Brauer, S., Siklander, P., & Ruhalahti, S. (2017). Motivation in digital open badge-driven learning in vocational teacher education. *Ammattikasvatuksen aikakauskirja*, *19*(3), 7–23.

Motivation in Digital Open Badge-Driven Learning in Vocational Teacher Education

Sanna Brauer
KM, lehtori
Ammatillinen opettajankoulutus,
Oulun ammattikorkeakoulu
sannabrauer@gmail.com

Pirkko Siklander
KT, yliopistotutkija, dosentti
Kasvatustieteiden tiedekunta,
Lapin yliopisto
pirkko.siklander@oulu.fi

Sanna Ruhalahti
Tradenomi (YAMK), lehtori
Ammatillinen opettajakorkeakoulu,
Hämeen ammattikorkeakoulu
sanna.ruhalahti@hamk.fi

VERTAISARVIOITU
KOLLEGIALT GRANSKAD
PEER-REVIEWED
www.tsv.fi/tunnus

Abstract

Digital open badges, a set of micro-credentials, have recently been introduced as tools for digital identification and recognition of expertise acquired in practice or through studies. The current study aims to examine what motivates students in the badge-driven learning process. The theoretical framework focuses on concepts of achievement goals, triggers of learning, and intrinsic and extrinsic motivation. Data were collected in 2016 from group interviews (n=6) of in-service trained professional teachers

(n=17) and pre-service students of vocational teacher education (n=12) who earned 645 badges over one year in a Learning Online PD program. The research was conducted via data-driven content analysis. Results revealed several variables affecting motivation: progressive challenges and the extent of required performance, enthusiasm for the badge-driven learning, study progress, inspiring gamification, the option to study regardless of time and place, and optional study paths. This paper informs future researchers aiming to understand how badge-driven learning supports motivation.

Keywords: *motivation, digital open badges, vocational teacher education, digital pedagogy, professional development*

Motivaation ilmeneminen digitaalisin osaamismerkein ohjautuvassa oppimisessa ammatillisessa opettajankoulutuksessa

Tiivistelmä

Digitaaliset osaamismerkit on otettu käyttöön eri tavoin saavutetun osaamisen tunnistamisen ja tunnustamisen välineenä. Tutkimuksen tavoitteena on kuvata, mikä digitaalisten osaamismerkkien käytössä motivoi opiskelijoita oppimisprosessin aikana. Teoreettinen viitekehys perustuu saavutusorientaation, oppimisen virikkeiden sekä sisäisen ja ulkoisen motivaation käsitteisiin. Tutkimusaineisto kerättiin vuonna 2016 ryhmähaastattelemalla (n=6) digipedagogiseen täydennyskoulutukseen osallistuneita ammatinopettajia (n=17) ja ammatillisen opettajankoulutuksen opiskelijoita (n=12), jotka ansaitsivat vuoden aikana 645 osaamismerkkiä Oppiminen Online -osaamisenkehittämisohjelmassa. Aineistolähtöisen sisällönanalyysin perusteella esitämme motivaatioon vaikuttaviksi muuttujiksi seuraavat: tehtävien haastavuus ja vaadittu laajuus, osaamismerkeistä innostuminen, oppiminen ja opinnoissa edistyminen, innostava pelillisyys ja mahdollisuus opiskella asiat ajasta ja paikasta riippumatta vapaavalintaisessa järjestyksessä.

Avainsanat: *motivaatio, digitaaliset avoimet osaamismerkit, ammatillinen opettajankoulutus, digipedagogiikka, osaamisen kehittäminen*

Introduction

Digitalisation has changed society in terms of how we work, teach, learn and assess learning. As a result, it has become socially significant to increase individuals' competences in order to meet the requirements and needs of working life. McClelland describes competences as achievements acquired through training and development rather than proof of intelligence (1973; 1998). The European reference framework of key competences for lifelong learning (European Union, 2006, p. 3) emphasises that "competence" involves not only essential knowledge but also the skills and attitudes applied appropriate to context. The Centre for the Development of Vocational Training defines competence as the ability to apply learning outcomes adequately in education, work, personal or professional development; these outcomes inclu-

de knowledge; skills; and personal, social, and/or methodological abilities (Cedefop, 2014).

Digital badges are electronic microcredentials that can be used to identify and promote competences. Badges (such as the Mozilla Open Badge) refer to the student's, the earner's, participation in education or skills development; they may also be awarded following completion of a certificate. The Open Badge architecture is built upon an identification image, graphic or icon and the accompanying information content. This content shows the name of the badge, issuer identification, the knowledge and expertise criteria required, and a description of the evidence (e.g., an online document) (Abramovich, Schunn, & Higashi, 2013; Brauer & Ruhalahti, 2014).

Many studies have noted the promise of digital open badges (Hickey, Willis III, & Quick, 2015). The problem in digital badging is that we don't know their full potential. It is difficult to estimate the value of badges compared with the existing certification system, for instance. Anyone can create Open Badges and recognise the achievements of others (Mozilla Open Badges, 2017), and there exist few practically tested pedagogical models available. This limitation makes it challenging to design optimal digital open badge-driven learning processes. Therefore, this study aims to examine what motivates students in the badge-driven learning process.

