

# A DETAILED ANALYSIS ON THE USE OF GAMIFICATION IN CLOUD BASED LEARNING MANAGEMENT SYSTEMS

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## ABSTRACT

The concept of infusing game elements into non-game applications has been gaining momentum as of lately. In this paper we explore and identify the variables which affect learning experience and how knowing those can help in implementing game mechanics on a Learning Management System (LMS) which is flexible in nature in its operations so that it can be scaled as required using cloud infrastructure. This research tries to assess how, why and where gamification and cloud computing should be best utilized in the context of learning management systems by exploring both existing learning management systems using game mechanics and outlook of how gamification can be used to propel students' overall learning experience.

**Keywords:** *Gamification, Learning Management System (LMS), e-Learning, Computer aided instruction, Educational technology, Mobile learning, Cloud platform*

## 1. INTRODUCTION

The following research is a culmination of work to harness the benefits of utilizing game mechanics within the context of a learning management system which would essentially be the next step to bring back the engagement within the education arena which is now left behind in the rapidly innovating technological space. The purpose of research is to investigate the aspects of how and why Gamification methodology should or should not be used to enhance the current generation of learning management systems, which have yet not caught with the advancements of the new era and how learning mechanism differs for students now than of the yesteryears.

Research will cover a detailed analysis on why particularly the combination of Cloud infrastructure and Gamification together will create the perfect blend of technologies for the basis of forming the platform which will be a milestone in developing integrated solution for the betterment of the education and learning process itself. As the nature of how information is presented and consumed by people greatly affects people's interest, it would be critically put to test why education management

systems could gain an upper edge by replicating game mechanics.

The use of games in the education industry is not something of a novelty as it has been practiced from the very start of computing age but integrating their mechanics into non-game applications is at the forefront of new age technological advances. Twenty first century witnessed the dawn of newer ways of communication and networking which in turn greatly changed the landscape of technology horizon in totality from the desktop computing to mobile computing. The means of engaging with content changed along as the perceptions and perspectives of general population rose in terms of technological awareness and competency.

The rise of such increasingly diversifying portfolio of online systems has given birth to a newer breed of web applications which are utilized to engage users at the maximum level, which is also the very same idea being researched in terms of its applicability and usefulness on the process of learning through game based task completion methodology which will be critically briefed through this paper with the help of relevant case studies and review of existing gamified learning web applications.

## 2. PROBLEM DESCRIPTION

The human psychology from the times of stone-age has been about the survival of the best and fittest. The very same can be observed in the age where plethora of technological advances have taken place and they are a very integral part of everyday life itself. The behaviors of learning essentially have been changed from rote learning, to more open out of the box thinking and that has given rise to new challenges towards the community of academicians and curriculum development personals, who now face an era of unprecedented technological gap between what they were accustomed to and what today's generation is growing up with.

The empirical evidence is showed by Gartner [1] that the effectiveness of knowledge management systems for education have either too complicated structures to function properly within the dynamically changing academic environment or they fail to deliver effective content which engages students and their interest at an optimum level. There are many studies which have shown that learning experiences enhanced significantly if game mechanics are applied in non-intrusive and integrated manner to the learning management systems. Several of such case studies will be further explored.

This nonlinear progression of technological advances with consistently avoided area of educational systems has created the opportunity for delving into the new age of educational evolution by the integration of cloud computing and gamification.

## 3. LITERATURE REVIEW

### 3.1 Use of Cloud Computing for Educational Institutions

Various Institutions have opted to move towards cloud infrastructure hence reducing on site servers needed for handling student's emails. Email is the standard feature of communication that can be handled by cloud service providers. Google and Microsoft [2] generally offer free Email service to educational sector. These companies, along with providing email features gives the whole suite of software that can be utilized by students. For example, Google Apps for Education and Microsoft Live Education comprises of various educational tools and services such as spreadsheet and

presentation editors.

There are also apps for collaboration for teams, file sharing, online communication application such as Skype and Google Hangout. These can be all edited in a team collaboration, and large storage facilities are present to facilitate storing of essential data to users who can continue to interact with those documents even when they leave.

There are various reasons why services are provided for free to educational institutes among companies who are competing for market share. Software such as the ones mentioned above are always provided at a discounted price to educational sector to build relationship with institutes which may provide their future employees. By offering such software at such a convenient rate, they are also able to build brand awareness and loyalty which may allow their other services to gain attention and be sold to potential customers in future.

A student who may witness the firsthand features of such software may persuade future employers to switch to such software which in turn will provide revenue to companies offering that software.

Another emerging use of cloud computing is to host learning management systems which are traditionally operated from onsite servers.

*Table 1: Benefits of Cloud Computing for Educational Institutions [3]*

Benefit	Description
Economy	It is a prime advantage for many institutions where services such as email come free of cost. Therefore, it reduces the cost of operating on premises servers, this frees up real estate resulting in cutting of personal cost or redeployment of staff. The point where institution pays for per user is appealing.
Elasticity	Cloud computing elastic facet allows institutions to begin with small scale services and gradually grow up to a formidable size without much up-front investment, which allows for quick escalation in demand at peak time such as during year start or exam time. This discourages the need to plan usage levels in advance.
Enhanced Availability	Availability can be high with less downtime because of higher resources and expertise available to cloud service providers. University computing service department may achieve 99.5% availability for educational service, but Google generally outperform its mark of 99.9% availability for its education application suite. Students deserve to get maximum availability of online resources.
Lower Environmental Impact	Cloud computing allows to reduce electrical consumption by optimizing power usage over a group of customers, therefore achieving the 'green' targets set for reducing electricity consumption. However, it is not simple to obtain that low figure as consumption is growing globally.
Concentration on Core Business	Cloud computing also allows institutions to focus on core business functions such as education and research, as they do not require any special facilities such as power stations to manage resources. Computing services are becoming commoditized and it is better to be handled by organizations who have economies of scale.

