Universidade de Aveiro
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GAMIFICAÇÃO DE COMPETÊNCIAS TRANSVERSAIS NA UNIVERSIDADE DE AVEIRO

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Dissertação apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Comunicação Multimédia, realizada sob a orientação científica do Professor Doutor Luís Pedro e do Professor Doutor Carlos Santos do Departamento de Comunicação e Arte da Universidade de Aveiro.

o júri

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À minha Mãe
Ao meu Pai
Aos meus avós
À Joana,
À "Philly",
Ao Jekas e LD
Aos membros dos Indignos
Ao Pedro, mestre do Word

Obrigado

palavras-chave micro-credenciais, open badges; soft skills, competências transversais, gamificação, actividades extra-curriculares.

resumo A necessidade de trabalhadores demonstrarem competências para além das de conhecimento técnico está a aumentar em diversas indústrias no mercado de trabalho. Para encarar as crescentes expectativas de futuros empregadores e garantir um futuro profissional mais próspero, as instituições de ensino superior (IES) estão a investir cada vez mais na aquisição de competências transversais por parte dos seus estudantes, que vão para além das do currículo tradicional. Deste modo, as IES estão perante o desafio de ensinar competências transversais aos seus alunos ao mesmo tempo que procuram assegurar que o seu desenvolvimento é autenticado e valorizado por organizações empregadoras. Observa-se, para este fim, uma crescente adoção de “Open Badges” e micro-credenciais, visto que estas oferecem uma solução tanto para a necessidade de validação de competências transversais como para a motivação para a sua aprendizagem por parte dos alunos. Durante os últimos anos, os crachás digitais têm sido alvo de investigação educacional, cujo resultado aponta para uma relação proveitosa entre gamificação, crachás e resultados de aprendizagem. Este trabalho tem como objetivo expandir essa investigação ao estabelecer um enquadramento que sirva para a implementação de uma estratégia de crachás digitais para encorajar alunos a realizarem atividades que promovam o desenvolvimento de competências transversais. Os resultados deste estudo poderão ainda ser utilizados para guiar a construção de um sistema de crachás apto para se adaptar a vários contextos de aprendizagem e instituições.

keywords micro-credentials, open badges; soft skills, transversal competencies, gamification, extra-curricular activities.

abstract The need for future employees to show skill beyond that of “hard” knowledge is growing in several industries of the job market. To address the changing expectations of future employers and to guarantee a prosperous professional life, higher education institutions (HEI) are making increasing efforts to provide their students with soft skills, which go beyond that of the traditional courses’ curriculum. Therefore, HEIs are faced with the challenge of teaching transversal competencies to their students while ensuring that their development is authenticated and valued by employing organizations. To this end, open badging and micro-credentials are increasingly being employed, since they provide an answer for both the need for soft skill validation and for motivating their development. Digital badges have been subject to educational research in recent years, with results which point to a successful relationship between gamification, badges and learning outcomes. This work aims to further this research by establishing a theoretical framework for implementing a digital badge strategy to encourage students to perform activities that promote the development of soft skills. Our findings will inform the creation of a badge system suited be adapted and applied to various learning contexts and institutions.

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1. Introduction

Globalization has brought about serious changes to education. Students no longer look just towards their local or close environments in search of employment or further education, since they now have at their disposal a wide array of opportunities around the globe and possible pathways for a professional life (Kovalchuk et al., 2017). These global routes are made more enticing and urgent if the students see themselves in contexts where employment opportunities are low for their fields of study. Conversely, however, employers of areas such as technology, engineering and accounting, are faced with an increased pool of candidates to choose from, as they now receive applications from the world over, from candidates that, thus, are at a higher risk of not standing out from one another (Atkinson & Pennington, 2012; Ming Chia, 2005). As such, companies have become more selective of their future employees, valuing those who have an education that goes beyond that of formal education (Kovalchuk et al., 2017). Higher education institutions (HEI) are, therefore, concentrating efforts to ensure that their students are better prepared for a more competitive environment. Studies show that one of the better ways for a candidate to stand out from the rest is through a positive show of soft skills during the interview and entry process, especially leadership, teamwork and commitment (Andrews & Higson, 2008; Atkinson & Pennington, 2012). Besides professional circumstances, soft skills are also valuable for one's personal life or in interpersonal contexts.

Universities around the world recognize the importance of soft skills and make efforts to raise its awareness among their students, teachers and other academic personnel. There are several ways to implement soft skill training within a higher education plan. Be them dedicated training plans, encouragement of socialization, or

even including them in their curricula. The latter, however, is not as simple as the rest, since most courses were designed around the 'hard' knowledge they aim to equip their students with (Schulz, 2008). Alternatively, universities also strive to offer enriching extra-curricular activities, which have been proven to help develop students' soft skills.

However, not all students express interest in engaging with extra-curricular activities, hence communication strategies should be employed to motivate and reward students for their participation. Gamification is, concisely, a user-experience design methodology that serves to create, in the user, a willingness to engage towards a desired activity. Its usage and research in academia has also seen a significant increase with positive results (Koivisto & Hamari, 2019; Majuri et al., 2018), which supports its potential viability as a strategy to motivate students to participate in extra-curricular activities (Coleman, 2018). Gamification takes heavy inspiration from video game design philosophy, namely by adopting sets of game elements from the latter (Christians, 2018; Deterding, 2011; Deterding et al., 2011).

One particular game element that was used and researched often within the academic community was "Badges" (Koivisto & Hamari, 2019; Majuri et al., 2018). Amidst the growing trend of gamification, during the early 2010s, Mozilla and the MacArthur Foundation[1] started the Open Badges[2] Initiative. Their plan was to create a network of professional and/or educational institutions that would create, issue and authenticate digital badges amongst themselves (Loughlin et al., 2016; Mozilla, 2017), to professionally recognize badge earners for learning activities they choose to do and, thus, promoting a more flexible evolution of one's education (MacArthur Foundation, 2013). This means that students that would receive a digital badge, could

[1] https://www.macfound.org

[2] https://openbadges.org/get-started/

show it as part of their personal curriculum, as a micro-credential that, even though removed from a complete 'hard' knowledge course, meant that the earner took the initiative to learn it by itself, something highly valued by employers (Carey & Stefaniak, 2018). These digital badges, awarded as micro-credentials, open the doors for students to route their own paths for learning, all while receiving a level of certification that is comparable to that of a university diploma (Ellis et al., 2016).

In other words, digital badges lend themselves adequately to gamification strategies that seek to motivate individuals to engage with extra-curricular activities, since they give them not only the intrinsic reward of self-fulfillment and soft skill development, but also valuable and authenticated micro-credentials that can add to their personal curricula in order to help them stand out amongst their peers in their respective fields (Brauer, 2019; Coleman, 2018; Lewis et al., 2016).

1.1. Research Process

This study worked according to its aim to research and establish a gamification strategy in order to motivate students to develop their soft skills by engaging with extra-curricular activities and using a digital badge platform, preferably in-line with the Open Badges Initiative (OBI) infrastructure. Initially, we had planned to test the efficiency of this strategy by introducing digital badges to a group of higher education students and measure their engagement. As a secondary objective, we had aimed to produce a badge system[3] implementation model for the University of Aveiro that would serve as a proposal for which steps should be taken to implement a badge system as efficiently and successfully as possible.

However, due to the Covid-19 pandemic, our objective could not be effectively pursued. Therefore, we made our secondary goal the main focus, which was to produce a badge system implementation model. Therefore, our methodology consisted not only of role-play experiments, surveys and focus group studies but also of systemic reviews of our decision-making process as well as elements of grounded theory.

We have established that the main guiding research goal of this study is:

"How can a badge system implementation model be designed for higher education institutions?"

We will first go over the key topics that need to be understood within the context of this research. These include, in the following order: soft skills, extra-curricular activities, gamification, digital badges, Open Badges, micro-credentials. Additionally, since the study is driven, in part, by the University of Aveiro (UA) we will start the theoretical framework by analyzing the University of Aveiro and its shared values with the European Consortium of Innovative Universities (ECIU), that drive this study. Finally, the subsection "micro-credentials" will be followed by a case study of the Kaunas University of Technology and how it employs digital badges on their campus.

[3] A badge system refers to the network of badges provided by a hosting institution that encompasses all badges that can be obtained in an event or ongoing activity.

1.2. The case of the University of Aveiro and the ECIU

The University of Aveiro, founded in 1973, is a public university that offers courses of multiple fields and across different degrees of formation. According to the words of its dean, Paulo Jorge Ferreira, it is a modern forward-thinking institution, rooted in the principles of innovation through differentiation and bent on the search for quality. The UA values community and openness, firmly believing in an interdisciplinary future (Ferreira, 2018). Because of these and many other values, the UA sees itself as a proud member of several international alliances, such as the European University Association[4] (EUA), the Columbus association[5] and, relevant of this paper, the European Consortium of Innovative Universities[6] (ECIU).

The ECIU consists of a collective of Universities joined by their common values and beliefs regarding education. Youthfulness, "strengths in engineering and social sciences", "unconventional forms of teaching and learning", "[determined] to offer their students high quality education with international focus." are some of the core tenets displayed on their website. Most recently, the ECIU constituents have been determined to form a "True European University" [7], bent on not only tackling the sustainability challenges proposed by the European Commission, but also on creating a network of shareable, co-created knowledge and academic pathways for researchers, teachers and students alike. The latter is of great importance for the ECIU since it is the baseline reason for its interest in micro-credentials. The consortium aims to create a recognition system of skills so that participating members are validated for

[4] https://eua.eu/
[5] http://www.columbus-web.org/en/home.htm - association of European and Latin American universities
[6] https://www.eciu.org
[7] https://www.eciu.org/about-eciu

the activities they engage in while studying or working under the consortium universities (European Consortium of Innovative Universities, n.d.; Hansen et al., 2002)[8].

Not only as a member of the ECIU but also conforming to its own forward-thinking principles, the UA embraces experimentation to create an enriching environment for its academic community. From implementing digital badges in Massive Open Online Courses (MOOCs) to gamifying features on their campus' website, the University of Aveiro supports research on modern strategies of communication and service design (Araújo et al., 2017, 2018a, 2018b)

Therefore, this research is in part driven by the UA's mission statement, shared with the ECIU, and its ambitions towards innovation and enrichment of the experience it offers. Ultimately, the UA aims to provide its graduates not only with the distinctive curricula offered by their courses, but also with the necessary preparation for a successful transition to the job market by way of validated and recognized micro-credentials for their extra-curricular efforts and accomplishments.

[8] https://www.eciu.org/news/towards-a-european-micro-credentials-initiative - "The micro-credentialing movement supports the increased flexibility of education, easing accessibility for life-long learners and enhancing possibilities to work with society. Micro-credentials are of crucial importance to exciting future-focused initiatives, like the European Universities Initiative and the ECIU University".

2. Theoretical Framework

2.1. Soft Skills

2.1.1. Background and Definition

The history of the study of soft skills dates back to Paul G. Whitmore's and J.P. Fry's "Soft skills: Definition, behavioral model analysis, training procedures", a compendium of competency tests made on subjects from different military schools published in the "Report of CORNAC Soft Skills Training Conference" in 1972 (Whitmore & Fry, 1972). As Whitmore implies, it is difficult to precisely define what soft skills are. This, in turn, makes it difficult to pinpoint its precursors. Other terms of similar nature would arise during the following decades, such as "emotional intelligence", "people skills" and "life skills", among others, all of which can be seen as parallels of soft skills.

Sandra Guerra-Báez (2019) states that although social skills can be considered as a part of soft skills, the former does not usually include abstract skills that do not necessarily involve interpersonal actions. Therefore, the author instead links the concept of soft skills to that of "life skills" defined by the World Health Organization (WHO) Division of Mental Health (1994) as personal and interpersonal abilities that are needed for self-coping mechanisms in reaction to external forces such as people or challenges (Guerra-Báez, 2019). Looking at the cited WHO document (WHO, 1994), we can see more similarities between their concept of life skills and that of soft skills. It starts by describing the notion of "psychosocial competence" and how it relates with an individual's ability to remain healthy, both psychologically and physically, while coping, adapting and dealing positively in response to "others, his/her culture and environment" as well as "demands and challenges"(WHO, 1994). They underline

that promotion of these competences can help one develop their coping mechanisms as well as interpersonal capabilities, suggesting that teaching life skills to children and adolescents can be done in an accommodating school program. The document (WHO, 1994) establishes ten "life skills" around which their study is based on:

- Decision making
- Problem solving
- Creative thinking
- Critical thinking
- Effective communication
- Interpersonal relationship skills
- Self-awareness
- Empathy
- Coping with emotions
- Coping with stress

The WHO grounds its selection of life skills on the basis that these will be beneficial not just for the present of children and adolescents but also for their future. In a way, they recognize that these skills will be useful for their professional lives. However, as the title of their study suggests, these were not selected considering solely one's professional outcome, but rather as a factor to promote personal well-being and to prevent health problems. Soft skills, on the other hand, are more often the subject of interest in the business world. This is because "soft" is usually contrasted with "hard" skills, commonly associated with cognitive knowledge that is formally taught in educational institutions, which had been thought to be the main indicators for professional success (Guerra-Báez, 2019; Schulz, 2008) There has, in fact, been an increase in the need for professionals equipped with these skills at an international

level (Andrews & Higson, 2008; Balcar et al., 2011a; Garner et al., 2019; Guerra-Báez, 2019; Lippman et al., 2015). Additionally, the meaning of the term "soft skills" is context dependent, as skills such as "culture awareness" may qualify as "hard skills" professions and courses in the field of Human Resources, whilst being merely extraordinary for chemistry professionals, for example (Schulz, 2008). As such, research on exact soft skills varies not only depending on the field the study is centered around, but also personal factors like hiring rate, employer's preference, and even the respective authors' personal assessment in choosing and defining the soft skills to evaluate, among others (Guerra-Báez, 2019; Schulz, 2008).

For the purposes of our research, we have decided to focus on Balcar et al.'s work (Balcar et al., 2011a) made in association with the European Commission, published in 2011. It sought to define, among others: a comprehensible language for understanding and categorizing soft skills, which are in most demand and what methods are used for their development and wider transferability. Even though it was published in 2011, the research was made with future-proof in mind, meaning that it is certified to be relevant up until the year 2020. Furthermore, Balcar et al. drew upon a plethora of international sources, from the European Union's member states and partners from the Organization for Economic Co-operation and Development: USA and Canada.

In Balcar et al.'s words, all skills are transferrable, but to different degrees. These can range from "hard" skills, the most job-specific competencies that allow transfer between similar occupations, and "soft skills", coined as the most perfectly transferrable skills and seen by employers as "closely connected with attitudes, which are intangible, and difficult to quantify and develop" (Balcar et al., 2011, p. 9). Based on the work of Balcar et al., our study adopted the following definition: soft skills are a set of personal and interpersonal capacities that, along with their "hard" skills, provide

the individual with valuable and unique features not only for professional circumstances but also for self-management and self-worth. To clarify, "soft" and "hard" in the work of Balcar et al. signify the level of transferability of the skills in question. "Soft" skills are used to refer to personal and interpersonal skills, while "hard" skills refer to technical or theoretical knowledge on relevant to specific fields that, thus, do not transfer easily to other areas of study. Generic "hard" skills, however, may refer to specific knowledge that is more transferrable, such as proficiency with languages or software: skills that are broadly valued among different areas.

2.1.2. On the importance of Soft Skills and their teaching

It is important to look at the results of existing research to gauge exactly how much of an impact do soft skills have on employability and success. A study by Andrews and Higson's (Andrews & Higson, 2008) compared the level of similitude between employers and students' perception of what constitutes valuable soft and transversal hard skills, in order to highlight areas in need of improvement in students' education. The research, conducted within four countries (UK, Slovenia, Romania & Austria) concluded that there was a significant match between both parties' perception, and that students felt, at the time, that they lacked certain communication skills and transversal hard knowledge, which made them feel less confident in their skills as a whole (Andrews & Higson, 2008).

A similar study to that of Andrews and Higson's was conducted by Chiara Succi & Magali Canovi (Succi & Canovi, 2019). As opposed to the previous study, this one, aiming to collect more quantitative data, employed only soft skills divided into three categories: "Personal", "Social", "Methodological". Of these, two skills from the "Social" category, "Communication" and "Team-Work", and one from "Personal", "Being Committed to Work", emerged as the more important between respondents (also employers and students) when it comes to graduate employability. These results reflect those from the work of Andrews and Higson, wherein communication and team-work related abilities were also deemed as the most relevant (Andrews & Higson, 2008; Succi & Canovi, 2019).

The latter study (Succi & Canovi, 2019) references the former during its conclusions (Andrews & Higson, 2008), alluding to relationships between them. First, Succi and Canovi (2019) state that the importance given to soft skills reflects an increasingly higher demand, by employers, for graduates who are flexible across work environments, capable of communication between different platforms, self-determined and able to form bonds among teams. This, according to them, is a result of globalization, as it led employers to wider pools of graduates, thus generating more competitive environments, where soft skills now play an even more significant role than before. Both studies also highlight the crescent need for soft skills to be brought to the attention of all parties: students, employers and Higher Education Institutes (HEI). Furthermore, they also urge HEIs to promote soft skills and their importance among their students. Andrews and Higson also call for more work-based learning programs among HEIs, so that graduates can be better prepared for their jobs, as it will also make them more desirable towards future employers and Human Resources agents.

As we can see, both studies highlight the need for soft skill development among educational institutions. Nevertheless, as we have gone over, that term is context dependent. For example, a student of Multimedia Communication will be naturally more versed in information and communication technologies than most other graduates of other fields. However, this subject matter, in this case, refers to the 'hard' knowledge of the course taken. There are multiple ways to enhance soft skill development in educational institutions (Schulz, 2008). The mere act of socializing, as long as it is made with purposeful intention, can develop certain soft skills related to interpersonal interaction, like listening, arguing, or even language fluency. Bernd Schulz goes on to recommend students to join clubs or debating societies[9] and even suggests that these skills can be incorporated in a curricular plan. However, regarding the latter, he warns that implementing soft skills in an established course plan might be very difficult as courses are usually designed around the hard skills they are supposed to teach (Schulz, 2008).

[9] "a club, e. g. at a school, which regularly holds debates" taken from collinsdictionary.com

2.1.3. Extra-curricular activities as a path to Soft Skills

There has been research made on extra-curricular activities as methods for developing soft skills specifically. Yew Ming Chia (2005) compiled quantitative data on extra-curricular activity participation of accounting students, as well as their emotional intelligence and academic performances, in order to accurately measure how much this data helped the students perform well at job interviews and the subsequent number of final jobs offers (Ming Chia, 2005). Although the participation in extra-curricular activities was only measured in terms of a subject's leadership capabilities, it still found that these positively impacted the number of job interviews of a candidate. "Emotional Intelligence", on the other hand, proved to be significant for further stages of job interviews as well as hiring. It should be noted, however, that the authors assume that this variable is to be benefitted by the participation in extra-curricular activities (Ming Chia, 2005).

Atkinson & Pennington's results (2012) support the notion that extra-curricular activities may help students standout and gain an edge over others. In their research on the key issues of engineering unemployability, they point out that most of the students observed did not participate in voluntary activities outside their student union, and that even less had played parts that required responsibility in clubs or societies (Atkinson & Pennington, 2012). Furthermore, employers also claimed to regard extra-curricular activities (such as student unions and volunteering) as positive signs of initiative and uniqueness, while also endowing the candidates with "wider perspectives". Hence, both the interviewed employers and Atkinson & Pennington themselves advise students to enroll in extra-curricular activities in order to bolster their development of soft skills.

Finally, Kovalchuk's article (Kovalchuk et al., 2017) brings to light Bourdieu's forms of capital[10] to support its theoretical framework. Kovalchuk frames curricular and co-curricular activities as "investments" that yield both social and cultural capital, that can serve to help candidates get hired, thanks to their developed networking and social skills. Though his study focuses on the field of engineering, his qualitative results show that both curricular and co-curricular activities are essential resources, as form of capital, that benefit the transition, between student to employee, at different stages. While the former provided the foundations needed to confidently perform their tasks, co-curricular activities helped the students develop their soft skills, namely leadership, time-management as well as other social skills.

In summary, the importance of soft skills cannot be understated, as its demand in the current professional and business world has been significantly increasing. Not only do employers seek confident candidates with good leadership and communication skills, they also link extra-curricular activities with personal qualities, such as initiative, commitment and time-management.

[10] Pierre Bourdieu (1986) is a renowned sociologist and anthropologist. Author of the essay "The Forms of Capital" he "defines capital as any resource effective in a given social field which individuals inherit within or beyond the family, accumulate over time, and use to reap social rewards and maintain social class privileges. Bourdieu differentiated between three forms of capital: economic (material and financial assets), cultural (knowledge, behaviors, skills, tastes, styles, and educational qualifications), and social capital (social connections and group memberships) (as cited in Kovalchuk et al., 2017)."

2.2. Gamification

2.2.1. Defining Gamification

In his conference talk at Google, "Meaningful Play: Getting Gamification Right", Deterding (2011) provided a framework for a more prosperous outcome of gamification, giving examples of apps and services that had been unsuccessful with gamification and what they lacked, comparing them to triumphant examples. In his presentation, Deterding first described "Points, Badges, Leaderboards". as mere blueprint elements for gamification, in which Points refer to the "Feedback", Badges to a "Reward System" and Leaderboards to the "Competitive Structure". He stated that this blueprint alone may not be enough, suggesting 3 "Missing Ingredients" that can be crucial for a successful gamification experience: "Meaning", "Mastery" and "Autonomy". In brief, each one of these ingredients consists of:

Meaning – Acknowledging that virtual rewards, by themselves, are meaningless to the user. Awards in gamified experiences should be aligned with the players' personal goals in using the service or product, so that they may feel like their actions had a meaningful reward. Connecting "to a meaningful community of interests", progressing through an encompassing narrative or giving the reward a "pro-social" impact are examples of ways this meaning can be achieved by the player.

Mastery – Understanding that games are fun because they make the user curious and engaged to learn. This means that gamification should "provide interesting challenges" with multiple paths to the same goal, so that the player feels as though they were learning how to surpass them. These goals should be "clear" and "varied" in their tasks, as should their individual difficulty level be "well-paced" from one another.

Finally, the player should be positively reinforced with due frequency, but especially when clearing the most difficult and pivotal challenge in each given set.

Autonomy – Recognizing that players should feel like they are progressing and playing on their own terms. The gamification experience should not be something that the player is forced to do, but rather "challenged" to do. The author punctuates this last "ingredient" with the "peril of extrinsic rewards", wherein he explains that a player should be willing to carry out the experience because they seek an intrinsic sense of fulfillment, instead of playing for the sake of having better grades or a better salary.

Before going forward, it should be clear that these "three missing ingredients" are not game elements, rather they are three experiences that the gamified product should instigate within its participants (Deterding et al., 2011). Game elements can consist of game design tools that are implemented by the gamified product to achieve this experiential goal[11]. "Points, Badges and Leaderboards" are, therefore, tools to achieve a design purpose. Deterding, in attempting to define "gamification" opts to narrow the concept of game elements to "characteristics" that can be found in games (but not all games) wherein they "play a significant role" (Deterding et al., 2011). So, in Deterding's view, gamification's "blueprint" ("Points", "Badges" and "Leaderboards") only covers a base level of game characteristics. Of course, there are multiple ways to think about these elements.

> *"(...) one of the keys to improving the gamified user experience is to utilize the right game features at the right time."*
>
> (Christians, 2018, p. 35)

[11] This relationship between elements and goals is explained in more detail by the MDA framework (Hunicke et al., 2004)

Christians (2018) echoes the philosophy of Deterding's presentation. Christians proposes a more condensed, bottom-up view of designing gamification, by ordering four "Game Elements" derived from game theory (Christians, 2018). In this sense, he seems to adopt a view of game elements akin to Deterding's "blueprint of characteristics", in which he lays out what he considers to be the baseline elements of a game or gamified product, working his way up to the elements he deems as "operational" towards that baseline. Christians places "Epic Meaning" as the most important game element, followed by "Narrative", "Progress and Feedback" and then "Achievements, Badges and Leaderboards" (Christians, 2018). The first two precisely mimic what Deterding defines as "Meaning" in gamification: that the gamified experience should offer a context where the players' actions and rewards mean something to their end goal. The "Narrative" element is the context in which the "epic meaning" can be felt by every player's action. It is the reason why early videogames like "Missile Command" had in their manuals a story that placed the player as the defender of earth that must aim and fire against the invading extra-terrestrial invasion. Without this story, the game would consist of only placing a green pixilated X on top of other red pixels (Deterding, 2011). It is within this narrative that "Progress and Feedback" is usually framed around, so that the player feels more engrossed within the experience. Defeating a particularly difficult virtual enemy that is worth 10.000 points, when every other is worth 100, gives weight to the victory and it signifies to the player how much of what they've learned throughout the game has made them grow. The scoreboard, for example, displays how many points the player has garnered, a simple way of signifying progression. Upon reaching a certain score, the player may be awarded with a message or artifact, which leads into the next game element. "Achievements, Badges and Leaderboards" are, therefore, game elements

that give feedback to the player, rewarding how much they have advanced in (or changed) the narrative of the game, reinforcing the sense of meaning within the experience. A Leaderboard is an element which is usually displayed to every player, showing the top ten players that have earned the most points or badges, for example. Scoring high enough to be placed within the top ten players is a form of player feedback that impacts not only them but others playing the game. Finally, badges, titles or achievements, like they are used in military services, are permanent rewards that signify, to the player and his peers, a remarkable demonstration of skill or completion of a challenge that the game frames as demanding and meaningful.

