

Using Gamification to Motivate Students with Dyslexia or other Special Educational Needs

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ABSTRACT

The concept of gamification is receiving increasing amounts of attention, particularly for its potential to motivate students. However, to date the majority of studies in the context of education have predominantly focused on University students. This paper explores how gamification could potentially benefit a specific student population, children with dyslexia who are transitioning from primary to secondary school. Two teachers from specialist dyslexia teaching centres used classDojo, a gamification platform, during their teaching sessions for one term. We detail how the teachers appropriated the platform in different ways and how the students discussed classDojo in terms of motivation. These findings have subsequently informed a series of provisional design recommendations, presented within the paper, regarding how gamification platforms could be optimised for students with dyslexia. We also examine the benefits of our exploratory approach with regards to theory building that can be tested in confirmatory research. We conclude by arguing that our work can serve as a springboard for discussing how gamification platforms could be of use for students with other special educational needs.

Author Keywords

Gamification; SEN; Dyslexia; Educational Technology.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

Developmental dyslexia, or specific reading disability, is a literacy-based learning difficulty. It has been defined as “an unexpected, specific, and persistent failure to acquire efficient reading skills despite conventional instruction, adequate intelligence, and sociocultural opportunity” [13]. While prevalence estimates are susceptible to definitional

manipulation [44], and rates differ from country to country, it has been suggested that dyslexia affects around 4%-8% of the UK population [36].

The literacy difficulties associated with dyslexia can result in many children becoming demotivated within school. This is particularly common when students begin the transition to secondary education where literacy forms a substantial part of many lessons and it is assumed that students have acquired the necessary reading skills. To assist with their literacy difficulties, students may be identified as having ‘Special Educational Needs’ (SEN) and consequently receive additional learning support within their schooling. In the UK, this can take the form of one (or more) sessions a week outside of their normal classroom with a SEN teacher or learning support assistant, each of which generally consist of teaching interventions targeting the student’s specific educational needs with the aim of helping them to catch up with their peers. However, often SEN teachers are not specialist dyslexia experts as they have to deal with a wide range of special needs and the student may need more intensive support than the SEN teacher can provide. This can lead many parents to seek additional tuition outside of school from specialist dyslexia teaching centres to help improve literacy skills. Although this can be beneficial it also requires these children to spend additional time undertaking the types of activities that they typically struggle with, an experience that can be demotivating, fuelling their low levels of self-esteem. Indeed, motivation is a substantial issue for most dyslexic students. Research shows that dyslexic students have lower motivation when compared to students without dyslexia in reading as well as other aspects of their learning [46], highlighting the importance of applying motivational teaching strategies for dyslexic students [36].

Looking at education more broadly, the importance of sustaining students’ motivation has been a longstanding concern. One recent mechanism, which has proved to have some success in increasing student motivation, is “gamification”: the use of game elements, such as digital rewards, in non-game contexts [15]. While a variety of studies have explored the use of gamification with University students, showing that the mechanism can increase student motivation [14], the specific needs of primary school students with SEN (such as dyslexia) have not been addressed. Our research stemmed from the belief that a gamification platform could be beneficial for this

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population, given that students with dyslexia often struggle to be motivated to practice their literacy skills.

In light of the limited previous research in this area, in this paper we take an exploratory approach to understand the implications of the popular gamification platform classDojo¹ on student motivation in the context of specialist teaching sessions for students with dyslexia. Our main contributions are twofold. Our first contribution focuses on how use of the platform impacts on the motivation of the students, deriving a number of provisional best practices for the pedagogically meaningful use of gamification for primary school students with dyslexia. Our second contribution, which is more methodological in nature, concerns how exploratory approaches to gamification in context enable ecologically valid examinations of its use. We encourage others to utilise such an approach to develop a deeper understanding of how real, unpredictable, and diverse pedagogical practices can affect the success and utility of gamification platforms.

BACKGROUND

Gamification as a Motivational Tool

In contrast to “serious games”, which are games designed for non-entertainment purposes, gamification entails “the use of game design elements in non-game contexts” [15]. The most commonly employed aspect of gamification is the use of an achievement system, often in the form of badges or rewards [1, 25]. Such systems have analogous “real world” comparisons with famous examples including the medals of the armed forces or the badges awarded within the Scout movement. The root purpose of these awards is based around motivating people to undertake particular tasks and as tokens of recognition for specific achievements. Gamification strives, at its core, to increase motivation.

It is worth considering what it means to be motivated. “To be motivated means to be moved to do something” [39]. Motivation is not a unitary phenomenon for most individuals - different people may have different types and amounts of motivation, which can be shaped by the activity they are undertaking. Someone who is unmotivated to read may be a highly motivated writer.

Additionally, researchers commonly divide motivation into two types based on the source of the motivation: *intrinsic* motivation occurs where no reward is received beyond undertaking a particular activity, while *extrinsic* motivation refers to undertaking an activity in order to receive a desired outcome separate from the activity.