### 3.2 Risks of Cloud Computing

Cloud computing is primarily a new concept that may threaten the individual freedom of certain individuals in institutions. Such individuals may fear their role being outsourced with senior managers may feeling uneasy with the notion of transferring hosting of business-critical data and services to third party services. Therefore, some risks have more to do with perceptions than reality.

### 3.3 Data Security

A probable concern for many institutions is the security of data as institutions may feel more comfortable if their data was hosted in-house rather than to a third-party service. To them, transferring business critical data to a third-party service poses a risk.

European Union [4] has recently seen emergence of stricter laws that prohibits storage of personal data to certain countries with signed agreements bonding different parties. Due to this, some cloud storage providers give guarantees that the data storage will be done in only specific countries.

Another primary risk that comes as a result is the breach of confidentiality which may involve an individual of institution using the institution leading to rising costs and negative publicity.

Though high services availability is one of the main advantages of cloud computing, there is a risk of high profile providers under the threats of DDOS than individual institutions. Contracting more than one cloud service providers minimizes risks as the failure of one cloud service providers would not completely break down the service.

### 3.4 Lock-In

Companies such as Microsoft and Google have white label solution as they all the institutions to rebrand the service sourced from either Google or Microsoft. This could pose a potential risk if the institutions have placed their reliance on these services for critical operations [5]. While most providers claim of inter-operability of their products, it is generally observed that moving from one service to another requires exhaustive fine tuning of the data so that it migrates into the newer service without any issues.

This lock in effect causes issues for institutions if they come across after implementing services from one provider that another one is giving a better deal of the same, they cannot just instantly switch to another one due to inconsistencies in multiple provider's overall cloud architecture and how they structure data.

### 3.5 Gamification

Gamification on the other hand is shown again and again in various contexts to increase the rate of interest and engage users as shown Mashable [6] from big corporations like SAP, Microsoft, and Nike etc. The unique combination of gamification and cloud infrastructure is the answer to new generation of learning management systems. It is hence now an established fact as also reported by the author Chatfield [7] That using gamification has led to greater turnover rates, increased revenues, more engaging experience for the users and driving content consumption to higher levels.

The elements of gamification as described by Kermek [8] which will be analyzed within the learning management system are leader boards, badges to be unlocked after completing certain tasks, time based activities providing incentives such as public acknowledgement, interactive quizzes, peer reviewing and the integration of simulation and discovery based learning.

Cascading information theory [9] suggests that continuous information retrieval is highly fertile ground for increasing learning activity, thus by combining time-based tasks into fun filled game-based mechanism such as students may earn bonuses on doing certain tasks within the set time frame, challenging them to solve problems not just by memorizing facts but by critically analyzing and forming strategies on the go as they do while playing games as pointed by Brainyard [10].

The total effect of the previously discussed phenomenon will greatly amplify the experience of learning through self-paced and/or group activities hence improving knowledge retention, giving students enough interest so that they may explore and learn on their own level of comfort, because unlike traditional student assessment systems they are usually labelled into their performance disregarding their intellectual faculties of mind in subjects they can excel provided a level of flexibility of the system to conform accordingly.

Furthermore, every activity is associated with certain number of points which in turn will be like virtual currency that can be utilized to unlock additional study notes, tips for exams and various other incentives which can be set by the lecturer as the author Shaffer. D [11] illustrates in his book

titled “How computer games help children learn”. This motivates and instills in student’s a positive attitude towards setting their goals and achieving targets.

According to the research from Gartner [1] Gamification will penetrate more than 50% organizations that are dealing within process innovation and by the end of 2014 70% [12] of the key international corporations will make use of some form gamification to better their workflow.

### 3.6 Education Industry and Technology

Learning in as on-going process that starts as soon as the consciousness develops. Education on the other hand is a more formal process of learning that has been doctored and fine-tuned by generations of educationalists to be made better from one generation to another. In this modern era, Education can be passed down and categorized in two methods: Instructor-led and Computer-based.

#### 3.6.1 Instructor-Led

This is the most common type of way education has been given through the ages and still forms how most students are taught. It comprises any setting whether formal or informal, where the information is passed down through the instructor to one or more students. This practice is categorized as instructor-led teaching.

Table 2: Pros and Cons of Instructor-Led Training | Badgeville [13]

Pros	Cons
It is very interactive as questions and answers are exchanged rapidly in real time.	Effectiveness of knowledge pass down totally depends on instructor.
It has the potential to encourage activities such as group discussion, demos.	The ability of instructor to deliver knowledge effectively and his/her grasp on the subject matter varies widely.
It can create an ideal environment for involved people to have high information retention rate.	It may get expensive as instructors may choose a specific place. Additional costs may incur due to logistics of training venue.

#### 3.6.2 Computer-Based

Similar to instructor-led training, computer-based delivery of education doesn’t necessarily have to be always in formal setting. For example, Udemy is a

web portal that offers various educational courses and training material that allows professionals and students alike to get trained. In another example, Pilots often go through computer simulation based training to get familiarized with flight controls and other flying techniques.

Table 3: Pros and Cons of Computer-Based Learning | Badgeville [13]

Pros	Cons
It is affordable, and people can train on their own schedule	This method lack interactivity
Flexible for diverse types of people; professionals, students or someone else	People at the receiving-end of the knowledge train often don't have an effortless way to post queries
	Also, lower information retention rate

#### 4. GAMIFICATION IN EDUCATION

Gamification can interact with both methods of education delivery by emphasizing on user experience one gets with instructor by allowing the room for a level of interactivity and practice. One of the beneficial effects because of this is that it keeps stress level on instructor on a minimum whilst keeping the students engaged and motivated.

In contrast computer games have the necessary level of interaction between participants and instructors. So in this case, the instructor may not be actual human but rather a game based logic that may assist a participant when they are not able to understand something or when they need help.

Two ways to include game mechanics in education irrespective of whether they are computer-based or instructor-led, are:

1. Gamifying the course(s) or parts of it
2. Creating a game for the course(s) or parts of it

To understand whether to create a game or gamifying the courses, one must first be able to understand how game mechanics or gamification thereof works and in what ways it differs from traditional games.

