endorsements and comments reflecting its value. When these badges incorporate a level of learning analytics in order to capture the vast wealth of learning, formal, informal and non-formal, learning can truly be dynamic and adaptive to represent authentic and individual learning pathways.



**Fig.16 Visual argument for making meta-learning visual (Chen, Grocott and Kehoe, 2016)**

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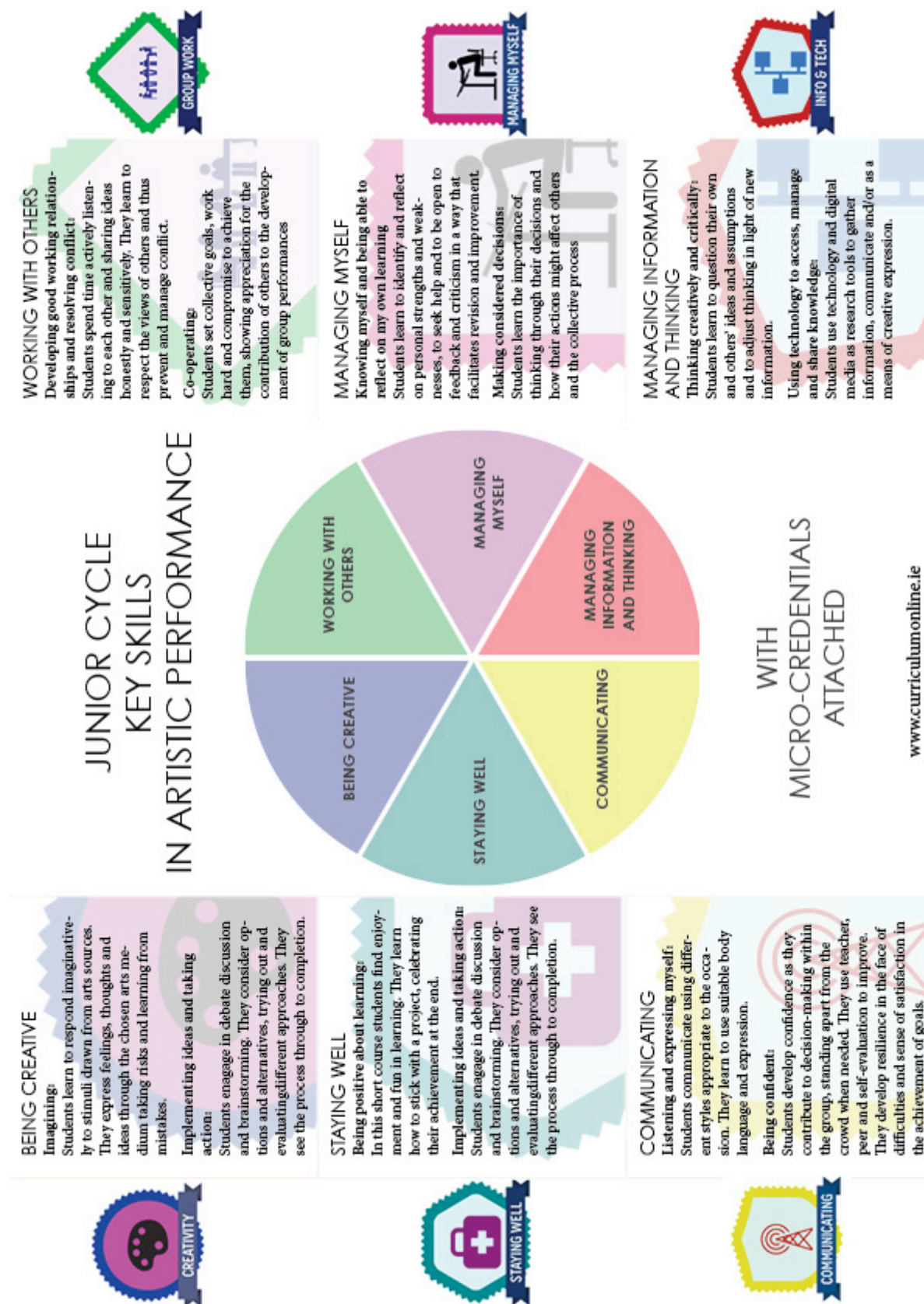
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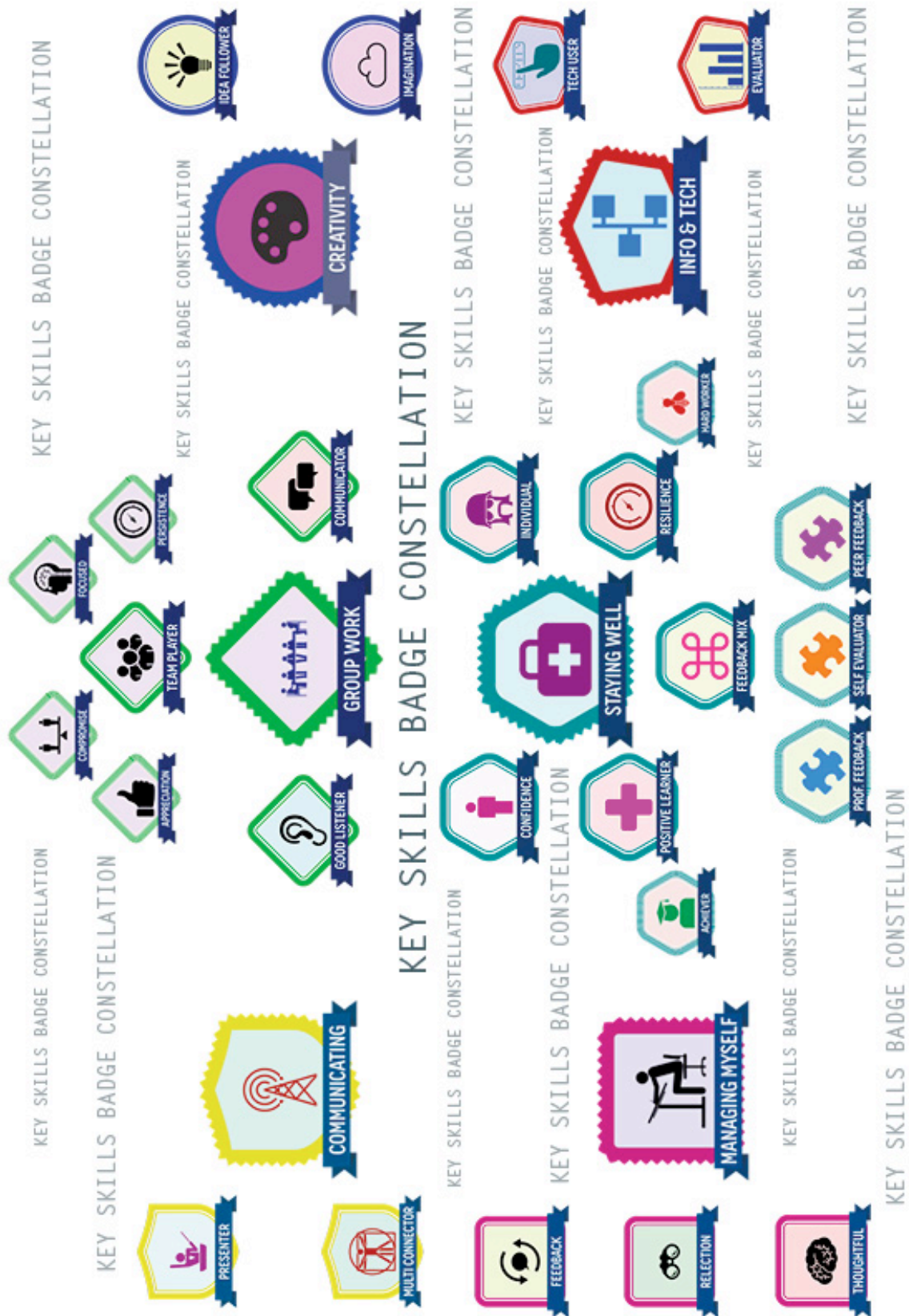
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**APPENDIX 1. Junior Cycle Key Skills Linked to Micro-credential Badges**