In summary, for the purposes of this paper, the following definition of gamification was elaborated based on the literature reviewed (Christians, 2018; Deterding, 2011) and will be considered for the purposes of this research: Gamification consists in using game design theory as the basis of designing a non-game product, service or experience, applying relevant game elements to ensure that participants are not only motivated to use the product, but that also stand to learn and find self-fulfillment in doing so.

2.2.2. The history of Gamification

There has been a significant increase of research made on the practice of gamification, in various fields, with arguably positive results (Koivisto & Hamari, 2019; Majuri et al., 2018), ever since its increase in mediatic coverage during the start of the past decade (Giang, 2013; Manjoo, 2014; Marketeer, 2016; Moskvitch, 2011; Swallow, 2012). Observing the history of the term, it is possible to conceive a timeline that ties its historical precursors, the origin of its practice and its mass-adoption by modern industries.

Analyst Burke (2014) points to badges awarded to model recruits among boy scouts, mimicking the use of medals and distinctions given to soldiers in the military (Burke, 2014), while Christian (2018) references one of the earliest customer rewards program, Sperry and Hutchinson Co.'s Green system of stamps, implemented in 1896, which could be acquired by consumers who would recurrently purchase at their retailers. These examples refer to practices that resemble game design and gamification, but, at the time, neither term was academically observed nor defined. The latter was first coined in 2003 by computer programmer and business consultant Nick Pelling, who used it in his now inactive consulting company, Conundra Lda.

"Conundra is a UK-based consultancy specialising in "Gamification" This means: we help manufacturers evolve their electronic devices into entertainment platforms."

(Pelling, 2003)

This was the first time the word had been used as a description of a sellable, replicable service. Although the company itself did not make a significant impact, the term would see increased usage throughout the following years. The first reported

company to produce effective pioneer work on the concept was Bunchball, who aimed to bolster user-engagement by implementing game design elements into their services (Christians, 2018). The company was founded in 2005 and, two years later, it would launch its flagship online platform at the time "Nitro for Salesforce" (Lopez, 2011; Taylor, 2011). "Salesforce" is a software designed to help companies and managers extract data from, among others, their customers, partners, and, more importantly, their employees' results (Salesforce, 2019). Bunchball's "Nitro for Salesforce" operates as an add-on tool for "Salesforce" allowing it to create and implement game elements[12] like challenges, achievements and leaderboards in which employees would compete in order to earn virtual awards that could translate to real benefits. The users' progress in each element would be measured and shown using the employee results data provided by "Salesforce" (Patrizi, 2011).

Bunchball would feature the word "gamification" prominently in its advertising. However, "Nitro For Salesforce" would only take-off four years after its launch, when the term truly began to gather the attention of the industry and transforming itself into a "marketing buzzword" (Burke, 2014). One company stands out as a crucial success story that legitimized the movement and generated the necessary buzz. Foursquare's app allowed users with smartphones to share their geo-location with their friends, so that they may meet one another, a function dubbed as the "check-in". With this functionality, the company implemented gamification within the whole service using elements as badges and titles awarded for users with multiple "check-ins", depending on location (Village et al., n.d.; Zichermann & Cunningham, 2011). The success of Foursquare among its early adopters quickly expanded to a broader audience, which caught the attention of its peers and competitors. Soon after, a large

[12] Game elements can consist on game design tools that are implemented by the gamified product (Deterding, 2010)

number of companies would quickly adopt similar gamification strategies or develop new services altogether, built from the ground up with this methodology in mind (Deterding, 2010; Koch-Grünberg, 2011).

As the gamification trend began to take shape, so too did specialists and advocates rise as self-proclaimed experts and defenders of the movement (Koch-Grünberg, 2011). Most notably, Gabe Zichermann, CEO of gamification.co[13], wrote the book "Gamification by Design" (2011), to serve as the ultimate guide for professionals of various fields who sought to learn how to implement the practice in their own contexts. In this book Zichermann claims to have gone over several concepts of game design theory, selecting seven key game elements, framed as essential for the purposes of the book, while disregarding those deemed unfit e.g.: "narrative structure". The seven listed key game elements are "points, levels, leaderboards, badges, challenges/quests, onboarding, and engagement loops" (Zichermann & Cunningham, 2011).

In response to the growing gamification movement, several professionals of game design stepped forth to refute it, warning of the potential harm its advocates could cause by inadvertently spreading a misconstrued notion of not just game design but videogames in general. Bogost (2011) wrote a critical piece on the movement for Gamasutra "Persuasive Games: Exploitationware". In this article, Bogost expressed his opposition against gamification, as he saw Zichermann's deconstruction of game design shallow and misleading. He states that what "Gamification by Design" suggests as "key game elements", like points or badges, are secondary tools for measuring progress within a game, and don't provide the structure needed for a game or gamified product to thrive, contrary to what Zichermann implies. Furthermore, Bogost believes that this, in turn, belittles the complex and expressive nature of videogames

and their specific systems, by exposing them as simpler then what they really are (Bogost, 2011). He also mentions other authors that have suggested different names for it, in an attempt to better precise it as a concept only superficially related to game design. Robertson (2010) posits that a more fitting name for the term would be "pointsification". In other words, she does not believe that the term is rooted deeply enough in game design for it to be considered a part of the same whole, hence her dismissal of the term's semantics more than anything else.

Despite its detractors, gamification yielded significant results in academic research. According to the results of studies conducted in the field of education, different cases suggest several advantages and disadvantages. Research shows an increased efficiency in completing the gamified tasks (DeMers, 2018; Zhou et al., 2019) and a reduction of "dead-line oriented" mindsets while encouraging completionism behavior (Hakulinen et al., 2015). Furthermore, gamification can connect on deeper levels with different students, providing them with significant emotional and social experiences (Domínguez et al., 2013).

On the other hand, results also point to negative observations depending on the participants or the implementation of the system itself. If the strategy creates an overly competitive environment with extrinsic rewards it can ward off subjects who do not find motivation in them (Domínguez et al., 2013). However, if the process fails to convey a meaningful reward, in the eyes of the user, it can lead to negative behavior like "procrastination" of lack of engagement towards the gamified task (DeMers, 2018; Domínguez et al., 2013; Zhou et al., 2019). To solve these negative observations, studies point to similar conclusions in the field of education, namely that the gamified experiences should consider designing around intrinsic motivation and understand

[13] https://www.gamification.co

what is actually meaningful for the end-users (DeMers, 2018; Deterding, 2011, 2015; Domínguez et al., 2013; Koivisto & Hamari, 2019; Majuri et al., 2018; Zhou et al., 2019).

Research on several fields related to gamification maintained a steady growth throughout the decade (Christians, 2018; Halavais, 2012; Watson, 2014). Hamari and Koivisto (2019) reveal that the number of hits for the search word "gamif*", in both Scopus and Association of Information Systems Electronic Library (AISeL) databases, saw a progressive increase from 92 to 263 and then to 368, for the years 2012, 2013 and 2014, respectively. Conducting a search query in Scopus, using the same string "gamif*", the number of hits for each following year, after 2014, goes from 757, to 968, to 1114, to 1332 and to 1469 for 2019 (Table 1.). Hamari and Koivisto's literature review also shows that 28% of the studies analyzed revealed completely "Positive" results of the application of gamification in all fields and an additional 47% of "Mixed with Positive". In fact, research done in the field "Education/Learning" proved to be the most productive, with a 37.5% of "Positive Results".

	Year	*Number of hits*
Hamari's results (Scopus and AISeL)	*2012*	**92**
	2013	**263**
	2014	**368**
Alvarez et al.'s results (Scopus only)	*2015*	**757**
	2016	**986**
	2017	**1114**
	2018	**1332**
	2019	**1469**

Table 1. Consists of the first 3 rows of Hamari (2019). The following rows are search results for the query "gamif" conducted on 17th of January 2020.*

In short, gamification continues to yield positive results in current research. This means that the concept remains as a legitimized process of building experiences with game design elements.

2.3. Open Badges

Parallel to the gamification trend, educational and business institutions also began conducting research on digital badges for not only generating more meaningful rewards for their communities, but also for creating shareable digital symbols that would 1. hold the earner's achievements and 2. could carry that information across institutions, adding more badges to their collection in the process (Araújo et al., 2018a; Ellis et al., 2016). To this end, Mozilla created the Open Badges Initiative (OBI) with funding from the MacArthur Foundation (Mozilla, 2017), announced during the fourth Digital Media and Learning competition (2011)[14].

The OBI consists of creating a single world-wide network of institutions that use digital online badges to credit specific skills learned by their respective participants. These badges can be collected by earners via the institutions' own means of attribution. As long as the organization is affiliated with OBI, any badge issued can be officially recognized by others that also adhere to it. Thus, these earners create a collection of competencies validated by the badges they collect, since the data held by each of these consists of information about the earner, the achievement, the respective issuer and awarding institution. This collection can be easily shared in social media, personal websites or one's professional resumé. The latter is of special note

[14] https://www.hastac.org/competition/digital-media-learning-competition-4

because it opens the door to potential professional partnerships or even employment (Mozilla, 2017).

Badges can be made for a variety of scenarios, ranging from ongoing activities in an institutional context (i.e.: campus activities, or course work) or specific one-time events. Applying badges to different tasks of one activity effectively means building a badge system, usually under the same badge platform[15]. As the name implies, a badge system refers to all badges that pertain to a single institution for their activities or the badges made for a single event. Badges in this system will usually operate under the same platform and, as such, have similar descriptors and aesthetics (Lockley et al., 2016). The OBI is a framework that makes it so that badges created in any platform all have similar metadata, which, in the context of this work, will be often referred as "badge anatomy". This anatomy comprises the descriptors of a badge. Badges created in platforms compliant with the OBI framework have only slight variations of these descriptors (Lockley et al., 2016):

- "The competency statement" (description)
- "Standard(s) with which the badge is aligned" (alignment)
- "Performance criteria"
- "Evidence of performance"
- "Method of assessment and/or rubric"
- "Recipient"
- "Issuer"
- "Endorser" (if appropriate)"
- "Date of issue"
- "Date of expiration (if appropriate)"

[15] A digital badge platform consists of a website or online software that allows its users to create, issue and display digital badges. These platforms can have varying features between them, apart from these basic ones. For more information about terms related to open badges, please refer to: https://openbadges.org/about/faq

Additionally, Mozilla Open Badges' technical framework allows for institutions to easily create and share badges for their activities, thus contributing to a richer catalogue of badges that further distinct one earner's collection from another (MacArthur Foundation, 2013). To reiterate, any task can be worthy of a digital badge, which can validate skills that are not easily taught in the classroom. This allows educators to expand their formative offering beyond the curricular plan, as learners stand to gain much more from workshops or other extra-curricular activities designed to develop those skills. (Loughlin et al., 2016).

In brief, the Open Badges Initiative aims to create a new democratic paradigm for valuing and recognizing what is learned. It seeks to encourage schools, recruitment offices and after-school projects to create and deploy meaningful badges, so that every achievement or acquired skill or ability is duly acknowledged. Within a network of partners of the initiative, they can also serve to establish professional credibility before a wider audience, so that earners can have more diverse curricula that more accurately portray their uniqueness among their peers, as they can now share the badges they have collected throughout their lives.

"The promise is to ensure that badges give everyone recognition for the learning that happens everywhere and lets them share it in the places that matter."

(MacArthur Foundation, 2013)

2.3.1. Micro-credentials

Mozilla's Open Badge Initiative meant that skills that are not usually part of a curriculum plan could receive much more attention and recognition from evaluators and peers. This new opportunity kickstarted a wave of micro-credential recognition, that sought to bring these otherwise less visible, 'isolated' skills to the forefront (Mozilla, 2017).

Micro-credentials are directly related to Open Badges. In a way, they refer to the desired outcome of acquiring a digital badge: knowledge on how to do specific tasks. This is a challenge to more traditional models of education, wherein several individual tasks are usually part of an integrated system that was designed to teach a specific subject matter in at least some level of integrity (Gibson et al., 2016). In other words, micro-credentials are like different waypoints on a map (West & Lockley, 2016). One can look at education programs of any kind (be them crash courses, workshops, bachelors, etc.) as possible routes that go through these different waypoints in a specific order, so that the learners can acquire the necessary "fractions" of knowledge to be deemed skilled or proficient in the lectured field. The benefit of "fractioning" these routes is that it allows the learner the freedom to acquire a specific skill or skills from within that network and being duly recognized for doing so. The MacArthur Foundation and its partners see this concept as a crucial step towards innovating the modern, technologically advanced, educational system. They recognize that learning is a life-long experience, and that one who is curious will constantly come across events, or waypoints, in their lives in which they can develop a specific skill. The Open Badges Initiative seeks to give institutions the means of validating the merits of isolated tasks and activities outside of their curricular plans, all while rewarding their students with a visual symbol that acknowledges their micro-competences earned.

As stated, The MacArthur Foundation and Mozilla were not alone in this endeavor to promote digital badges and micro-credentials for the future of education. Several organizations, like Digital Promise[16] and Learning Forward[17], along with several academic entities helped promote discussion surrounding the topic by advancing with more experiments in their institutions. The ECIU also took an interest in furthering research in micro-credentials and badges. The consortium aims to create a recognition system of skills so that participating members are validated for the activities they gather while studying under the consortium's universities (European Consortium of Innovative Universities, n.d.; Hansen et al., 2002). To this end, these universities developed or adopted digital badge apps and gamification strategies within their campuses, one of which is the Kaunas University of Technology.

2.3.2. Case Study: Kaunas University of Technology

Kaunas University of Technology[18] (KTU) is a pioneering example of the integration of badges in higher education. They have a special extra-curricular program that promotes a number of activities which have corresponding badges that students can earn in the University's chosen platform, Badgecraft[19], compliant with the OBI. With a dedicated support team, KTU developed a gamification strategy through their digital badge program[20], active since 2017. The latter instigates students to acquire digital badges. First and foremost, it should be noted that in KTU students can acquire points

[16] https://digitalpromise.org
[17] https://learningforward.org
[18] https://en.ktu.edu/
[19] www.badgecraft.eu
[20] https://students.ktu.edu/digital-badges/

to be eligible for a scholarship. These points result from the sum of good grades and the value of the badges earned. Those with most points are eligible to receive a scholarship, so it acts as an extrinsic motivator for students to participate. The badges are broken up in six different categories: "WANTed", "GIFTed", "GUIDed", "UNITed", "INSPIRed", ACTIVATed" are the names of the six branches of this program, each of which reflects the type of tasks that can be rewarded with badges. For example, "ACTIVATed" rewards sport activities, whether they are practiced at a professional level or part of the student's past-time. They include tasks such as: "Volunteering as technical coordinators for X hours" or podium "placement within a contest or competition". "GUIDed" comprises of activities related to tutoring and peer-based knowledge exchange e.g.: "peer mentor" or "seminar delivery". All the available badges have different values from one another, as one grants the student more points than the others, hence why tasks that are measured by "X hours" are rewarded based on the total number of hours dedicated to it. KTU employs a gamification reward that is reliant on extrinsic motivation. However, the digital badge programs give some context to the student, as they choose what kind of title they want to earn, depending on the badges they collect.

Unfortunately, since the program has only been active for a few years, studies with empirical data collected from KTU's digital badge program were not found at the time of writing this document. It is unknown what implications does that program have on a student's campus life e.g.: does the digital badge program work as a gamified experience or does it amount to additional stress for the participant? Nonetheless, KTU stands as an exemplary partner of the Open Badges Initiative, especially given its connection to surrounding companies that recognize their badges and use them actively to seek out and recruit employees from the campus.

In brief, badges, as game elements, can be a powerful tool to carry out a meaningful experience. Within a well-designed gamification model, they can be key to motivate the participant, since they are a palpable, "material" reward. Badges can be easily collected and displayed, as opposed to grades, for example. The value of the award, however, is heavily affected by the Open Badges Initiative and micro-credentials, which makes them that much more instrumental to the earner's future in professional circumstances.

3. Methodology

For the purposes of this work, we have employed a qualitative research methodology coupled with elements of grounded theory, to not only register the relevant subjective data about the concept of soft skills and micro-credentials and how they are perceived by students at the University of Aveiro, but to also summarize the work that has been done on the design of badge systems and induct a hypothetical implementation model.

To clarify, grounded theory consists of an inductive research methodology in which a hypothesis is formed through the analysis of the available empirical data previously gathered by other sources or collected during the same research (Charmaz, 2001). This type of research is unique in the sense that it does not start from a preconceived hypothesis, though it may have guiding research questions, but rather works towards one based on the data. There are three overarching steps that researchers tend to follow when applying this methodology:

i. Coding - In which data is tagged and sorted into different emerging patterns, designated as "codes".

ii. Memo-writing - The relationships between codes and the conditions in which they are formed are subsequently registered. From this process, theoretical links and categories emerge and hypothesizes start to form.

iii. Theoretical sampling - During the final step, researchers refine the theoretical statements that arose in the previous stage, looking to add complexity and density to their findings. This step may consist in gathering more data or by making focused comparisons between the data previously gathered.

The steps above were taken from Kathy Charmaz's "Grounded Theory: Methodology and Theory Construction" (2001). It should be noted that this method is transversal to either quantitative or qualitative research. In the case of the present study, we adopted elements of grounded theory to reach our conclusions. Namely, we considered as data both the process and results of our work as well as those from our archival sources, to theorize a more efficient and effective method for our objective. The badge system implementation model that we have reached is, therefore, a hypothetical set of instructions that badge system designers may follow in order to achieve their goals more efficiently, ideally surpassing the hurdles that we and other researchers have uncovered through our investigations.

Because of our employed methodology, our findings are not concentrated solely on our results. The whole process of investigation is, in and of itself, part of the data under analysis since it serves our grounded theory approach to reach our conclusive hypothesis. For this reason, it is relevant to share exactly which steps were taken during our investigation and how it changed overtime. To better represent our research and how it developed, we have compiled a list of all steps taken in chronological order. The steps in bold will be expanded upon in the following sections.

1. Badgecraft is selected as the badge platform for the investigation.
    a. However, during role-playing tests performed with the platform, stability issues arose which prompted the team to consider other possibilities.

2. **A digital badge platform benchmark is created,** listing several online platforms and their features.

    a. The selection was narrowed down and Badgr[21] was chosen to substitute Badgecraft in our research.

3. A field test is performed with Badgr to get a deeper understanding on how it functions. For this test, we chose a 2-hour student activity for which we created several badges. Students were made aware of the platform and the available badges.

    a. Badgr seems to be working properly but the chosen activity does not seem appropriate for our investigation due to its duration.

    b. Another activity was selected – The tasks of this new activity could be concluded in a span of an academic year.

4. The COVID-19 quarantine goes into full effect in Portugal, which prompted the team to focus primarily in producing the badge system implementation model for the University of Aveiro.

5. A **focus group** is conducted with teachers and selected former participants of the selected activity.

6. A **survey** is sent out to students that have, over the course of the academic year, had the opportunity to undertake the tasks of our selected activity.

[21] https://info.badgr.com/

7. A **grounded theory** methodology was adopted, and we compounded the data gathered from our last two steps with the findings of the works we analyzed.

    a. Based on all of the results, we employed inductive reasoning to reach a badge implementation model.

4. Results and Discussion

4.1. Badge Platform Benchmark

As stated, the main goal of this investigation was to study the effectiveness of gamification, using digital badges, in motivating student to develop soft skills. However, our methodology changed a few times during the investigation. These changes prompted us to take different approaches and conduct tests on badge platforms as well as social experiments. The badge platform implementation model presented in section 4.7. (p. 71) is the direct result of all our tests and our decision process. It is the product of our accomplished work, its own review and what we concluded to be a more productive course of action to take in order to implement a badge system within our educational context.

At first, it was established that, for the purposes of our on-site investigation, we would use Badgecraft, the digital badge platform adopted in KTU, which would be tested within a controlled environment in the University of Aveiro. The goal was to create, within the platform, several badges that would be rewarded by completing tasks within a chosen extra-curricular activity. Soft skills would be framed as the formative rewards of each acquired badge. In this way, we aimed to have students, that would participate in said activity, register accounts and collect badges as they were undertaking the tasks. However, the Badgecraft platform did not seem to perform well if many users decided to create an account and claim badges in a short period of time. This was revealed during a presentation of the platform and its functionalities to several members of the student council, heads of student clubs and members of the University's board of directors. The purpose of this presentation was to show the potential of digital badges, the proposed platform and to create a

discussion on how it could serve the invited parties' interests. We received a positive response from the invitees regarding the potential of digital badges. However, the lack of stability shown by the platform prompted us to change our direction.

Thus, we decided to investigate other digital badge platforms. For this reason, we compiled a benchmark of several platforms that are available online. We defined several criteria and created a table (Table 2.) that details all platforms researched and each basic functionality that they do or do not possess.

	Badge Creation	Hierarchy		Access			Social Interaction	Issuing Options		Evidence System	Statistical Data
	Is there a badge creation feature?	Different User Roles	Different Badge Values	Browser	API integration	Stand-alone app	Can users see/interact with each other?	QR/claim code	Email	Customizable Evidence System	Exportable statistical data
Badgecraft	X	X	X	X		X		X	X	X	X
Accredible	X	X		X	X				X	X	X
Badgelist	X	X		X	X		X		X	X	X
Purdue Passport*	X	X	X	X		X	X		X	X	X
BadgeFactor	X	X		X**			X		X	X	X
OpenBadges.me	X	X	X	X	X				X	X	X
Badgr	X	X (pro)	X (pro)	X	X		X	X (pro)	X		X (pro)
Bestr		X		X							
ForAllBadges	X	X		X		/	X		X	X	

*Table 2. Benchmark of studied digital badge apps available online. The platforms can be found in the left column while the generic features are at the top; *Purdue Passport requires an Instructor Account, which is only available upon request. Since we had not received a response from Purdue, data was gleaned from the information available on their website, online tutorials and academic sources (Dimitrijević et al., 2016; Newby et al., 2016); **BadgeFactor is a Wordpress plugin; (pro) = refers to a feature only fully available in the paid premium version of the platform.*

The criteria used in the benchmark matrix of Table 2. can be understood as follows:

- **Badge Creation**

An important functionality to ease the implementation of Open Badges is a badge-creation tool so that those responsible for creating badges may have accessible means with which to carry out their task. A simple image importer is considered as a base feature to pass the criteria, however, existing visual templates and access to color options, as well as pre-made symbols and text-editable labels are also valuable.

- **Hierarchy**

Having a hierarchy of user roles means that they can be either "admins" or merely "badge earners". This allows us to make sure other users cannot, for example, issue badges to one another when they are not supposed to or validate personal evidence submitted by their peers. We also accounted for intermediate roles like "issuer", meaning one user could be responsible for issuing badges but not have access to administrative tools. Having multiple users with exclusive rights to badge issuing means that the tasks of analyzing evidence and issuing badges can be split more easily. "Different Badge Values" means that the platform allows for its badges to have different values form one another, which allows creator to have tiers of badges based on merit. For example, if it is possible to make it so one badge requires the completion of multiple others, then that badge could be of a higher value in the hierarchy than those that are necessary to attain it.

- **Access**

This criterion refers to how the platform is accessed and whether it can be easily integrated within a developed system. All of the researched platforms can be accessed using a regular web-browser. But only some of them offer stand-alone apps that can be downloaded to a smartphone. Additionally, only a few have a shareable Application Programming Interfaces[22] (API) that allows designers to use them in their own platforms.

- **Social Interactions**

It is important to know whether the platform allows its users to view each other's progress and badges earned within the platform. This may be beneficial for the gamification strategy because this information can affect the user, making them curious and motivated upon seeing friends or other users acquire certain badges. It can function, therefore, like the "Leaderboard" game element, as an example. Therefore, "Social Interaction" refers to features in the realm of user interaction i.e.: public profiles or comment sections.

- **Issuing Options**

In all platforms, issuing badges happens once the earner completes the given task. All platforms allow for issuers to instantly attribute badges through the platform itself

[22] API can be defined as "a software intermediary that allows two applications to talk to each other. Each time (…) an app like Facebook [is used to] send an instant message or check the weather (…), [an] API [is being used]". Taken from https://www.mulesoft.com/resources/api/what-is-an-api.

or by email, but only some allow it through other means ("QR code/claim code"). This is relevant because, besides its versatility, it can help unforeseen situations e.g.: a badge earner not having access to a smartphone or computer to conclude a task.