It is not known exactly how gamification affects motivation. Those sceptical of the benefits of gamification have argued that the use of scoring systems as a motivator (which is not the only form gamification can take) can

improve extrinsic motivation while reducing intrinsic motivation (e.g. [27, 33]). Nicholson argues that “the underlying message of these criticisms of gamification is that there are more effective ways than a scoring system to engage users” [33]. These criticisms remain speculative, however, as it does not acknowledge the lack of evidence on whether gamification indeed acts as a tangible reward that decreases intrinsic motivation, or conversely as a form of positive performance feedback which is thought to enhance intrinsic motivation [10, 11, 39]. This will depend on both how the gamification platform is deployed and also what motivates a specific user when they are entering the interaction [43].

Ryan and Deci’s Self-Determination theory [39] breaks down motivation into several different forms based on the perceived locus of causality (i.e. how external the achievement is to the individual). When individuals perceive themselves to be the locus of causality they are intrinsically motivated. As their perception shifts from an internal to an external locus of causality, they become increasingly more extrinsically motivated (moving through the stages of integration, identification, introjection and external regulation). Using this model we would suggest that gamification lies somewhere between introjection (fostering a sense of pride) and identification (where the student recognises the importance of the activity for achieving some goal) [39]. This is educationally relevant as it suggests that the motivation that gamification could provide, even if extrinsic, is about the student improving themselves rather than seeking a reward per-se (what the model terms “external regulation”).

Various researchers, most notably Decker [12] and Hamari et al. [25], have argued that while there is the potential for gamification to encourage transient forms of motivation, the effect of gamification is heavily dependent upon the context in which it is being applied [43]. Adults who are trying to get fit through using a gamified exercise program [24] are voluntarily using the program to achieve their self-set goals. This is a very different context to secondary school students who are compelled to use a gamified platform to learn algebra [40]. Herein lies an unresolved question – does gamification increase motivation even for those people compelled to use it? Given the unique properties of the educational context, it is necessary to consider the work that has specifically examined the use of gamification in educational contexts.

Gamification in Education

One of the main opportunities for using gamification has been in the field of educational technology. Motivation is an important part of education and strongly influences the extent to which students use effective learning strategies [34]. Ormrod (2006) identifies six different ways that motivation can affect students including directing behaviour towards particular goals [32], increasing the amount of effort and energy expended in activities related to these

¹ <https://www.classDojo.com>

goals [35] and leading to increased performance [41]. In terms of reward mechanisms, educators cannot always rely on intrinsic motivation when many learning tasks are not inherently interesting or enjoyable [39]. While extrinsic motivation has often been characterised as being an impoverished form of motivation, we should note that “students can perform extrinsically motivated actions with resentment, resistance, and disinterest or, alternatively, with an attitude of willingness that reflects an inner acceptance of the value or utility of a task... in the latter case, the extrinsic goal is self-endorsed and thus adopted with a sense of volition” [39].

Given the link between learning and motivation, it is unsurprising that gamification has garnered a lot of attention due to its potential to motivate students. However, despite the anecdotal evidence available (e.g. [38]) and examples of popular gamified educational systems (e.g. the Khan Academy²) empirical data supporting the educational benefits of gamification in terms of increasing student motivation or linking this motivation to learning outcomes is still in its early stages [1]. While some extant research does examine gamification targeted at primary school student users [4, 16, 19], its focus has not been on motivation. At the same time, empirical work that examines gamification and motivation (such as [1, 9, 14, 17, 26, 30]) tends to focus on University students, and reports mixed evidence of its success on this user group [43].

For example, Denny (2013) presents one of the most comprehensive empirical studies, analysing 1000 undergraduate students² use of a gamified online learning platform [14]. They established that the students using the gamified version answered more questions and used the system more frequently than those students who used the non-gamified platform. Based on survey data they also argued that the students enjoyed using the badges and indicated a strong preference for their inclusion in the standard interface. Domínguez et al. (2013) demonstrated how a gamified e-learning platform resulted in higher final test scores compared to students who used the non-gamified version [17]. Their survey data indicated high involvement with the tool but with no data from the control group it is difficult to interpret this data. As a third example, Barata et al., (2013) used a gamified version of the e-learning platform Moodle alongside their lecture course for two years, comparing it against the previous three years of the course [1]. While the grade results were somewhat mixed, they examined motivation through lecture attendance, the number of downloaded lecture slides and the number of posts each student made. All three of these measures increased significantly during the gamified years compared to the non-gamified years. This indicates that the gamification may have increased motivation but not performance. As a final example, Sætre (2013) presents a

case study of a class of 27 students aged 13-15 using DragonBox, a gamified algebra system, for one month [40]. While focused on comparing scores in pre- and post- study tests, based on a cursory interview he notes that the students reported that the system was “good”, while his observations indicated that students did indeed use the software.