## APPENDIX 2. Badge Constellation



## **APPENDIX 3. Key Skill Badges and Learning Outcomes Weightings**

### Badge Learning Outcomes

Being Creative (100)

Imagining (50)

I can:

- use different ways of learning to help develop my imagination
- imagine ways that I can make a positive difference in the world
- take inspiration from the courage and imagination of others
- express my feelings, thoughts and ideas through movement, writing, music, art, storytelling, drama and imaginative modes of expression
- participate in learning in creative ways
- suggest creative ways that help me to learn
- use a variety of learning tools that help me to be creative
- be innovative and creative in using digital technology to learn, think and express myself
- create digital media objects which demonstrate creativity and imagination to present learning

Follow your Ideas (50)

I can:

- test out ideas
- evaluate different ideas and actions
- see things through to completion
- think through a problem step-by-step
- try out different approaches when working on a task and evaluate what works best
- seek out different viewpoints and perspectives and consider them carefully
- imagine different scenarios and predict different outcomes
- take risks and learn from my mistakes and failures
- repeat the whole exercise if necessary
- explore the possibilities of mixing different technologies and digital media to help me reflect, problem solve and present ideas

Working with Others (100)

Good Listener (25)

I can:

- show respect for different positions and different points of view

The Communicator (25)

I can:

- share my ideas honestly and with sensitivity

- name, express and manage my emotions appropriately
- give and receive praise and criticism constructively
- contribute to decisions as part of a group
- help other students to understand and solve problems
- demonstrate collaborative learning using digital technology
- use digital technology to participate in collaborative learning and communication spaces

#### Team Player (50)

##### Miss Focused (12.5)

I can:

- believe in my ability to make a difference
- think critically about the world and its problems and propose solutions

##### Persistent (12.5)

I can:

- work in pairs and larger groups to help each other when we are learning
- recognise that many different people can support my learning and know how to get that support
- continue with a course of action in spite of difficulty or opposition

##### Appreciation (12.5)

I can:

- show appreciation for the contribution of other team members
- appreciate others' similarities and differences as a valuable part of life
- show respect for people of different cultures, backgrounds, beliefs and sexual orientation
- show openness to learning from different people

##### Compromise (12.5)

I can:

- take on different roles within groups
- prevent and manage conflict situations
- agree collective goals and work with others towards achieving shared goals
- be flexible and willing to make compromises to achieve a common goal

#### Managing Myself (100)

##### Personal Reflector (33)

I can:

- recognise my personal strengths and weaknesses
- identify influences that make me who I am

- express my opinions and feelings appropriately
- find ways of dealing with setbacks and difficulties
- set personal goals
- assess my own learning and suggest ways that it can be improved
- use different technologies to plan, manage and engage in my learning
- express, share and present opinions through the use of digital technology

#### Feedback Processor (34)

I can:

- set learning goals and evaluate my progress towards achieving those goals
- receive and make use of feedback on my learning
- identify what I need in order to achieve my goals
- ask for help and know where to go when I need help
- prepare detailed plans
- learn from my past actions and make changes if necessary

#### Thoughtful/Considered Decision Maker (33)

I can:

- understand the importance of thinking through my decisions
- consider a number of possible consequences when planning and deciding on actions
- listen to different perspectives when considering my options
- choose between different courses of action and explain my choice
- make plans in order to act on my decisions
- contribute to decision-making within the class and group

#### Managing Information and Technology (100)

##### Idea Evaluator (50)

I can:

- look for new and different ways of answering questions and solving problems
- ask questions to probe more deeply
- look for new experiences that challenge how I think about myself and the world
- question ideas and assumptions, both my own and other peoples'
- make estimations and predictions and compare them with others
- make connections between what I already know and new information
- adjust my thinking in light of new information
- reflect on and review my own progress
- identify blocks or barriers to my learning and suggest ways of overcoming them
- set realistic targets

- use a range of tools to help manage my learning
- keep believing that with continued effort I can succeed

#### Knowledgeable Tech User (50)

I can:

- recognise what I already know and the wide range of information available to me
- use a range of strategies to find information and data
- analyse information and data presented in a variety of forms
- evaluate the quality of that information and data and their sources
- make judgements about how valid and reliable that information is
- prepare and organise information and data so that it makes sense to me and others
- question ideas and assumptions, both my own and other peoples'
- make estimations and predictions and compare them with others
- make connections between what I already know and new information
- adjust my thinking in light of new information

#### Communicating (100)

##### Communication Multi-tasker (50)

I can:

- listen actively
- express what I think and feel clearly in an appropriate tone
- agree or disagree respectfully
- use suitable body language and expression
- ask well thought-out questions and listen to the answer
- use different styles of communication suited to the situation
- participate confidently in class discussion
- understand and use a wide vocabulary
- speak and write in well-constructed sentences
- edit, correct and improve my written work
- use a range of writing forms to express my ideas
- make decisions about how best to communicate for particular purposes
- be respectful and responsible in my digital and online communications

#### Thoughtful/Considered Presenter (50)

I can:

- express my ideas and emotions through performance and presentation such as visual art, music, drama, design and graphics

- make choices about how I can best present my ideas to others, taking account of my audience
- communicate using a variety of styles, including role-play, drama, posters, and storytelling
- present my point of view and be able to explain and support it
- respond to opposite arguments constructively
- present, interpret, and compare information and data using charts/diagrams
- use digital technology creatively to present, interact with and share ideas for different audiences

Staying Well (100)

Positive Learner (30)

I can:

- find enjoyment and fun in learning
- feel positive about myself

Committed Worker (20)

I can:

- learn from my mistakes and move on
- show responsibility when dealing with digital technology and data protection

Personal Achiever (20)

I can:

- find enjoyment and fun in learning
- feel positive about myself
- recognise and celebrate my achievement

Confidence (50)

Standing Apart from the Crowd (15)

I can:

- communicate my opinions and beliefs with confidence in a variety of ways
- stand apart from the crowd when needed
- express and manage different emotions

Evaluation (20)

Teacher (6)

I can:

- Accept evaluative feedback from my teacher
- Investigate more deeply the evaluative feedback from my teacher
- Use the evaluative feedback from my teacher to improve my learning

Peer (6)

I can:

- Accept evaluative feedback from my peers
- Investigate more deeply the evaluative feedback from my peers
- Use the evaluative feedback from my peers to improve my learning

Self (8)

I can:

- Provide evaluative feedback to myself
- Investigate more deeply my own evaluative feedback
- Use my own evaluative feedback to improve my learning

Resilience (15)

I can:

- stick with things and work them through until I succeed



## **Appendix 4. Student Information Sheet**

### **Student Participant Information Sheet**

#### **TITLE OF PROJECT:**

Assessing the value of using a Digital Badge Credentialing System (DBCS) to provide transparent learning pathways for students acquiring soft skills in post-primary education.

LEAD RESEARCHER: Aideen Reddy

#### **BACKGROUND TO RESEARCH:**

This research examines the usefulness of micro-credentials, at Junior Cycle level, to provide students with transparent learning pathways for attainment of Key Skills. The micro-credentials will be issued in the form of digital badges through the school's Learning Management System (LMS), Moodle, which will then be displayed on the school's ePortfolio system, Mahara, and also the Credly iOS app on the student's iPad. The research seeks to find out if such an approach can provide students with more clarity of soft skills they are acquiring, through the curriculum.

#### **PROCEDURES OF THIS STUDY:**

As part of this study participants will be asked to:

- Complete required tasks, both in class and as homework, designed to develop specific key skills.
- Participate in a focus group to discuss the student experience of using micro-credentials.
- Complete two fully anonymised questionnaires prior to and post learning experience to assess your experience of using micro-credentials and your understanding of soft skills.

Both the researcher and teacher will:

- Provide unbiased observations (through note-taking) of the above mentioned tasks, carried out by students.

#### **PARTICIPATION:**

Participation in this study is voluntary. Participants may withdraw at any time without penalty. Any student unwilling or unable to take part in the study will be moved to another art class (same year group) to complete a similar project.

#### **ILLICIT ACTIVITY:**

In the unlikely event that illicit activities become known over the course of this research, these will be reported to appropriate authorities.

#### **DATA RECORDING:**

Data collected will be separated from personal identity information as soon as possible after collection. Codes will be used to identify individual cases. The key linking such codes to personal information - names will be kept secure and separate from the dataset.

#### **CONFLICT OF INTEREST:**

Participants include students and a teacher in the school where I am employed.

#### **PUBLICATION:**

The results from this study will be presented as part of the project work for a postgraduate degree MSc in Technology and Learning (TCD).