- **Evidence System**

Most badge platforms allow the badge creator to not only set a task, but also decide what evidence is needed for it to be recognized as completed. This feature refers to the possibility of customizing the type of evidence the earner needs to submit.

- **Statistical Data**

It is very useful that the badge platform can export usage data, so that we may more easily define and analyze Key Performance Indicators (KPIs). The output should feature variables such as: User Data, Badge data, Log Data, Chart and Graph Export, Metrics, etc.

It should be noted that Table 2. does not account for unique features that each platform may have. The ones presented on Table 2. refer to basic and advanced functionalities that some platforms have readily and freely available. However, when narrowing down our selection to two platforms, their unique features were considered. A presentation was made highlighting both platforms, Badgr and Passport, and their distinct qualities to members of the board of directors of the University of Aveiro. Badgr was chosen as the more appropriate platform. The decision was made alongside these members, which expressed an interest in the

longevity of the platform beyond our study and advised us to research one that could be more easily integrated by the University of Aveiro in the future. While Passport had a very robust system thanks to its comprehensible platform and array of options regarding badge viewing, user interaction and evidence systems, Badgr's replicable API meant that the University of Aveiro could use it to build its own badge platform and, as such, would not have to rely so heavily in external, proprietary software. Badgr also has the unique feature of letting designers create pathways between their badges, meaning that they can create progress maps that give users a look at how each badge relates to one another in a system and how they make up a learning journey (this feature, however, has since been reserved for premium users).

4.2. Badgr testing

Just like Badgecraft, after settling on our chosen platform, we decided to perform a test to fully explore its functionalities and evaluate what would be necessary to prepare for an on-site social research. We created a few badges for a 2-hour extra-curricular activity performed by students of the bachelor's in New Communication Technologies (NCT). This extra-curricular activity, named "AVILA Sessions", consisted of several challenges performed in groups of first and second-year bachelor's students of the course and it was overseen by third-year students of the same course or from the Multimedia Communication Master's degree (MCMM). These challenges were like puzzles designed to familiarize the students with learning programming languages and logic. The objective was to overcome these challenges. The investigators decided to create a badge for each challenge and award it to each member of each team as they were surpassing them. At the end of the activity, we

learned that Badgr's feature of issuing badges to multiple participants at once using an excel sheet with their emails ("bulk award") made for an accessible monitoring and issuing experience. However, we noticed that this activity was not appropriate for our objectives, since its speed-based challenges meant that students were more likely to forget that they were being awarded badges in the process. A report of this exercise was written and sent to our partners in the board of directors of the University of Aveiro. This report is available in the Appendix section of this document (Appendix I, p. 103).

4.3. Selecting the activity

Our next step focused in picking a more appropriate activity with which to conduct further testing and carry out our original goal with Badgecraft. Unfortunately, it was at about this time that the global COVID-19 pandemic reached Portugal. A few days after, lockdown restrictions were announced which meant that we were no longer able to observe students interact with the platform in an on-site setting. Due to this situation, the research team decided not to test nor observe the engagement of students with the platform directly, and instead focused more on how we could successfully implement a badge strategy to our chosen activity. It should be clarified that by "activity" we refer to an overarching/ongoing event that happens in the University of Aveiro and allows for the opportunity to undertake extra-curricular tasks. AVILA Sessions proved to be too short and compact since its tasks were meant to be concluded in two hours, total. As such, we began to consider activities that involved extra-curricular tasks which could be accomplished within a lengthier timeframe.

The University of Aveiro's Multimedia Communication Master's (MCMM) degree is split in two formative branches, one dedicated to training digital audio-visual competencies and the other dedicated to interactive multimedia. Both follow an innovative method of education, as each branch is taught under a broader context of Project-Based Learning (PBL). In the first year of the master's course, students are grouped into teams and challenged to produce a final product or portfolio that requires the mastery of all subjects under each branch. To clarify, Project-Based Learning is a teaching method that is adopted in order to better attach soft skill training with "hard" knowledge education since it simulates the experience of having a deadline to work towards as a team (Ngang Tang, 2019). This practice opens the doors for many soft skill training opportunities, considering that students are expected to manage their own individual evaluations with their continuous assessments as teams. Some of these opportunities could be considered as extra-curricular activities, since not all of them are strictly under-evaluation. The digital audio-visual (AV) branch of the MCMM course requires students to produce various film works, from short movies to webisodes, among others. This offers students the opportunity to take roles that are not evaluated directly and, as such, are a form of voluntary self-development. These include performative roles such as actors, narrators, musicians, but also tech roles such as web-developers (since developing websites is not part of the AV curricula in this context), among others. Thus, we considered these opportunities as possible tasks that could be associated with a badge system, in which students would win a badge if they played these roles in other teams outside of their own. Furthermore, these opportunities are grounded in peer-motivated learning, since each participant is expected to meet their peers' expectations, even if their roles are not formally evaluated. Additionally, according to research on badge systems, peer-based recognition is an effective motivator for performing tasks related to badges (Otto & Hickey, 2014).

In summary, the PBL activity encompasses extra-curricular roles that students voluntarily perform as part of the PBL assignments of the digital audio-visual branch. We chose a specific set of roles based on the results of the focus group research we conducted, which will be expanded upon in the next section.

4.4. Focus Group

After choosing the activity for this research, we were now faced with the challenge to understand how we could design badges in a manner that made sense for hypothetical stakeholders (such as learners, or third-party consumers) of our badge system. Given that the extra-curricular tasks of our selected activity rely on peer-based assessment, both our focus group and our surveys were designed to gather data about how previous participants of the tasks (from prior academic years) perceived soft skills and their relation to the tasks that they had executed. Our objective was essentially to understand how to fill the OBI descriptors of each badge, in manner that makes sense for previous and future participants (for a clarification on the OBI framework and descriptors, see section 2.3., p. 26).

In this section, we will detail the format of the focus group and its results, explaining how they guided our research.

Format: Dynamic Focus Group – discussion held in an online meeting which was recorded by the investigation team. Participants were asked to open and edit a Google Slides file for the purposes of this investigation.

Participants' characteristics:

- Alumni from the second year of the MCMM (2019/2020) course, specifically the digital audio-visual branch.
- Teachers of the MCMM course that had overseen the PBL activity in the academic year 2018/2019

Nº of participants: 5 students and 2 teachers

Duration: The focus group lasted 2 hours and 6 minutes.

This focus group had three primary goals: (1) to create a discussion and understand the perception of soft skills among teachers and previous participants of the activity we had selected, (2) observe how they grade the importance of soft skills, in general and specifically in relation to the activity and its tasks and (3) to determine which possible tasks we should consider associating our badges with. The participants of the online focus group were asked to complete challenges and answer a few questions meant to generate discussion among members about their opinion on soft skills and, to an extent, badges and micro-credentials. The structure of this focus group was divided in 3 phases:

Phase 1 – Question the group about what they define as soft skills

The focus group started with a brief introductory discussion about what are transversal competencies to register each participant's perception on the matter. The investigation team then ended the phase by stating what their own definition was. This was done in order to establish a mutual understanding throughout the rest of the focus group.

Phase 2 – "Mystery Colleague"; an operational exercise with Google Slides

Phase 2 started with a slide (Figure 1.) that contained a text inviting participants to simulate a scenario in which they would have to compose a team in order to tackle a PBL-like project (which all participants had concluded, or supervised, in the prior year).

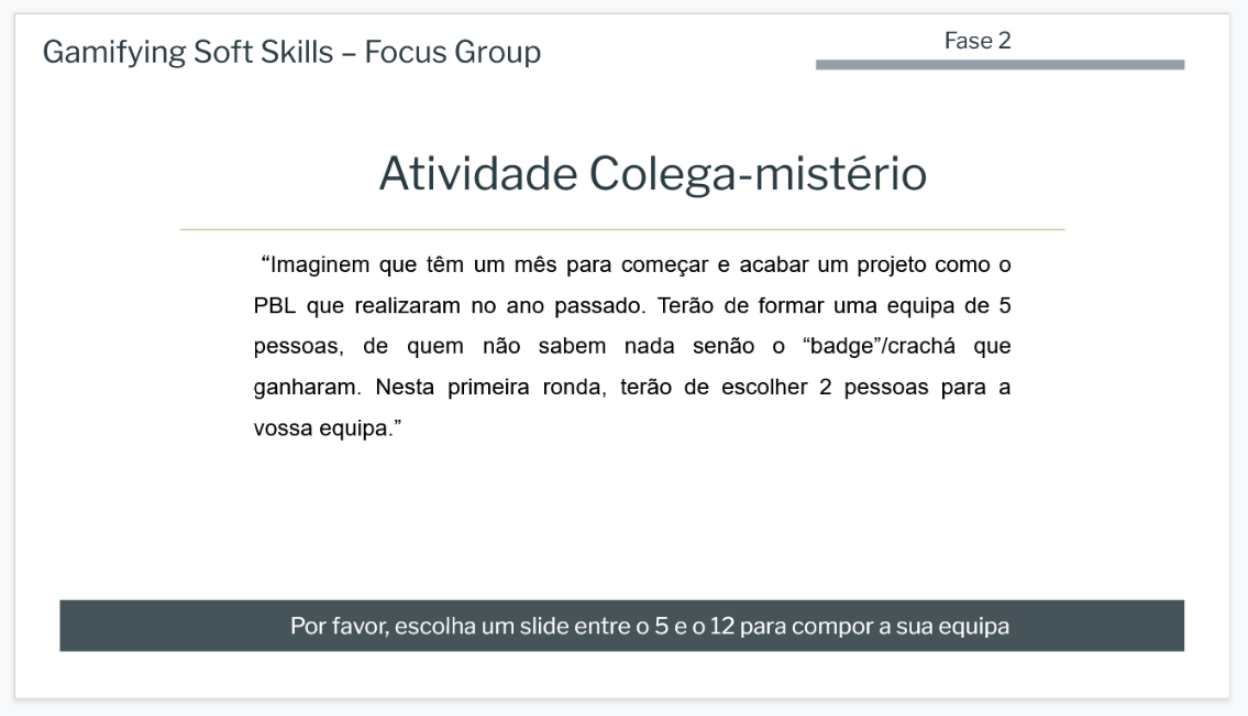

Figure 1. *Focus group Slide 1. Slide text, translated from Portuguese: "*Imagine that you have one month to start and finish a project similar to the PBL activity that you undertook last year. You will have to form a team of 5 people of whom you know nothing except that they have one single digital badge that they earned in the past. In this first round, you will have to pick 2 members for your team.*" Textbox below: "*Please choose a slide from #5 to #12 to compose your team."

The slides in the next page (Figure 2.) were all visually equal, save for the participant's name in the bottom right corner. In each slide, there were 12 "cards", each of which had a text that indicated an accomplished task. These cards, or "mystery colleagues", are meant to represent hypothetical individuals that have concluded a PBL activity in the past. The text box on each card shows the task that each "colleague" completed. Each one of these tasks was proposed by the authors of this research. The 12 cards can be seen in the left quadrant of the screen. 10 of them are coloured and two are blank for reasons that would be divulged in the next phase.

The tasks are as follows:

Black – "Never arrived late for meetings or classes"

Beige – "Always took the initiative to communicate with external agents"

Green – "Felt at ease during presentations"

Red – "Solved conflicts between ideas or obstacles during the process"

Purple – "Aided other groups in their work"

Orange – "Helped maintain the focus of their group members during their work"

Blue – "Taught their group members software or techniques"

Brown – "Was the most contributory to brainstorming sessions"

Grey – "Designed work plans / distributed tasks for each member to do"

Pink – "Concluded their tasks in time and acted proactively to do more"

Figure 2. Focus groups slide 2. Template for the slides in which participants would undertake their focus group tasks. The area beneath the colored cards reads: "Drag here your mystery colleagues", *above the orange lines.*

Participants were first asked to choose their preferred cards (or "mystery colleagues") and then drag them to the area beneath the 12 cards. This would give us (and them) a visual and interactive representation of each team. Participants were advised to reflect upon what each task (on each card) could say about the "personality" of these symbolic figures. The point of this phase was to create a mental frame for each participant so that they could start reflecting upon the tasks and what soft skills they would reflect. By framing the challenge of assembling a team based on these activities, we aimed to have a clearer picture of the tasks they valued, so that we may pick them for the badge system with more academic accuracy.

Afterwards, participants were asked to "create" two other tasks for the blank cards. This exercise was meant to understand whether they could envision other demonstrations of positive soft skill representation that could be missing from the research team's proposals, or at least reveal to us how close we were from their

expectations. However, if they could not come up with new ones, they would be asked to simply pick two others from the remaining cards.

Finally, participants were asked to justify their choices of cards. After this discussion, each participant had the opportunity to reorganize the ones they picked based on the arguments of the other participants. To further expand on the discussion, the moderator was allowed to raise questions about what could be read from each card and their task. With this phase, we intended to get even closer to what each participant considered valuable tasks so that we may finalize our final list for the badge system.

Phase 3 – Soft Skill Tags

For the final part of the focus group, participants were asked to designate "tags" for each card they chose for their team. These tags had inscribed in them several of our chosen soft skills for analysis. The aim of this final point was to evaluate which soft skills they would recognize in each member. Thus, we were building a peer-recognized way to tie the appropriate soft skills to each task. With this information we would have a set of tasks and corresponding soft skills that each badge could recognize. These tags could be found in the right half of the slide. They were meant to be dragged below each card, and only 1 for each card. Here is the list of all selectable soft skills, adapted from "Transferability of Skills across Economic Sectors: Role and Importance for Employment at European Level" (Balcar et al., 2011a, p. 25):

- Leadership
- Cooperation
- Initiative

- Creativity
- Flexibility
- Communication
- Organization
- Autonomy
- Quality control
- Information and Communication Technology Skills (ICT skills)

After all tags had been attributed to each card, the research team quickly analyzed which one was the most used for the most popular badge. Afterwards, a discussion was held about the results so that each participant could give their final thoughts on transversal competencies and digital badges. From this discussion we were able to get closer to validate a recognition process with which to link transversal competencies to each badge.

4.4.1 Focus Group – Results

Phase 1 – "What are transversal competencies?"

The answers to this question were unanimous and did not deviate much from how the research team had defined the term for the purposes of this work. Two of the students answered in a manner all other students agreed with, "It's a quality, an individual characteristic that applies to all realms of their life; [the] ability to

communicate and [how] it [is] useful in their lives, be it in their relationship with neighbors, in their workplace, or even a focus group for a dissertation"; The other student added: "[It is something that] goes beyond the realm of technique [like] writing, for example (...); "My ability to organize ideas or arguments. It is transversal throughout distinct techniques". These comments were corroborated by one of the teachers: "They are competencies that you can carry from anywhere to anywhere else – the point is to be able to give a person a skill that they can use in diverse situations, they will apply it in other realms, and it will work. [That] competency is an ability; an overarching ability that is not very specific, applicable in different contexts". Given these responses, the research team then provided its own definition, which everyone agreed with. We concluded that the participants and the team were in accordance with the term and its core meaning, thus we proceeded with the focus group.

Phase 2 – "Mystery Colleague"; an operational exercise with Google Slides

Comments made during phase two reflected one of the first major discoveries in this study, which was the danger of making skills too granular. One professor said: "I would not make a team pick based on this"; "Who would certify these credentials?" A student added: "This is not even 10% of what is necessary to choose someone (...)"; and also, when referring to the task "Helped maintain the focus of their group", this student said: "[it] may be interpreted as someone who is a pain to work with".

General observations about the cards

One of the main criticisms made about the cards and their tasks was their ambiguity. A lot was said about how they could be interpreted both in a positive and in a negative way. One student and one professor commented on how difficult it was to assemble these teams based solely on one accomplished task. The student reported how "initiative" could lead to a negative experience, because if the person was too hasty, then it could throw off the team's balance. They made the same comment towards the task regarding "maintaining the focus of everyone involved", since it could indicate that the person who held that award was a "cumbersome", overzealous member. Teachers agreed on the difficulty of selecting a member whilst knowing solely one accomplished task, especially without knowing a specific, pre-determined function for the team member. This comment can reflect a problem with our selected tasks: that they do not clearly reflect a role or a generic technical competency that usually facilitates choice and organization. One of the teachers admitted picking the "Taught their group members software or techniques" card because it implied some knowledge of software, which was "crucial to positively execute the PBL activity". This same teacher further suggested that the focus group team should have made clear whether the technical skills of the hypothetical members were at the same level or not. A student also seconded this comment, stating that they chose to perceive the cards in the exercise as multiple competencies of one person. This student was trying to build an ideal candidate for his team, instead of considering a full team of different people. This particular finding encouraged us to consider more specific tasks that imply some level of technical competency and are easier to observe and to evidence.

Observations on the cards created by participants

The main reason why the research team asked the participants to create their own cards was to assess whether the set of tasks we had proposed was matched by the participants' expectations on what they considered to be tasks that could positively demonstrate soft skills in the PBL activity. By allowing them to create and justify their own tasks, the participants could highlight other moments that should be rewarded with a badge. However, the team encountered an interesting trend. Most cards created by the participants were not specific tasks, rather they were the outcomes of what we intended the tasks to show. Instead of providing practical examples of what could show leadership, or communication skills, participants mostly wrote down examples such "Showed leadership skills", which means that (1) the exact nature of these cards/tasks was not adequately communicated and (2) that imagining adequate tasks to demonstrate these soft skills could be challenging. The first example of a created card was proposed by one of the teachers who wrote the aforementioned "Show leadership skills". The moderator asked if they could provide examples of what can show leadership within the PBL activity, to which the teacher replied that a person usually becomes the leader of a group when they consistently take the initiative to speak on its behalf and answer questions – "it is the person that, when a question is asked, takes the initiative; it is the person to whom their colleagues look when they [as a group] are asked a question and await a reply". Most other created cards exhibited the same trend; students wrote tasks like "Pleasant and communicative person"; "Demonstrated resilience in the face of unforeseen circumstances and rejections"; "Knew how to work in a team"; among others. All the participants were asked to expand on possible tasks that could demonstrate these skills, but we found that the underlying issue was that they all struggled with exemplifying a situation in which that skill would undoubtedly be demonstrated. There was however one student

that created a card with an explicit task, that task being "bought beers [for their colleagues]". This humorous suggestion was purposefully vague but also very telling of what, in the student's opinion, would be a good demonstration of teamwork: "[it refers to] the capacity of solving social problems, to show a human facade". Though it sounds unprofessional, it holds as a possible task that could demonstrate a willingness to be genuine and to boost team morale. It compounds many possible soft skills, specifically in the realm of interpersonal relations. This, in conjunction with the results yielded from the next phase, encouraged the team to find more specific tasks that involved a sort of technical role. Thus, these results guided us to define a new set of roles to use for our research, specifically in our surveys. This new set consists of the following roles:

- Acting in a short film or webisode produced by students of other teams in the audio-visual branch.
- Narrating in a short film or webisode produced by students of other teams in the audio-visual branch.
- Being the make-up artist in a short film or webisode produced by students of other teams in the audio-visual branch.
- Composing or designing sound for a short film or webisode produced by students of other teams in the audio-visual branch.
- Helping the student team with building a website for their projects (when it was not under evaluation).
- Helping or teaching members of the student team about software that can be relevant for their project.

Phase 3 – Soft Skills tags

In the 3rd phase of the focus group, participants were asked to link their preferred soft skills to their chosen cards. The most popular tag for each card can be found on the table below (Table 3).

Cards	No. of times they were picked-			Soft skill tags that were most associated
	Teachers	Students	TOTAL	
Solved conflicts between ideas or obstacles during the process	1	3	4	Leaderships & Communication
Was the most contributive to brainstorming sessions	2	1	3	Creativity
Concluded their tasks in time and acted proactively to do more	1	2	3	Initiative
Taught their group members software or techniques	1	2	3	Initiative
Designed work plans / distributed tasks for each member to do	1	2	3	Quality Control & Autonomy
Always took the initiative to communicate with external agents	0	1	1	ICT Skills
Helped maintain the focus of their group members during their work	0	1	1	Quality Control
Felt at ease during presentations	0	1	1	Autonomy
Aided other groups in their work	0	0	0	-

Table 3. Focus Group Soft Skill tag association results.

The results of this phase highlighted the need to use more broader definitions of soft skills. Taking, as an example, the most popular card, "Solved conflicts between ideas or obstacles during the process", the tags that were attributed by all participants to this card all fall under Balcar et al's "cluster of relationship and service skills" (Balcar et al., 2011a). Adopting definitions of clusters instead of specific soft skills also helps in having a clearer idea on the general transversal competencies one person may have, which reduces the hyper-granularity that the participants pointed to.

The table below (Table 4.) displays the clusters of skills we decided to adopt for our survey. We have adapted these from the list of soft skills we used in Phase 3 of the Focus Group (section 4.4.1, p. 51) taken from Balcar et al., (2011a). We have used their definitions of clusters since they synthesize many specific skills, which makes their distinctions, as a group, more pronounced between them and the next cluster.

Skill Clusters (PT)	**Skill Clusters (ENG)**	**Definition**
Competências de relacionamento interpessoal	Cluster of relationship and service skills	"This cluster involves skills intending to meet someone else's needs, attuning oneself to the concerns and needs of the others, working to meet those needs".
Competências de eficácia pessoal	Personal effectiveness skills	"Skills gathered in this cluster reflect some aspect of an individual's maturity in relation to himself/herself, to others and to work".
Criatividade	Creativity	"Creativity provides foundation for art, science, philosophy and technology. The creative process involves the integration of several mental functions and also involves all the components of the life experience".
Competências orientadas a objetivos	Cluster of achievement skills	"The essence of this cluster is a bias towards action, directed more to task accomplishments than to impact on the other people"
Mestria de instrumentos de comunicação	ICT skills/E-skills	"These skills involve the confident and critical use of Information Society Technology (IST) for work, leisure and communication".

Table 4. Clusters of Skills and definitions, adapted from Balcar et al.'s (Balcar et al., 2011b)

It should be noted that "Creativity" is not a cluster in the original document. However, given the creative nature of the MCMM course, the PBL activity, and how much it was emphasized during the focus group, we have decided to single it out from the other clusters, including its original one: "Personal Effectiveness Skills". Also, the "Cluster of relationship and service skills" is referred in this document as "interpersonal competencies".

4.5. Surveys

As stated before, our focus groups and our surveys were designed to understand the perception of soft skills by previous participants of the tasks. The surveys, however, were specifically constructed for two purposes: to gauge a wider perspective on competencies by reaching more individuals, and to more specifically find which competencies are relevant for each task. In this step, we will detail the format of the surveys and their results, explaining how they guided our research.

Duration: Two weeks were given to gather responses

Participants: The surveys were made using Google Forms. One form was sent out to two student groups, one for each academic year. Both groups were in Facebook Messenger, since students were known to create groups in this platform to discuss several topics relating to the MCMM course. One more form was sent out to four specific teachers who had a significant role in the PBL activity.

Once the team achieved a list of tasks that could award badges in our selected activity, we aimed to understand which soft skills these badges could be linked to,

since the metadata on each badge should reflect the appropriate competency it develops. This is a stage in badge system development that raises many obstacles regarding the authentication of the skills involved, and solutions include contacting professionals in curricular studies, psychology, or career development. However, these practices can slow down the design process and, though valuable, may produce results that do not match the expectations of the participants. Moreover, studies in prototypical badge systems suggest that peer-recognition frameworks can provide successful results regarding the design of the badges themselves (Otto & Hickey, 2014).

For this reason, the research team decided upon conducting a survey in order to obtain exploratory results on how teachers and previous students ranked the relevance of skill groups to each task that they oversaw or participated in, respectively. We got in touch with the student Messenger groups of each MCMM branch of both years (first and second) and sent them the forms so that they could respond at will. The teachers were contacted directly.

Student's form:

Each form consisted of two sections. The first section was dedicated to retrieve data about the respondents' MCMM branch and their year of enrollment. The second section contained six "yes or no" questions. In each of these six questions, students were asked if they had performed one of the tasks we had selected. Each question had a short description to remind the students to answer only if the tasks were concluded in a context in which they were not being evaluated (thus assuring that they were done voluntarily). If they answered "yes", they would be directed to a sub-section in which they were asked to rank each skill group on how important they were

for completing the task. These skill groups were also drawn up according to the results yielded from the Focus Group study (see 4.4.1., p 50). Students would rank the relevancy of each soft skill group in a table (see Table 5. for a visual representation.) The respondents could pick from a table in which each column had a different soft skill group, and each row was ordered from "The Most Relevant" to "Relevant".

The instructions for the ranking table of the skill groups read as follows:

"From the following groups of transversal competencies (Table 5.), which, in your opinion, were the most important to undertake the task of the previous question? (*the referred task was mentioned in brackets).* Please pick 3, organizing them in order of relevancy."

	Interpersonal Competencies	Self-Efficacy Competencies	Creativity	Achievement Skills	ICT Skills
The Most Relevant	?	?	?	?	?
Very Relevant	?	?	?	?	?
Relevant	?	?	?	?	?