RESEARCH AIMS AND APPROACH

While the aforementioned measures in support of gamification are varied, there is some basis for arguing that gamification can increase some students’ motivation and learning outcomes. This could be particularly valuable for students with dyslexia who, as we have previously discussed, can have issues with being motivated to work on their literacy difficulties [36]. To date, there has been limited research examining the impact of gamification on SEN students. For example, even though scholars such as Ern, [18], have hypothesised that game mechanics could be of use in designing interventions for students with autism, to our knowledge, researchers have not validated these claims empirically. Our work follows on from previous research that highlights how important it is to consider motivation as an intrinsic component to teaching students with dyslexia [36]. We explore how gamification can be used to motivate students with dyslexia who are at a critical transition point in their education, moving up from primary to secondary school.

Previous work on studying gamification and motivation has predominantly relied on quasi-experimental approaches. A number of motivation measures have been used in an attempt to establish the effect of gamification on student motivation with qualitative data primarily used to supplement these quantitative results (e.g. [1, 6, 9, 12, 14, 17, 26, 40]). This approach has yielded mixed results, showing that motivation and learning outcomes increase for some students in some settings. Cautioning against a technology-centred perspective on gamification, Deterding et al. (2011) have shown through illustrative examples of gamified systems that game rewards or badges become meaningful only when users’ primary task encourages autonomy, achievement and mastery [15]. The challenge thus remains in separating the effects of gamification from the way in which a gamification platform is used in context. Therefore, the interaction between gamification and the learning environment is of critical importance to those employing gamification in education, and even more so in specialist education where the learning environment is carefully designed and orchestrated. Learning environments tailored to children with SEN are typically constructed to take into account a student’s specific educational support needs (such as literacy impairments), cognitive weaknesses (such as organisational and memory weaknesses) and emotional needs (such as low self-esteem), necessitating a highly personalised teaching approach which is distinct from mainstream University tuition [13, 36]. Given the mixed results of previous research, and the extant literature on gamification and SEN contexts, the present paper takes

² <https://www.khanacademy.org>

an exploratory approach to understand (i) how gamification can be used by specialist teachers to foster student motivation, and (ii) how students' motivation may be impacted by different pedagogical practices.

METHODOLOGY

Within this research we adopted a case study-based approach to understanding how gamification could be used in specialist dyslexia teaching sessions. Case study research aims to illuminate a set of decisions, exploring why they were taken, how they were implemented, and with what result [42]. Aiming at “analytic generalisation” [20, 45], case study research allowed us to explore gamification, focusing on how students were motivated, and why [42, 20]. The aim of this paper is to report on the lessons learned from deploying a gamification platform in the context of specialist SEN teaching sessions that may then be used as a basis for future work rather than generalising the results of this study to other contexts. Using an exploratory, inductive approach allows us to investigate the impact gamification has in the context of SEN classrooms and reveal particular pedagogical practices that advance our understanding of the benefits or challenges in applying gamification to educational situations.

Participants

We recruited three dyslexia specialist teachers, from two different specialist dyslexia teaching centres in the UK. Both of these centres belong to the same non-profit organisation and followed a similar curriculum. All of the teachers had over 10 years experience in teaching children with dyslexia. Unfortunately, one of these teachers subsequently dropped out of the study as the students she recruited stopped attending her teaching sessions. The remaining two teachers (T:1 and T:2) agreed to use classDojo with seven different students during the summer term (approx. 12 weeks from April 2014 until July 2014). During this time the software was used throughout all 12 of the teaching sessions with each session lasting 1.5 hours. The parents of all seven children also agreed to take part in the study. T:1 recruited two students and T:2 recruited five. All students were taught in pairs with the exception of C:7 (i.e. [C:1] with [C:2], [C:3] with [C:4] and [C:5] with [C:6]). Those students taught in pairs were able to view the performance of their classmate within ClassDojo. Table 1 presents a breakdown of the students taking part in the study.

Child	Parent	Age	Student Gender	Teacher
[C:1]	[P:1]	9	Female	[T:1]
[C:2]	[P:2]	9	Female	[T:1]
[C:3]	[P:3]	11	Male	[T:2]
[C:4]	[P:4]	11	Male	[T:2]
[C:5]	[P:5]	8	Female	[T:2]
[C:6]	[P:6]	12	Female	[T:2]
[C:7]	[P:7]	8	Male	[T:2]

Table 1. Breakdown of the study participants.

Technology

We chose to use classDojo³ as our gamification platform. A popular platform, classDojo currently has 2.4 million teacher accounts covering 53 million students in 180 countries. classDojo offers customisability, allowing the free-form creation of badges. This allows teachers to create whatever badges they deem necessary for the specific motivational needs of their students. Additionally, the system works on a tablet and only needs two taps to award a badge, allowing it to be easily integrated into teaching sessions.

There are two main components to the classDojo system. The first is the awarding of badges. When a teacher logs into the system (either online or through the tablet app) they first select a teaching session. Once a session is selected, the students within that session are displayed. Each student is represented by a customisable avatar. When an avatar is selected, the teacher can then award a badge from a set list of either positive (green) or negative (red) badges (see Figure 1). The set of badges is fully customizable for each teaching session, allowing the teacher to tailor the awards for the needs of their students. The inclusion of red badges is unusual as gamification typically focuses on rewarding achievements rather than recording failures.