- Increase level of interaction & rewards – Doing something in actual rather than reading the text and content is still the same
- Increase level of awareness – This is where games don't focus much whereas in

gamification it's very essential element for training

- Activity based tasks – The sense of accomplishment after an activity has been completed, which is rewarded after going through in game tasks and missions.

#### 4.1 Game-Based Learning Systems

The most frequent problem with computer led trainings through games is that they become redundant and cannot retain student's engagement level after prolong usage. This is a hindrance as repetition though is given for one to learn and grasp subject in sufficient detail. Therefore, games created for education should have following characteristics:

- Be more challenging than the learner in terms of skills
- Be able to identify the skill level of new player
- Provide instant feedback

Not only these characteristics make learning more engaging and motivating for the students but also, they increase the efficacy of the learning methodology itself.

#### 4.2 How to Gamify

The game mechanics [13] can be added as per the requirements of what is needed and to what extent it is required. One or more of the following can then be used for gamifying the application.

- Each completed activity gives awards points to the learner
- After criteria is met by learner, badges/awards can be issued
- Leaderboard can be created to rate top performers
- Levels of repeat tasks can be defined or to perform harder tasks
- Higher levels can be unlocked after earning badges

The table below summarizes the list of differences between an actual game and gamification.

Table 4: Difference between Games and Gamification | Badgeville [13]

Game	Gamification
There is a set rule which is to be	It's more flexible in nature, as it only uses game mechanics and

followed in games	mimics game behavior in rewarding the learner in some form or other.
It is binary in nature as either you win or lose in a typical game.	There is no concept of losing within gamified application, as it's integration is only to motivate and derive more engagement from the users.
Often playing the game itself is satisfactory and rewarding experience.	Reward mechanism is optional hence it is not necessary element of the gamified application.
More difficult to create due to larger budget and skills needed	On the contrary gamification is relatively easier and does not need substantial budget.
The whole theme of the game revolves around a central story.	Game elements can be added to existing application without much changes required.

### 4.3 Types of Players

Most games have four primary types of players [13], based on their unique characteristics:

- Achievers – Those who are derived from being on the top
- Explorers – Those who take interest in discovering new experiences
- Socializers – Those who are primarily interested in engaging with others socially
- Killers – Those who have individualistic nature, they take pride in getting rid of other players

From the previously mentioned types of players, just achievers and explorers are the ones who suit the requirements for games with educational motives. This is due to the fact that educational games have a purpose beyond the entertainment aspect. This is how our kind of players measure up to fulfill this new purposes.

An achiever is willing to go to whatever lengths needed to complete the course. An explorer on the other hand will explore all the sections of game thereby completing the game. Socializer is not motivated to complete the course rather he would engage with other users. For the killers, there is no fun if the game does not offer an experience of eliminating other users which is what motivates them therefore they may not complete the game, hence for educational games the player types which will be suitable are Achievers and Explorers.

### 4.4 Player Lifecycle

Often in a typical game, a player goes through what is referred to as player lifecycle as briefed below:

- Newbie – New players to the game who need initial guidance, works out for them if initial levels are easy, that way they can get easily familiarized
- Regular – Once players are used to the game play, it becomes a habitual thing for them to do. With each preceding levels, sophistication increases depending on the type of players
- Enthusiast – These players are now on the master level and need additional twists/challenges to continue playing

In contrast to that, the life cycle of a player is different in educational games. The newbies after grasping the initial mechanics of the game, quickly progress to achieve mastery of the game and stop playing usually after they've completed all the tasks/activities in the gamified application.

### 4.5 Educational Games Case Studies

SONY WONDERBOOK [13]: Sony launched a device referred to as Wonder book which connects with PS3 and allows to create a virtual reality where people participate in the book stories reenactment rather than reading the book. By doing this, they changed the normal mode of interaction with the book with much more interactive interface for their collaboration with JK Rowling, the author of famous Harry Potter series. The book had spells which can be interacted with PS3 controllers.

WORLD PEACE GAME [13]: Primary School teacher John Hunter created a novel board game which used real world scenarios for engaging students and teaching about World Peace in the process.

The players take the role of world leaders, few of the results of this unique game experience are as follows:

- Players essentially solved global warming
- One student saved world from global conflict of war by blocking supplies and trade with countries which engaged in hostility.
- Students realized that a world where resources are equally shared is better than where the resources are just hoarded by some countries

This overwhelmingly positive outcomes made John Hunter [13] the recipient as one of the top educational activists by Time Magazine.

## 5. CASE STUDIES OF GAMIFICATION

In recent times, companies have taken interest in investing in online communities according to Badgeville [14]. Gamification is used for increasing engagement between employees and the company but many organizations often find themselves on the wrong side of the struggle to keep the customer, partner and employees engaged. Gartner [12] have found that about 72% of users do not log in to their accounts of online communities.

*Table 5: EMC<sup>2</sup> Case Study [15]*

EMC is an American Company providing services in cloud computing, data storage and IT security domains among other wide range of services. They adopted social software from JIVE for their internal portals to drive more engagement.	
Challenge	<ul style="list-style-type: none"> <li>• Making users to take part in the community and interact by posting messages</li> <li>• Letting them complete their user profiles without any extrinsic added value</li> <li>• Getting people to help each other out using the social community</li> </ul>
Solution	<ul style="list-style-type: none"> <li>• Build RAMP: Recognition, Awards &amp; Motivation Program</li> <li>• Provide intrinsic motivation in forms of hundreds of achievements to be unlocked</li> <li>• Provide pathways to set goals and achievements so that users may follow the sequenced of related events.</li> </ul>
Results	+10% more documents were created +10% increase in visits +12% increase in page views +15% replies to discussion threads +19% files downloaded +41% videos watched 21% increase in overall user activity

*Table 6: Marketo Case Study [15]*

Marketo is industry leader in providing the suite of web application for marketing automation with more than 2000 clients worldwide. It launched an online community in 2010 for its customers and partners where they can engage and benefit from each other through sharing their individual expertise.