## Appendix 5. Student Assent to Participate Form

### Student Assent to Participate in Research

#### DECLARATION:

- I agree to participate in this study with the understanding that permission has been sought separately from my parent/guardian to participate.
- I have read, or had read to me, an information form providing information about this research and this consent form.
- I understand that my participation in the online questionnaire is fully anonymous and that no personal details about me will be recorded.
- I understand that it is a staff member of Loreto College, St. Stephen's Green running this study but that no information in this study will be used to identify me.
- I have had the opportunity to ask questions and all my questions have been answered to my satisfaction. I understand the description of the research that is being provided to me.
- I agree to my data being presented as part of the project work for the MSc in Technology and Learning (TCD) in a way that does not reveal my identity.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I consent to being observed, by the researcher through note-taking, while completing the tasks associated with this project.
- I understand that in the unlikely event that illicit activities become known over the course of this research, these will be reported to appropriate authorities.
- I understand that my data will be stored securely and deleted on completion of the study.
- I understand that the study involves viewing a computer screen and that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

Signature of Participant: \_\_\_\_\_ Date: \_\_\_\_\_

Signature of project leader (TCD): \_\_\_\_\_ Date: \_\_\_\_\_  
Ms Aideen Reddy

#### Statement of investigator's responsibility:

I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely provided assent to participate in the research. I undertake to act in accordance with the information supplied.

RESEARCHER CONTACT DETAILS: [a.reddy@loretothegreen.ie](mailto:a.reddy@loretothegreen.ie)

## **Appendix 6. Parent(s)/Guardian(s) Information Sheet**

### **Parent(s)/Guardian(s) Information Sheet**

#### **TITLE OF PROJECT:**

Assessing the value of using a Digital Badge Credentialing System (DBCS) to provide transparent learning pathways for students acquiring soft skills in post-primary education.

LEAD RESEARCHER: Aideen Reddy

#### **BACKGROUND TO RESEARCH:**

This research examines the usefulness of micro-credentials, at Junior Cycle level, to provide students with transparent learning pathways for attainment of Key Skills. The micro-credentials will be issued in the form of digital badges through the school's Learning Management System (LMS), Moodle, which will then be displayed on the school's ePortfolio system, Mahara, and also the Credly iOS app on the student's iPad. The research seeks to find out if such an approach can provide students with more clarity of soft skills they are acquiring, through the curriculum.

#### **PROCEDURES OF THIS STUDY:**

As part of this study participants will be asked to:

- Complete required tasks, both in class and as homework, designed to develop specific key skills.
- Participate in a focus group to discuss the student experience of using micro-credentials.
- Complete two fully anonymised questionnaires prior to and post learning experience to assess your experience of using micro-credentials and your understanding of soft skills.

Both the researcher and teacher will:

- Provide unbiased observations (through note-taking) of the above mentioned tasks, carried out by students.

#### **PARTICIPATION:**

Participation in this study is voluntary. Participants may withdraw at any time without penalty. Any student unwilling or unable to take part in the study will be moved to another art class (same year group) to complete a similar project.

#### **ILLICIT ACTIVITY:**

In the unlikely event that illicit activities become known over the course of this research, these will be reported to appropriate authorities.

#### **DATA RECORDING:**

Data collected will be separated from personal identity information as soon as possible after collection. Codes will be used to identify individual cases. The key linking such codes to personal information - names will be kept secure and separate from the dataset.

#### **CONFLICT OF INTEREST:**

Participants include students and a teacher in the school where I am employed.

#### **PUBLICATION:**

The results from this study will be presented as part of the project work for a postgraduate degree MSc in Technology and Learning (TCD).

## Appendix 7. Parent(s)/Guardian(s) Consent Form

### Parent(s)/Guardian(s) Consent Form

#### DECLARATION:

- I am 18 year or over and competent to provide consent.
- I have read, or had read to me, an information form providing information about this research (as detailed in the information sheet) and this consent form.
- I understand that my daughter's participation in the online questionnaire is fully anonymous and that no personal details about her will be recorded.
- I understand that it is a staff member of Loreto College, St. Stephen's Green running this study but that no information in this study will be used to identify my daughter.
- I have had the opportunity to ask questions and all my questions have been answered to my satisfaction. I understand the description of the research that is being provided to me.
- I agree to my daughter's data being presented as part of the project work for the MSc in Technology and Learning (TCD) in a way that does not reveal her identity.
- I freely and voluntarily agree to my daughter being part of this research study, though without prejudice to her legal and ethical rights.
- I understand that she may refuse to answer any question and that she may withdraw at any time without penalty.
- I consent to her being observed, by the researcher and teacher through note-taking, while completing the tasks associated with this project.
- I understand that in the unlikely event that illicit activities become known over the course of this research, these will be reported to appropriate authorities.
- I understand that her data will be stored securely and deleted on completion of the study.
- I understand that the study involves viewing a computer screen and that if my daughter or anyone in her family has a history of epilepsy then she is proceeding at her own risk.
- I have received a copy of this agreement.

I \_\_\_\_\_ consent to my daughter \_\_\_\_\_ taking part in this research project.

Signature of Parent/Guardian: \_\_\_\_\_ Date: \_\_\_\_\_

Signature of project leader (TCD): \_\_\_\_\_ Date: \_\_\_\_\_  
Ms Aideen Reddy

#### Statement of investigator's responsibility:

I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent. I undertake to act in accordance with the information supplied.

RESEARCHER CONTACT DETAILS: [a.reddy@loretothegreen.ie](mailto:a.reddy@loretothegreen.ie)

## **Appendix 8. Teacher Participant Information Sheet**

### **Teacher Participant Information Sheet**

#### **TITLE OF PROJECT:**

Assessing the value of using a Digital Badge Credentialing System (DBCS) to provide transparent learning pathways for students acquiring soft skills in post-primary education.