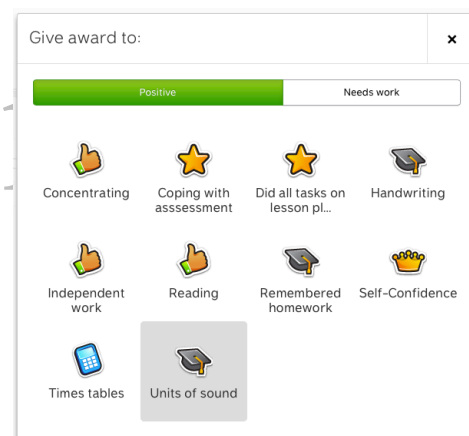


Figure 1. The pop-up showing the positive badges a teacher has customised to award to a given student.

The second element of the classDojo platform is the reporting system, designed to maintain a record of the badges awarded and to keep parents and guardians updated with their child's progress if they sign up to the platform (see Figure 2). A weekly report of their child's badges is automatically emailed to parents every week. This report also contains any comments teachers have written about specific badges.

³ <https://www.classdojo.com>

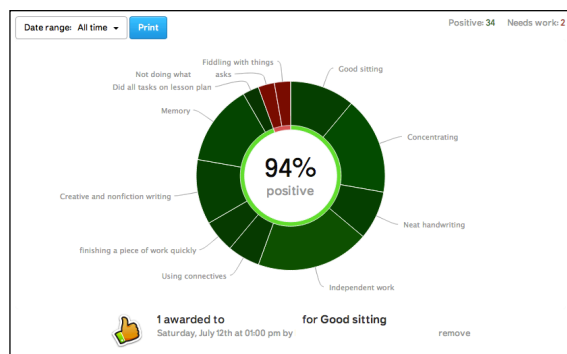


Figure 2. Example student's badges across time (name removed to preserve anonymity).

Procedure and Data Collection

Teaching sessions at the specialist centres involve one teacher and one to two students. Focused on improving the students' literacy skills, the sessions are tailored towards each individual student's needs. Although all of the centres follow the same high-level curriculum, each centre and teacher has a high degree of flexibility in how they run their own teaching sessions. While we had a rich understanding of these sessions from previous work, our previous focus had not been on motivational strategies.

To obtain rich data without influencing the behaviour of staff and students during the sessions, we conducted face-to-face interviews both pre- and post-deployment of classDojo. While this does limit the data we have collected, it ensures that the teachers were able to use the software within a naturalistic setting, reducing the pressure to use it in 'correct' or 'expected' ways, as can happen when being observed by a researcher.

We performed a pre-study semi-structured interview with each of the teachers, parents and students in order to better understand how the teaching sessions were currently run. It was intended that this baseline data would allow us to contrast the sessions using classDojo with a "typical" session. The teacher interviews lasted on average 39 minutes (SD=2.8) and focussed on how they motivate their students, what achievements they reward and how, and finally what their interest in the platform was. The interviews with parents lasted on average 18 minutes (SD=5.0) and covered how motivated their child was to attend the specialist sessions and whether there were any skills they wanted their child to be rewarded for (such as persistence) that were not currently covered at the teaching centre. The interviews with children lasted on average 11 minutes (SD=5.9) and mainly focused on how they were rewarded within the teaching sessions and how this made them feel. On the request of the parents, some of the interviews with the children were conducted with their parents present.

The post-study interviews took place at the end of the study and focussed on whether the students' motivation had changed after classDojo had been introduced and how well

the platform integrated into the sessions. The teacher interviews lasted on average 44 minutes (SD=4.9), the parent interviews lasted on average 14 minutes (SD=3.1) and the child interviews lasted on average 17 minutes (SD=3.9).

In addition to the interview data we kept a daily log of parental and child logins to the system. From the classDojo system itself we were also able to view how many badges were awarded and what badges the teachers created.

Technological Support

Previous work in educational technology research highlights two common methodological considerations we needed to address to support the introduction of a new technology. Firstly, sustained support needs to be provided to both instruct the teachers how to use the technology and to provide assistance when problems are found. Secondly the technology needs to fit within the teacher's existing classroom practices [8, 31].

In order to provide sustained support to the teachers we remained in contact with them throughout the study period, emailing them fortnightly to ensure they were not experiencing any problems. After some initial issues with the firewalls at the teaching centres, the teachers had no problems with using classDojo. We also made it clear that we were happy to come back into centres to fix any issues they may have been having. With regards to existing classroom practices, during the pre-study interviews we discussed with the teachers how the platform worked and how they might like to integrate it into their teaching sessions. We repeatedly reassured the teachers that they could customise their use of the classDojo platform around their pre-existing teaching practices. Additionally, at the onset of the study, one of the researchers supported each teacher to set up an initial set of badges intended to scaffold the teachers' understanding of the badge creation process.

Analysis

Our analytical approach in this study stems from interpretivist traditions. According to interpretivism, the understanding of phenomena happens through personal interpretation and construction of meaning with the truth differing from person to person [21, 37]. Interpretivism recognises the legitimacy of different perspectives and how they are rooted in participants' values. While we present our perspective on the data, we freely acknowledge that others would likely have alternative perspectives.