Table 5. Representation of the ranking tables found in the students' survey.

Teacher's form:

The form was also sent to teachers, but instead of having a "yes or no" question for each task, the teachers to whom we sent out this form had a ranking table (like Table 5.) for every task, asking them, in their opinion as supervisors of the PBL activity, what did they think were the most important groups of soft skills to positively accomplish each task.

Both forms were accompanied by a glossary explaining each group of skills. The glossary definitions for these groups of soft skills were an adapted translation of the clusters of soft skills mentioned in Balcar et al.'s work (Balcar et al., 2011b) (see Table 4. p. 57).

The results of this study are merely explorative, as they better serve the purpose of exemplifying how this data should be applied when designing badges. This should not forego a professional analysis or framework for recognizing these skills, but if the objective is to build a prototypical system to gain a deeper understanding of its inner-workings and to scope the propensity and engagement of the target audience, adopting more efficient methods to perceive the skills that each badge certifies is not without merit. In other words, scoping the perception of peers to understand which skill is being developed in each task may produce badge descriptors that are more easily readable and understandable by participants of the badge system. Thus, the results of this survey were merely used as examples to suggest how they can be applied.

4.5.1 Surveys – Results

Respondents: 19 Students, of which 12 had completed at least one of the tasks; Only 1 Teacher responded, out of the 4 contacted.

As mentioned before, the results of this study are not supposed to draw any meaningful conclusions about the effectiveness of digital badges on Higher Education Institutions. It provides an opportunity to review the process of building a peer-recognition framework.

First, here are the results of the demographical questions:

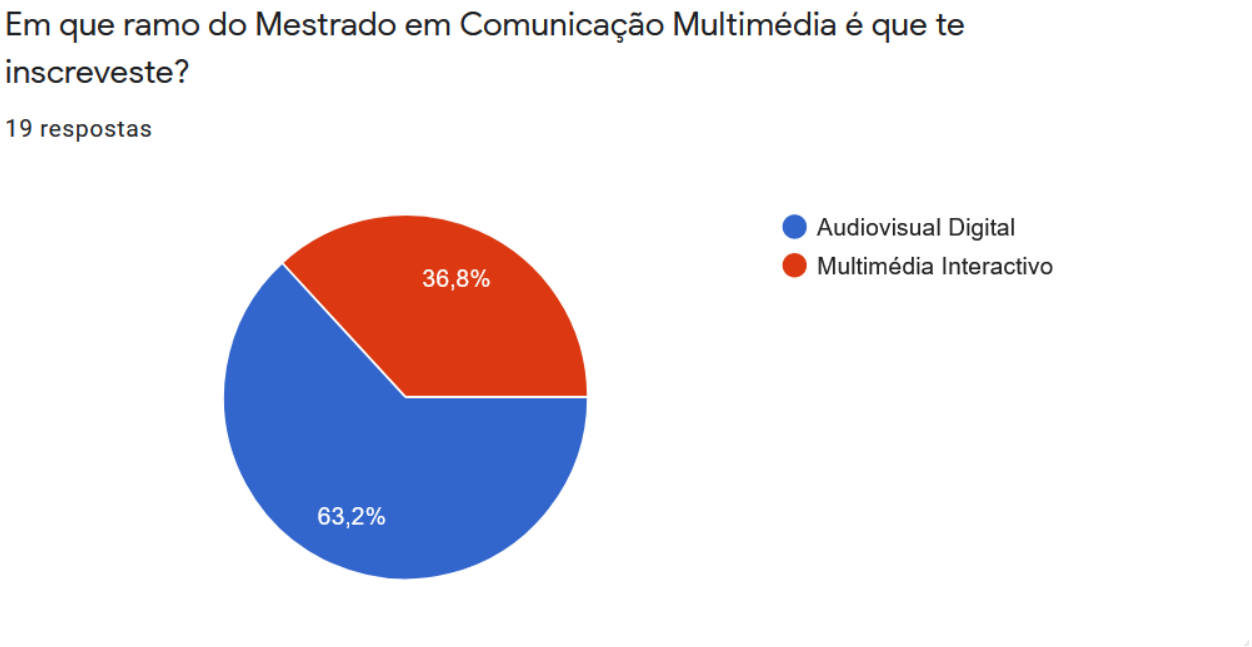

Figure 3. Pie chart depicting which branches each student was enrolled in. It reads: "In which branch of MCMM did you enroll in?*". The possible answers are, translated* "Digital Audiovisual" *(blue) and* "Interactive Multimedia*" (orange).*

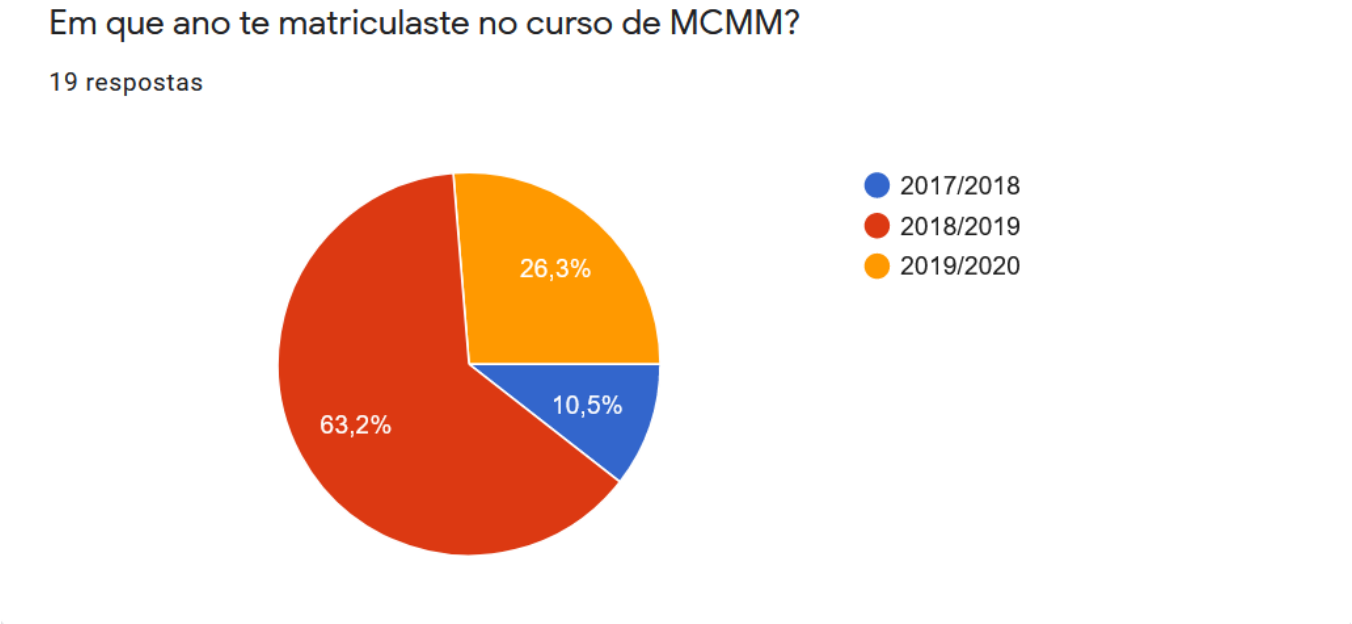

Figure 4 Pie chart depicting in which academic year the students were enrolled in. It reads: "In what year did you enroll at MCMM course?"

These pie charts (Figure 3. and Figure 4.) show that most respondents had made their enrollment in the academic year of 2018/2019, into the audio-visual branch. It makes sense considering that those that had enrolled in the following year (2019/2020) were in the process of conducting the tasks of the PBL activity, of which there were less that year due to the lockdown measures. It is also not surprising that the audio-visual group responded the most, since the tasks that we defined for this study are exclusive to their branch, and there is a lot of inter-group cooperation between the students, which means that they will many times perform these extra-curricular roles with groups other than their own. However, it is important to remember that students that had not concluded any of our tasks still responded to our survey, which is about 37% of respondents. Of the remaining 63%, we know that 9 respondents were enrolled in the audio-visual branch and 3 in the interactive multimedia branch.

The following two graphs are the students' and teacher's answers to the task of acting in a short series or webisode (Figure 5 and Figure 6). Please refer to the glossary in Table 4. (p. 57) to understand the definitions of the soft skill groups.

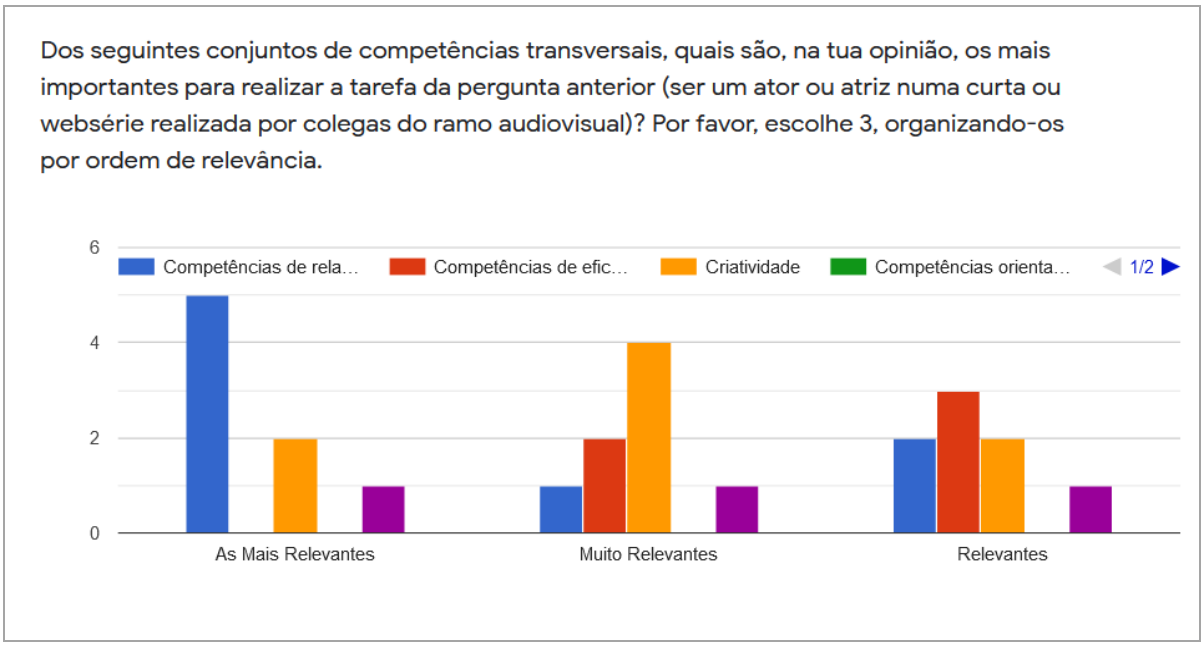

Figure 5. Results from the forms sent to student groups. The task refers to the role of acting (the badge was named "Oscar Material"). The total number of respondents was 8. The purple bar indicates the group of ICT skills.

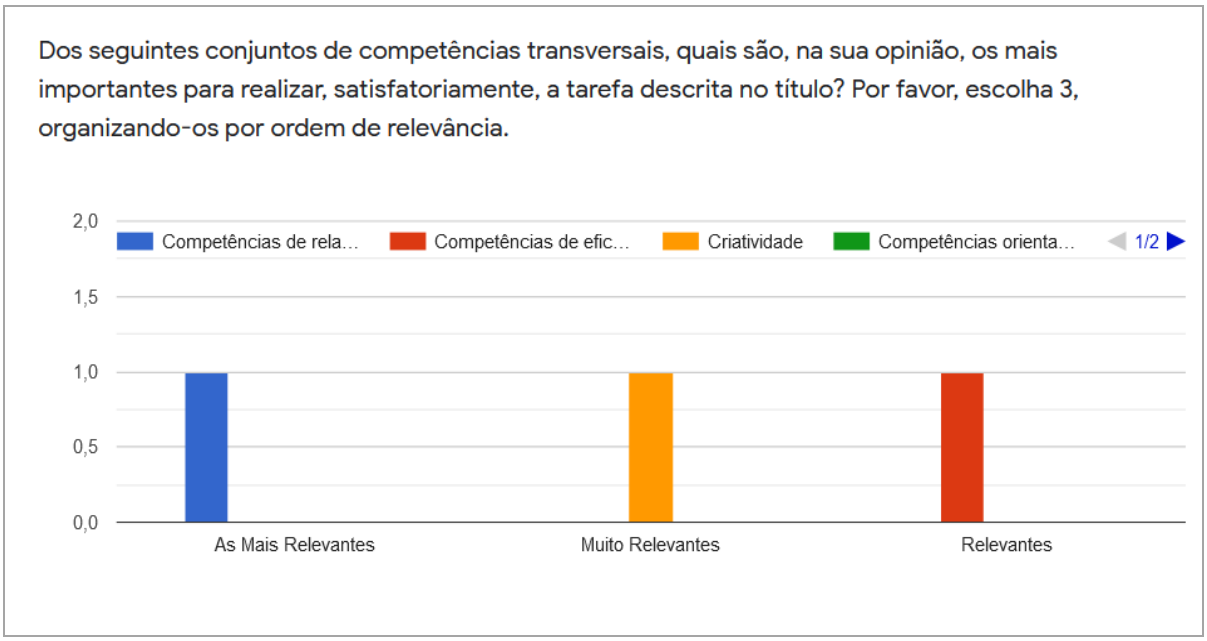

Figure 6. Results from the forms sent to teachers. The task refers to the students' acting roles. Only one teacher responded.

The following 2 graphs are the students' and teacher's answers to the task of assisting in editing software during and for the PBL activity (Figure 7. and Figure 8.):

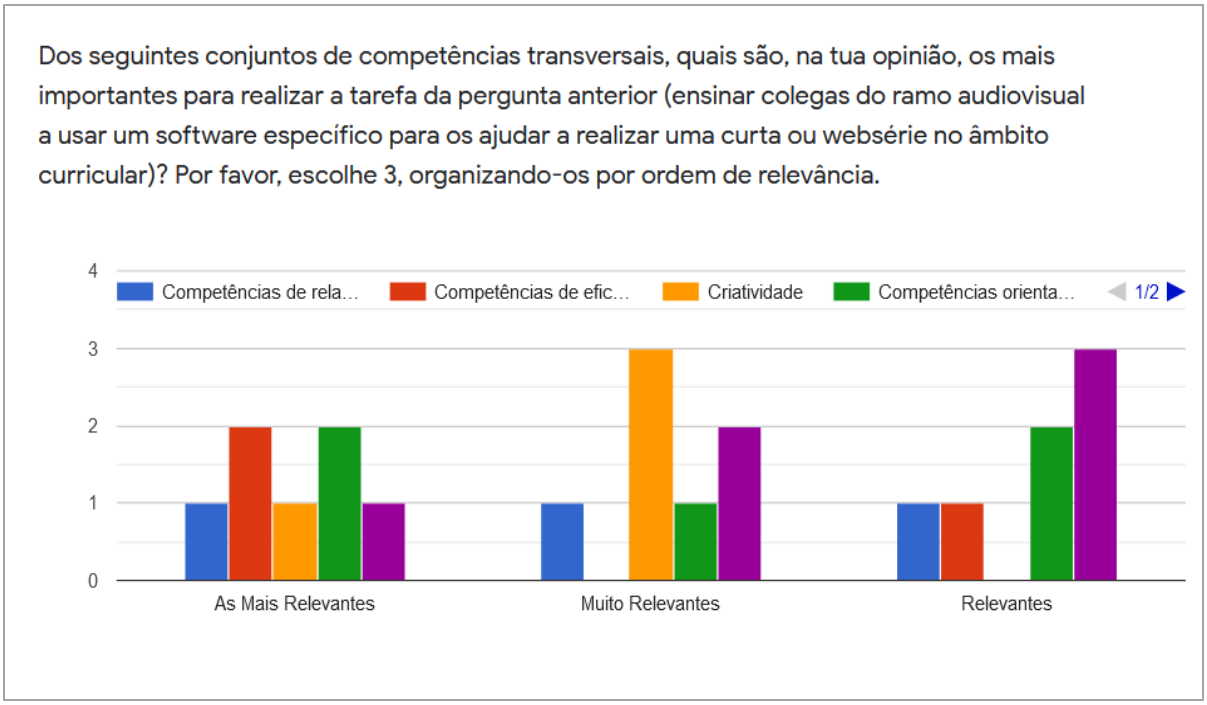

Figure 7. Results from the forms sent to student groups. The task refers to the role of assisting the team with editing software (named: "Software Guru"). The total number of respondents was 7. The purple bar indicates the group of ICT skills.

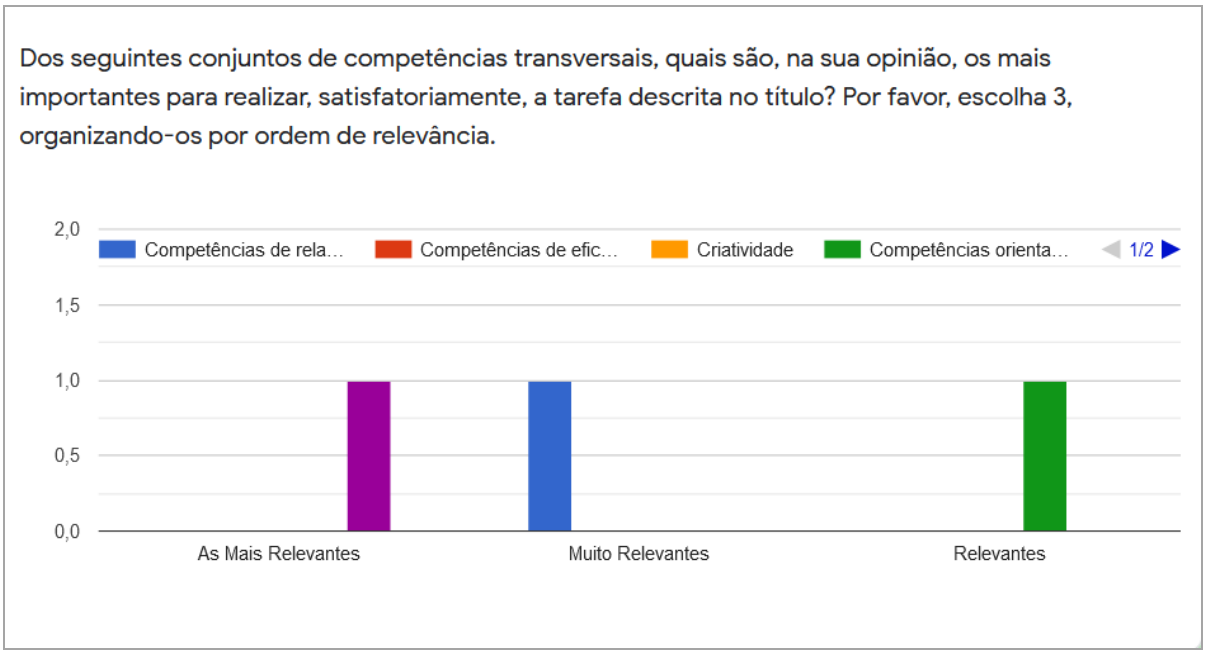

Figure 8. Results from the forms sent to teachers. The task refers to the students' role of assisting the team with editing software. Only one teacher responded. The purple bar indicates the group of ICT skills.

The text in each graph translates to "Of the following groups of soft skills, which are, in your opinion, those you consider more important to successfully execute the task previously mentioned *(each graph mentions the appropriate task)*. Please pick 3 groups, ordering them by relevance".

By grouping each opinion with three levels of relevancy, we could theoretically display these skill rewards in three different tiers. For instance, referring to the role of actor/actress (Figure 5. and Figure 6.), there is a unanimous majority of responses that state that interpersonal competencies are the most relevant to positively carry out the task. Taking this into account, we could assign these skills as the main skill cluster demonstrated upon completing the task, whereas the secondary skill demonstrated could be creativity and the tertiary one be personal effectiveness competencies. Each skill on the first two figures is unanimously categorized as "The Most Relevant", "Very Relevant" and "Relevant" by both teachers and students.

The second task (the role of assisting the team with editing software) provides a more challenging perspective since there is no consistency between the results (Figure 7. and Figure 8.). Of course, to make such an assessment depends on what weight we attribute to the students' response against the teachers'. There are many ways to solve this challenge, but we believe it is important to review our decisions to understand what the proper path could be. Seeing as we chose an activity that is more aligned with a peer-recognition framework[23] (Otto & Hickey, 2014), one could argue that the student's perspective is more important. However, it should be noted that this task was not sent out to random teachers, but in fact they were specific teachers that had a role in overseeing the PBL activity. Meaning that their active role and experience also holds a high level of relevance that should be translated into our badge to secure an appropriate authentication of the skills developed. In this case, we

would suggest an approach that accommodates both the students' and the teacher's perspective. The teacher considers ICT skills as the most relevant to execute the task at hand, while a vast majority of students consider them relevant. This means that, theoretically, if ICT skills were listed as a reward of that task, future students would not see an immediate disconnect between both. This skill cluster can be coded as the primary developed competency, since it is regarded as such by the teacher, while still being acknowledged by all students as relevant. Therefore, for the badge awarded for assisting the team with editing software, we would rank ICT skills as the primary demonstrated skill cluster. Regarding the secondary and tertiary skills, since there is no alignment between the teacher's evaluation and the students', we believe the next majorly appreciated skill cluster should be the one listed as secondary, this being Achievement skills. This is because, although the teacher ranked them the 3rd most important, many students, 5 out of 7, consider them at least "relevant", which should then attribute the rank of secondary competency demonstrated. The tertiary skill, since we are now talking about a lesser amount of relevance, could follow the students' perspective and, therefore, be "Creativity", since it would theoretically, further align itself with the expectations of future students, with 4 out of 7 students considering them relevant.

4.6. Further Research on Badge Systems

Research on badge systems, gamification and soft skills was ongoing throughout the investigation. This same research informed our decisions on the type of activity we have chosen for our hypothetical badge system, as well as the option to conduct our

[23] will be expanded upon in Step two of section 4.6., page 67 of this document.

focus group and to expand our research to a larger number of students and teachers thanks to the surveys. However, specific articles and sources were subsequently selected to guide us in designing our model for badge system implementation. This, in essence, comprises the elements of grounded theory research we have adopted in our study. Although we do not follow exactly the three steps of grounded theory (see section 3, p. 33 of this document, for reference), we adopt its inductive logic by: referring to our research steps, considering their results and, after doing the same for our selected studies, understanding which order and methodologies would yield a more efficient and effective process. In this section, we will expand upon the sources we have specifically selected for the construction of our model.

After collecting our data, these specific documents helped us in synthesising our findings and postulate how to proceed in making the model. These documents point to earlier practices of badge system design in various educational institutes, and each article focuses on specific subjects, such as the organization of badge systems, learning frameworks, types of activities, indicators of success and failure among the systems in education and the importance of the surrounding ecosystem.

One of the primary archival guides for this research were the articles written by the Design Principles Documentation (DPD) project[24]. The investigators on this project had the opportunity to follow the development of 30 prototypical badge systems, that were funded by Mozilla and the HASTAC organization (Otto & Hickey, 2014). Having witnessed the development of these models, they were able to make several observations on how their practices evolved separately. They would ask the leading teams of these systems to report their plans and experiences, which would be registered by the authors so that they could compare how and why the initial goals of these teams changed overtime. Similarities and distinctions in badge system design

were reported and sorted, ranging from practices as specific as recognition, authentication, ecosystem application, types of activities and tasks, to broader, more fundamental factors, like the intended badge functions, theoretical learning frameworks and how they influenced each badge model. The DPD project team proceeded with organizing these practices and functions into operable principles, which would further isolate the differences in each system, thus allowing the authors to establish statistical variables and relate them to the different outcomes that each system produced. However, it should be noted that the DPD project authors do not consider their findings to be conclusive. Instead, they advise the reader to consider their process as illustrative. This means that their various conclusions about what works better in badge systems are not based in causality but prototypical correlation. Nonetheless, it was based on these principles that we idealized a roadmap to guide further endeavours in badge system design. By presenting these principles as possible paths that a badge system designer may take, we are summarizing to the future badge teams two key topics: (1) the paths travelled by the pioneering badge system designers and (2) the suggestions made by the DPD project team to solve the challenges of those paths. Furthermore, the DPD project was not the only document that was consulted to inform our discussion of the results.