LEAD RESEARCHER: Aideen Reddy

#### **BACKGROUND TO RESEARCH:**

This research examines the usefulness of micro-credentials, at Junior Cycle level, to provide students with transparent learning pathways for attainment of Key Skills. The micro-credentials will be issued in the form of digital badges through the school's Learning Management System (LMS), Moodle, which will then be displayed on the school's ePortfolio system, Mahara, and also the Credly iOS app on the student's iPad. The research seeks to find out if such an approach can provide students with more clarity of soft skills they are acquiring, through the curriculum.

#### **PROCEDURES OF THIS STUDY:**

As part of this study your students will be asked to:

- Complete required tasks, both in class and as homework, designed to develop specific key skills.
- Participate in a focus group to discuss the student experience of using micro-credentials.
- Complete two fully anonymised questionnaires prior to and post learning experience to assess your experience of using micro-credentials and your understanding of soft skills.

You, as participant and teacher, will be asked to:

- Provide unbiased observations of the above mentioned tasks, carried out by students, to the researcher in written format.

#### **PARTICIPATION:**

Participation in this study is voluntary. Participants may withdraw at any time without penalty. Any student unwilling or unable to take part in the study will be moved to another art class (same year group) to complete a similar project.

#### **ILLICIT ACTIVITY:**

In the unlikely event that illicit activities become known over the course of this research, these will be reported to appropriate authorities.

#### **DATA RECORDING:**

Data collected will be separated from personal identity information as soon as possible after collection. Codes will be used to identify individual cases. The key linking such codes to personal information - names will be kept secure and separate from the dataset.

#### **CONFLICT OF INTEREST:**

Participants include students and a teacher in the school where I am employed.

#### **PUBLICATION:**

The results from this study will be presented as part of the project work for a postgraduate degree MSc in Technology and Learning (TCD).

## Appendix 9. Teacher as Participant Consent Form

### Teacher Participant Consent Form

#### DECLARATION:

- I am over 18 years old and I am competent to provide consent.
- I have read, or had read to me, an information form providing information about this research and this consent form.
- I understand that my participation is fully anonymous and that no personal details about me will be recorded.
- I undertake to provide observations in line with ethical practices – no participant will be identified or personal details recorded.
- I understand that it is a staff member of Loreto College, St. Stephen's Green running this study but that no information in this study will be used to identify me.
- I have had the opportunity to ask questions and all my questions have been answered to my satisfaction. I understand the description of the research that is being provided to me.
- I agree to my data being presented as part of the project work for the MSc in Technology and Learning (TCD) in a way that does not reveal my identity.
- I freely and voluntarily agree to be part of this research study, though without prejudice to my legal and ethical rights.
- I understand that I may refuse to answer any question and that I may withdraw at any time without penalty.
- I understand that in the unlikely event that illicit activities become known over the course of this research, these will be reported to appropriate authorities.
- I understand that my data will be stored securely and deleted on completion of the study.
- I understand that the study involves viewing a computer screen and that if I or anyone in my family has a history of epilepsy then I am proceeding at my own risk.
- I have received a copy of this agreement.

I \_\_\_\_\_ consent to taking part in this research project.

Signature of Participant: \_\_\_\_\_ Date: \_\_\_\_\_

Signature of project leader (TCD): \_\_\_\_\_ Date: \_\_\_\_\_  
Ms Aideen Reddy

#### Statement of investigator's responsibility:

I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent. I undertake to act in accordance with the information supplied.

RESEARCHER CONTACT DETAILS: [a.reddy@loretothegreen.ie](mailto:a.reddy@loretothegreen.ie)

## **Appendix 10. Board of Management Information Sheet**

### **Board of Management Information Sheet**

#### **TITLE OF PROJECT:**

Assessing the value of using a Digital Badge Credentialing System (DBCS) to provide transparent learning pathways for students acquiring soft skills in post-primary education.

LEAD RESEARCHER: Aideen Reddy

#### **BACKGROUND TO RESEARCH:**

This research examines the usefulness of micro-credentials, at Junior Cycle level, to provide students with transparent learning pathways for attainment of Key Skills. The micro-credentials will be issued in the form of digital badges through the school's Learning Management System (LMS), Moodle, which will then be displayed on the school's ePortfolio system, Mahara, and also the Credly iOS app on the student's iPad. The research seeks to find out if such an approach can provide students with more clarity of soft skills they are acquiring, through the curriculum.

#### **PROCEDURES OF THIS STUDY:**

As part of this study student participants will be asked to:

- Complete required tasks, both in class and as homework, designed to develop specific key skills.
- Participate in a focus group to discuss the student experience of using micro-credentials.
- Complete two fully anonymised questionnaires prior to and post learning experience to assess your experience of using micro-credentials and your understanding of soft skills.

Both the researcher and teacher will:

- Provide unbiased observations (through note-taking) of the above mentioned tasks, carried out by students.

#### **PARTICIPATION:**

Participation in this study is voluntary. Participants may withdraw at any time without penalty. Any student unwilling or unable to take part in the study will be moved to another art class (same year group) to complete a similar project.

#### **ILLICIT ACTIVITY:**

In the unlikely event that illicit activities become known over the course of this research, these will be reported to appropriate authorities.

#### **DATA RECORDING:**

Data collected will be separated from personal identity information as soon as possible after collection. Codes will be used to identify individual cases. The key linking such codes to personal information - names will be kept secure and separate from the dataset.

#### **CONFLICT OF INTEREST:**

Participants include students and a teacher in the school where I am employed.

#### **PUBLICATION:**

The results from this study will be presented as part of the project work for a postgraduate degree MSc in Technology and Learning (TCD).