With the participants' consent, the 32 interviews (14 student, 14 parent, 4 teacher) were recorded and transcribed for analysis. An inductive thematic analysis was conducted, directed by our key focus on gamification, namely any motivational effects and how the teachers appropriated the platform into their teaching practices. Throughout the analysis, we attempted to achieve neutrality with regards to how interviewees' perspectives were represented and interpreted. To achieve this, two authors separately coded

the interviews and then discussed the uncovered perspectives.

Triangulation was employed during the analysis, comparing data from the interviews against the logs kept by the classDojo platform to help us better understand the phenomenon under consideration. Additionally, when interpreting student motivation, whenever possible we triangulated parent, teacher and student interviews to capture possible multiple perspectives.

Our thematic analysis yielded 13 codes that coalesced into three key themes:

(1) **initial motivational strategies and teacher expectations** describes how the teachers motivated their students prior to using classDojo and the expected benefits of using the software;

(2) **pedagogy and classDojo** focuses on how the different teachers appropriated the software and how it changed their pedagogy;

(3) **inter-individual differences and motivations** captures how different students were affected by the use of classDojo.

We now discuss each of these themes in turn.

FINDINGS AND DISCUSSION

Initial motivational strategies and teacher expectations

Prior to using classDojo, both of the teachers motivated their students by using a strategy that predominantly consisted of a high degree of verbal feedback to indicate when progress had been made. As part of this verbal feedback, the teachers frequently supported the students with praise. This was viewed to be particularly important as many of the students did not experience praise or recognition of achievements in school, which was extremely demotivating. As T:1 explained: *“I want them to know that they are doing well, because some of them have got quite fragile self esteem, many of them are used to failure...”*

Although dyslexia is predominantly seen as a literacy impairment, students with dyslexia often have difficulties with meta-cognitive skills, memory, perseverance and organisational ability [11]. Because of this, students with dyslexia often make slow progress. Both teachers in the pre-study interviews explained that their assessment framework and strategies do not account for improvements in these broader, non-literacy skills: *“the standardised tests are so insensitive basically, so the student can have made a lot of progress, I must have worked on quite a few spelling patterns and done really really well and that pattern doesn't come up in the test so it looks like they haven't kind of moved at all...”* [T:2]. This means that even when a student has made progress, it may not be recognised in their test scores.

Both teachers entered the study with a desire to experiment with classDojo, believing that badges may be more tangible than verbal feedback, and as a consequence potentially more motivating for their students. Beyond this tangibility, the badges also reify the notion of progress, which becomes an object for consultation and discussion rather than a comparison process. T:2 pointed out, *“I think it would be nice to have something more concrete rather than just 'look at this page from 6 months ago' and how you've improved...”*.

Pedagogy and classDojo

Both teachers had a consistent pattern of use during the study, using the system regularly across the 12 weeks of the study with no decrease of use over time. Despite some shared attitudes and strategies at the onset of the study, the two teachers appropriated and used the gamification platform very differently. T:1 applied an activity-driven pedagogical design basing badges around the activities she typically ran during a given teaching session. She explained that: *“I customised mine to suit the lessons that I had, some of the icons, the badges for the reading packs that they do, spelling packs, the high frequency words, how well they did with dictation sentences”*.

Table 2 summarises the badges created and used by T:1 with her students. C2 was awarded less badges overall because she attended one less lesson than C1 and, in general, completed fewer activities than C1. Additionally, T:1 retained complete control over both the decision to award a badge and the interaction with the tablet when awarding a badge: *“I had them there so when I awarded a point I would say 'well that's your reading pack done, well done you did well with that' and then I'd also say you're having a point for your reading pack”*.

T:2 took a very different approach, focussing on metacognitive skills and designed badges that reflected unrecognised, underlying skills that were critical to learning. Even though these skills were not formally assessed, T2 was aware that they posed challenges to her students. Thus, when awarding a badge there was an implicit acknowledgment that the student had made an extra effort in a personally challenging area. As she explained, *“I'd say most of the targets I set were either behavioural ones, so things like, good sitting, independent work, not messing around... or reinforcement for the tasks that I knew individual students really hated as a kind of incentive”*. T:2 created the badges by iteratively customising them, adding additional ones on-the-fly during her teaching sessions as needed, personalised to the difficulties of her individual students. Table 3 summarises the badges created and used by T:2 with her students. Additionally, T:2 granted her students more autonomy in creating and awarding themselves the badges. Thus, students were encouraged to propose new badges but also to award themselves a badge, or when in a group they gave each other badges.

	C:1	C:2
Self-Confidence ^	1	2
Reading Speed ^	1	2
Motivation ^	1	1
Fluency ^	1	
Perseverance ^	1	
Dictation*	10	5
Working Independently*	8	6
High Frequency Words*	8	3
Reading Accuracy*	4	5
Spelling Pack*	5	3
Reading Pack*	5	2
Syllable Division*	1	
Total Number of Badges	46	29

Table 2: Badges used by T:1.