Aside from the work made by the DPD project there is another archival reference that was fundamental in guiding our design of a prototypical badge model. "Foundations of digital badges and Micro-Credentials" is a book edited by Dana Kristin Mah et al. (2016) that features a wealth of articles that report several experiences and academic research made from around the world, encompassing digital badges and micro-credentials at multiple levels, ranging from theoretical frameworks, historic backgrounds, past and current practices, among other

[24] http://dpdproject.info/about/

perspectives. It exposes many different case studies, all of which could contribute to a better understanding of digital badges and micro-credentials. Although many were useful to our work, we have decided to isolate those that served as more direct indicators for the various steps of our model. These are the following:

- "Passport to Designing, Developing and Issuing Digital Instructional Badges" by Newby et al. (2016)

- "Badging Platforms: A Scenario-Based Comparison of Features and Uses" by Dimitrijević et al. (2016)

- "Drivers, Affordances and Challenges of Digital Badges" by Lockley et al. (2016)

- "Toward a comprehensive Theoretical Framework for Designing Digital Badges" by Willis and Xie (2016)

- "When Digital Badges Work: It's not About the Badges, it's About the Ecosystem" by Itow and Hickey (2016)

- "Implementing a Badging System Faculty Development" by Hamson-Utley & Heyman's (2016).

4.7. Badge Implementation Model

Below is a visual representation of our final digital badge model (Figure 9.). In the following pages we will expand upon each step.

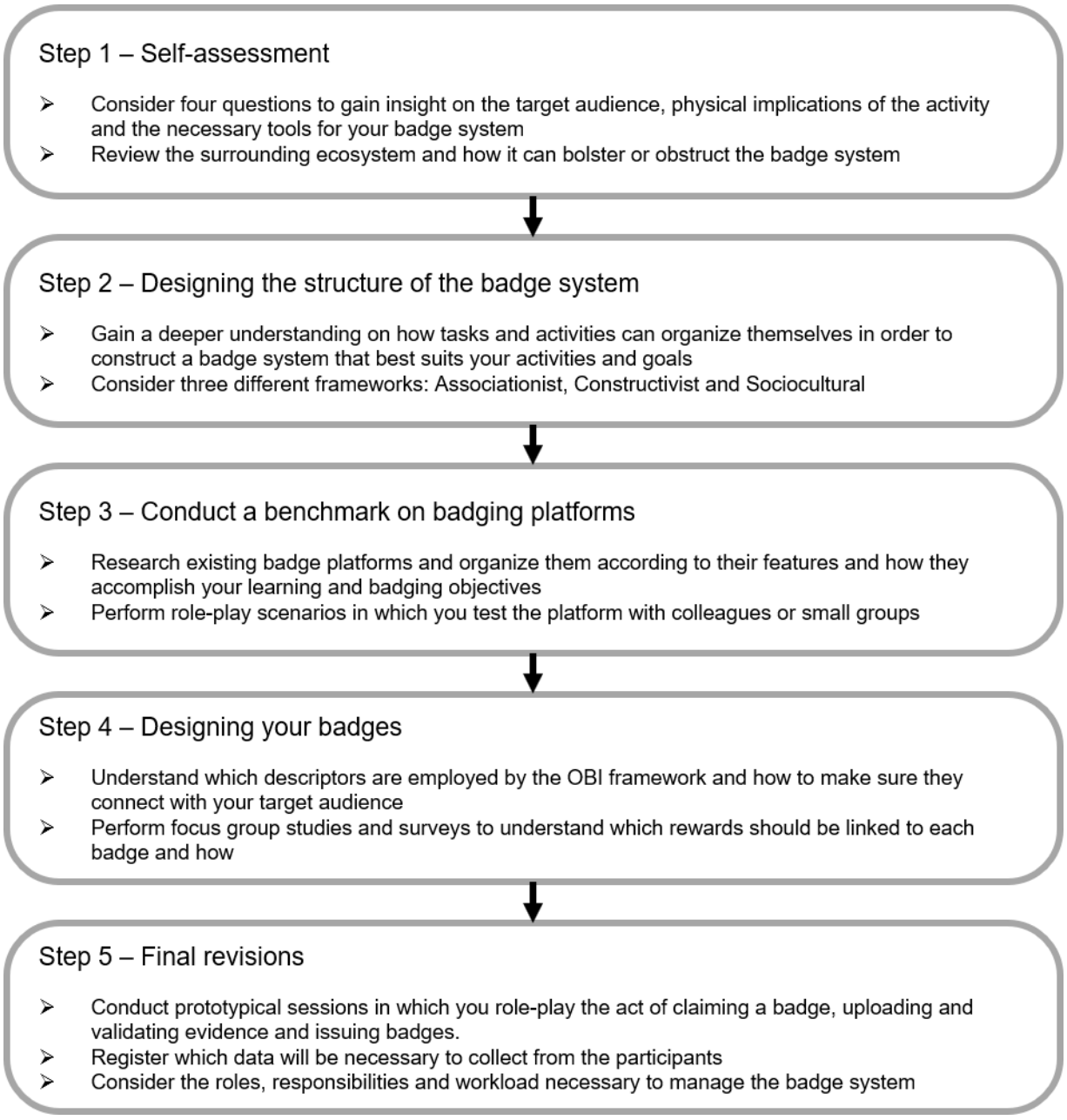

Figure 9. A visual representation and summary of our badge system model

Step one – Self Assessment

As mentioned, one of the archival sources that was instrumental to our research was the edited volume "Foundation of digital badges and micro-credentials" (Mah et al., 2016). Articles from this volume have been used throughout the present document, however, for the purposes of this chapter, the research team would like to highlight specific articles that we considered more useful at revealing instructional guidelines to build a digital badge system.

The first of these is the work made on Purdue University's Passport[25] digital badge platform "Passport to Designing, Developing, Issuing Digital Instructional Badges" by Newby et al. (2016). This work offers a guide through Passport, which works with the OBI framework, praised by the authors for its robustness. This platform offers tools that allow instructional users to link badges to several types of educative tasks and challenges as well as diverse assessment methods, coupled with a traditional image editor to create badges with, and a general information editor in which one can set learning outcomes and badge competencies. Students can also use the platform to display their badges earned, which means the platform comes packaged with its own social networking system.

The platform guide comes after a section named "Badge Development Guidelines" (p. 181) in which the authors offer several considerations (or "rationales") relevant to the process of adopting a badge platform. These considerations present general rationales and rhetorical questions that help the badge system designer make a proper self-assessment of their objectives. Specifically, they can provide insight into factors such as the target audience, educational purposes, badge value,

environmental conditions, and authentication practices. The authors divide these considerations in "prior, during" and "after" the creation of a single badge, going even deeper into suggested metrics that can more specifically evaluate the badge itself. Since we are working on a broader scale than just the design of single badge, we have decided to focus our perspective into the "prior" considerations and expanding upon them, adapting them to a more holistic view, which is also backed up by the DPD document mentioned before.

The considerations brought up by Newby et al. were adapted into the following questions which the design team should consider before proceeding to advanced steps:

- Question 1: Who is the target audience in the badge system? Who are the earners, assessors[26], and issuers? What are the earners' educational desires and personal interests?
- Question 2: What are the educational purposes of the activity you wish to recognize and/or what formative functions would the badges serve?
- Question 3: Under which conditions and constraints does the activity/badge system operate? What are the technological needs for each participant to claim and share their badges?
- Question 4: What will constitute necessary evidence for a participant to realize the purposes of the badge?

Reflecting upon Question 1 should reveal demographical data that may give some indication on the language that should be adopted throughout the system's presentation. Establishing user profiles that reflect their educational interests should

[25] https://passportlearn.com/

[26] Agents responsible for validating and evaluating the completion or failure of the task that is linked to a badge. Success awards the earner with the badge while failure does not.

help the team to project scenarios and examples that can be tested and prototyped. This also applies to the other roles, like assessors and issuers. Even though they are not the badge earners, it is important to promote their interests in participating. These will most likely be other teachers, thus it is important to know their educational objectives so that the design team can explore ways to demonstrate digital badges as viable ways to further their goals.

Question 2 is designed to suggest a review of the activity and tasks. Is the activity meant to motivate students to learn a particular subject (motivational purposes)? Is it to show how something that they have learned before can be pragmatically applied (application purposes)? Is it to teach a particular subject matter (informational purposes) or to assess the knowledge that they have previously gathered (assessment purposes)? Knowing the answer to these questions further clarifies the types of badges that should be created, as well as possible learning pathways between them.

Question 3 refers specifically to the environment the participants will be in while claiming badges, i.e., what kind of evidence should they provide and how will it be certified. The design team should review what is necessary for students to enact the activity and to interact with the badge platform, taking note of any crucial hardware or software that would otherwise be missing.

Finally, question 4 should help the designer conceptualize what resources will be needed to produce the necessary evidence itself. The team should also reflect upon what kind of evidence this will be (photographical, written, recorded, etc.).

In addition to these questions, we would also recommend two other self-assessment opportunities for the design team to review the surrounding ecosystem[27] of their badge model and to create a decision log. These two points are brought up by the DPD project authors, who place great emphasis on both the ecosystem surrounding the badge system and the tools it provides. They point out that many of the least successful badge systems that they monitored failed to consider these factors, which made their badge systems redundant or ineffective. The most successful models that were observed by the DPD project team had integrated their badges within the ecosystem, taking advantage of existing e-portfolio tools, online forums, social habits and practices, communication opportunities within their institutions, among others.

In summary, for this first step of the model, our research indicates that following a rationale of self-assessment at multiple levels, coupled with the creation of a decision log can help the design team have a clearer understanding of their own objectives, their target audience, the parties involved, the tools that will be necessary for producing and evaluating evidence and how the surrounding ecosystem may inhibit or facilitate the development of the badge system. Much like the referred chapter from Newby's work, we compiled a table that summarizes the information on step one of the badge model (see Table 6., next page):

[27] "Ecosystem", in this context, refers to the learning environment and opportunities that the educational institution provides. For further details, check the article "When digital badges work: It's not about the badges, it's about learning ecosystems" (Itow & Hickey, 2016) which can be found in the book "Foundation of Digital Badges and Micro-Credentials: Demonstrating and Recognizing Knowledge and Competencies", chapter 10, page 415 (Mah et al., 2016).

Rationales	Insights
Q1: Who is the target audience in the badge system? Who are the earners, assessors, and issuers? What are the earners' educational desires and personal interests?	Helps define the kind of language to be used in the communication strategy, like copy and badge descriptors, to align badge goals with those of the participants.
Q2: What are the educational purposes of the activity you wish to badge and/or what formative functions would the badges serve?	Purposes can range from: Motivational, Informational, Applicational, and Assessment – Having an idea of these will help visualize the task and badge organization of the system.
Q3: Under which conditions and constraints does the activity/badge system operate? What are the needs (tech wise) for each participant to claim and share their badges?	Assess the tools and resources that will be necessary to participate in the badge system, produce evidence and share badges.
Q4: What will constitute necessary evidence for a participant to realize the purposes of the badge?	Assess the competencies necessary to prove mastery of the subject matter.

Table 6. Rationales and Insights, adapted from T. Newby et al.'s work. (Newby et al., 2016)

Step two – Conceptualizing a viable system framework

Having now a clear understanding of the activity one wishes to apply a badge system to, it is easier to project how the badges could work with each other. Among the observed badge models, the DPD project team noticed structural similarities. The organizational model for badges also proved to be a predictive factor for success, which revealed specific challenges between several frameworks. To clarify, the organization of badges in a badge system can adopt many forms. Depending on the activity proposed, the tasks that award badges can have different types of relationships, which ultimately shape the experience and badge-claiming processes for their participants. For example, badges with applicational purposes, i.e.: tasks in which knowledge is to be pragmatically applied, would often organize themselves in scaffolds, meaning one could only claim certain badges after having a specific set. Informational tasks could be divided into any number of badges, depending on the division of the subject matter itself, i.e.: there may be one participation badge for attending a single event, or several badges for being present at specific presentations. As for assessment and motivational purposes, the former may require a passing grade on a task, while the latter can be applied to an extra-curricular activity.

The DPD project cites 3 learning frameworks that are somewhat linked to how the projects organized their badges. We summarized these systems beyond their theoretical framework in favour of a more pragmatical approach for badges:

Associationist approach: According to DPD project, these models were mostly linked with associationist learning theories, that frame knowledge as a high order concept divided into hierarchies and networks of units of information. This, in badge design, can translate in a multitude of badges that have close association with each other, which can be organized in scaffolds, i.e.: one attains a high order badge after

multiple other badges have been claimed. This granularity of tasks encourages a self-paced progression within the system. Knowledge is, thus, treated as a summative process, wherein competencies are slowly built up until a mastery of a given subject matter is achieved. This is similar to more traditional models of education, hence why the DPD project links it to extrinsic motivation. A visual example of this approach can be found in Figure 10. (see next page) which was taken from Hamson-Utley & Heyman's "Implementing a Badging System Faculty Development" (2016). In their work, these authors also highlight the value of scaffolding goals as a way to sub-divide high order knowledge. This visual representation of the framework may help the designer understand the hierarchal nature of this approach and the possible relationships that badges (and micro-credentials) can form under its framework.

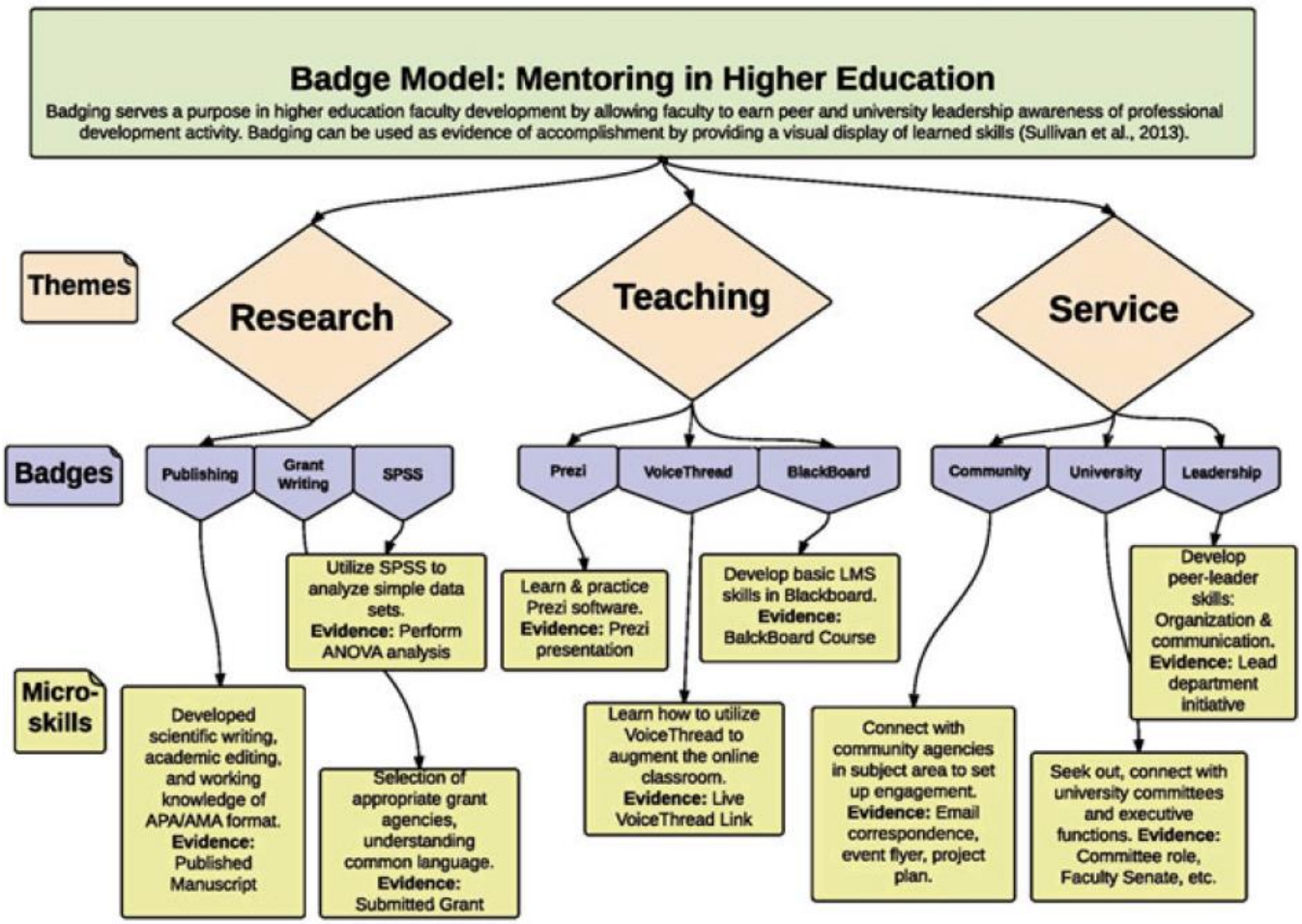

Figure 10. An example of an Associationist framework taken from "Implementing a Badging System Faculty Development" (Hamson-Utley & Heyman, 2016)*. Each theme represents a division from a high order concept. Badges and micro-skills are, then, sub-units of those themes.*

Constructivist approach

This approach to badge system design is characterized as somewhat of an opposite to the former, wherein high-order knowledge is not broken into units. Instead of having multiple badges for several tasks within an activity, fewer badges were rewarded for the completion of bigger groups of tasks, reducing granularity. According to the DPD project, this kind of organization system dismisses summative

assessment in favour of a broader understanding of the activity's learning objectives. It is the individual that makes sense of the whole experience, instead of it being already divided into clear connections. The assessment methods in this model focus on the overall performance of the participant who wishes to earn the badge.

Socio-cultural approach

This approach does not necessarily contrast with the previous ones as much as they did with each other. It distinguishes itself mostly because of the nature of its activities, tasks, and assessment methods, rather than their granularity. Which means it can be either highly granular or not, since it sets itself apart for being more focused in tasks wherein participants engage in learning through groups of peers. This, in turn, forms a peer-based framework for recognizing their earned competencies and progress (in other words, a peer-recognition framework). This process of sense-making is not necessarily summative or individual, but rather motivated and mediated by social interactions, which can make this approach more intrinsically rewarding depending on the participants and the tasks. In other words, the badges are made to reward already existing behaviour and social dynamics.

As stated before, the DPD project concludes that all the projects under their observation offered some sort of a hybrid between these systems. Some badges within their systems were more scaffolded, others demanded more complex and intricate skills and others had a strong association with a peer-based learning experience. Hybridization is, as such, expected and encouraged. The following table seeks to concisely expose the information present in DPD's documented, using their own words:

Badge System Design Approaches	Primary characteristics
Associationist	"(a) badges for self-paced individualized mastery of specific competencies, (b) summative assessments of those competencies, and (c) external and extrinsic forms of motivation"
Constructivist	"(a) awarding badges for completing larger projects or investigations, (b) higher-order conceptual understanding, and (c) performance-based and portfolio-based assessment methods"
Sociocultural	"(a) badges for engaged participation in social learning and completion of group projects, (b) peer-assessment or "crowdsourced" assessment practices, and (c) more social and cultural forms of motivation"

Table 7. Adapted from the Design Principles Documentation project (Otto & Hickey, 2014)

Step three – Platform benchmarking and selection

In section 4.1. we presented a benchmark detailing the analysis of several badge platforms with different features (Table 2. p. 37). Once we had a clear idea of our badge-rewarding tasks and how to leverage the resources within the ecosystem, deciding which platform to use was made easier. This benchmarking practice is defended both in the DPD project's document and in Dimitrijević et al.'s article "Badging Platforms: A Scenario-Based Comparison of Features and Uses" (2016), the latter of which offers a platform benchmark with different criteria, which shall be expanded upon in this step.

The benchmark table made during our investigation offered an overview of digital badge platforms sorted by their basic and advanced features. However, Dimitrijević et al.'s benchmark (Table 8.) scores several platforms according to their effectiveness in usability scenarios. This scenario-based benchmark can be useful for desginers to have an idea on how the features we covered can impact the experience of the user. Additionally, these scenarios serve as suggestions for role-playing tests that the design team should conduct to gain a clearer understanding of the platforms under analysis. Therefore, we will briefly go over Dimitrijević et al.'s findings, summarizing how they defined their scenarios and resulting benchmark.

After an overview of the badge platforms that were analysed in the aforementioned document, Dimitrijević et al. proceeded to suggest a "general badging scenario" of interacting with badge platforms, comprised of four steps (adapted from Dimitrijević et al., 2016):

"1. A badge issuer establishes badge earning criteria, and then designs, creates and offers badges.

2. Users earn and collect targeted badges.

3. Users decide which badges they want to display/share on personal profile pages, social networking sites, community hubs, etc.

4. People interested in the badge holders' background go through their public/shared badges and learn more about the achievements of interest by examining the information exposed by the badges."

From this general scenario, Dimitrijević et al. developed seven sepecific scenarios, each of which with a list functional requirements. Platforms were graded based on how many functional requirements they could fulfill for each scenario. Thus, acording to the team, the higher they would score, the more adept the platform would be at carrying out each scenario successfully. Since this section in the present study functions as a suggestive guideline, we will not go into each functional requirement of the scenarios proposed by the aforementioned authors. However, we will provide their definition and one example of each functional requirement for a better understandment of their nature. Following this we will provide the benchmark table of that same study (Table 8.).

The scenarios are as follows:

1. Scenario 1 (S1) – "**Offering badges:** In order to make badges available for issuance, a badge designer/creator designs/creates badges and badge pathways in accordance with the selected instructional design." – S1 had 9 functional requirements; example: "creation of badge visual representation".
2. Scenario 2 (S2) – "**Badge discovery:** In order to discover learning/badge opportunities, a learning opportunity seeker searches for, reviews and compares the learning opportunities." – S2 had 3 functional requirements; example: "selection of a badge opportunity".
3. Scenario 3 (S3) – "**Applying for badges**: In order to apply for a badge, an applicant registers for the badge opportunity, and works on meeting the badge criteria and obtaining the evidence that the badge criteria were satisfied (…)" – S3 had 4 functional requirements; example: "applying for a badge by submitting the evidence or artifacts".
4. Scenario 4 (S4) – "**Awarding badges:** For a badge to be awarded, assessors (individual assessor, multiple assessors or software system) first assess the badge application; (…). If the badge awarding is approved, the issuer makes the badge available to the badge earner." – S4 had 14 functional requirements; example: "manual badge awarding".
5. Scenario 5 (S5) – "**Management of and reflection over collected badges**: In order to track his/her progress and to improve awareness of his/her self-improvement goals, a badge applicant collects, organizes and reflects over the badges, preferably with the aid of visualizations." – S5 had 6 functional requirements; example: "importing badges earned elsewhere".
6. Scenario 6 (S6) – "**Displaying and sharing badges**: In order to present his/her achievements to the public, a badge earner tailors the badge display and displays or shares his/her badges." – S6 had 7 functional requirements; example: "displaying badges on a personal page within the platform".

7. Scenario 7 (S7) – "**(Re)viewing a badge earner's achievements**: In order to get familiar with or to verify a badge earner's achievements, a badge consumer views/examines the badge earner's overall achievements, exposed e.g. in his/her public profile or digital portfolio, as well as individual badges of interest." – S7 had 5 functional requirements; example: "evidence validation".

	BadgeList	BadgeOS	Credly	ForAllRubrics	Open Badge Factory	Purdue Passport
S1 "Offering badges"	4/9	**5/9**	3/9	5/9	4/9	3/9
S2 "Badge discovery"	1/3	**2/3**	1/3	1/3	1/3	**2/3**
S3 "Applying for badges"	**4/4**	3/4	3/4	3/4	3/4	3/4
S4 "Awarding badges"	6/14	8/14	8/14	**9/14**	6/14	7/14
S5 "Management and reflection over collected badges"	1/6	1/6	**4/6**	3/6	4/6	2/6
S6 "Displaying and sharing badges"	5/7	1/7	**7/7**	5/7	5/7	5/7
S7 "(Re)viewing badge earner's achievements"	3/5	2/5	3/5	3/5	**5/5**	**5/5**

Table 8. "The number of implemented functional requirements in relation to the number of functional requirements identified for a specific scenario" taken from Dimitrijević et al's. work (Dimitrijević et al., 2016, p. 151).

The benchmark table provided Dimitrijević et al. offers a scenario-based review of existing badge platforms. Together with our benchmark, readers may have a clearer idea on which features do badge platforms have and how do they perform in different usability scenarios. Knowing how the selected activity functions and how each task is

authenticated and validated should inform the designer on which scenarios will be crucial to play out properly in their systems. Thus they can role-play these scenarios with their analysed platforms to gauge which performs better.

In summary, step three should be dedicated to conducting research on existing platforms. The designers should conduct pilot studies with role-playing scenarios to reach conclusions about the practical implications of using these platforms. Creating a handful of badges and inviting willing participants to carry out a small activity are examples of methods for evaluating a platform. We claim that the choice should be limited to platforms that are compliant with the OBI framework, so that badges earned may be compatible with other platforms and portfolios the world over, should the system be successful.

Step four – Designing the badge anatomy

In their document "Drivers, Affordances and Challenges of Digital Badges" (2016), Lockley et al. state that digital badges distinguish themselves from higher-education credentialing systems because they provide more accurate portrayals of the student's competencies. This is because badges operate on an evidence-based system, which means that each competency credited by a badge links to a set of specific tasks the learner has successfully realized, rather than it being implied in a grade-based diploma, in which learning outcomes are not usually divided into modular units of knowledge. In this way, badges can act as a "*lingua franca"* between "learners, educators and employers", since they can clarify exactly which skills and attributes their badges recognize (Lockley et al., 2016). This why the recognition of competencies is crucial for the success of a badge system both for its participants and future stakeholders.