## Appendix 11. Board of Management Consent Form

### Board of Management Consent Form

#### DECLARATION:

- I am the Principal/Secretary to the Board of Management of the school in which this research will be carried out (Loreto College, St. Stephen's Green).
- I understand that the students involved are under 18 years old and not competent to provide consent and as result will have parent(s)/guardian(s) provide consent on their behalf.
- I have read, or had read to me, an information form providing information about this research (as detailed in the information sheet) and this consent form.
- I understand that the teacher's and students' participation in the online questionnaire is fully anonymous and that no personal details about them will be recorded.
- I understand that it is a staff member of Loreto College, St. Stephen's Green running this study.
- I have had the opportunity to ask questions and all my questions have been answered to my satisfaction. I understand the description of the research that is being provided to me.
- I agree to student data being presented as part of the project work for the MSc in Technology and Learning (TCD) in a way that does not reveal students' identity.
- I freely and voluntarily agree to the school (Loreto College, St. Stephen's Green) being part of this research study, though without prejudice to the school's legal and ethical rights.
- I understand that the school may withdraw at any time without penalty.
- I understand that in the unlikely event that illicit activities become known over the course of this research, these will be reported to appropriate authorities.
- I understand that student data will be stored securely and deleted on completion of the study.
- I understand that the study involves viewing a computer screen and that if a student or anyone in her family has a history of epilepsy then she is proceeding at her own risk.
- I have received a copy of this agreement.

I \_\_\_\_\_ consent to taking part in this research project.

Signature of Principal/  
Secretary to the Board of Management \_\_\_\_\_ Date: \_\_\_\_\_

Signature of project leader (TCD): \_\_\_\_\_ Date: \_\_\_\_\_  
Ms Aideen Reddy

#### Statement of investigator's responsibility:

I have explained the nature and purpose of this research study, the procedures to be undertaken and any risks that may be involved. I have offered to answer any questions and fully answered such questions. I believe that the participant understands my explanation and has freely given informed consent. I undertake to act in accordance with the information supplied.

RESEARCHER CONTACT DETAILS: [a.reddy@loretothegreen.ie](mailto:a.reddy@loretothegreen.ie)



## Appendix 12. Ethics Approval from The School of Computer Science and Statistics TCD



Aideen Reddy <reddyal@tcd.ie>

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**RE: [Research-ethics] Ethics Application 17/16**

Gavin Doherty <Gavin.Doherty@scss.tcd.ie>  
To: Aideen Reddy <reddyal@tcd.ie>  
Cc: Richard Millwood <richard.millwood@tcd.ie>, Research Ethics <research-ethics@scss.tcd.ie>

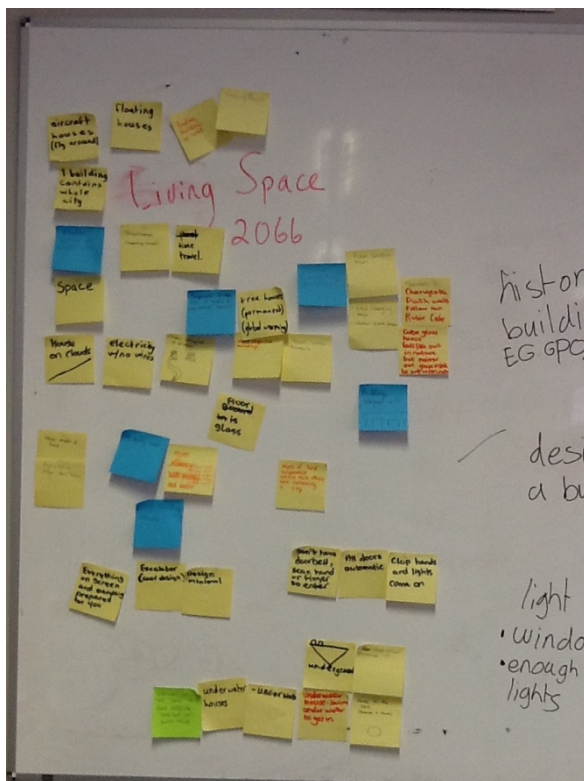
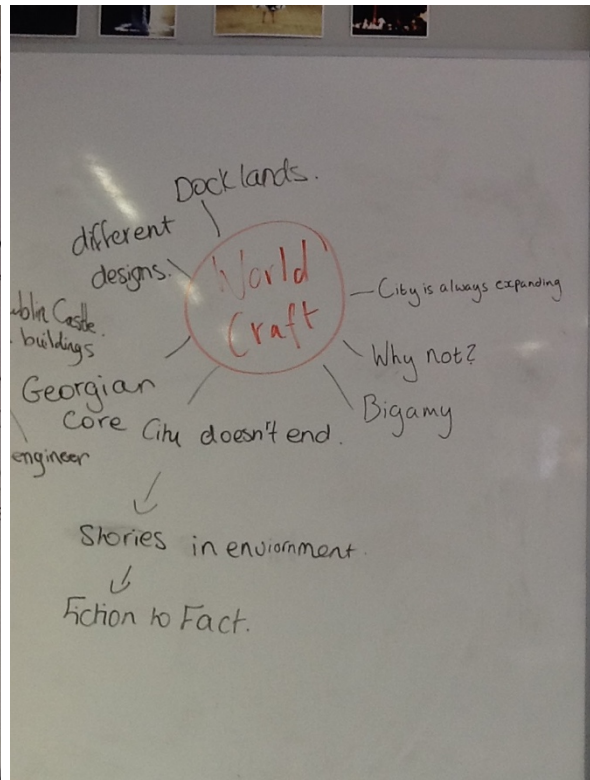
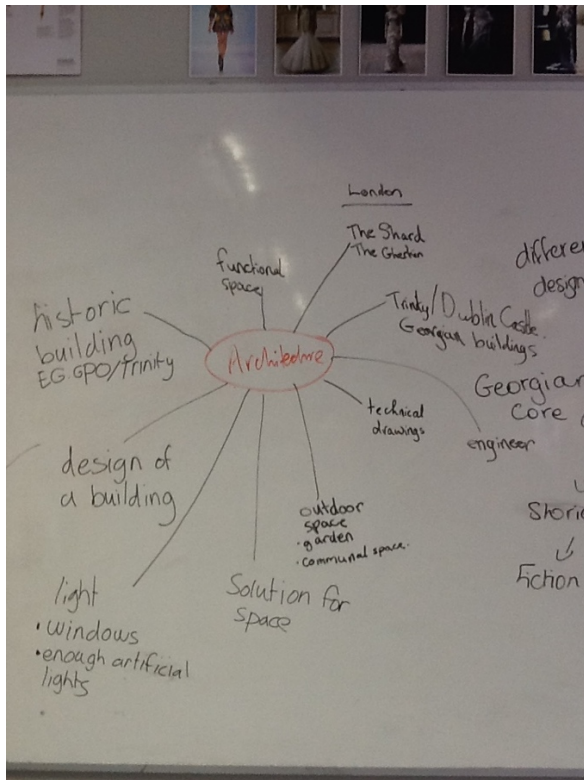
13 April 2016 at 17:18