^ Indicates positive badges created by the researcher.

* Indicates positive badges created by T:1 independently.

These contrasting pedagogical uses and strategies had a significant impact on students' perception of the badges. The first cause of this difference in perception was the different levels of **personalisation of the badges**. T:1 customised the badges at the beginning of the study, and following this the badges remained static and applicable to all students on the basis of their activities. One consequence of this activity-based design was that students' progress was comparable across time. As T:1 described, this introduced some tension when a student was away for a week resulting in her receiving less badges overall: *"then sometimes it [classDojo] had both students up there and then one of the students could see the marks for both students and because one was away one week she had much less marks and it looked a bit... and I'm thinking 'oh'."* This unexpected consequence introduced a comparative element between students that can be discouraging for students with dyslexia [7, 36]. While this comparison arose as a result of the teaching context (i.e. two students sharing a single tablet), awarding the same badges to every student creates an equivalence between the badges that enables them to directly compare their achievements.

Conversely, T:2 created personalised badges in a iterative process during the course of the study. As such, badges were not uniformly applicable nor uniformly awarded to students. Across her cohort, students were forthcoming about the sense of accomplishment they felt when being rewarded for something they personally found difficult and challenging. C:6 explained that *"I would get the units of sound one [awarded for using a computer-based literacy program] because T:2 made one up and I liked that one because I hate units of sound."* Moreover, by using classDojo as a forum for identifying and discussing skills requiring improvement, T:2 promoted some students' metacognition and autonomy. During the interview, C:4

described handwriting as a particular challenge explaining his plans to ask his teacher for a corresponding classDojo badge. He went on to attribute this metacognitive awareness to the way classDojo had been used: *"[the badges] have all got a different meaning... [previously] T:2 randomly gave us a sticker when we'd completed a piece of work and we haven't made a link [to skills]. It would just be you've completed a piece of work."* The explicit link that the classDojo badges build between mastery and particular skills helped students to identify and reflect on the progress they had made during a particular session.

The second cause of the students' different perception of the badges followed from the process taken by T:1 and T:2 to **create and award classDojo badges**. Whereas T:1 based the badges on literacy activities that remained stable over time, T:2 focused on underlying skills to learning, while at the same time inviting students' continuous involvement by allowing them to propose new badges: *"the students start to own it because they will suggest to you why don't we have a badge for this and they will, you know, that's something that they have realised is maybe a strength that they would like to build up and you can do it instantly then and they feel it's more theirs... (T:2)"* The consequence of this was that students appear to assign personal meaning and significance to the badges. C:3 explained that *"it's like our own little thing and it's lots of different things that they are for, so they've all got a different meaning."*

Overall, students of both T:1 and T:2 were positive about classDojo and, from the logs, many habitually looked at their badges when at home. Similarly, all students valued the link between progress in learning and the awarding of badges. As C:2 explained, *"I liked seeing how much I'd improved and... being able to check on what I was doing and how many points I was getting..."* Four of the students talked about the pride they experienced when getting a badge: *"they make me feel proud... they make me feel I've done something well"* [C8]. One of the parents, noted how her daughter *"was looking forward every week to seeing the points build up."* However, whereas T:1's students tended to refer more broadly to progress based on the number of badges they had received, T:2's students' discussions tended to be more directed to specific understanding of skills and agency.

	C:3	C:4	C:5	C:6	C:7
Memory ^		2			5
Self-Confidence ^	2				
Concentrating*		1		6	6
Independent work*	3	2			7
Finishing a piece of work quickly*		4			2
Coping with frustration*	3	2			
Spelling Pack*	2	3			
Coping with assessment*	2	2		1	
Handwriting*			5		
Did all tasks on lesson plan*			4		1
Working together sensibly*	1	3			
Good sitting*					4
Creative and nonfiction writing*					4
Reading*			2	2	
Units of sound*				3	
Neat handwriting*					3
Remembered homework*				2	
Suffixing rules*		2			
Using connectives*					2
Not insisting on perfection*	2				
Times tables*				1	
Off Task*		1			
Talking out of turn □				1	
Fiddling with things +					1
Not doing what the teacher asks +	1				1
Total Number of Badges	16	22	11	16	36

Table 3. Badges used by T:2.

^ Indicates positive badges created by the researcher.

* Indicates positive badges created by T:2 independently.

□ Indicates negative badges created by the researcher

+ Indicates negative badges created by T:2 independently.

Thus, we note that even though both teachers followed the behaviourist tradition embodied in the design of classDojo, their pedagogical practices within and around the technology fostered different motivational styles and outcomes. While T:1's use appeared to have highlighted the importance of the number of badges awarded, T:2's use appeared to promote a focus on independence, meta-cognition, and challenge. This in turn encouraged T:2's students to identify specific skills as being important to their learning. Our findings thus highlight how the

appropriation of classDojo by the different teachers has a direct impact upon how students interact with, and are motivated by, the gamification platform.