Theoretical Framework

The eclectic approach of the study involves three concepts intended to open up the phenomenon: 1) achievement goals (cf. Elliot, 1999), 2) triggers of online learning (Glen & Wilkie, 2000; Hidi, 2000), and 3) intrinsic and extrinsic motivation (Abramovich et al., 2013; Reiss, 2012). These entities differ conceptually, but, in this context, they include the same phenomena. In this study, we focus on mapping theories to cluster students' experiences of stimulating and supportive digital open badge-driven learning. As a complex process with dimensions of online learning and gamification, mapping forms a more detailed theoretical sketch of badge-driven learning. This study provides options to deepen the perspective in the upcoming studies and practical applications.

Achievement Goals

Achievement goals are constructed of mastery and performance objectives reflecting the accomplishments in a particular situation (Barron & Harackiewicz, 2000; Pintrich, 2000). According to Pintrich (2000), the construction often refers to individuals' reasons for pursuing achievement while representing purposes like mastery or superiority of an academic learning task. Performance is judged based on a specific criteria or targets. As a student, a teacher often plans to use situation-specific strategies to attain outcomes. These strategies are important aspects of self-regulation in learning and goal-setting processes (Fryer & Elliot, 2007).

Achievement goals represent an important part of the structure of gaming and gamified learning solutions. Competence-based badges used by the Boy Scouts or military are commonly offered for learning as a merit, a practice sharing the same features as game models. Abramovich et al. (2013) confirm that badges are similar to videogame achievements, as badges

can be awarded for incidental activities as well as skills mastery or demonstration of knowledge. In addition, a player's success on a videogame is viewable to other players; similarly, the badge earner is able to share badges with peers within institutions or within the general public. Reid, Paster and Abramovich (2015) describe such phenomena as "game-like encouragement": in educational settings, badges are often used to recognise learning and to motivate the learner. The idea of gamification is to use elements of gaming in a new context aiming to motivate users of the product or service towards a desired behaviour. These online systems seek to arouse people's enthusiasm to learn, similar to the excitement of playing games. As such, designing engaging gamification to support motivation in nongame systems is a new area of interest for practitioners and researchers (Deterding, 2012; 2015).

Triggers of Online Learning

The trigger is the initial stimulus (Glen & Wilkie, 2000) used by students to help them learn (Roberts & Ousey, 2003) and to communicate, reflect and react. Hidi (2000) defines triggering as "the first stage of situational interest". She suggests that maintained situational interest may lead to increased knowledge if the situational interest continues. When triggers are used to maintain situational interest, Hidi (2000) considers it to be intrinsically motivated behaviour. Situational interest may move the learning process beyond the development of individual interest to personal enthusiasm for creating new hypotheses (Hidi & Harackiewicz, 2001). Interest-triggered learning activities enhance deep-learning and help the student to meet the set requirements and criteria (Krapp, 2002).

Interest-triggered learning activities enhance deep-learning.

The latest educational research (Järvelä & Renninger, 2014; Renninger & Bachrach, 2015) indicates that interest, motivation and engagement build a process with triggers playing a key role by cultivating and maintaining student interest. According to Krapp (2002) interest is content-specific. Waheed, Kaur, Ain and Hussain (2015) found that autonomous and easy accessibility in online learning environments intrinsically motivates further education students. Roberts and Ousey (2003) have stated that triggers can be presented in a variety of ways to develop problem solving while ensuring that students enjoy their learning. Trigger development takes time, practice and dedication to the concept (Roberts & Ousey, 2003). Clearly, a better understanding of the triggering process could make a significant contribution to the design of online learning environments.

Intrinsic and Extrinsic Motivation

Digital badging is considered to be a form of motivation to assess competences and to structure studies (Ahn, Pellicone, & Butler, 2014). Scholars have posited two types of motivation, intrinsic and extrinsic (Reiss, 2012). As a result of their studies Verhagen, Feldberg, van den Hoof, Meents, and Merikivi (2011) suggest taking both intrinsic and extrinsic motivation into account when predicting and explaining behaviour. Individual interests differ by quality and quantity as a child's intrinsic proactivity later turns into a de-

veloped interest (Krapp, 2002). The theoretical foundation of intrinsic quality is the concept of undivided interest; the results are similar for interest-based activities whether the task is compulsory or play (Krapp, 2002). However, the motivational pull of game design elements in non-game contexts is considered situated (Deterding, 2011), underscoring the importance of studying the triggers of interest in more detail. Krapp (2002) discovered that interest research is compatible with the concept of self-determination theory (SDT), a connected macro-theory of human motivation (Deterding, 2011; Ryan & Deci, 2002). Deterding (2011) considers motivational affordances and SDT to be a promising approach for systematically conceptualising gamification in non-game contexts. For online studies, it seems that we should observe the intersectionality of intrinsic and extrinsic motivation given that the dual view might be rather simplistic in terms of contextual effects and motivation itself.

Abramovich et al. (2013) suggests an interplay between different types of learners and different types of badges earned as motivators. They found that learners' prior knowledge and experiences with the domain being badged influenced how quickly and easily badges were earned. They theorised that badges awarded for participation would increase motivation for all users. In addition, skill badges were associated with motivational changes in the content area of the badges themselves. Students considered badging significant if they valued a specific badge. Abramovich et al. found evidence that skill badges support high-performing students familiar with the topic; hence, the effect on low-performing students might be motivationally negative, and badges could be considered extrinsic rewards. This finding corresponds to Deterding's (2012) assertion that the "entity being gamified needs to have some intrinsic value already — a reason for users to engage with It".