Challenge	<ul style="list-style-type: none"> <li>• Analyzing how users engaged with the platform itself</li> <li>• Designing a user experience with best interaction in mind</li> <li>• Rewarding those users who are most loyal towards the Marketo brand itself</li> <li>• Providing value for the users so that they participate in the discussions Q/A</li> </ul>
Solution	<ul style="list-style-type: none"> <li>• Marketo's benefited by using Badgeville's Behavior Platform to implement game mechanics into its community</li> </ul>
Results	<ul style="list-style-type: none"> <li>• 71% More engagement in day-to-day actions on site</li> <li>• +48% More queries resolved by participation</li> <li>• +36% Newer ideas were submitted</li> <li>• +40% More engagement upon the ideas submitted</li> <li>• +124% Increase in the votes on best ideas</li> </ul>

*Table 7: Deloitte Case Study [15]*

Deloitte implements their own learning management system for their vast employees training and development. It covers all the case studies and knowledge base for more than 50,000 executives, it provides detailed insights and key information on which decisions are made by their consultants in delivering solutions to their client's world over.	
Challenge	<ul style="list-style-type: none"> <li>• To make their employees and clients to access their knowledge base more often</li> <li>• Increase in the number of courses accessed/viewed</li> <li>• To keep delivering corporate training despite their busy work schedule</li> </ul>
Solution	<ul style="list-style-type: none"> <li>• Deliver instantaneous feedback to their consultants on their advancement</li> <li>• Defining a course hierarchy to follow</li> </ul>

	<ul style="list-style-type: none"> <li>Letting users to accumulate ranks and badges</li> <li>Creating leaderboards and task based missions for users to gain points</li> </ul>
Results	<ul style="list-style-type: none"> <li>46.6% increase in day to day user repeat access</li> <li>+36.3% surge in number of users who use it at least in one week</li> <li>50% reduction in the average time required to finish their courses</li> <li>On an average each user achieved at least 3 badges</li> <li>Top users earned more than 30 achievements and badges</li> </ul>

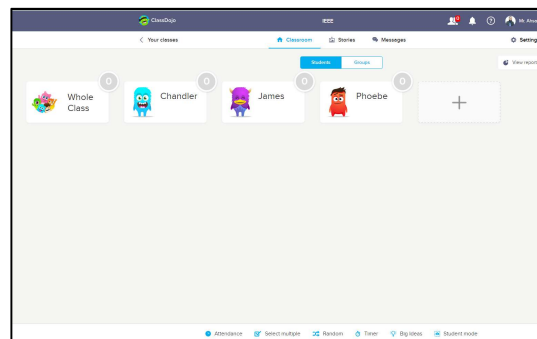


Figure 2: class room interface ClassDojo

As depicted in figure 2, all students have their own avatar assigned to them at the time they are enrolled into the class. The teacher can select the whole class, mark their attendance or give feedback to individual students. The students get awarded in terms of points which the teacher sets for them for any number of given activity. This feedback can be checked by parents as well. Once a classroom is created, unique codes are generated for every student and parent to enroll in the classroom by using ClassDojo web or mobile application to track their progress.

## 6. REVIEW OF EXISTING GAMIFICATION APPLICATIONS IN EDUCATION

### 6.1 ClassDojo

ClassDojo [16] is an online web application which provides gamified experience to more than 15 million students worldwide. This can be easily classified as one of the largest implementations of gamification at such a scale using cloud infrastructure. It is a straight forward application which engages students, parents and teachers in a very interactive setting.

The service is free for institutions and teachers; they can create classrooms online wherein they can reward or point out if a student needs work through awarding them badges of different skills which can be defined by the instructor for each class's individual needs.

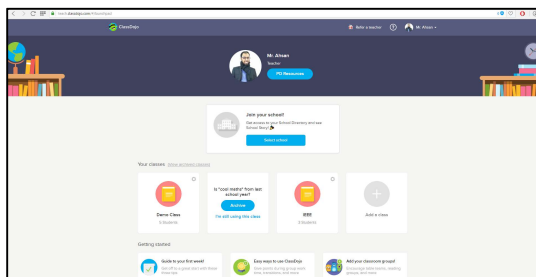


Figure 1: instructor dashboard classdojo

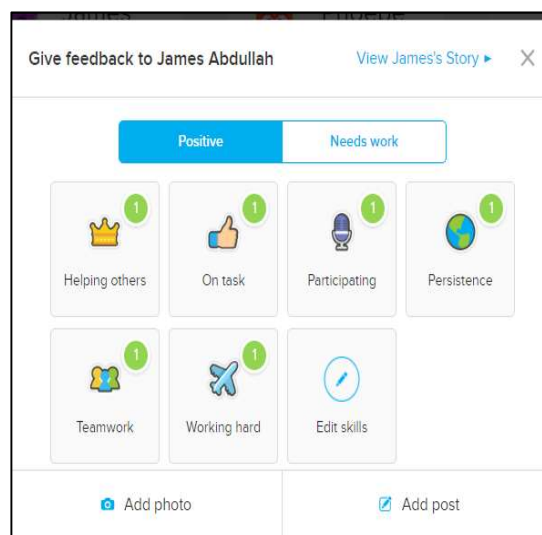


Figure 3: positive feedback activity ClassDojo

Upon selecting feedback for a particular student, multiple options are shown with various icons each having points associated with it. In case of positive feedback, they will be added to student's overall points otherwise the points will be deducted. If a teacher wants to give any visual feedback, he can

attach a picture while providing the feedback and can write a post for detailed comments.