Inter-individual Differences and Motivation

During the post-study interview, T:1 explained that her students were already motivated learners, which one of the parents (P:1) went on to confirm: "*My little one is really improving and her self confidence... she just so looks forward to it [the teaching sessions].*" In part because of this, T:1 pointed out that classDojo made little difference in her lessons: "*I don't think the children took that much notice of it if I'm honest... they probably would have responded as well, if not better, to a star in a book or something like that...*". However it is worth noting that T:1 retained complete control of the system, not allowing the students to explore or use it on their own. In short, T:1 used the classDojo as a traditional reward system making her view unsurprising.

Both teachers agreed that technologies such as classDojo may work best for students who need constant reinforcement. T1 argued: "*if you've got children that have got problems with attention and things I think you would have to keep them in mode and motivated that way.... I can see it could have a much better application for students who find it hard to stay on task, that's where I see it's strength lying... I don't think its something that you just have and expect it to have the same impact for all of the students that you use it with.*". Within the study, this point was exemplified with one of the children, C:7, who had severe difficulties in attention and motivation. Though C:7 claimed that classDojo had not changed his motivation, both his father and T:2 observed a significant difference. T:2 explained the impact classDojo had had on her student's behaviour within the sessions: "*C:7 in particular was extremely motivated and this was a child who has got concentration and attention problems... and with him you only had to threaten him with a red badge and he'd be back on his seat doing what you wanted, it was amazing...*"

Avoiding negative badges appeared to be a strong motivator for two other students, even though their teacher did not use these badges with them during the course of the study. C:3 in particular mentioned several times that "*I didn't get any red badges like I said so that's made me feel good as well...*" C:4 too seemed to be strongly affected by the mere presence of these badges: "*I think I haven't got any red marks but I'm trying my hardest not to get red marks so it is trying to push you up which is really, really good...*". This is an aspect that would potentially warrant further exploration as gamification platforms typically do not record failures.

Our findings highlight that students respond differently to the positive and negative badges. In the case of C:7 who lacked motivation, moving him toward extrinsic motivation through the awarding of positive badges was a desirable outcome that translated in his ability to engage with a

learning task. Conversely, a subset of students regulated their behaviour to avoid the perceived external sanctions of the negative badges. Given our earlier observations about C:3's and C:4's autonomy and self-endorsement of their learning, we argue that for some students the existence of sanctions may invite undue focus on their avoidance, potentially sabotaging self-regulation and intrinsic motivation and undermining the independent understandings of strengths and weaknesses. We argue that introducing negative badges changes the dynamic of gamification platforms, allowing extrinsic and intrinsic motivation to operate in concert with mixed motivational results for students.

IMPLICATIONS FOR GAMIFICATION

Our study has focused on exploring how teachers can appropriate gamification platforms in different ways and whether this appears to affect the motivation of students with dyslexia. This has led to us examining a number of inter-connected issues, which we present below as a set of provisional implications for gamification within this area which merit further exploration in future work.

First we discuss the formulation of best practices regarding pedagogical uses for gamification and how these may transfer to other SEN students. Second we focus on the design of the gamification platform to identify some features that appear to mediate teachers' best practices and students' motivation, suggesting new design directions that follow on from our research. Finally we compare our study methodology and findings to previous research approaches, identifying how these contrasting approaches impact on our evolving understanding of gamification.

Implications for Best Pedagogical Practice with Gamification

Our primary research goal was to explore how gamification can be used by teachers to motivate students with dyslexia who are at a critical point in their education due to transitioning from primary to secondary school. Our results indicate that teaching practices with regards to the use of gamification in turn shape the pedagogical and motivational benefits experienced by students. T1 used the platform primarily to award badges for activities students had completed, awarding the badges in a manner similar to traditional reward system used in schools (e.g. stars or stickers). We note that this pattern of use has received the most critique by those sceptical about gamification [27, 33]. In comparison, through providing students with a sense of control over the platform, and targeting the badges towards their individual challenges, T2's practices fostered agency, reflection and meaning making, which are all pedagogically important [34]. In particular, granting students control and agency over the awarding of badges assisted students in identifying their own strengths and weaknesses.

Our findings thus emphasise how gamification platforms are appropriated by teachers is as significant as how they are designed when it comes to educational outcomes. This necessitates the development of best practices regarding the

use of gamification and to this end our data suggests three critical pedagogical practices that need to be explored in future work: (1) providing students with badges for overcoming personally meaningful challenges, (2) giving students the agency to identify their own weaknesses through a process of negotiation with their teacher, followed by (3) self-reflection and monitoring of their improvements.

Based on our exploration of how gamification can be used by students with dyslexia, we argue that the potential benefits may extend beyond this population to students with other types of SEN, who may face different challenges than those diagnosed with dyslexia. While students in our study experienced linguistic, or meta-cognitive weaknesses, SEN students can face concentration challenges (ADHD), communication and social skills (autism), or intense phobias (anxiety disorders) [3]. However, similar to students with dyslexia, these challenges require personalised support. We also argue that researchers and practitioners can build upon the lessons we learned to facilitate the *process* of designing pedagogically sound tasks through iterative reflection. We hope that our work stimulates further research in this area exploring if and how our pedagogical recommendations – where gamification becomes a way to challenge students and give them control over their learning – can transfer to other SEN groups.