Intrinsic motivational orientation is seen to moderate linear relationships between learning assignment difficulty and enjoyment, such that students high in intrinsic motivational orientation enjoy more difficult assignments than individuals with a low intrinsic orientation (Abuhamdeh & Csikszentmihalyi, 2009). When changing the perspective in gamified applications and the flow of optimal experience, "challenges should be balanced relative to the player's perceived current ability such that they appear neither too hard nor so easy that they generate no uncertainty before nor competence upon overcoming them" (Deterding, 2015, p. 299; Csikszentmihalyi, 1990). Deterding (2015) underscores the importance of motivating, enjoyable experiences, providing students the option to choose "to tackle a challenge for the sake of enjoyment". Intrinsically motivated activities provide their own inherent reward, so motivation for these activities does not depend on external rewards (Deci, 1971; Ryan & Deci, 2000). Using an operational definition, "fun" challenges also mean "free choice". By comparison, Ryan and Deci (2000) explain that extrinsic motivation refers to doing something because it leads to a separable outcome; therefore, behaviour is driven by the instrumental value of the learning activity.

Modern interest research has produced a variety of conceptualisations and theoretical definitions (Krapp, 2002). With many crossover interests, motivation and gamification research draw on an interesting net of eclectic theories. However,

these approaches are not mutually exclusive. It would be simplistic to set badges as achievement goals (in the literal sense) in the gamified learning process. In learning research, understanding the basics of gaming mechanics is not enough, particularly when seeking to maintain and cultivate the student's interest in learning. Current models of online learning are not directly applicable to the entity of the gamified badge-driven learning process. Deterding (2011) sought out the motivational dynamics of gamified applications. Similarly, we are considering the cross-relations and dynamics of motivational badge-driven learning by means of theoretical mapping.

Methodology

Research Question

This study aimed to examine the digital open badge-driven learning process related to the competence-development continuum of vocational teachers, in particular the identification and recognition of digital pedagogical competences. The research objective was to reveal what motivates students in the badge-driven learning process?

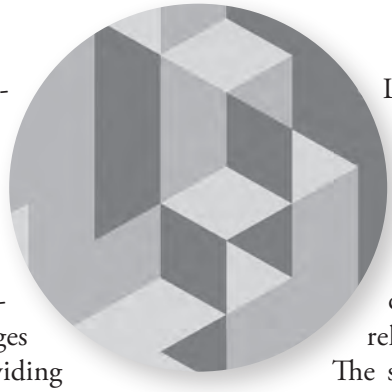
Participants and Context

Participants were Finnish in-service trained professional teachers (n=17) and pre-service students of vocational teacher education (n=12). The study included both men and women with a previous higher education degree in a professional field. They were invited to group interviews based on their achievements in the Learning Online PD program. The participants represented badge earners on every level of the Learning Online requisite ICT-skill set based on the national ICT-competence framework. Therefore, they were known to be competent at operating online and would find it natural for data collection to be implemented with new means. The groups of interviewees were similar in terms of background, online experience and professional networks.

The context of the study was a competence-based vocational teacher education, both in-service and pre-service training focusing on competent professionalism instead of abstract learning goals. The pedagogy originates from professional growth and learning as a process. The digital pedagogical training for teachers supports the principles of life-long learning. This learning emerges from competences the individual needs in work, growing with the community's shared expertise and collaboration (Oamk, 2015, pp. 4-12)

Learning Online

Funded by the National Board of Education in Finland, Learning Online is a national professional development program for vocational teachers started in 2014. Learning Online was built on a national ICT-competence framework (Ope.fi) aligning with the Unesco ICT competency framework for teachers. The requisite skill sets consist of three levels, and assessment is based on identification and recognition of competences. The learning process on Learning Online is facilitated by a MOOC (Massive Open Online Course) with gamified elements. Learning Online provides approximately 50 different subjects for online study (http://www.oppiminenonline.com) at one's own pace. An online training session on a specific subject is offered for each badge on the skill set to allow the student to meet the badge criteria.



Digital badges are issued based on an application, in accordance with the criteria displaying the expertise achieved in detail. Location-based teams compete online, collecting badges that are earned by providing evidence of a skill competency online. Seeking to motivate peers and achieve better results, the leaderboard indicates a team's performance based on badges earned while playing at the defined skill set. The participant-centred pedagogical model aims to inspire and encourage teachers to share their existing and updated digital pedagogical expertise within their working communities.

Study Design and Technological Settings

Group interviews were organised through Adobe Connect web conferencing software, which enables voice over internet protocol, online screen sharing, simultaneous chat discussions and recording of the active view. In addition to Adobe Connect recordings, the sound was recorded separately in the IC recorder and the texts were copied as separate files to back up the data collected.

At the beginning of the meeting, the interviewer presented the process and ethics of the research. The interviewees confirmed their consent for the use of collected material by participating in the interview and selecting "agree" on the system function keys.

The interviewer controlled both the discussion and group dynamics in the guided group interview (Ronkainen, Pehkonen, Lindblom-Ylänne, & Paavilainen, 2013, p. 116). The technical setting and study design was optional for participants as they felt themselves capable, comfortable and relaxed operating online. The study situation provided an opportunity to reflect on the experience, and the interviewer sought to ensure sufficient space for interviewees to describe their own thoughts, encouraging participants to share their stories.

Data

Data were collected from group interviews (n=6) with teachers (n=17) and teacher students (n=12) who earned 645 badges over one year. All online group interviews were implemented in the spring of 2016, and data from all six sources were transcribed. The pseudonymised data reveals only elements that will help to describe and understand the context of the study (Cortazzi & Jin, 2006). The transcription provided 439 minutes and 141 pages for analysis.