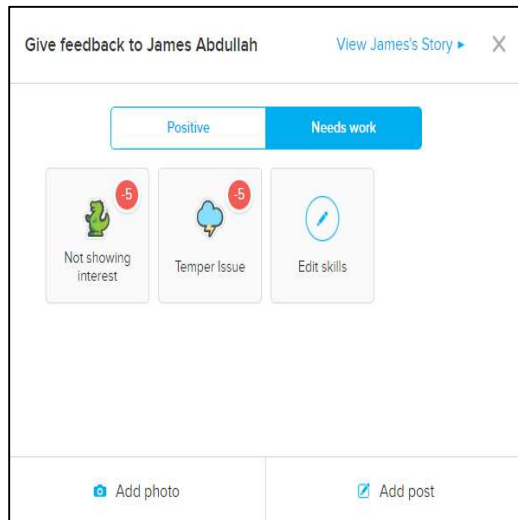


Figure 4: needs work feedback activity ClassDojo

Upon selecting needs work feedback for student, the options are presented similar to positive, just in this case they carry negative points associated with them. This strategy has worked very well in allowing students to engage in the class activities more actively as they are motivated by accumulating points by doing in class activities upon which they are rewarded, the needs work also helps them and their parents to identify areas where they need more improvement in.

This simple yet elegant integration of gamification has allowed ClassDojo to be adopted worldwide; specially in the primary and secondary classes where students give value to more visually engaging interface and friendly user interface. One other thing it provides is the interaction with parents, usually parents are not kept up to date with how their children are performing, with ClassDojo they can be made aware of their performance and engage with teachers on how best to cater their children's learning needs.

ClassDojo also provides an element of social networking within its platform by giving each student their own story, where they can share their work, students can add photos and videos of their work using a shared classroom iPad where no individual login is required.

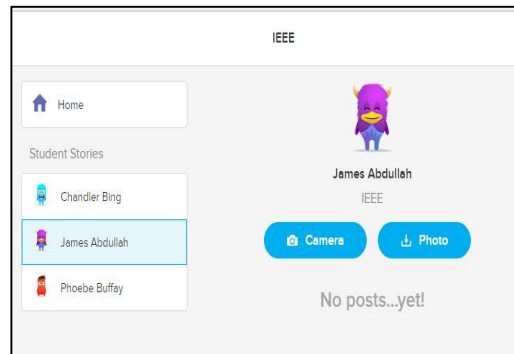


Figure 5: student story ClassDojo

## 6.2 Code School

With the rapid boom in the software development industry due to the multimillion dollar companies booming out of nowhere, the culture of Silicon Valley has influenced thousands of people to be interested in learning to code. That has itself led to formation of digital companies which took the opportunity and mixed gamification with learning experience to make their platforms more interactive and engaging.

Code School [17] is one of the several such digital era companies, it is an online platform where people can learn coding by following in browser instructions, so it results in a more interactive learning experience rather than the traditional screencasts or slideshows.

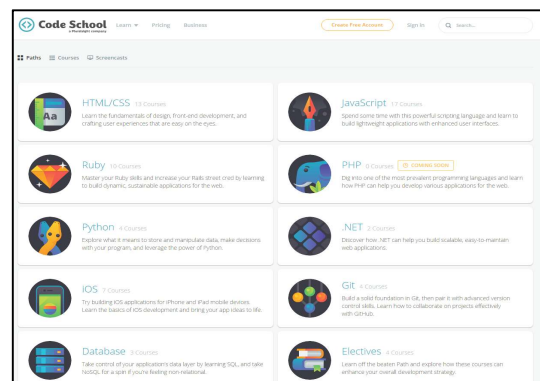


Figure 6: learning paths code school

Once students enroll in a course they are given live exercises into their browser window, each step is explained once the user completes on screen instructions and runs the code. The code therefore is

interpreted on the runtime.

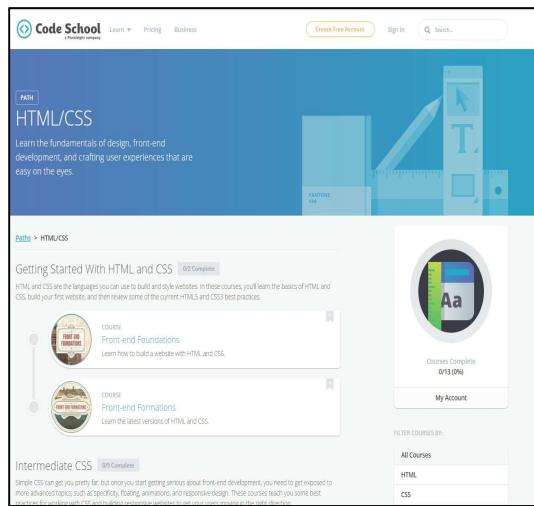


Figure 7: HTML/CSS path code school

Similar to ClassDojo, Code school also rewards student's points on completion of course units/exercises and also shows course completion in percentage. As the student's progresses in courses he is also rewarded by badges as seen in the figure 7.

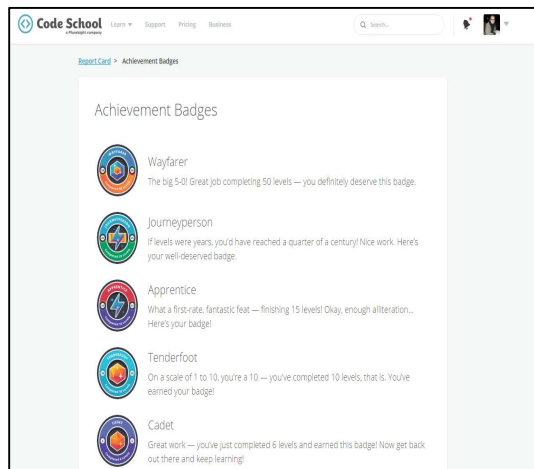


Figure 8: badges code school

Points are also accumulated on code school which is another very useful metric used in most of the gamified applications. It allows user to feel the sense of achievement that he has invested time which can also give him more competitive spirit, as the points are usually also scored on leaderboard where the student can see where he ranks in comparison to other students.