Dear Aideen,

Your revised application has been reviewed and you may proceed with your study.  
Best of luck with it.

Regards,  
Gavin (on behalf of the SCSS ethics committee).

**APPENDIX 13. Images of Student Divergent Thinking Work**



## APPENDIX 14. Team Roles

### Team Roles

Teams function best when members have assigned roles. Please review the list below and allocate, as a group, roles for each team member.

The roles you, as a team, assign should reflect the goals of the project and the size of the team. You may allocate 3 or 4 roles to each team member if needed.

|                          |  |
|--------------------------|--|
| <b>Facilitator:</b>      | Chair team meetings, keeps the team on task, and assigns work.   |
| <b>Recorder:</b>         | Takes notes to sum-up team discussions and decisions, and keeps all important records.                                     |
| <b>Reporter:</b>         | Acts as team spokesperson (PR), outlining the team's work.   |
| <b>Timekeeper:</b>       | Makes sure the group is aware of timeline and deadlines. Makes sure meetings start on time.                                |
| <b>Devil's Advocate:</b> | Raises opposing-arguments and (constructive) objections, provides different explanations and solutions.                    |
| <b>Harmonizer:</b>       | Works to create a harmonious, unified team and reach general agreement (while still accepting a full expression of ideas.) |
| <b>Prioritizer:</b>      | Makes sure the team focuses on most important areas while not getting caught up in details.                                |
| <b>Explorer:</b>         | Looks for new potential in situations and people (team members and clients) and explores new areas of information.         |
| <b>Innovator:</b>        | Encourages imagination and adds new and different views and ideas.   |
| <b>Checker:</b>          | Checks to make sure all team members understand the group's approach, ideas and conclusions.                               |
| <b>Runner:</b>           | Gets needed items and acts as the point of contact between their team and other groups as well as the teacher/instructor.  |
| <b>Wildcard:</b>         | Takes on the role of any missing member and fills in wherever needed.  |

**APPENDIX 15. Team Contract**

**Team Contract**

Team Name: \_\_\_\_\_

Date: \_\_\_\_\_

**GOALS:** What are our team goals for this project?  
What do we want to accomplish? What skills do we want to develop or improve?

**EXPECTATIONS:** What do we expect of one another in regard to attendance at meetings, participation, communication, quality of work, etc.?

**POLICIES & PROCEDURES:** What rules can we agree on to help us meet our goals and expectations?

**CONSEQUENCES:** How will we deal with a lack of work in regard to these goals, expectations, policies and procedures?

We share these goals and expectations, and agree to these policies, procedures, and consequences.

\_\_\_\_\_ Team member name and role(s)

\_\_\_\_\_ Team member name and role(s)

\_\_\_\_\_ Team member name and role(s)

\_\_\_\_\_ Team member name and role(s)

## APPENDIX 16

### A-PRIORI AND EMERGENT CODING AND THEMING OF SEMI-STRUCTURED GROUP INTERVIEW

|   |   |
|---|---|
| <p><b>Q1. Do you believe the digital badges awarded in this project clearly reflect your skills?</b></p> <p><b>All Students</b> – mixture of yes and no</p> <p><b>Student</b> – I thought the badges helped point out skills I hadn't even thought about <i>Self-awareness</i></p> <p><b>Researcher</b> – that is interesting. Do you think these skills were ones which you displayed?</p> <p><b>Student</b> – Yes, but I didn't really notice. I think the badge just made me think about it. <i>Self-awareness</i></p> <p><b>Researcher</b> – Does anyone have any other comments?</p> <p><b>Student</b> – I think because it was a teamwork project you couldn't really see my work as an individual.</p> <p><b>Researcher</b> – also very interesting comment. Do you think the badges reflected more the team than the individual?</p> <p><b>Student</b> – yes, I think so. Some people on teams worked harder and possibly deserved badges when others didn't.</p> <p><b>Student</b> – I feel the opposite. I contributed equally as well as the others in my group. The badges reflect this. <i>Self-awareness</i></p> <p><b>Student</b> – I liked that the badges picked out things we are not usually marked on.</p> <p><b>Researcher</b> – very interesting. Can you elaborate on that?</p> <p><b>Student</b> – I think in group work there are very important things to help us work well as a team like being very clear when you communicate and compromising. I just think these don't usually get noticed and the badges helped me to focus on them and maybe realise their importance. <i>Self-awareness, constructivism, student-centred, holistic</i></p> <p><b>Researcher</b> – Thank you for expressing that. It's always interesting to hear different experiences and thoughts. Any more comments?</p> | <ul style="list-style-type: none"> <li>• Self-awareness</li> <li>• Constructivism</li> <li>• Holistic</li> <li>• Student-centred</li> <li>• Gamification/motivation</li> <li>• Credibility</li> <li>• Future possibilities</li> </ul> |
|---|---|