Analysis

Methodologically, the research was conducted via data-driven content analysis (Schreier, 2012) using NVivo 11.3.2 software. The content analysis focused on identifying significant factors affecting motivation in badge-driven learning. We categorised data into hierarchically inclusive relationships and analysed with ongoing comparison. The unit of analysis was a phrase, sentence or other short expression of words that captured the meaning of an aspect related to the phenomena.

Table 1. Coded Data Compared by Sorted Data Resulting Motivation

Coded Data		Result Data	
Expressions Total	1224	Nodes Total	316
Cases Total	57	Cases Total	18

The main coding categories were formed in a data-driven manner based on the relationship between subcategories. The inductive thematic analysis revealed variables affecting motivation, as can be seen in Table 2.

Table 2. Main Coding Categories Compared by Coding References

Nodes	Sources	References
Progressive challenges and the extent of required performance	6	91
Enthusiasm for badge-driven learning	6	67
Study progress	6	58
Inspiring gamification	6	55
Option to study regardless of time and place	4	28
Optional study paths	5	17

The saturation of the data assisted in merging the categories within the coding process. Table 3 exemplifies these subcategories based on nodes and node frequencies.

Table 3. Example of Subcategories of Enthusiasm for the Badge-Driven Learning

Enthusiasm for badges	5	27
Enthusiasm for studies	6	25
Perceived value of badging	3	15

Enthusiasm for badges included the following initial codes (examples):

- *It was interesting to seek more badges (based on existing competences), and on the other hand, to jump to a strange, new thing that gives you basic info. Say, for example, 3D was for me such a relatively strange topic. It felt pretty exciting that I also learned some basic information about that by achieving the badge for myself.*
- *I think those badges are so cool to do - a bit at the time and somehow I learned so well.*
- *I was excited about this because competence-based assessment works really well here. If you know how to do something, you do not have to do it again from the beginning.*

In the final outcome, we clustered the results with a mapping of the theoretical framework. Clustering was relational to

the research question and revised via triangulation in order to increase the validity of findings.

Figure 1. Clustering data

The mapping consists of the theoretical framework of achievement goals and of intrinsic and extrinsic motivation, both of which are emerging in badge-related studies of motivation (Abramovich et al., 2013; Ahn et al., 2014) and in studies of gamification and game-like encouragement (Deterding, 2011, 2012; Reid, Paster & Abramovich, 2015). Previous research has not identified the pedagogical or gaming-mechanics elements that trigger student activity in badge-driven learning in practice. Although the results of assignment difficulty and study arrangements could have been explained using the previous theory, interest-triggered learning activities (Krapp, 2002) and the triggers of online learning (Järvelä & Renninger, 2014; Renninger & Bachrach, 2015) were included in mapping, because the theory suggests that triggers may provide a success key for gamified solutions (Sailer, Hense, Mayr, & Mandl, 2017). We investigate whether triggers also explain how gamification in practice turns badges from certificates into activating tools of learning.

Findings

The aim of the study was to examine what motivates students in the digital open badge-driven learning process. The results reveal six main variables affecting motivation. The clustering (Fig. 1) of quantified results indicates that motivation in digital open badge-driven learning is based more on achievement goals and triggers of online learning than factors of intrinsic and extrinsic motivation. However, these concepts relate to one another as complementary aspects of the phenomenon and the significance of each theoretical approach is emphasised related to the clustered results.

Data-driven thematic analysis revealed the importance of *achievement goals* (122) in designing digital open badge-driven learning. Participants' *enthusiasm for badge-driven learning* (55) indicates that competence-based assessment may attract pre- and in-service vocational teachers to learning. Students get excited about the badges, but above all, about learning new, tangible things:

> *"It was more sensible to do something properly and apply it in my own work. Sometimes I used some old stuff (to demonstrate a competence), but several tasks required the use of a specific tool. It has been really useful to me. Knowledge has become homogeneous with the fact that there aren't whole black areas, like 'I'm not familiar with it and I'm not using it.' These kind of assumptions disappeared altogether."* (In-service teacher on skills set developer-level III)

Inspiring gamification (55) enhances learning because participants begin to keep track of their learning in terms of what to learn next and how to reach the target level as soon as possible. Participants in study groups were even betting on who would reach a certain level first and collect the most badges. Participants who had considered themselves "anti-gamers" became excited about the game and found badge achievement refreshing.

> *"Yes, it was a big motivator and you craved more. I also did a batch of badges at a time or in waves. I had that flow on."* (In-service teacher on skills set expert-level II)

Designing and implementing effective gamification for online learning requires that participants find both new challenges and demonstration of competences rewarding. Research indicates that *triggers of online learning* (119) affect motivation. By identifying progressive challenges and the extent of required performance as triggers, we specify badges as a tool to structure and activate studies.

> *"I have been able to create my own schedule and my own task order, and I've also looked for the background materials quite a lot myself. My role as an expert is emphasised in this way. The assignments are not fixed."* (In-service teacher on skills set novice-level I)

The formulation of learning objectives and badge criteria should vary, not rise linearly, both by complexity and extent to maintain and cultivate the students interest. The criteria required should inform the scale and challenge of the demonstration of competence and evidence required. Relatively small assignments inspire studies regardless of time and place:

> *"The competition between teams was nice, but the most important thing was playing. I used to play Mafia Wars for four hours a day until my husband banned it. This is how I satisfy the craving when going to bed but not feeling sleepy yet. One more. I got one more badge. It*

seemed to me the best quality (of education), the most addictive and interesting learning experience of my life, although not an easy achievement." (In-service teacher on skills set developer-level III)

Successful studies motivated students to a certain degree; however, it is more important to build badge constellations of competences and to incorporate these into inspirational play through gamification. Though trainers considered badges suitable for visualising the study path, the students did not find it particularly important in this context. Nonetheless, participants in Learning Online enjoyed customising the study path. The autonomy and freedom to choose between different challenges motivated students to demonstrate existing competences while allowing them to focus on content directly applicable to their working lives.