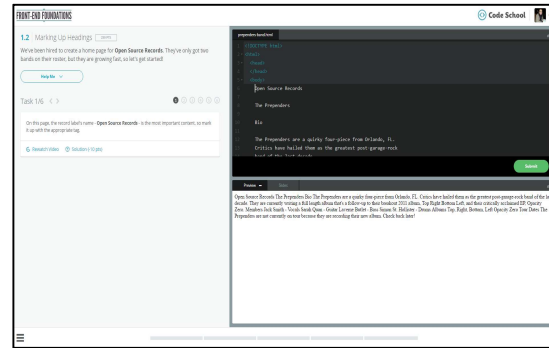


Figure 9: live code exercises code school

Figure 9 illustrates how the user experiences the learning within the course, a small video is shown before the exercise area appears briefing about the details which are essential for completing the exercise. The live coding is actually implementation of game behavior as well, since in games players are expected to interact with each event in a particular way.

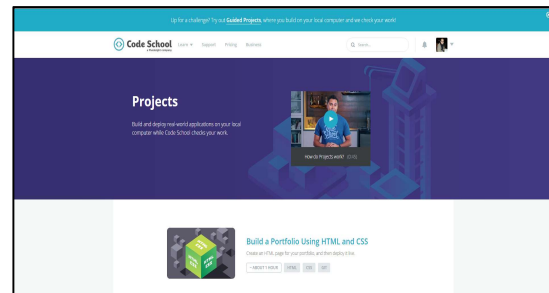


Figure 10: real world project exercises code school

Along with the interactive lessons, Code school also makes use of gamification in a step further, as to allowing users to build projects on their local computers which are then assessed by Code School mentors giving them essential feedback, this makes it two-way interaction rather than one-way interaction in most recorded lessons.

This behavior is what allows the coding experience to be more engaging as the student not only grasps the concepts but at the same time is implementing them in the live scenario rather than watching someone else do it for them in a recorded video. Seeing the real time results produces much more pleasant learning experience in comparison to the traditional learning experience which often requires watching a recorded lesson again and again.

Code school's intuitive use of gamification has allowed it to scale to very large demographic in a very short amount of time since its inception in 2011 Code school has grown to 2 million students. [17]

### 6.3 Duolingo

If gamification in education is mentioned, Duolingo [18] cannot be left unnoticed. This revolutionary start up targeted one of the largest areas of learning sphere, is that teaching different world languages. Gamification in this application was not something which was later injected into it, it was built and integrated from the get go. The application resembles more to casual games than to any serious learning app, but this is what makes it that much appealing to the masses.

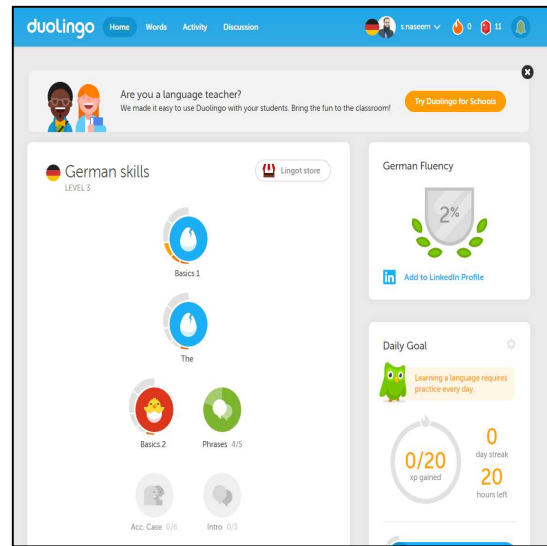


Figure: 12 profile page Duolingo

As observed in the figure 12, Duolingo also utilizes badges as in game incentive along with experience points and negative feedback to prompt users to come back to the application more often for revising lessons or else they will lose experience points.

Every lesson is crafted by three main components: Reading, Speaking and Listening. All the three are mixed with various multimedia quests which allows the user to practice either of the three mentioned components in an interactive manner. In the figure 13 below an example is shown where the word appears above, and user is requested to select a picture with the right translation.

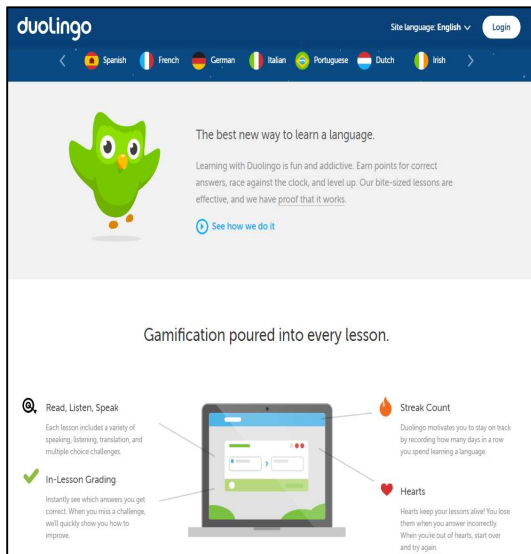


Figure 11: homepage Duolingo

Duolingo makes it fun and engaging to learning new language and it does an excellent job at it by reminding users to catchup and revise their lesson plans, thereby making learning not only much more interactive but this repetition also helps in cementing the newly learned vocabulary.

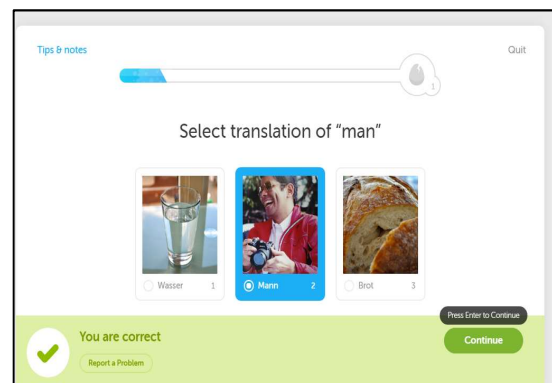


Figure13a: in game activity Duolingo

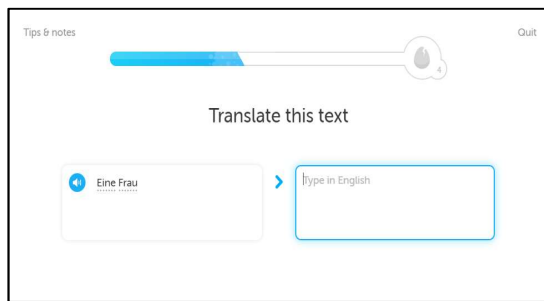


Figure 13b: in game activity Duolingo

Another such in game activity represented in the figure 14 represents when the user is given a text on one column and he is prompted to write appropriate translation in the right column. The words also have speaker icon associated which allows user to listen to the words. Upon wrong answer given it promptly gives instant feedback to the user which improves learning.