"*Developing competency frameworks requires agreement by discipline or domain experts from within the academy and from practice*" (Lockley et al., 2016, p. 55).

It was based on this argument that the authors of the present document placed great emphasis on conducting a focus group and survey research. It is important to know how to use badges' descriptors to create a solid understanding of the educational purpose of each badge and what benefits they might represent for the earner and professional judges, such as future employers. After all, this is the primary point of contact that participants will have with the system as a whole. Recognition and authentication are, as such, important issues that badges and their system must make clear to students and future employers, since their metadata comprises the entire value proposition of the badge (and Open Badges) in general. The challenge in this step is, then, to make sure that the competencies attributed to each badge make sense to each stakeholder within and the badge system (earners, issuers, future employers, and the institution itself). Depending on the structure and type of activity, the process with which to solve these challenges may vary. Sections 4.3. and 4.4. (p. 45 and 58) of the present document show how we approached this challenge. Furthermore, a list of the OBI framework's descriptors can be found in section 2.3. (p. 26) This framework is further emphasized by Lockely et al., stating that a shared standard of badge and competency recognition will make it possible for earners to bring their learning outcomes from multiple educational institutions to other contexts, thus realizing the OBI's mission to recognize lifelong learning.

Step five – Review of necessary materials

The fifth and final step of our proposed model should consist of a general review of the whole process, but specifically of the experiments done with the badge platform and badges. This phase should be dedicated to establishing what are the exact tools and resources will be necessary to effectively carry out the badge system as intended. This requires an in-depth knowledge of the chosen platform, the chosen activity and the resources available to the students themselves.

Thanks to the platform test that we conducted with Badgr (section 4.2., p. 42), we were able to understand what necessary materials would be needed. In our example, we observed that Badgr has a "bulk reward" feature which, if given an excel sheet with all recipients and their respective emails addresses, they can collect the badges simultaneously, which reduces the cost that other platforms have of having to issue each badge individually. These email addresses need to be registered in an excel sheet template provided by the platform. Therefore, we will need to contact our participants to collect their preferred email addresses, which will later have to be registered in the excel sheet. Badgr also requires the participants to ask for their badges via email. Furthermore, Badgr does not have a functionality that allows users to send evidence for their completed tasks, so participants will have to send their evidence through email as well. This means that we will need to communicate with the participating students beforehand to collect their emails and instruct them on how they should proceed to claim a badge and send the necessary evidence. This could also be done by making use of the University of Aveiro's campus website, where we could publish these instructions and necessary procedures to engage with the badge platform.

5. Conclusions and Further study

This research began as a study on gamification strategies and how effective they could be in encouraging the development of soft skills through extra-curricular activities in HEIs. Due to the Covid-19 pandemic, instead of making a field experiment, the team decided to design a model that could be adopted by designers to implement badge platforms within their institutions. Of course, this model would have to undergo some level of experimentation to accurately measure its validity. Additionally, we believe that more participants, namely more responding teachers and students, would have also contributed to more accurate results and conclusions. This lack of overall engagement could reveal an absence of interest from the target audience, which is also valuable insight to have. Nonetheless, our explorative study provides a proposal for a badge system implementation model and a possible decision process to follow it.

From selecting our activity, benchmarking the available badge platforms and engaging with the student community with our focus group study and surveys, we believe that we have achieved a proposal that can be fruitful for further experimentation, which can provide a point of reference for future designers. Our grounded theory research encompasses several case studies and theoretical conclusions.

Our research question: "How can a badge system implementation model be designed for higher education institutions?" is directly linked with the challenge and context of the University of Aveiro. It was with that context in mind that the model was developed. The elements of grounded theory research that we have adopted to construct our badge model stems from several case studies and different

backgrounds and contexts. We believe that, coupled with our own research, we have streamlined a plethora of rich, experiential information from each source. This model is, in this way, a meta-analysis of existing literature, unique for its agglomerative and transversal nature. As we have stated, it does not guarantee a valid strategy to successfully implement badge systems within HEIs but can shed light on future system designers and help them make sense of all the available information. Furthermore, we believe that our processes in each step, such as the platform benchmark or our contacts with students and teachers, can also be useful for the collection of qualitative data or for future badge platform research, since it may bring to light necessities that specific platforms may tackle more accurately.

Additionally, we believe to have made advancements in understanding how higher education students and teachers perceive the value of soft skills and micro-credentials as they relate to extra-curricular activities. Much of what was said by the students during the focus group could be read as critiques of micro-credentials. A single soft skill reward may not be enough to give it the proper value for the earner and subsequent observers. To this end, we believe that reducing the hyper granularity of our micro-credentials by changing our soft skill list into clusters of soft skills would help future students better assess their value. This could benefit our badge system, since it would help students find it more credible and engaging, crucial aspects for the success of badge systems. Crediting soft skills by clusters is also used by the Europass[28] certification protocol (European Commission DG Employment Social Affairs & Inclusion, 2018) which corroborates our findings.

[28] https://europa.eu/europass/en

The research conducted in this document could be useful for achieving a meaningful gamification strategy to implement a badge system. Even if future research ends up suggesting a different model or alternate guidelines, we believe it will help badge designers and educational agents by giving them a starting point and suggestive approaches to the various obstacles that Open Badges in HEIs face. Regarding micro-credentials, their validity among alumni can be further clarified if the surrounding ecosystem is leveraged as a tool for more effective communication of the badges' potential.

Looking forward, researchers could try to implement this model and measure its efficiency and longevity within their own contexts and communities. This area of study is still new for various educational institutions. Therefore, it is crucial that more pioneering badge systems are tested on campus, in which, for example, participants are tasked with using a badge platform and claiming badges while registering their experiences and engagement. Future focus groups could be conducted for students who have received badges, or for teachers who were responsible for evaluating submitted evidence or for overseeing the tasks. There is also an important factor that is relatively underdeveloped in this area of study, namely the implications of having designers and agents in charge of making the system function appropriately. If badges were to have a global success in one HEI, how many staff members would be needed to manage the process? And how many hours would they have to work, in addition to their academic responsibilities? As badging and Open Badges are further developed in HEIs, it is possible that new functions within institutions will have to be created to manage these systems. Finally, the issue of the value of micro-credential is also dependent on other parties that were not the focus of this study, namely employers and stakeholders. Students' perspective on micro-credentials and Open

Badges is also very dependent on how they are valued by future employers or institutions.

The success of micro-credentials and digital badges, be it at a local or larger scale, can benefit students greatly for allowing more transversal or soft skills to be seamlessly integrated within campus activities and the academic life. The burgeoning success of Open Badges can encourage many students, teachers, course directors and employers to challenge more traditional forms of learning and recognize the potential of life-long learning through the self-paced mastery of the individual's preferred subject matters. Ultimately, this will produce more unique professionals with increasingly distinct sets of skills, both generic and specific. In turn, this will distinguish them from their peers, as it will train them to be all-rounders in their areas and excel in the soft skill demanding future of the workplace and academia. By constantly engaging with learning opportunities and acquiring more competencies, more learners can be encouraged to adopt a lifelong learning perspective throughout their professional lives.

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APPENDIX

I. Badgr Pre-Pilot Test Report

Introduction

This document is a report of the pre-pilot experiment conducted on the 10th of March 2020 in the University of Aveiro, wherein the Badgr platform was used to create badges for the "AVILA Sessions". This activity is hosted by teachers and both former and current students of the New Technologies of Communication (NTC) BSc of the Department of Communication and Art. This test served to evaluate Badgr's features and potential in this environment in order to gain a better understanding of them and the platform's overall performance, which is the reason why we designate this test a "pre-pilot".

AVILA sessions consist of 2-to-3 hour mentorship activities, where students from the New Technologies of Communication BSc form teams in order to tackle challenges based around programming languages, to help them succeed in a specific class. The supervisors and mentors of this activity consist of students that have completed that said class, be them current students of the course or even master's students. This activity is not only meant to help degree students hone their programming skills, but also for its mentors to develop communication, tutorship and planning skills, among other transversal competencies. These sessions often operate like a gamified competitive event, where teams made up of the participating students will need to conclude a linear

sequence of tasks before all other groups. Additionally, these events are usually built around themes, which helps in gamifying the whole activity, creating a both dynamic and fun environment for the participants to hone the skills that each challenge is tailored to test. The mentors are responsible for planning the event as well as designing the challenges and assets, which means they are compelled to discuss their ideas with one another and provide support for the participating students. Therefore, we consider that the AVILA sessions make for an interesting activity to test the badging platform with, since not only does it have organized challenges for the participants, each of which rewarding a specific skill, it could also be used to merit the mentors for the soft skills they develop while setting up the event: from communicating, designing assets, taking leadership in one session, among others. However, for the pre-pilot test we decided to only apply the badging experience around the participating students' challenges, since introducing the badge for the mentors at this stage would have been too late, seeing as they had already planned and set up the event.

The challenges for the participants follow a linear "path", each one requiring the student to display their knowledge of a specific function of a programming language. Hence, in order to test out the "Pathways" functionality of Badgr, an element was designed for each challenge, and every student of each team would receive a badge upon its completion.

Before the Session:

The first thing one must do before creating badges and Pathways in Badgr is to establish an Issuer. It does not need to be externally validated. A "Badges UA" issuer was created for testing purposes.

The AVILA Session activity had 4 distinct challenges corresponding to different functions of SQL language. Firstly, a Pathway was made for the whole activity, as well as a corresponding group that was subscribed to it.

The following badges were made:

- A Participation Badge
- A badge for each challenge (4 challenges)
- A badge for completing the session (6 badges in total)

Designing badges is easy and intuitive. Badgr allows users to either upload their own custom badge images or create one from their several icons and frames. It is possible to create a template and then use it for another badge, which helps the issuer maintain visual consistency between their badges. It is possible to inspect a badge and see who it has been already issued to, as well as editing its various attributes.

It was slightly more complex to construct a Pathway. I first created an element for each challenge, added the corresponding completion badge and made it so every subsequent element required the previous' badge to be completed. However, this would result in an instant completion of all elements when one badge was issued, because acquiring the previous badge was all it took for the next element's badge to be completed. Which means, in a linear Pathway, they would all be collected instantly. The solution was merely to remove completion badges, which stops the next badge from being automatically attributed. This was fixed before starting the pre-pilot experiment. Other than this minor setback, creating a Pathway was still simple to do, thanks to Badgr's UI that allows for users to create simple flow charts with "children" and "parent" elements.

Finally, groups are also not hard to make, but it is slightly cumbersome to create one, since it is necessary to first have a Pathway, and then, in the "Pathway" window, click on the "Manage Groups" button. Only then are we able to create a group to be subscribed to that Pathway, which means one cannot create a group and invite the people first, which, however, is not a significant detriment to the platform. It should be noted that a

group may be subscribed to several pathways. It is possible to import a .csv and invite multiple people at the same time. The platform allows for a template to be downloaded, with several columns of which only the email is required to be filled in. The uploading process is straight-forward and works the same for awarding badges in bulk.

Knowing that the teams for AVILA sessions had been already formed, for a total of 6, an equal number of excel sheets were produced. In these, participants would insert their emails so that they would later receive invitations to make an account and join the group created for the activity.

Before moving on, I should mention that it is also possible to invite staff members for the Issuer role. These may have one of 3 separate roles: "Owner" (all privileges), "Editor" (can create, delete and award badges but cannot change other staff member's roles) and "Staff Member" (can only issue badges). No additional roles other than my own as "Owner" were created for this experiment.

During the Session:

As the session began, I followed the progress of each group from a distance. I would ask the mentors to tell me when each team had completed a challenge since Badgr does not have an evidence submission system. As each team completed a challenge, I would go to the "badges" window and select the "bulk award" feature to reward the whole team at the same time, each member acquiring the badge automatically. It was easy to do, and I felt safe knowing that Badgr does not award the same badge twice, which means, even if I picked the wrong group, it would not cause

issues.

As I was taking notes, I would check the platform to collect more information. I noticed that although I could issue badges to members of the group in Badgr, these did not have a confirmation mark besides their name in the "Group Members" window. Badge earners in Badgr are not instantly added to a group for receiving a badge from a Pathway that group is subscribed to. It seems that the person is required to create an account, sign off and then sign in again into Badgr in order to be a listed member (Fig. 1). This, however, does not seem to create any change between members, at least in the perspective of an issuer. If a member of a group, even without the confirmation mark, receives a badge from a subscribed Pathway, it is possible to see that participant's progress thanks to a percentage bar on that player's handle in the "dropdown" menu of the group (Fig. 2).

Since players were competing to have their team be the first to solve all challenges, they did not take the time to join the group or view the badges.

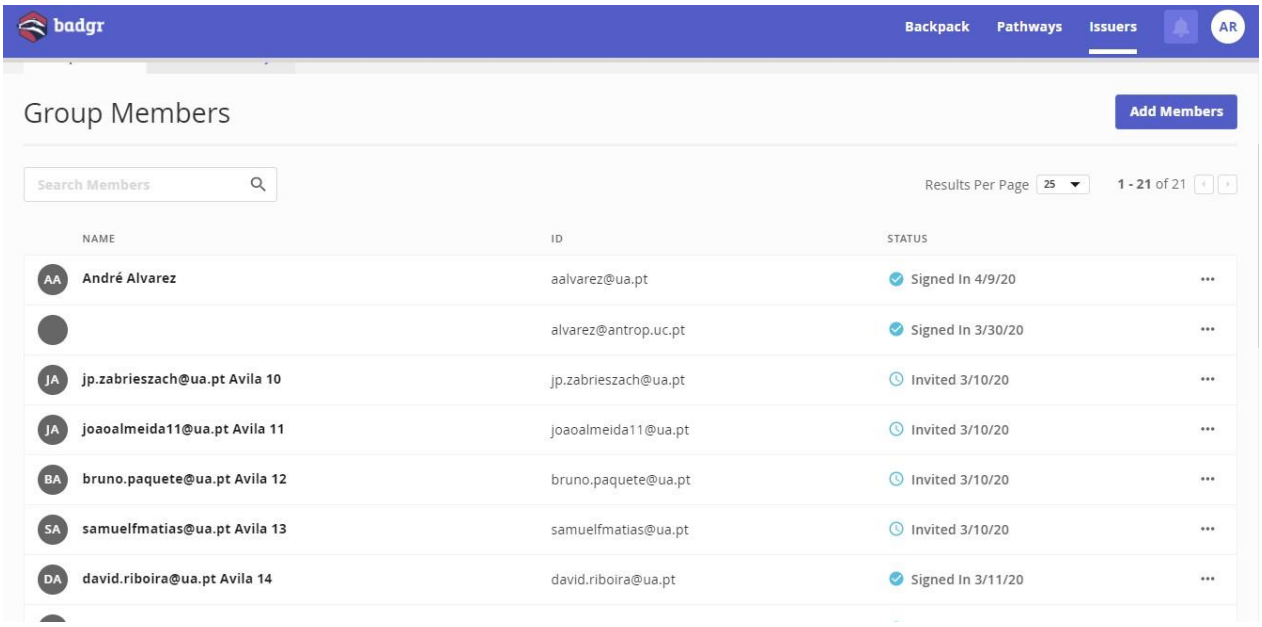

Fig 1. 'Group Members' window in Badgr*

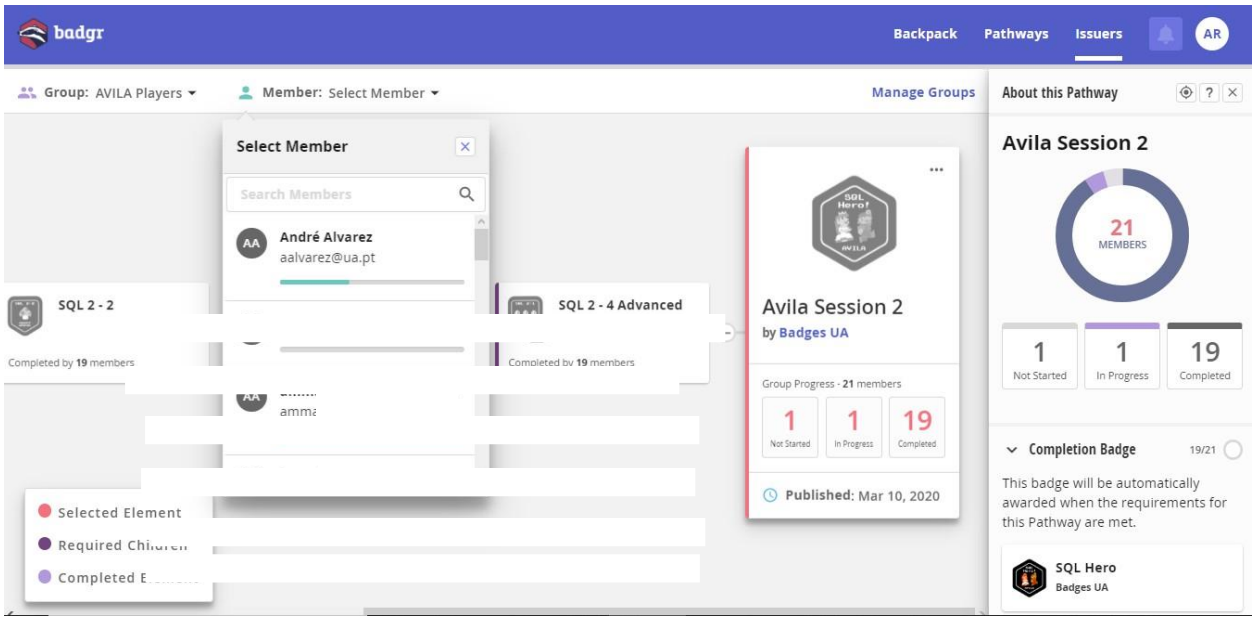

Fig 2. 'Pathways' window in Badgr

*Two of the members in the Group correspond to test accounts ("André Alvarez" and the other one in blank); The "status" only changes from "Invited" to "Signed in (...)" once the member signs in a second time after creating the account; Personal emails have been cut out from the image.

After the session:

After the activity, everyone's Pathways' progress bar shot up to 100% in the Pathways window. At first, we thought this happened because of students having to first create an account and accept the badges, which is not the case, since badges are awarded automatically, regardless of having an account. Simulations after the event were made which revealed that awarding badges in bulk may take more time to process, requiring the user to refresh the page often to clear the cache so that one may see the updated progress bars. However, it was not possible to exactly replicate the problem, which means that it may have been fixed with updates. Even so, this feature of

Pathways can help with accurately tracking the progress of each member if we consider activities of greater lengths (weeks or months, instead of a 2-hour session). The "bulk award" feature proved to be practical, since platform administrators can safely insert ".csv" files without fear of repeating names or badge awards. All they need is the template and then have the participants insert their emails and other details in the appropriate columns.

One of the participants, with which I spoke after the session, revealed that he was not aware that he had been included in the Badgr's group, as he did not receive an email that clarified his inclusion. This means that further external communication regarding the platform may be necessary when applying Badgr to other activities.

Results

- 100% of the badges were collected.
- Every student accessed the platform at least once.
- Each participant's progress was accurately monitored by Badgr (fig. 2)
- Only one student accessed the platform more than once, thus being the only whose status has a highlighted confirmation mark followed by "Signed in (...)" (fig. 1)

In summary

We believe Badgr can be a valuable badge platform for the recognition of extra-curricular activities within the University of Aveiro. The overall presentation is intuitive, simple and fairly easy to use. The "bulk award" feature and the ability to track each individual's progress within the Pathway seems to be very valuable in other activities. Designing badges is also easy to grasp, while allowing for multiple possibilities thanks to its sizeable icon and frame selection. It also allows one to create and save an aesthetical template. Finally, the existing roles for each Staff Member facilitates the creation of a hierarchy for any given team.

However, it should be noted that acquiring the Pro version is recommended, since the extra features are very useful. Not only would the platform become a more flexible tool to work with in various contexts (thanks to the QR/claim code functionalities), having a feature that gives us more accurate statistical data on the badges earned would be beneficial, especially when considering to apply the platform at an institutional level. Unfortunately, besides the missing features from the Pro, having each new member sign in to create an account, then sign off and in again to be seen as a member of a group can prove to be bothersome, but, thankfully, even if members don't do that we can still track their badge progress.

Regarding the activity itself, I think that we were able to have a clearer understanding on how Badgr works, but I do believe that AVILA sessions, at the participants' level, may not be the best activity to apply the platform in its free version. On the other hand, it could be a better fit at the mentor's level, since the activity planning process usually takes up one or two weeks prior to the event. This would require a very different logic of "skill-tree"/Pathway design since they do not complete each challenge in a fixed order, nor are they required to complete all tasks, since each

mentor has different roles in each event. Additionally, other methods of validating the attribution of each badge would have to be considered, as well as other challenges and achievements to be selected. For example, we could have the group of mentors recognize that one of them, during the planning of a session, had proven to be more creative for making the highest number of valuable suggesting during the brainstorming phase, or recognizing the member who was more frequently able to solve conflicts during the process, or even those that designed more assets. We believe that this could be the basis of the actual test we will be using for the project.

If we were to move forward with conducting the actual test with AVILA sessions, a focus group with former mentors should be held in order to reach specific examples of achievements that are valued among the mentors' staff. These achievements would then be used as the challenges in the actual test and would warrant a badge for everyone that completed them. Their recognition would be collective, so that everyone in a given group agrees that the person receives the appropriate badge.

This is just an example of what is possible to do with Badgr. Above all, we believe that this platform stands out for its versatility and simple yet efficient design. We do not think acquiring the Pro version will be necessary at this time, considering that we do not plan to select an event like AVILA sessions that only occurs for 2-3 hours. Instead we are currently discussing activities that will last until the end of the semester, which will open more opportunities for the students to learn the available badges and have time to complete the corresponding tasks. Furthermore, we can see Badgr's tracking functionality work as intended, and, thanks to the different staff roles we can potentially invite teachers or supervisors to issue badges, opening up another avenue for valuable results.