Discussion

This study sought to examine what motivates students in the digital open badge-driven learning process in the context of vocational teacher education. We suggest a practical implication in the design process of digital open badge-driven learning.

The practical implication is concluded as a result of a reasoning chain in which the resulting variables affecting motivation are linked to the practical level of the design process. Based on a clustering of the findings, the theoretical approach connects to the design phase of badge-driven learning, providing the option to view each phase through different layers based on previous research. A similar multifaceted approach, called "game design lenses," is presented to instruct designers how to review game designs and domains from different perspectives. This concept of design lenses provides an example of a model suitable for studying multifaceted concepts, even though Deterding (2015) considers the approach difficult to apply beyond games. Focusing the theoretical approach on a phase-by-phase basis deepens the design process of badge-driven learning, as shown in Figures 2–4. However, neither the sequence of layers (A–C) nor the design phases appear in the same order in every design cycle; hence, the layer and practice may connect otherwise.

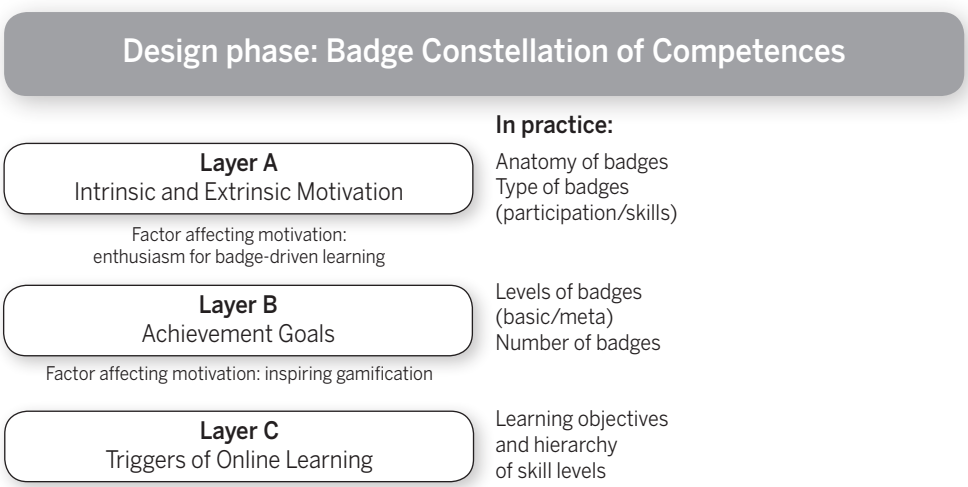


Figure 2. Example of different layers for the creation of the badge constellation

The design phase of the badge constellation of competencies involves the creation of badges and the definition of badge levels (basic/meta) to support enthusiasm for badge-driven learning and to inspire gamification. The findings suggest that achievement goals are the most suitable layer to look at in this design phase; however, achievement goals are necessarily tied to intrinsic and extrinsic motivation, which, as the theoretical framework, enables a review of the badge constellation—for example, by the relation and ratio of different types of badges (badge of participation/skills badge). Badge constellation structures gamification of learning. Game-like encouragement relates to the theory of achievement goals (Reid et al., 2015), but a change of perspective to the triggering of online learning focuses the design process of badge constellation on the activation and maintaining of learning (Hidi, 2000). Formulation of learning objectives or badge criteria are triggers that stimulate (Glen & Wilkie, 2000) students and enhance learning (Roberts & Ousey, 2003; Krapp, 2002). Gaming might provide an alternate framework for the process of thoughtful experience and interaction (Deterding, 2012).

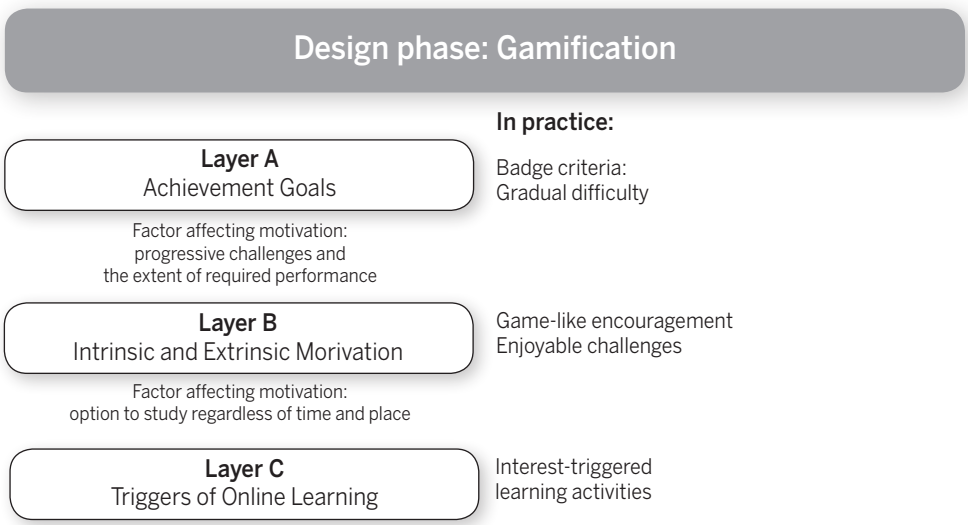


Figure 3. Example of layers for gamification

Similar to the visible achievements of gamers, gamification of the digital open badge-driven learning process has the potential to motivate students (Abramovich et al., 2013; Reid et al., 2015). Challenging learning assignments reflecting real life are significant for gamification as triggers of online learning and intrinsic motivation (Abuhamdeh & Csikszentmihalyi, 2009; Roberts & Ousey, 2003; Deterding 2015). Assignment difficulty refers to enjoyment in gaming (Deterding, 2015; Roberts & Ousey, 2003), the flow of optimal experience (Csikszentmihalyi, 1990) and superior performance. Triggers cultivate and maintain student interest during the learning process (Järvelä & Renninger, 2014; Renninger & Bachrach, 2015).