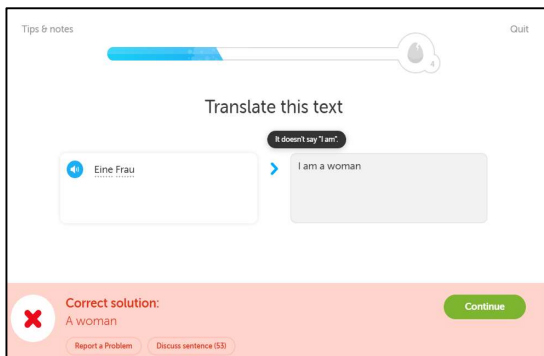


Figure: 14 in game activity Duolingo

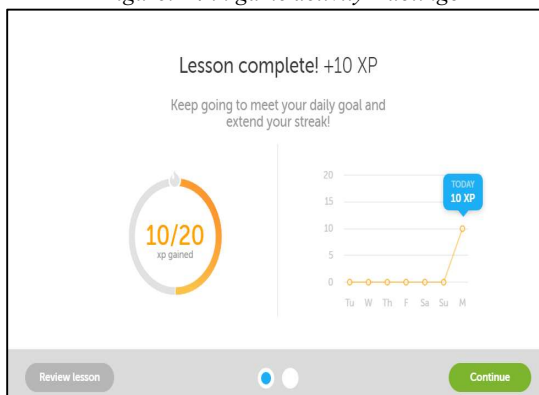


Figure 15: activity completion Duolingo

Upon successful each activity the user presented with a graphical representation of his achievement and experience points gathered in a given amount of

time period as observed in the figure 15.

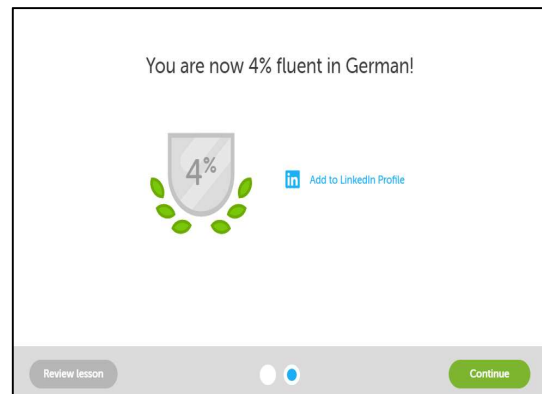


Figure 16: activity completion Duolingo

Not only the user is presented with experience points but he is also given the incentive to share his achievement on LinkedIn with a badge representing his newly learned language proficiency. This drives engagement with the app high as users are driven from the motivation of impressing potential employers through their achievement.

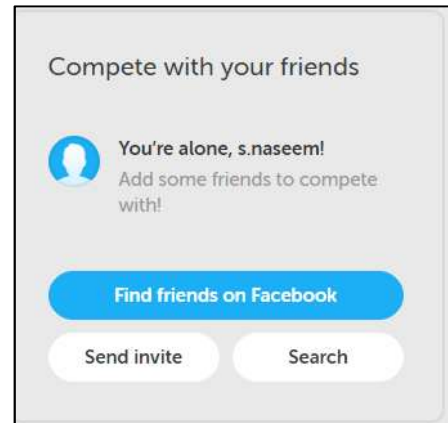


Figure 17: social engagement Duolingo

Duolingo ticks all the right checks when it comes to using gamification in the most user friendly and effective way. It utilizes social networking for increasing competition and in turn make user engage even more time with the learning.

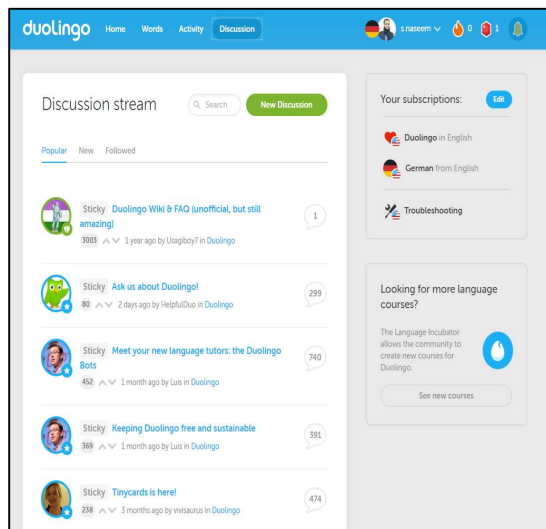


Figure 18: discussion stream Duolingo

As illustrated in the figure 18, Duolingo also makes use of interaction between the different users to make one more avenue for learning languages, as the users create different topics to talk about such as in forums.