All students – Silence

**Q2. What benefits do you see for digital badges as credentials?**

**Student** – it's always nice to be rewarded for your work. It made me want to contribute more. *Motivation*

**Researcher** – Did you find them motivational then?

**Student** – Yes *Motivation*

**Researcher** – did anyone else find the badges motivational?

**Student** – They didn't really act as an incentive to me, I wasn't aware of them at the beginning of the project. Only about half way through.

**Student** – I don't think the badges would motivate others as much as me. *Motivation – intrinsic?*

**Student** – You can also see what you have done so far. *Constructivism*

**Researcher** – Very interesting. Can you explain that a bit more?

**Student** – I think they show achievements and help keep track of your work. *Constructivism*

**Q3. What difficulties do you see for digital badges as credentials?**

**Student** – They don't mean as much. You can't physically hold them. *Credibility*

**Student** – They could be viewed as only labels *Credibility*

**Student** – They might not be considered as important. *Credibility*

**Researcher** – that is very interesting, when you say as important. As important as...?

**Student** – Real certificates.

**Researcher** – why do you think that is?

- Self-awareness
- Constructivism
- Holistic
- Student-centred
- Gamification/motivation
- Credibility
- Future possibilities

**Student** – because they are more official and people take them more seriously. *Credibility*

**Student** – when something is online you're thought to question it because anyone can put something online so maybe that's the reason? *Credibility*

**Researcher** – that is a very insightful comment, thank you. Does anyone have anything else to add?

**Student** – I think in the future this could change. Maybe badges will be normal as certificates and school reports.

**Researcher** – maybe. Does anyone else think this could happen?

**All students** – some nods and muttered 'Maybe's

**Researcher** – Does anyone have anything else to add?

**All students** – silence

**Q4. How would you change the badging process used in this project?**

**Student** – I would make them more visible *Social/Future*

**Student** – They could be more connected. Like levels in a game. *Gamification*

**Student** – They could connect more with other apps. *Future*

**Researcher** – any other ideas

**All Students** – silence

**Researcher** - Thank you all for your time and insights

- **Self-awareness**
- **Constructivism**
- **Holistic**
- **Student-centred**
- **Gamification/motivation**
- **Credibility**
- **Future possibilities**

## APPENDIX 15. Board of Management Approval



TELEPHONE:  
• SECRETARY/RECEPTION : 6618179 •  
• FINANCE OFFICE : 6618180 •  
• FAX: 6612306 •  
E-Mail: [info@loretothegreen.ie](mailto:info@loretothegreen.ie)  
[www.loretothegreen.ie](http://www.loretothegreen.ie)

LORETO COLLEGE,  
53/55 ST. STEPHEN'S GREEN  
DUBLIN 2.


Aideen Reddy  
Loreto College  
53 St Stephen's Green  
Dublin 2

Dear Aideen,

The Board of Management is delighted to facilitate your research and looks forward to reading your findings.

We wish you every success in your continued studies.

Yours sincerely

  
Jackie Dempsey  
Secretary to Board of Management



## APPENDIX 15. Self Evaluation Group Work Form

### Self-Evaluation Form for Group Work

Your name \_\_\_\_\_  
\_\_\_\_\_

Group Name:

Please tick the box that best describes the level to which each statement describes your contribution to the group.

|   | <b>Seldom</b> | <b>Sometimes</b> | <b>Often</b> |
|---|---------------|------------------|--------------|
| Contributed good ideas                        |               |                  |              |
| Listened to and respected the ideas of others |               |                  |              |
| Compromised and cooperated                    |               |                  |              |
| Took initiative where needed                  |               |                  |              |
| Came to meetings prepared                     |               |                  |              |
| Communicated effectively with teammates       |               |                  |              |
| Did my share of the work                      |               |                  |              |

My greatest strengths as a team member are:

The group work skills I plan to work to improve are:

**APPENDIX 19. Peer Evaluation Group Work Form**

**Peer Evaluation Form for Group Work**

Your name \_\_\_\_\_ Group  
 Name \_\_\_\_\_

**Please note this group assessment will be tallied with others and information shared with the group will not identify you, the assessor.**

Write the name of each of your group members in a separate column. For each person, indicate the level to which you agree with the statement on the left, using a scale of 1-4 (1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree). Total the numbers in each column.

| <b>Evaluation Criteria</b>                               | <b>Group member:</b> | <b>Group member:</b> | <b>Group member:</b> |
|--|----------------------|----------------------|----------------------|
| Attends group meetings regularly and arrives on time.    |                      |                      |                      |
| Contributes meaningfully to group discussions.           |                      |                      |                      |
| Completes group assignments on time.                     |                      |                      |                      |
| Prepares work in a quality manner.                       |                      |                      |                      |
| Demonstrates a cooperative and supportive attitude.      |                      |                      |                      |
| Contributes significantly to the success of the project. |                      |                      |                      |
| <b>TOTALS</b>  |                      |                      |                      |

**Feedback on team dynamics:**

1. How effectively did your group work?
2. Were the behaviors of any of your team members particularly valuable or detrimental to the team? Explain.
3. What did you learn about working in a group from this project that you will carry into your next group experience?

*Adapted from a peer evaluation form developed at Johns Hopkins University (October, 2006)*