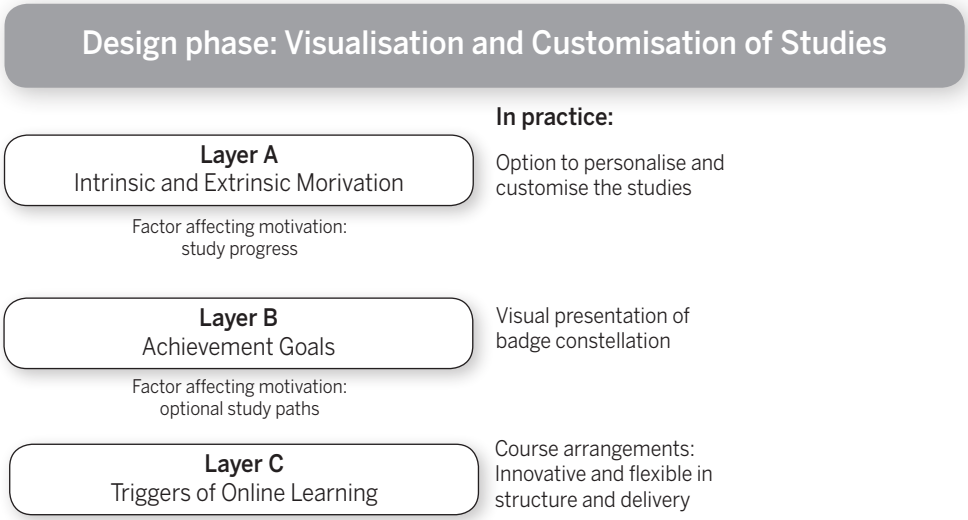


Figure 4. Examples of layers for study path visualisation

Badge constellation visualises the opportunity to customise studies to the achievement of personal goals. Our findings indicate that teachers' motivation in digital open badge-driven learning may be related to pre-ability and mastery of skills and competences. These results align with Abramovich et al. (2013) who indicated that the success of high-performing, competent students does not depend on participation badges but on skill badges. Badge achievement positively confirms students' beliefs regarding their current abilities, and these students expect to succeed. In terms of gamification, assignments should not appear too difficult or easy (Deterding, 2015). Visual presentation of badge constellation is part of the learning environment and should support easy access to learning material and flexibility regarding the time and place of learning to motivate further education students (Waheed et al., 2015).

The findings suggest that study path visualisation constitutes an interface for customisation. Digital open badges visualise the learning process further (Davies, Randall, & West, 2015) making it easy to study. Learning Online PD program provides a perfect example of a gamified learning application with reduced complexity. Deterding (2012) claimed the simplest components of gamification to be badges, levels, points, and leaderboards. Based on a few elements of gaming, Learning Online has already proved successful in terms of both quantity and quality of learning outcomes. In a user-centred theoretical framework, Nicholson (2012) articulates useful design values for meaningful gamification, such as user centricity, transparency and personalisation (cf. Deterding, 2015); however, no actual methods are provided in this framework. Deterding (2015) explains that existing research often identifies challenges and requirements from the perspective of gameful design, which includes ludic qualities or gamefulness in nongame contexts. Gamification seeks to increase motivation using game design elements to create systems affording the motivating, enjoyable experiences characteristic for gameplay. This mo-

del provides a practical approach for designing competence-based challenges and needs to be reviewed further.

The studied experiences and experiment form a cyclical model of design emphasising layers of theoretical aspects shown in Figure 5. The concepts cross-relate to one another as complementary aspects of the phenomenon, even though the practical choices of the design process recur stepwise in cycles. The nodes of emerging solutions, as well as the constraints preventing the development of innovation, may be processed one challenge at a time (Bereiter, 2002).