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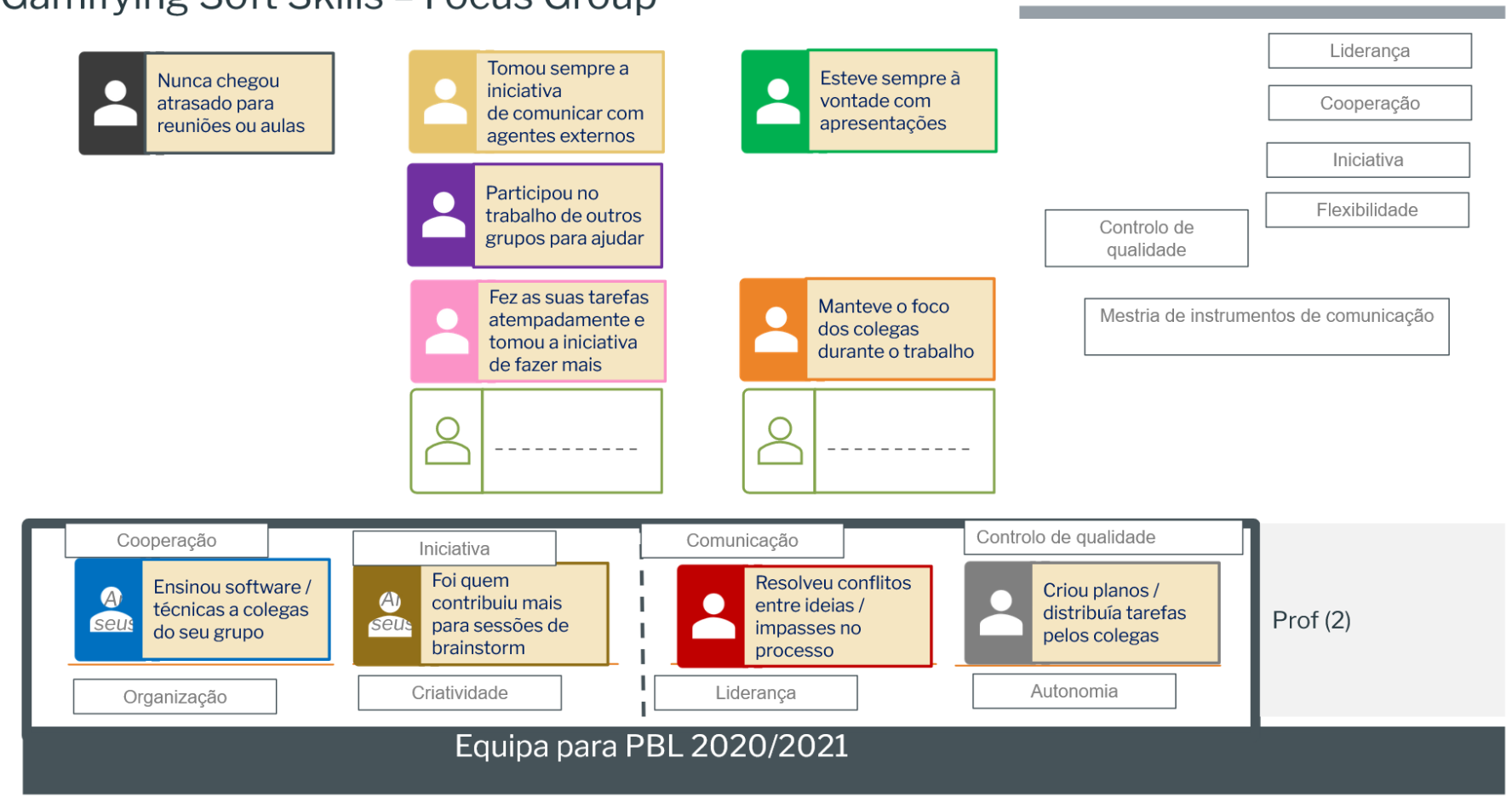
April 13th 2020

II. Focus Group

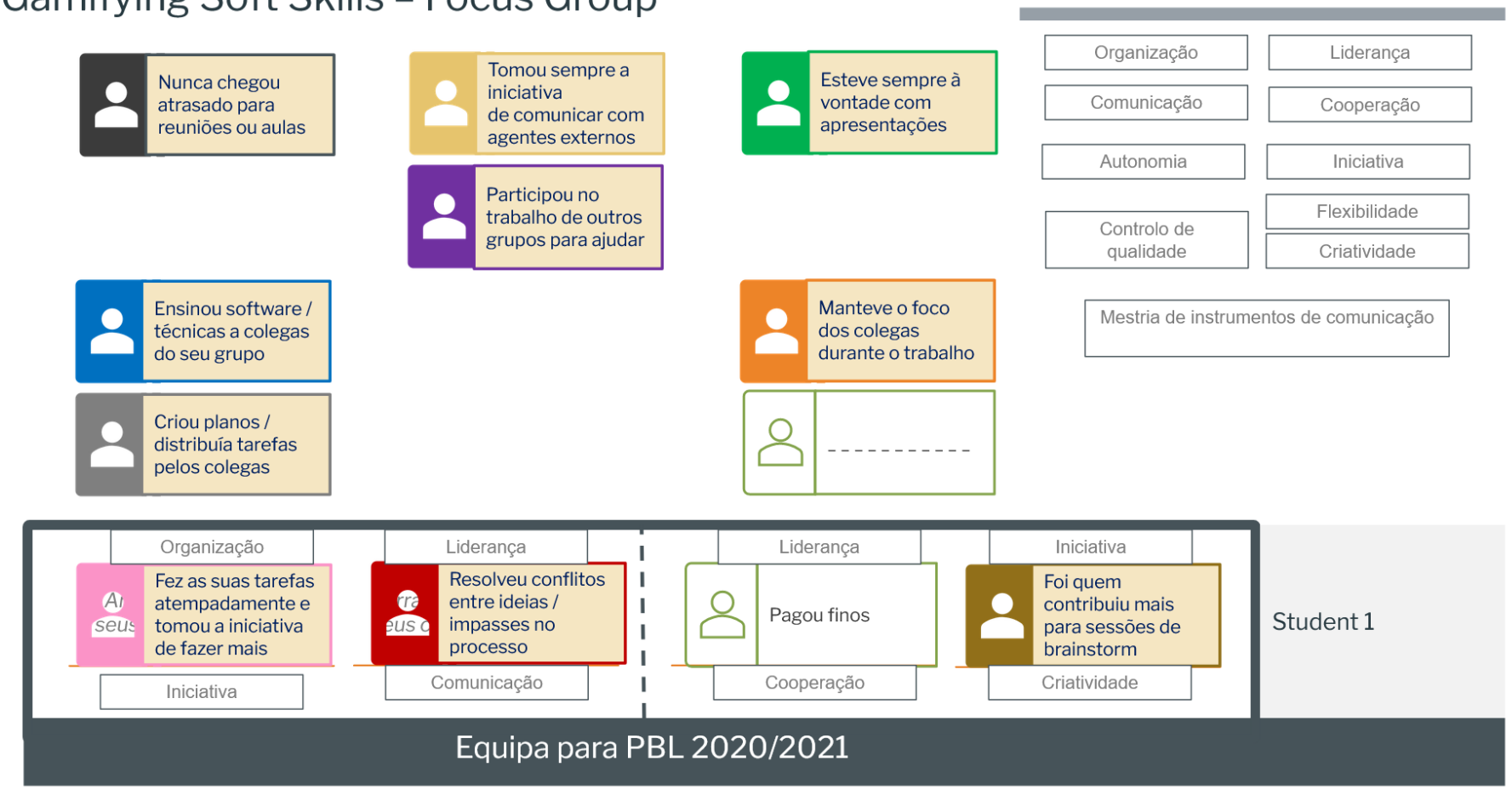
Final Slides

Gamifying Soft Skills – Focus Group

Gamifying Soft Skills – Focus Group



Gamifying Soft Skills – Focus Group



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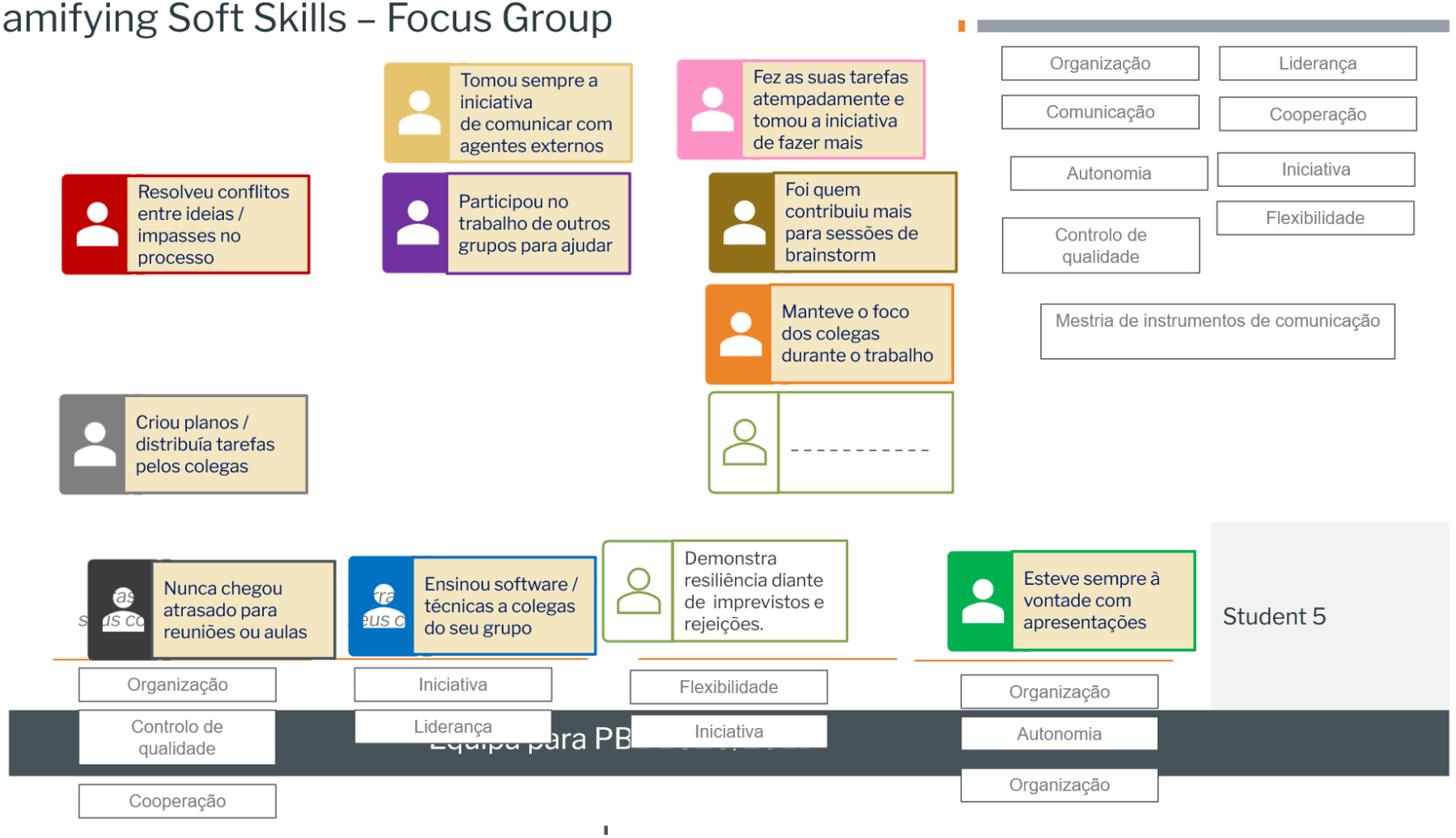

III. Surveys - Teacher's forms

1. Questions

Gamifying Soft Skills - questionário de investigação

Esta investigação tem como finalidade estudar a implementação de uma plataforma de crachás digitais e analisar o seu potencial no sistema de ensino na Universidade de Aveiro. Os crachás em questão, também conhecidos por "badges", servirão para recompensar os alunos interessados em atividades voluntárias, opcionais ou extra-curriculares, uma vez que estas contribuem igualmente para o desenvolvimento das suas competências transversais.

A equipa investigadora visa descobrir quais possíveis ligações se podem estabelecer entre as tarefas realizadas, dentro de um contexto específico, e as competências transversais que estas desenvolvem ou denotam. Para o efeito, a equipa decidiu reunir tarefas que surgem da participação voluntária nos projectos de realização de curtas e web-séries do primeiro ano do ramo audiovisual digital do Mestrado de Comunicação Multimédia, já que estas implicam o envolvimento de colegas de outros grupos ou até do ramo mulimédia. Com este exercício pretendemos inquirir os professores responsáveis pelas cadeiras do ramo audivisual que propiciam estas mesmas tarefas, com o intuito de conhecer a sua opinião no que toca às competências transversais que cada tarefa desenvolve.

Neste questionários foram isoladas 6 tarefas para avaliação. Pedimos que, para cada uma, indique, na sua opinião, quais conjuntos de competências transversais são mais relevantes para a realização staisfatória da tarefa em questão. Cada conjunto deverá ser ordenado por relevância e só poderá escolher 3 para cada uma das 6 tarefas.
*Obrigatório

1. Endereço de email *

Participar voluntariamente como ator / atriz numa curta ou websérie realizada por alunos do ramo audivisual digital.

2. Dos seguintes conjuntos de competências transversais, quais são, na sua opinião, os mais importantes para realizar, satisfatoriamente, a tarefa descrita no título? Por favor, escolha 3, organizando-os por ordem de relevância. *

Na última alínea pode encontrar um glossário que esclarece cada conjunto de competências.

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	Competências de relacionamento interpessoal	Competências de eficácia pessoal	Criatividade	Competências orientadas a objetivos	Mestria de instrumentos de comunicação
As Mais Relevantes	◯	◯	◯	◯	◯
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Relevantes	◯	◯	◯	◯	◯

3. Pode usar esta alínea para justificar a sua opinião.

Glossário de conjuntos de competências

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Competências orientadas a objetivos, como por exemplo: a preocupação por ordem e qualidade; iniciativa; planeamento; resolução de problemas e pesquisa e gestão de informação. São competências definidas pela tendência do indivíduo a tomar ações para alcançar objetivos concretos.

Mestria de instrumentos de comunicação: Competências que denotam um conhecimento mais específico. Estas referem-se às capacidades de manipulação de instrumentos de comunicação sejam estes software (programas de edição de imagem, vídeo, texto) ou ferramentas físicas (manipulação de câmaras de filmar ou fotográficas).

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Ensinar ou dar apoio a alunos do ramo audiovisual com software para edição e realização de curta ou webséries?

10. Dos seguintes conjuntos de competências transversais, quais são, na sua opinião, os mais importantes para realizar, satisfatoriamente, a tarefa descrita no título? Por favor, escolha 3, organizando-os por ordem de relevância. *

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Ajudar os colegas do ramo audivisual a construir uma página web, sem ser de uma rede social, para uma curta ou websérie que tenham produzido em âmbito curricular.

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Fim do questionário

Muito obrigado pela sua participação.

14. Se tiver alguma dúvida, sugestão ou comentário que queira colocar, por favor insira na caixa em baixo.

2. Answers

Gamifying Soft Skills - questionário de investigação

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As Mais Relevantes	○	◉	○	○	○
Muito Relevantes	◉	○	○	○	○
Relevantes	○	○	○	◉	○

Pode usar esta alínea para justificar a sua opinião.

Glossário de conjuntos de competências

Competências de relacionamento interpessoal, por exemplo: Comunicação; Cooperação - Estas competências denotam as capacidades de perceber as necessidades dos outros e as de cooperar com eles.

Competências de eficácia pessoal: São competências associadas ao desempenho de um indivíduo quando este opera sob stress e em situações complicadas. Estas competências denotam capacidades tais como: manter a concentração/calma em situações de stress; lidar com o insucesso; adaptação a novos ambientes; multi-tasking; entre outras.

Criatividade: Devido à natureza da atividade de realização fílmica, esta competência de eficácia pessoal foi isolada das demais. A criatividade é uma das bases fundamentais da arte, ciência, filosofia e tecnologia. Esta integra várias funções mentais juntamente com a experiência de vida acumulada, podendo, desta forma, refletir-se em competências como: originalidade, abertura a novas ideias, riqueza de imaginação, capacidade de inovar ou de usar recursos pouco convencionais, pensamento abstracto, entre outras.

Competências orientadas a objetivos, como por exemplo: a preocupação por ordem e qualidade; iniciativa; planeamento; resolução de problemas e pesquisa e gestão de informação. São competências definidas pela tendência do indivíduo a tomar ações para alcançar objetivos concretos.

Mestria de instrumentos de comunicação: Competências que denotam um conhecimento mais específico. Estas referem-se às capacidades de manipulação de instrumentos de comunicação sejam estes software (programas de edição de imagem, vídeo, texto) ou ferramentas físicas (manipulação de câmaras de filmar ou fotográficas).

Participar voluntariamente como compositor(a) ou sonoplasta numa curta ou websérie realizada por alunos do ramo audivisual.

Dos seguintes conjuntos de competências transversais, quais são, na sua opinião, os mais importantes para realizar, satisfatoriamente, a tarefa descrita no título? Por favor, escolha 3, organizando-os por ordem de relevância. *

Na última alínea pode encontrar um glossário que esclarece cada conjunto de competências.

	Competências de relacionamento interpessoal	Competências de eficácia pessoal	Criatividade	Competências orientadas a objetivos	Mestria de instrumentos de comunicação
As Mais Relevantes	○	○	◉	○	○
Muito Relevantes	○	○	○	○	◉
Relevantes	○	◉	○	○	○

Pode usar esta alínea para justificar a sua opinião.

Glossário de conjuntos de competências

Competências de relacionamento interpessoal, por exemplo: Comunicação; Cooperação - Estas competências denotam as capacidades de perceber as necessidades dos outros e as de cooperar com eles.

Competências de eficácia pessoal: São competências associadas ao desempenho de um indivíduo quando este opera sob stress e em situações complicadas. Estas competências denotam capacidades tais como: manter a concentração/calma em situações de stress; lidar com o insucesso; adaptação a novos ambientes; multi-tasking; entre outras.

Criatividade: Devido à natureza da atividade de realização fílmica, esta competência de eficácia pessoal foi isolada das demais. A criatividade é uma das bases fundamentais da arte, ciência, filosofia e tecnologia. Esta integra várias funções mentais juntamente com a experiência de vida acumulada, podendo, desta forma, refletir-se em competências como: originalidade, abertura a novas ideias, riqueza de imaginação, capacidade de inovar ou de usar recursos pouco convencionais, pensamento abstracto, entre outras.

Competências orientadas a objetivos, como por exemplo: a preocupação por ordem e qualidade; iniciativa; planeamento; resolução de problemas e pesquisa e gestão de informação. São competências definidas pela tendência do indivíduo a tomar ações para alcançar objetivos concretos.

Mestria de instrumentos de comunicação: Competências que denotam um conhecimento mais específico. Estas referem-se às capacidades de manipulação de instrumentos de comunicação sejam estes software (programas de edição de imagem, vídeo, texto) ou ferramentas físicas (manipulação de câmaras de filmar ou fotográficas).

Ensinar ou dar apoio a alunos do ramo audiovisual com software para edição e realização de curta ou webséries?

Dos seguintes conjuntos de competências transversais, quais são, na sua opinião, os mais importantes para realizar, satisfatoriamente, a tarefa descrita no título? Por favor, escolha 3, organizando-os por ordem de relevância. *

Na última alínea pode encontrar um glossário que esclarece cada conjunto de competências.

	Competências de relacionamento interpessoal	Competências de eficácia pessoal	Criatividade	Competências orientadas a objetivos	Mestria de instrumentos de comunicação
As Mais Relevantes	○	○	○	○	◉
Muito Relevantes	◉	○	○	○	○
Relevantes	○	○	○	◉	○

Pode usar esta alínea para justificar a sua opinião.

Glossário de conjuntos de competências

Competências de relacionamento interpessoal, por exemplo: Comunicação; Cooperação - Estas competências denotam as capacidades de perceber as necessidades dos outros e as de cooperar com eles.

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Competências orientadas a objetivos, como por exemplo: a preocupação por ordem e qualidade; iniciativa; planeamento; resolução de problemas e pesquisa e gestão de informação. São competências definidas pela tendência do indivíduo a tomar ações para alcançar objetivos concretos.

Mestria de instrumentos de comunicação: Competências que denotam um conhecimento mais específico. Estas referem-se às capacidades de manipulação de instrumentos de comunicação sejam estes software (programas de edição de imagem, vídeo, texto) ou ferramentas físicas (manipulação de câmaras de filmar ou fotográficas).

Ajudar os colegas do ramo audivisual a construir uma página web, sem ser de uma rede social, para uma curta ou websérie que tenham produzido em âmbito curricular.

Dos seguintes conjuntos de competências transversais, quais são, na sua opinião, os mais importantes para realizar, satisfatoriamente, a tarefa descrita no título? Por favor, escolha 3, organizando-os por ordem de relevância. *

Na última alínea pode encontrar um glossário que esclarece cada conjunto de competências.

	Competências de relacionamento interpessoal	Competências de eficácia pessoal	Criatividade	Competências orientadas a objetivos	Mestria de instrumentos de comunicação
As Mais Relevantes	○	○	○	○	◉
Muito Relevantes	○	○	◉	○	○
Relevantes	○	○	○	◉	○

Pode usar esta alínea para justificar a sua opinião.

Glossário de conjuntos de competências

Competências de relacionamento interpessoal, por exemplo: Comunicação; Cooperação - Estas competências denotam as capacidades de perceber as necessidades dos outros e as de cooperar com eles.

Competências de eficácia pessoal: São competências associadas ao desempenho de um indivíduo quando este opera sob stress e em situações complicadas. Estas competências denotam capacidades tais como: manter a concentração/calma em situações de stress; lidar com o insucesso; adaptação a novos ambientes; multi-tasking; entre outras.

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Competências orientadas a objetivos, como por exemplo: a preocupação por ordem e qualidade; iniciativa; planeamento; resolução de problemas e pesquisa e gestão de informação. São competências definidas pela tendência do indivíduo a tomar ações para alcançar objetivos concretos.

Mestria de instrumentos de comunicação: Competências que denotam um conhecimento mais específico. Estas referem-se às capacidades de manipulação de instrumentos de comunicação sejam estes software (programas de edição de imagem, vídeo, texto) ou ferramentas físicas (manipulação de câmaras de filmar ou fotográficas).

Fim do questionário

Muito obrigado pela sua participação.

Se tiver alguma dúvida, sugestão ou comentário que queira colocar, por favor insira na caixa em baixo.

Se quiser seguir os avanços da investigação, poderá deixar em baixo o seu email para o efeito.

IV. Surveys - Students' forms

1. Questions

Gamifying Soft Skills - questionário de investigação

Esta investigação tem como finalidade estudar a implementação de uma plataforma de crachás digitais e analisar o seu potencial no sistema de ensino na Universidade de Aveiro. Os crachás em questão, também conhecidos por "badges", servirão para recompensar os alunos interessados em atividades opcionais ou extra-curriculares, uma vez que estas contribuem igualmente para o desenvolvimento das suas competências transversais.

A equipa investigadora visa descobrir que possíveis ligações se podem estabelecer entre as tarefas realizadas, dentro de um contexto específico, e as competências transversais que estas desenvolvem ou denotam. Para o efeito, a equipa decidiu reunir tarefas que surgem da participação voluntária (ou seja, que não são formalmente avaliadas) nos projectos de realização de curtas e web-séries do primeiro ano do ramo audiovisual digital do Mestrado de Comunicação Multimédia, já que estas implicam o envolvimento de colegas de outros grupos ou até do ramo mulimédia interativo. Com este exercício pretendemos inquirir os alunos de MCMM de ambos ramos de modo a primeiro perceber se já realizaram estas tarefas e, caso tenham, recolher a sua opinião experiencial sobre as mesmas e que associações criam entre elas e as várias competêcias transversais.

Neste questionários foram isoladas 6 tarefas para avaliação. Os participantes deverão indicar quais destas eles realizaram e, caso tenham, de seguida preencherão um exercício breve de associação entre conjuntos de competências transversais e a tarefa em questão. A equipa de investigação assegura que a autoria dos dados será mantida em anonimato. Todo o questionário não deverá durar mais do que 5 minutos a responder.
*Obrigatório

Antes de começar!

1. Em que ramo do Mestrado em Comunicação Multimédia é que te inscreveste? *

   Marcar apenas uma oval.

   - ◯ Audiovisual Digital
   - ◯ Multimédia Interactivo

2. Em que ano te matriculaste no curso de MCMM? *

Marcar apenas uma oval.

- 2017/2018
- 2018/2019
- 2019/2020

"Oscar Material"

Nota: as tuas respostas devem ser feitas tendo em consideração contextos de trabalho em que colaboraste, mas nos quais NÃO estavas a ser avaliado(a).

3. Alguma vez paricipaste como ator ou atriz numa curta ou websérie realizada por alunos do ramo audiovisual digital? *

Marcar apenas uma oval.

- Sim *Avançar para a pergunta 9*
- Não

"Make-up Master"

Nota: as tuas respostas devem ser feitas tendo em consideração contextos de trabalho em que colaboraste, mas nos quais NÃO estavas a ser avaliado(a).

4. Alguma vez participaste como maquilhador(a) numa curta ou websérie realizada por alunos do ramo audiovisual digital? *

Marcar apenas uma oval.

- Sim *Avançar para a pergunta 10*
- Não

"Mr. / Ms. Narrator"

Nota: as tuas respostas devem ser feitas tendo em consideração contextos de trabalho em que colaboraste, mas nos quais NÃO estavas a ser avaliado(a).

5. Alguma vez participaste como narrador(a) numa curta ou websérie realizada por alunos do ramo audiovisual digital? *

Marcar apenas uma oval.

- Sim *Avançar para a pergunta 11*
- Não

"The Songwriter"

Nota: as tuas respostas devem ser feitas tendo em consideração contextos de trabalho em que colaboraste, mas nos quais NÃO estavas a ser avaliado(a).

6. Alguma vez participaste como compositor(a) ou fizeste sonoplastia para uma curta ou websérie realizada por alunos do ramo audiovisual digital? *

Marcar apenas uma oval.

- Sim *Avançar para a pergunta 12*
- Não

"Software Guru"

Nota: as tuas respostas devem ser feitas tendo em consideração contextos de trabalho em que colaboraste, mas nos quais NÃO estavas a ser avaliado(a).

7. Alguma vez ensinaste colegas do ramo audiovisual digital a usar um software específico para os ajudar a realizar uma curta ou websérie no âmbito curricular? *

Marcar apenas uma oval.

- Sim *Avançar para a pergunta 13*
- Não

"The Wiz of Web-design"

Nota: as tuas respostas devem ser feitas tendo em consideração contextos de trabalho em que colaboraste, mas nos quais NÃO estavas a ser avaliado(a).

8. Alguma vez ajudaste colegas do ramo audiovisual digital a criar uma página web (sem ser um perfil numa rede social) para uma curta ou websérie que teham realizado? *

Marcar apenas uma oval.

- ◯ Sim *Avançar para a pergunta 14*
- ◯ Não *Avançar para a pergunta 15*

Avançar para a pergunta 15

Parabéns, ganhaste o badge de "Oscar Material"!

Badge "Oscar Material"

9. Dos seguintes conjuntos de competências transversais, quais são, na tua opinião, os mais importantes para realizar a tarefa da pergunta anterior (ser um ator ou atriz numa curta ou websérie realizada por colegas do ramo audiovisual)? Por favor, escolhe 3, organizando-os por ordem de relevância. *

Na alínea seguinte poderás encontrar um glossário que esclarece cada conjunto de competências.

Marcar apenas uma oval por linha.