Our research identifies a second potential contribution in shaping institutional practices. Often, influenced by top-down pressures, teachers will construct learning tasks on the basis of standard assessment frameworks. As our teachers pointed out, these frameworks can neglect to recognise underlying skills that form an important basis for successful learning. This is, in part, because at a policy level dyslexia is not well understood. Gamification can support a bottom-up approach that leverages teachers' knowledge and practices to overcome the problems caused by institutional and policy shortcomings. This is true of any area of SEN.

When gamification is designed to be customisable and open it can invite teachers to expand beyond the skills assessed through standardised measures, and reward students for otherwise unrecognised achievements. In our study this translated to covering a variety of skills from *concentration* as a necessary condition to engaging with a task to becoming more *self confident* and thus assuring students that they can make mistakes. Therefore, we posit that gamification can support lesson planning by directing teachers away from assessment frameworks in order to integrate pedagogical practices that address a more holistic approach to a SEN student's challenges.

Design Implications for Gamification in Education

Compared to the non-game contexts and tasks in the digital realm where gamification may be employed (e.g. Foursquare, Khan Academy), the context of classDojo is determined by each individual teacher and is highly

malleable. The difference in practices between the two teachers highlights the contextually-dependent nature of gamification. With this in mind, our results broadly indicate the importance of enabling the enactment of contextual practices and needs through *customisable* educational gamification platforms. At a high level, the customisation played a key part in convincing teachers that they could adopt classDojo because they felt they could adapt it to their existing practices. Additionally, the customisability of the classDojo badges was a critical feature in motivating students with dyslexia since it allowed one of the teachers in our study to target rewards to a child's individual needs and challenges. The same customisability allowed a teacher to define badge types as both rewards and sanctions. Using badges as sanctions may be particularly effective for students who suffer from a deep lack of motivation [28]. Alongside the importance of teacher agency, our findings also highlighted that *student agency* over the badge creation process can potentially develop students' metacognitive awareness and skills. Gamification designers may thus consider introducing features that enable students to customise badges, e.g. by suggesting new badges to their teachers, or revising existing badges created by their teachers for them. Moreover, the comparative analysis of T:1 and T:2 with regards to their divergent pedagogical practices is illustrative of Deterding's recent argument that the benefits of gamified systems can only be understood by looking at the context of use [15]. We suggest that using technology creatively in education is not straightforward and can be fostered through design supports within the gamification platform, for instance by capturing and providing teachers with access to the best practices of their peers.

Methodological Implications

The majority of previous research has taken a confirmatory approach to examining the effect of gamification on student motivation and learning outcomes, primarily utilising a quantitative research design (e.g. [1, 6, 9, 12, 14, 17, 40]). In contrast, we took an exploratory approach, gathering rich and detailed data to show the varied ways in which one particular gamification platform was appropriated. This shifted focus away from the mechanics of the system and its measurable effects on learning or motivation, to the integration of these mechanics in pedagogical practice focusing on how this shapes students' motivation. For example, we found that extrinsic and intrinsic motivation can operate in concert due to the perceived presence of sanctions in the form of negative badges. Future research may look to unpack how this co-existence could impact students' self-determination and volition.

In summary, understanding the nuanced interactions between pedagogy, learner and technology can be invaluable in examining the nature of who benefits the most from gamification, why and under what conditions, while suggesting new hypotheses that can be tested through further empirical research.

CONCLUSION

The present research was driven by the important role of motivation in teaching students with dyslexia [36]. Our research goal was to explore how gamification can be used to motivate students with dyslexia who are at a particularly critical transition point in their education due to moving from primary to secondary school. The results of our study show that gamification can foster student motivation, in this instance due to an interaction between a highly customisable design and pedagogically tailored appropriation by teachers.

Our study offers two main contributions. First of all we have established a number of provisional best practices regarding the pedagogical use of gamification. These practices stand to improve how teachers use gamification in the classroom, and thus its resulting impact on students in terms of learning outcomes. We found that customization was key to the successful use of classDojo, particularly in terms of teacher customisation of its badges. Additionally we found that the way badges were awarded has a significant effect on students' perceptions of them. We argue that encouraging students to customise their badges can encourage them to reflect on their own abilities and weaknesses. While the identified practices were specific to students with dyslexia, we have highlighted the ways in which they could be transferable to other SEN students. Further work is needed to better establish these best practices in a variety of contexts with a larger study population.

Our second contribution has been to highlight the value of exploratory approaches to studying gamification, allowing us to carefully examine the pedagogical context and practices needed to successfully deploy gamification platforms. Such an approach can offer new hypotheses for confirmatory research.

This work has highlighted some of the benefits that resulted from the use of a gamification platform with students with dyslexia. We hope that further research will examine more widely the potential uses of gamification to benefit the education of other primary school students both with and without SEN.

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