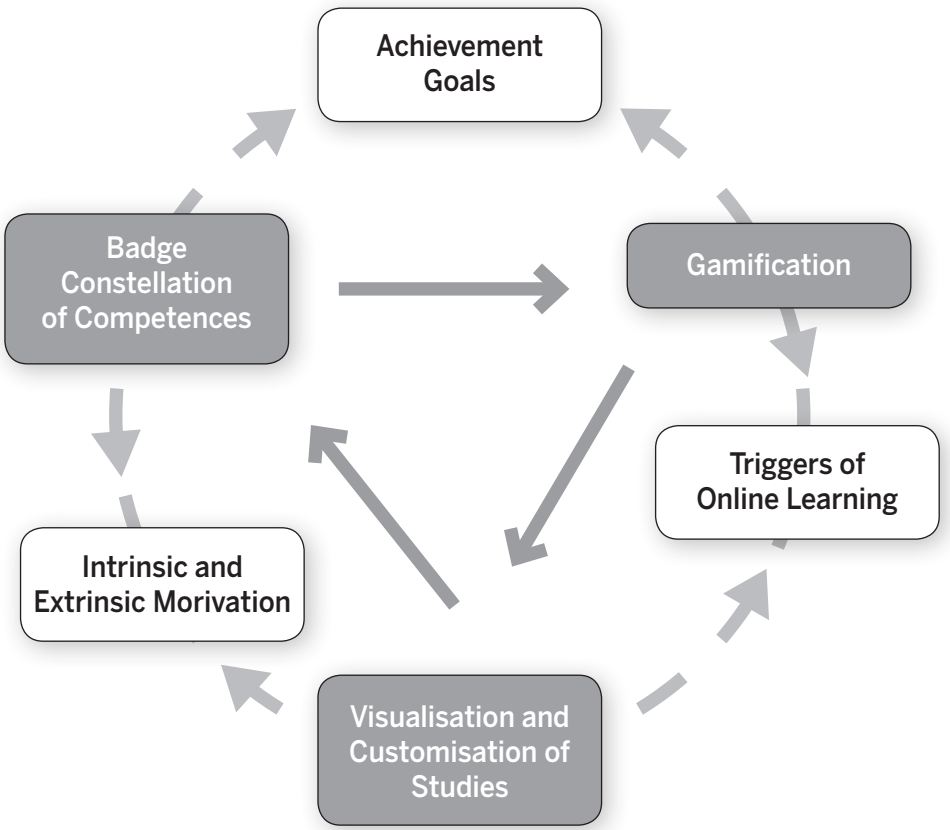


Figure 5. Design cycle and theoretical cross-relations and dynamics

Figure 5 illustrates the steps of the design process in practice, and it facilitates practical choices from the theoretical frameworks. The positioning of each theoretical approach in relation to the findings is emphasised. The figure facilitates the selection of a theoretical approach for studies of badge-driven learning and gamification visualising options, which will deepen the perspectives of future studies and practical applications.

In the future, the cycles of pedagogical design and developing learning solutions will provide both educational innovation and theoretical knowledge of learning.

The cycles of the model presented in this paper may give rise to a continuous model of innovative development (Bereiter, 2002) and a deepening circle that will facilitate the visualisation of future trends and address the needs of future research. It is essential to continue exploring connections between gamified learning processes and triggers. Similar to Reid et al. (2015), we believe that a hybrid model of competence recognition and gamified learning applications could maximize impacts on learner achievement and intrinsic motivation. However, badges may become extrinsic motivators when the process is not planned carefully. Deci, Koestner and Ryan (1999) noted that people receiving less than optimal rewards signifying competence are less likely to perform up to the specified standards. Likewise, Abramovich et al. (2013) found that it may be highly detrimental when people fail to achieve the maximum reward because this structure conveys negative competence information.

The study does have limitations. Two authors of the article have been involved in the development of the PD program from the beginning; however, this research does not take a stand on the functionality of the system. Furthermore, the research field of motivational psychology provides similar results using different approaches to explore factors affecting motivation. The aim of the current research was to further explore competence-based assessment and digital badging as a whole. These results will be used as a tool for more accurate conceptualisation in upcoming research.

This paper may inform future researchers seeking to understand how badge-driven learning supports motivation and enhances learning outcomes in higher education. The challenge for the future is to define how student guidance during the digital badge-driven learning process affects motivation and learning outcomes. Gamification initiatives and implementation of new technologies provide novel possibilities for combining gamification with digital badging more efficiently while improving learning outcomes.

References

Abramovich, S., Schunn, C., & Higashi, R. M. (2013). Are badges useful in education? It depends upon the type of badge and expertise of learner. *Educational Technology Research and Development, 61*(2), 217–232.

Abuhamdeh, S., & Csikszentmihalyi, M. (2009). Intrinsic and extrinsic motivational orientations in the competitive context: An examination of person-situation interactions. *Journal of Personality, 77*(5), 1615–1635.

Ahn, J., Pellicone, A., & Butler, B. (2014). Open badges for education: What are the implications at the intersection of open systems and badging? *Research in Learning Technology, 22*, 1–13.

Barron, K. E., & Harackiewicz, J. (2000). Achievement goals and optimal motivation: A multiple goals approach. In C. Sansone & J. M. Harackiewicz (Eds.), *Intrinsic and extrinsic motivation: The search for optimal motivation and performance* (pp. 229–254). San Diego, CA: Academic Press.

Bereiter, C. (2002). Design research for sustained innovation. *Cognitive Studies, Bulletin of the Japanese Cognitive Science Society, 9*(3), 321–327.

Brauer, S., & Ruhalahti, S. (2014). Oppimisen digiagentit. Osoita osaamisesi osaamismerkein. In A.-M. Korhonen & S. Ruhalahti (Eds.), *Oppimisen digiagentit*. HAMKin e-julkaisuja 40/2014. Retrieved from https://publications.theseus.fi/bitstream/handle/10024/85417/HAMK_Oppimisen_digiagentit_ekirja.pdf

Cedefop. (2014). *Terminology of European education and training policy: A selection of 130 terms.* Luxembourg: Publications Office. Retrieved from http://www.cedefop.europa.eu/en/events-and-projects/projects/validation-non-formal-and-informal-learning/european-inventory/european-inventory-glossary

Cortazzi, M., & Jin, L. (2006). Asking questions, sharing stories and identity construction: Sociocultural issues in narrative research. In S. Trahar (Ed.), *Narrative research on learning*: *Comparative and international perspectives* (pp. 27–47). Oxford: Symposium Books.