	Competências de relacionamento interpessoal	Competências de eficácia pessoal	Criatividade	Competências orientadas a objetivos	Mestria de instrumentos de comunicação
As Mais Relevantes	◯	◯	◯	◯	◯
Muito Relevantes	◯	◯	◯	◯	◯
Relevantes	◯	◯	◯	◯	◯

Glossário de conjuntos de competências

Competências de relacionamento interpessoal, por exemplo: Comunicação; Cooperação - Estas competências denotam as capacidades de perceber as necessidades dos outros e as de cooperar com eles.

Competências de eficácia pessoal: São competências associadas ao desempenho de um indivíduo quando este opera sob stress e em situações complicadas. Estas competências denotam capacidades tais como: manter a concentração/calma em situações de stress; lidar com o insucesso; adaptação a novos ambientes; multi-tasking; entre outras.

Criatividade: Devido à natureza da atividade de realização fílmica, esta competência de eficácia pessoal foi isolada das demais. A criatividade é uma das bases fundamentais da arte, ciência, filosofia e tecnologia. Esta integra várias funções mentais juntamente com a experiência de vida acumulada, podendo, desta forma, refletir-se em competências como: originalidade, abertura a novas ideias, riqueza de imaginação, capacidade de inovar ou de usar recursos pouco convencionais, pensamento abstracto, entre outras.

Competências orientadas a objetivos, como por exemplo: a preocupação por ordem e qualidade; iniciativa; planeamento; resolução de problemas e pesquisa e gestão de informação. São competências definidas pela tendência do indivíduo a tomar ações para alcançar objetivos concretos.

Mestria de instrumentos de comunicação: Competências que denotam um conhecimento mais específico. Estas referem-se às capacidades de manipulação de instrumentos de comunicação sejam estes software (programas de edição de imagem, vídeo, texto) ou ferramentas físicas (manipulação de câmaras de filmar ou fotográficas).

Avançar para a pergunta 4

Parabéns, ganhaste o badge de "Make-up Master"!

Badge "Make-up Master"

10. Dos seguintes conjuntos de competências transversais, quais são, na tua opinião, os mais importantes para realizar a tarefa da pergunta anterior (participar como maquilhador(a) numa curta ou websérie realizada por colegas do ramo audiovisual)? Por favor, escolhe 3, organizando-os por ordem de relevância. *

Na alínea seguinte poderás encontrar um glossário que esclarece cada conjunto de competências.

Marcar apenas uma oval por linha.

	Competências de relacionamento interpessoal	Competências de eficácia pessoal	Criatividade	Competências orientadas a objetivos	Mestria de instrumentos de comunicação
As Mais Relevantes	◯	◯	◯	◯	◯
Muito Relevantes	◯	◯	◯	◯	◯
Relevantes	◯	◯	◯	◯	◯

Glossário de conjuntos de competências

Competências de relacionamento interpessoal, por exemplo: Comunicação; Cooperação - Estas competências denotam as capacidades de perceber as necessidades dos outros e as de cooperar com eles.

Competências de eficácia pessoal: São competências associadas ao desempenho de um indivíduo quando este opera sob stress e em situações complicadas. Estas competências denotam capacidades tais como: manter a concentração/calma em situações de stress; lidar com o insucesso; adaptação a novos ambientes; multi-tasking; entre outras.

Criatividade: Devido à natureza da atividade de realização fílmica, esta competência de eficácia pessoal foi isolada das demais. A criatividade é uma das bases fundamentais da arte, ciência, filosofia e tecnologia. Esta integra várias funções mentais juntamente com a experiência de vida acumulada, podendo, desta forma, refletir-se em competências como: originalidade, abertura a novas ideias, riqueza de imaginação, capacidade de inovar ou de usar recursos pouco convencionais, pensamento abstracto, entre outras.

Competências orientadas a objetivos, como por exemplo: a preocupação por ordem e qualidade; iniciativa; planeamento; resolução de problemas e pesquisa e gestão de informação. São competências definidas pela tendência do indivíduo a tomar ações para alcançar objetivos concretos.

Mestria de instrumentos de comunicação: Competências que denotam um conhecimento mais específico. Estas referem-se às capacidades de manipulação de instrumentos de comunicação sejam estes software (programas de edição de imagem, vídeo, texto) ou ferramentas físicas (manipulação de câmaras de filmar ou fotográficas).

Avançar para a pergunta 5

Parabéns, ganhaste o badge "Mr. /Ms. Narrator"!

Badge "Mr. / Ms. Narrator"

11. Dos seguintes conjuntos de competências transversais, quais são, na tua opinião, os mais importantes para realizar a tarefa da pergunta anterior (participar como narrador(a) numa curta ou websérie realizada por colegas do ramo audiovisual)? Por favor, escolhe 3, organizando-os por ordem de relevância. *

Na alínea seguinte poderás encontrar um glossário que esclarece cada conjunto de competências.

Marcar apenas uma oval por linha.

	Competências de relacionamento interpessoal	Competências de eficácia pessoal	Criatividade	Competências orientadas a objetivos	Mestria de instrumentos de comunicação
As Mais Relevantes	◯	◯	◯	◯	◯
Muito Relevantes	◯	◯	◯	◯	◯
Relevantes	◯	◯	◯	◯	◯

Glossário de conjuntos de competências

Competências de relacionamento interpessoal, por exemplo: Comunicação; Cooperação - Estas competências denotam as capacidades de perceber as necessidades dos outros e as de cooperar com eles.

Competências de eficácia pessoal: São competências associadas ao desempenho de um indivíduo quando este opera sob stress e em situações complicadas. Estas competências denotam capacidades tais como: manter a concentração/calma em situações de stress; lidar com o insucesso; adaptação a novos ambientes; multi-tasking; entre outras.

Criatividade: Devido à natureza da atividade de realização fílmica, esta competência de eficácia pessoal foi isolada das demais. A criatividade é uma das bases fundamentais da arte, ciência, filosofia e tecnologia. Esta integra várias funções mentais juntamente com a experiência de vida acumulada, podendo, desta forma, refletir-se em competências como: originalidade, abertura a novas ideias, riqueza de imaginação, capacidade de inovar ou de usar recursos pouco convencionais, pensamento abstracto, entre outras.

Competências orientadas a objetivos, como por exemplo: a preocupação por ordem e qualidade; iniciativa; planeamento; resolução de problemas e pesquisa e gestão de informação. São competências definidas pela tendência do indivíduo a tomar ações para alcançar objetivos concretos.

Mestria de instrumentos de comunicação: Competências que denotam um conhecimento mais específico. Estas referem-se às capacidades de manipulação de instrumentos de comunicação sejam estes software (programas de edição de imagem, vídeo, texto) ou ferramentas físicas (manipulação de câmaras de filmar ou fotográficas).

Avançar para a pergunta 6

Parabéns, ganhaste o badge de "The Songwriter"!

Badge "The Songwriter"

12. Dos seguintes conjuntos de competências transversais, quais são, na tua opinião, os mais importantes para realizar a tarefa da pergunta anterior (compôr ou fazer sonoplastia para uma curta ou websérie realizada por colegas do ramo audiovisual)? Por favor, escolhe 3, organizando-os por ordem de relevância. *

Na alínea seguinte poderás encontrar um glossário que esclarece cada conjunto de competências.

Marcar apenas uma oval por linha.

	Competências de relacionamento interpessoal	Competências de eficácia pessoal	Criatividade	Competências orientadas a objetivos	Mestria de instrumentos de comunicação
As Mais Relevantes	◯	◯	◯	◯	◯
Muito Relevantes	◯	◯	◯	◯	◯
Relevantes	◯	◯	◯	◯	◯

Glossário de conjuntos de competências

Competências de relacionamento interpessoal, por exemplo: Comunicação; Cooperação - Estas competências denotam as capacidades de perceber as necessidades dos outros e as de cooperar com eles.

Competências de eficácia pessoal: São competências associadas ao desempenho de um indivíduo quando este opera sob stress e em situações complicadas. Estas competências denotam capacidades tais como: manter a concentração/calma em situações de stress; lidar com o insucesso; adaptação a novos ambientes; multi-tasking; entre outras.

Criatividade: Devido à natureza da atividade de realização fílmica, esta competência de eficácia pessoal foi isolada das demais. A criatividade é uma das bases fundamentais da arte, ciência, filosofia e tecnologia. Esta integra várias funções mentais juntamente com a experiência de vida acumulada, podendo, desta forma, refletir-se em competências como: originalidade, abertura a novas ideias, riqueza de imaginação, capacidade de inovar ou de usar recursos pouco convencionais, pensamento abstracto, entre outras.

Competências orientadas a objetivos, como por exemplo: a preocupação por ordem e qualidade; iniciativa; planeamento; resolução de problemas e pesquisa e gestão de informação. São competências definidas pela tendência do indivíduo a tomar ações para alcançar objetivos concretos.

Mestria de instrumentos de comunicação: Competências que denotam um conhecimento mais específico. Estas referem-se às capacidades de manipulação de instrumentos de comunicação sejam estes software (programas de edição de imagem, vídeo, texto) ou ferramentas físicas (manipulação de câmaras de filmar ou fotográficas).

Avançar para a pergunta 7

Parabéns, ganhaste o badge de "Software Guru"!

Badge "Software Guru"

13. Dos seguintes conjuntos de competências transversais, quais são, na tua opinião, os mais importantes para realizar a tarefa da pergunta anterior (ensinar colegas do ramo audiovisual a usar um software específico para os ajudar a realizar uma curta ou websérie no âmbito curricular)? Por favor, escolhe 3, organizando-os por ordem de relevância. *

Na alínea seguinte poderás encontrar um glossário que esclarece cada conjunto de competências.

Marcar apenas uma oval por linha.

	Competências de relacionamento interpessoal	Competências de eficácia pessoal	Criatividade	Competências orientadas a objetivos	Mestria de instrumentos de comunicação
As Mais Relevantes	◯	◯	◯	◯	◯
Muito Relevantes	◯	◯	◯	◯	◯
Relevantes	◯	◯	◯	◯	◯

Glossário de conjuntos de competências

Competências de relacionamento interpessoal, por exemplo: Comunicação; Cooperação - Estas competências denotam as capacidades de perceber as necessidades dos outros e as de cooperar com eles.

Competências de eficácia pessoal: São competências associadas ao desempenho de um indivíduo quando este opera sob stress e em situações complicadas. Estas competências denotam capacidades tais como: manter a concentração/calma em situações de stress; lidar com o insucesso; adaptação a novos ambientes; multi-tasking; entre outras.

Criatividade: Devido à natureza da atividade de realização fílmica, esta competência de eficácia pessoal foi isolada das demais. A criatividade é uma das bases fundamentais da arte, ciência, filosofia e tecnologia. Esta integra várias funções mentais juntamente com a experiência de vida acumulada, podendo, desta forma, refletir-se em competências como: originalidade, abertura a novas ideias, riqueza de imaginação, capacidade de inovar ou de usar recursos pouco convencionais, pensamento abstracto, entre outras.

Competências orientadas a objetivos, como por exemplo: a preocupação por ordem e qualidade; iniciativa; planeamento; resolução de problemas e pesquisa e gestão de informação. São competências definidas pela tendência do indivíduo a tomar ações para alcançar objetivos concretos.

Mestria de instrumentos de comunicação: Competências que denotam um conhecimento mais específico. Estas referem-se às capacidades de manipulação de instrumentos de comunicação sejam estes software (programas de edição de imagem, vídeo, texto) ou ferramentas físicas (manipulação de câmaras de filmar ou fotográficas).

Avançar para a pergunta 8

Parabéns, ganhaste o badge de "The Wiz of Web-Design"!

Badge "The Wiz of Web-design"

14. Dos seguintes conjuntos de competências transversais, quais são, na tua opinião, os mais importantes para realizar a tarefa da pergunta anterior (ajudar um grupo de colegas do ramo audiovisual a conceber uma página de web para uma curta ou websérie que tenham realizado num âmbito curricular)? Por favor, escolhe 3, organizando-os por ordem de relevância. *

Na alínea seguinte poderás encontrar um glossário que esclarece cada conjunto de competências.

Marcar apenas uma oval por linha.

	Competências de relacionamento interpessoal	Competências de eficácia pessoal	Criatividade	Competências orientadas a objetivos	Mestria de instrumentos de comunicação
As Mais Relevantes					
Muito Relevantes					
Relevantes					

Glossário de conjuntos de competências

Competências de relacionamento interpessoal, por exemplo: Comunicação; Cooperação - Estas competências denotam as capacidades de perceber as necessidades dos outros e as de cooperar com eles.

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Chegaste ao fim!

Muito obrigado pela tua participação.

15. Tens alguma sugestão, dúvida ou comentário em relação ao questionário que realizaste? Se sim, podes escrever em baixo. As tuas impressões são importantes para a investigação.

16. Se quiseres seguir a investigação, podes também deixar o teu mail em baixo para seres informado(a) sobre a progressão da mesma.

2. Answers

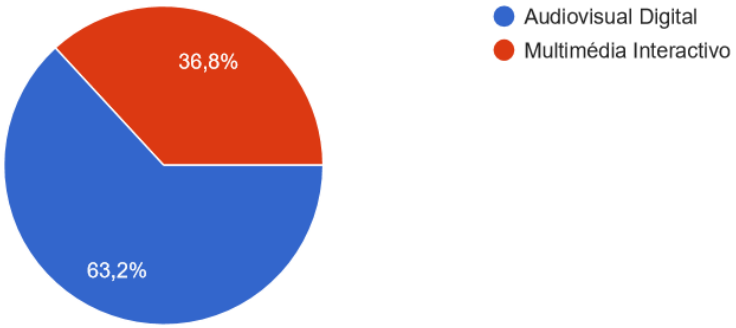
Gamifying Soft Skills - questionário de investigação

19 respostas

Antes de começar!

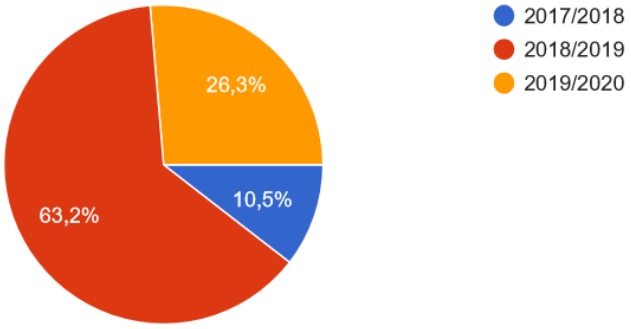
Em que ramo do Mestrado em Comunicação Multimédia é que te inscreveste?

19 respostas



Em que ano te matriculaste no curso de MCMM?

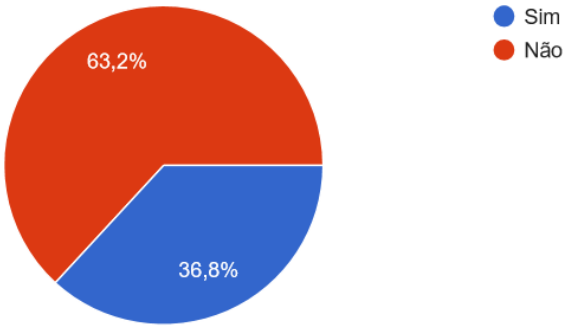
19 respostas



"Oscar Material"

Alguma vez paricipaste como ator ou atriz numa curta ou websérie realizada por alunos do ramo audiovisual digital?

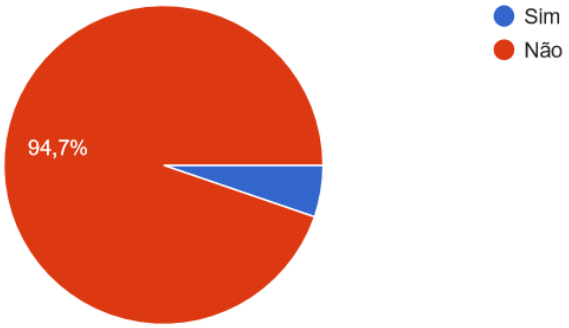
19 respostas



"Make-up Master"

Alguma vez participaste como maquilhador(a) numa curta ou websérie realizada por alunos do ramo audiovisual digital?

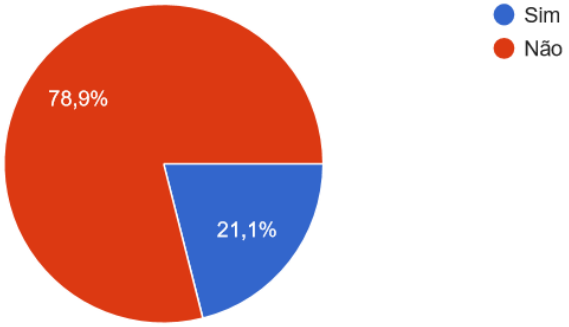
19 respostas



"Mr. / Ms. Narrator"

Alguma vez participaste como narrador(a) numa curta ou websérie realizada por alunos do ramo audiovisual digital?

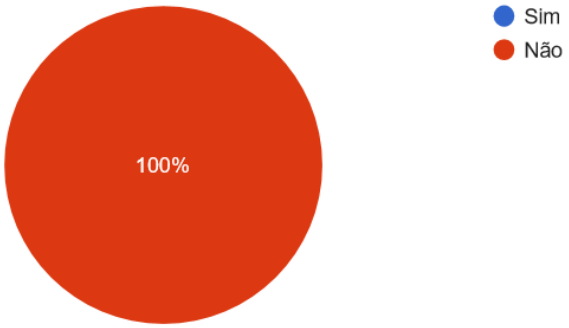
19 respostas



"The Songwriter"

Alguma vez participaste como compositor(a) ou fizeste sonoplastia para uma curta ou websérie realizada por alunos do ramo audiovisual digital?

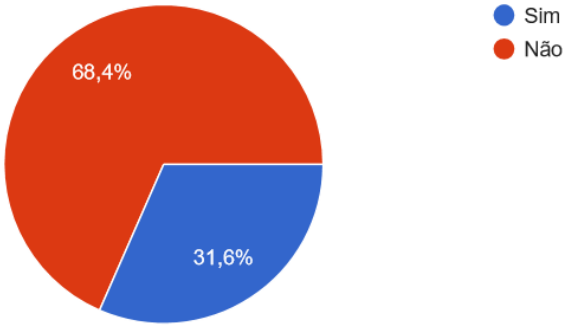
19 respostas



"Software Guru"

Alguma vez ensinaste colegas do ramo audiovisual digital a usar um software específico para os ajudar a realizar uma curta ou websérie no âmbito curricular?

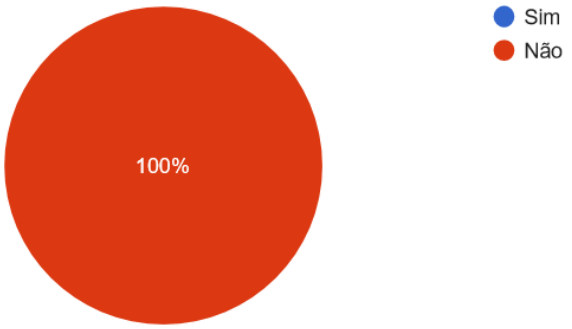
19 respostas



"The Wiz of Web-design"

Alguma vez ajudaste colegas do ramo audiovisual digital a criar uma página web (sem ser um perfil numa rede social) para uma curta ou websérie que teham realizado?

19 respostas



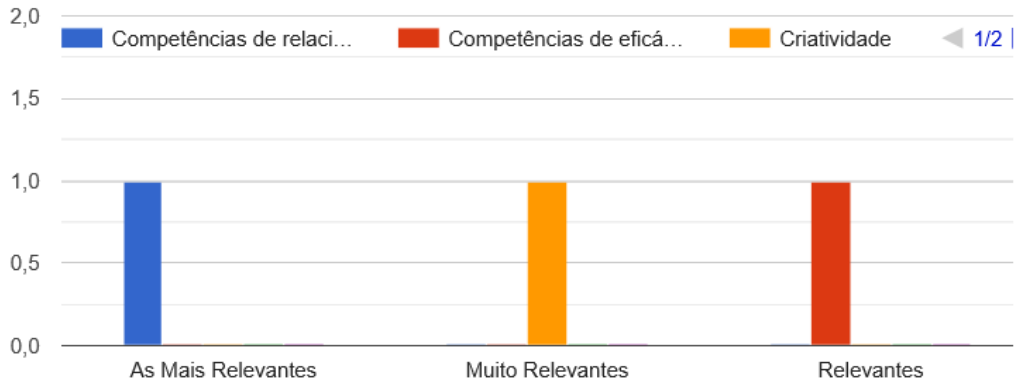
Parabéns, ganhaste o badge de "Oscar Material"!

Dos seguintes conjuntos de competências transversais, quais são, na tua opinião, os mais importantes para realizar a tarefa da pergunta anterior (ser um ator ou atriz numa curta ou websérie realizada por colegas do ramo audiovisual)? Por favor, escolhe 3, organizando-os por ordem de relevância.

Glossário de conjuntos de competências

Parabéns, ganhaste o badge de "Make-up Master"!

Dos seguintes conjuntos de competências transversais, quais são, na tua opinião, os mais importantes para realizar a tarefa da pergunta anterior (participar como maquilhador(a) numa curta ou websérie realizada por colegas do ramo audiovisual)? Por favor, escolhe 3, organizando-os por ordem de relevância.



Glossário de conjuntos de competências

Parabéns, ganhaste o badge "Mr. /Ms. Narrator"!

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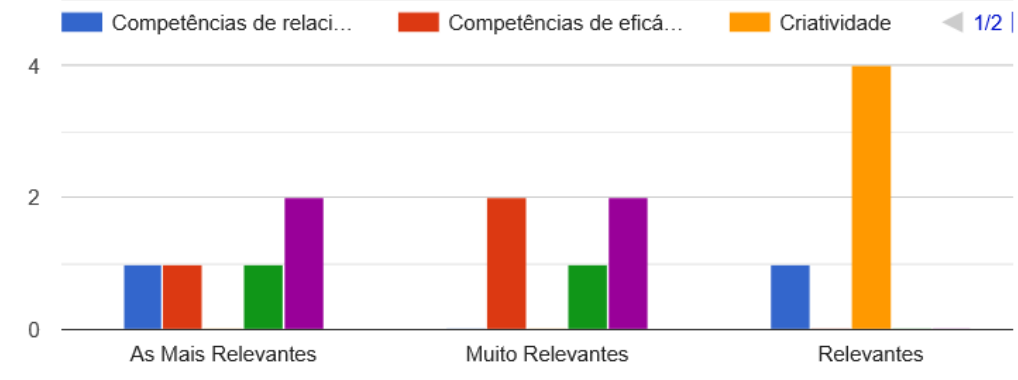


Glossário de conjuntos de competências

Parabéns, ganhaste o badge de "The Songwriter"!

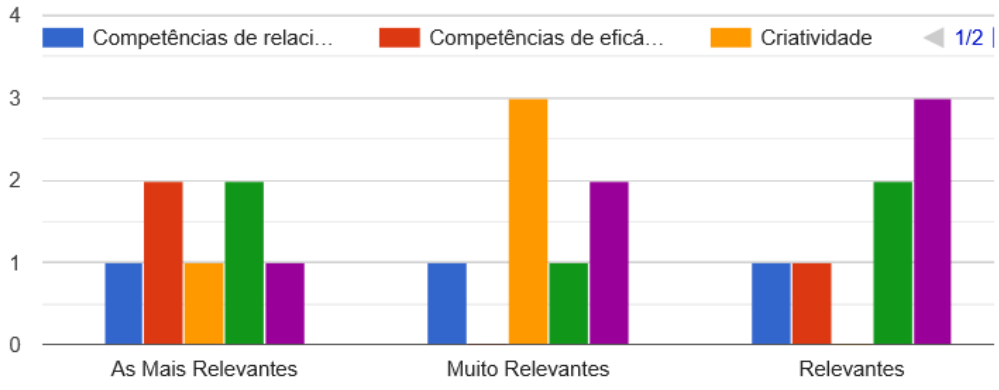
Dos seguintes conjuntos de competências transversais, quais são, na tua opinião, os mais importantes para realizar a tarefa da pergunta anterior (compôr ou fazer sonoplastia para uma curta ou websérie realizada por colegas do ramo audiovisual)? Por favor, escolhe 3, organizando-os por ordem de relevância.

Ainda não existem respostas a esta pergunta.

Glossário de conjuntos de competências

Parabéns, ganhaste o badge de "Software Guru"!

Dos seguintes conjuntos de competências transversais, quais são, na tua opinião, os mais importantes para realizar a tarefa da pergunta anterior (ensinar colegas do ramo audiovisual a usar um software específico para os ajudar a realizar uma curta ou websérie no âmbito curricular)? Por favor, escolhe 3, organizando-os por ordem de relevância.



Glossário de conjuntos de competências

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Ainda não existem respostas a esta pergunta.

Glossário de conjuntos de competências

Chegaste ao fim!

Tens alguma sugestão, dúvida ou comentário em relação ao questionário que realizaste? Se sim, podes escrever em baixo. As tuas impressões são importantes para a investigação.

3 respostas