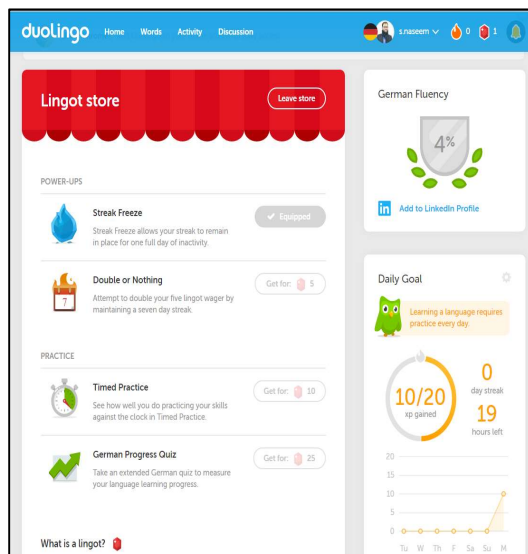


Figure :19 in game store Duolingo

Duolingo takes one more cue from the casual games on mobile devices which is in game store to purchase different power ups and unlock different aspects of the game. These are referred as Lingots in the Duolingo app, which can be earned by completing exercises and earning experience points. All this complements every other facet of learning

experience which has been made gamified, resulting a smooth learning experience for users. [19]

## 7. QUESTIONNAIRE

Questionnaire, being the most direct method of researching uninterrupted input from respondents, is perfectly suited for studying gamification effects on learning experience. The rationale for choosing questionnaire as a research instrument is due to its nature of accessibility and that the results can be better scientifically analyzed in comparison to other methods of research input such as interviews. Quantitative data obtained is essential in deriving meaningful conclusion.

Two sets of questions were prepared, one targeting the students and the other for teachers and course administrators. The questionnaires were distributed online using Google forms for easy accessibility across multiple devices. The main objectives of the questionnaire include the following:

- To identify what variables play most important role in learning experience using LMS (Learning Management System)
- To know how many people are aware of gamification concept and its applications?
- To determine the relationship between gamification of LMS and student's motivation
- To analyze the devices which students most commonly use to engage with the LMS.

## 8. FINDINGS AND DISCUSSION

The survey did result in comprehensive dataset with responses from a total 143 people, 33 of whom were teachers and 110 were students. Insights were obtained on general demographics and usage of LMS and how most resonated with previously listed primary research finding that LMS are difficult to use. The ease of use was one of the main reasons for hindrance in proving its full potential to both students and teachers. Gamification as a concept was found to be relatively unknown amongst the students however its definition was given to ensure that all respondents can answer related questions.

Cloud infrastructure was observed as secure and preferred amongst the teachers. Those who did enrolled in online courses gave insights into the importance of mediums of instructions which are preferred in an online course. Overall the data

obtained from the questionnaire clarified the position of gamification and cloud infrastructure, proving huge market opportunity for learning management systems which can benefit with a carefully planned integration of both technologies.

Although survey results exhibit strong positive points in favor of gamification, it is to be noted that with any technology implementation, gamification too has its drawbacks. Though [20] showed that majority of the research indicating a positive effect of gamification on user behaviors and attitudes, doubts remain about its real efficiency. Although, authors are able to identify several loopholes in the quantitative studies examined, such as small sample sizes, no visible control groups among other issues, making gamification a varied phenomenon where some underlying confusing factors may be there that could result in both positive and negative perceptions in regards to the studied applications.

Farzan [21], in their evaluation for a feature that rewarded contributions with points in a social networking site, observed that, though users were only initially interested to contribute additional activity to earn points, the impact of point system eventually wore off after its introduction. A study done by Hamari [22] showed that an essential factor in determining the relative success or failure of a gamification process is shown by the context in which it is implemented. The efficacy of how game elements work in tandem to the context they are used depends on the level of their integration and whether they were designed keeping in mind the end user.

Even though third-party services have helped in spreading the phenomenon of gamification, but on the other hand it has highlighted the issue of one-size-fits-all approach that can be practical for various gamification integrations. The design technique is mainly thought of as a cut and paste methodology, lacking authenticity not only for the low amount of elements deployed but also for the idea that has inclination towards considering various contexts and users under the same banner.

To solve these issues, Jacobs [23] suggested to change the perspective that aims at adding atomic game techniques to solutions for current situations in order to create new experiences, therefore making gamification technique for making new environments from combining mechanics and contexts that exist. The one-size-fits-all approach can cause harm since it is a provable fact that

designing for specific users is much more viable than designing vaguely for a large audience that includes various type of people.

At the same time gamification is getting huge response from academic world as researchers are aiming to investigate the effects that game elements have, for example in sports and physical activity [24], design methodologies [25], education [26] and health care [27]. This interest can also be observed in workshops organized, dedicated tracks to the topic in various international conferences, and also among the conferences that have gamification as their main topic [28].

A positive shift in attitude is being seen towards gamification, where previously it was mostly viewed for marketing field and industry debates. Gamification practices are slowly, but gradually, been consolidating as design techniques that could give new opportunities in increasing motivation level, engagements and for changing behavior. Casual gaming phenomenon has increased its presence to wide range of customers, increasing the popularity further to females and age group who previously did not inclined to the appeal of the games.

## 9. CONTRIBUTION TO THE BODY OF KNOWLEDGE

This research utilizes existing research on gamification uses in various applications and builds upon primary research of mapping it towards learning management systems which has gamification applied to them. The unique aspect of the research has been that even though gamification has been thoroughly studied but to date it was not analyzed in the niche of cloud-based learning management systems and thus our work contributes in taking live in use examples and then piecing together how they utilize gamification.

## 10. LIMITATIONS

Our research is however limited in its scope as we have reviewed limited number of cloud-based learning management systems which use gamification. Analyzing all of them would not have been possible and does not serve the purpose of having a cross sectional research of the industrial products. Furthermore, many of the learning management systems do not have a freemium model

therefore it would have added to cost factor to try them which would have hindered our research work.

## 11. CONCLUSION

Gamification, after thorough analysis on its own and within the context of education and learning management systems, gave rise to an important fact that it will continue to be adopted in novel ways because of its significant influence on shaping our learning and engaging experiences as observed through the case studies and gamification based educational applications reviewed. The scale to which applications have gone would have not been possible without the cloud computing power and infrastructure behind it. This rise can also be attributed to the growth of gaming industry and mass appeal that video games generate in the entertainment section. The future of learning will be defined by technological advances as the science ventures forward. Gamification of web applications specifically in the context of education sector will see a rapid rise in its adoption. With the current state of technological advances in both cloud infrastructure and newer scientific insights into understanding human behavior, it would not be a wrong assumption to make that within the next couple of decades, the way we learn will be completely transformed for the better of all.

## 12. ACKNOWLEDGEMENT

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