Csikszentmihalyi, M. (1990). Flow: *The psychology of optimal experience*. New York, NY: Harper and Row.

Davies, R., Randall, D., & West, R. E. (2015). Using open badges to certify practicing evaluators. *American Journal of Evaluation*, *36*(2), 151–163.

Deci, E. L. (1971). Effects of externally mediated rewards on intrinsic motivation. *Journal of Personality and Social Psychology, 18*(1)*,* 105–115.

Deci, E. L., Koestner, R., & Ryan, R. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125*(6), 627–668.

Deterding, S. (2011, May). Situated motivational affordances of game elements: A conceptual model. In *Proceedings of CHI 2011 Workshop Gamification: Using game design elements in non-gaming contexts* (pp. 34–37). Vancouver, Canada: ACM.

Deterding, S. (2012). Gamification: Designing for motivation. *Interactions*, *19*(4), 14–17.

Deterding, S. (2015). The lens of intrinsic skill atoms: A method for gameful design. *Human-Computer Interaction, 30*(3–4), 294–335.

Elliot, A. J. (1999). Approach and avoidance motivation and achievement goals. *Educational Psychologist, 34*(3), 169–189.

European Union. (2007). *The key competences for lifelong learning – A European reference framework*. Retrieved from https://erasmusplus.org.uk/file/272/download

Glen, S., & Wilkie, K. (2000). *Problem-based learning in nursing.* London: Macmillan Press.

Hickey, D. T., Willis III, J. E., & Quick, J. D. (2015). Where badges work better: Findings from the design principles documentation project. *EDUCAUSE Review*. Retrieved from https://library.educause.edu/~/media/files/library/2015/6/elib1503-pdf.pdf

Hidi, S. (2000). An interest researcher's perspective: The effects of extrinsic and intrinsic factors on motivation, In C. Sansone & J. Harackiewicz (Eds.), *Educational Psychology* (pp. 309–339). San Diego, CA: Academic Press.

Hidi, S., & Harackiewicz, J. (2001). Motivating the academically unmotivated: A critical issue for the 21st century. *Review of Educational Research, 70*(2), 151–179.

Järvelä, S., & Renninger, K. A. (2014). Designing for learning: Interest, motivation, and engagement. In D. Keith Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 668–685). New York: Cambridge University Press.

Krapp, A. (2002). An educational-psychological theory of interest and its relation to self-determination theory. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 405–427). Rochester, NY: Rochester University Press.

McClelland, D. C. (1973). Testing for competence rather than for "intelligence". *American Psychologist, 28*(1), 423–447.

McClelland, D. C. (1998). Identifying competencies with behavioural-event interviews. *Psychological Science, 9*(5), 331–339.

Mozilla Open Badges. (2017). Retrieved from https://openbadges.org

Nicholson, S. (2012, June). A user-centered theoretical framework for meaningful gamification. In C. Martin, A. Ochsner, & K. Squire (Eds.), *Conference proceedings of GLS 8.0* (pp. 223–230). Halifax, Canada: ETC Press.

Oamk. (2015). *School of Vocational Teacher Education, Curriculum and Study Guide 2015-2016*. Retrieved from http://www.oamk.fi/docs/flippingbook/amok/study-guide/2015-2016/files/assets/basic-html/index.html#1

Pintrich, P. R. (2000). An achievement goal theory perspective on issues in motivation terminology, theory, and research. *Contemporary Educational Psychology*, *25*(1), 92–104.

Reid, A. J., Paster, D., & Abramovich, S. (2015). Digital badges in undergraduate composition courses: Effects on intrinsic motivation. *Journal of Computers in Education*, *2*(4), 377–398.

Reiss, S. (2012). Intrinsic and extrinsic motivation. *Teaching of Psychology*, *39*(2), 152–156.

Renninger, K. A., & Bachrach, J. E. (2015). Studying triggers for interest and engagement using observational methods. *Educational Psychologist, 50*(1), 58–69.

Roberts, D. & Ousey, K. (2004). Problem based learning: Developing the triggers. Experiences from a first wave site. *Nurse Education in Practice, 4*(3), 154–158.

Ronkainen, S., Pehkonen, L., Lindblom-Ylänne, S. & Paavilainen, E. (2013). *Tutkimuksen voimasanat.* Helsinki: Sanoma Pro.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25*(1), 54–67.

Ryan, R. M., & Deci, E. L. (2002). Overview of self-determination theory: An organismic dialectical perspective. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 3–33). Rochester, NY: Rochester University Press.

Sailer, M., Hense, J. U., Mayr, S. K., & Mandl, H. (2017). How gamification motivates: An experimental study of the effects of specific game design elements on psychological need satisfaction, *Computers in Human Behavior, 69*, 371–380.

Schreier, M. (2012). *Qualitative content analysis in practice*. London: SAGE Publications Ltd.

Schunk, D. H., & Zimmerman, B. J. (2008). *Motivation and self-regulated learning: Theory, research, and applications*. New York, NY: Taylor & Francis.

Verhagen, T., Feldberg, F., van den Hooff, B., Meents, S., & Merikivi, J. (2012). Understanding users' motivations to engage in virtual worlds: A multipurpose model and empirical testing. *Computers in Human Behavior, 28*(2), 484–495.

Waheed, M., Kaur, K., Ain, N., & Hussain, N. (2015). Perceived learning outcomes from Moodle: An empirical study of intrinsic and extrinsic motivating factors. *Information Development, 32*(4), 1001–1013.