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GAMIFYING PROJECT-BASED LEARNING IN STATISTICS EDUCATION IN SINGAPORE

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Biostatistics is a second-year subject taken by Biomedical Engineering Diploma students in Temasek Polytechnic, Singapore. Gamification elements, referenced from the popular *Pokémon GO*, were infused into a suite of activities. The purpose was to engage and sustain the interest of students while facilitating the successful execution of their group project. The gamified initiative, named *Biostatistics GO*, generated much excitement and added depth to the learning of this project-based subject. In this paper, we present the design of *Biostatistics GO* by highlighting the key design principles, describing the gamification elements, and reviewing its impact on the students' achievements and learning.

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INTRODUCTION

Polytechnics in Singapore are post-secondary training institutes. They aim to develop students with the ability to apply knowledge and skills at the workplace. To prepare for the working world, students must master relevant skills, develop flexibility, adaptability, and nurture their desire for lifelong learning to cope with ever-changing industry practices. That is why polytechnics adopt applied learning pedagogies that involve elements of authenticity, relevance, community, learner-centricity, and hands-on learning, to "promote deep understanding" and "develop higher-order thinking" (Savin-Baden, 2000, p.30). Students are exposed to a wide variety of assessment modes and tasks that involve inquiry-based learning, experiential-learning, and project-based learning (Narayananayar, 2017).

Any statistical subject embodies a fixed set of desired outcomes, such as the ability to perform hypothesis testing on datasets, and well-defined deliverables, such as analysis reports. Desired outcomes, communicated via assessment rubrics, are provided upfront. Statistical literacy subjects have an established excellent approach that anchors on activity-based methods. They require students to comprehend statistical concepts, apply statistical procedures to real data, solve authentic problems, and/or even to improve current industry practices (Loveland & Schneiter, 2014; Calderwood, 2002). However, we have noticed that oftentimes, students get lost in the process of contextualization (i.e. to understand) and decontextualization (i.e. to extend to other applications). Hence, these gaps between knowledge and acquisition must be filled.

RATIONALE

Our project-based approach for Biostatistics enables the application of any acquired theoretical knowledge to ready-to-use deliverables. However, it is challenging for both students and tutors. Not only is it time-consuming, but there are also problems of student motivation, an overwhelming cognitive load, the management of intra-group dynamics and the accuracy of assessment (Helle, Tynjälä, & Olkinuor, 2006; Freedman, 2013). In addition, the anxiety of encountering

this approach can impede learning (Onwuegbuzie & Wilson, 2003).

Gamification in Project-Based Learning

In education, gamification can be defined as "the introduction of game design elements and gameful experiences in the design of learning processes" (Dichev & Dicheva, 2017, p. 2). Educational gamification seems to provide some rule systems which can allow the sequential process of 'Learn, Apply, Deliver, Repeat' to be guided and paced. Gamification can serve as an intervention in three areas of student learning, namely cognitively, emotionally, and socially (Lee & Hammer, 2011).

We decided to redesign the activities and infuse gamification elements into a suite of activities for project-based learning as Nah et. al.'s (2014) reviews of over 30 studies showed a good number of positive outcomes, although the overall outcomes were largely inconclusive. These were to address the above-mentioned challenges, foster group dynamics, reduce anxiety and cognitive load, and enhance motivation for sustained learning. We selected three gamification elements, namely goal-focused activities, reward mechanisms, and progress-tracking, to engage students and facilitate collaboration for their group statistical project in a health-related field. As our students were enthralled by the popular game *Pokémon GO*, we adopted it as a theme for the gamification of the project and named this learning experience *Biostatistics GO*.

The Original *Pokémon GO*

Pokémon GO is an augmented reality mobile game application. Launched in July 2016, it had amassed 65 million players within a year (Tassi, 2017). Each player is a *Pokémon* Trainer. The goal for the Trainer is to catch and train *Pokémons* (short form for pocket monsters) to battle one another. The player is represented by an avatar, which appears on a map based on the player's geographical location, and displayed on the screen of a mobile device. The player then has to move around the real-world surroundings to get the avatar to capture the desired *Pokémons* it encounters. During an encounter with a *Pokémon*, a player may throw a *Poké Ball* at it. The player who successfully catches a *Pokémon* will own it and is awarded an in-game currency known as *Candies*, which can be used to raise a captured *Pokémon*'s 'Combat Power' (CP). When a certain level is reached, the *Pokémon* evolves. The goal of the game is to catch and evolve all captured *Pokémons*.

PokéStops and *Pokémon Gyms* are displayed on the map. The avatar can go to the *PokéStops* to collect *Lure Modules* which are items used to attract additional wild and rare *Pokémons*. The *Pokémon Gym* is where the player can go to train their *Pokémons* by battling others, just as real-world gyms are places where one builds physique. Every time a *Pokémon* loses, its motivation drops, thus its CP drops too.

Purpose of This Paper

Our students used to learn statistics by rote, acquiring knowledge (e.g. equations and procedures) and solving problems during heavily weighted pen-and-paper assessments. We decided that a gamified project-based learning design approach would provide an enjoyable and positive learning experience (Zhang & Fang, 2019) that is meaningful, leading to deep learning (Marton & Booth, 1997).

In this paper, we describe the theoretical underpinnings of *Biostatistics GO* and show its impact on the students' achievements and learning. We also highlight characteristics of our gamification approach that support the four phases of Temasek Polytechnic (TP)'s self-directed learning (SDL) Framework (Learning Academy, 2016, n.d.). These are:

Plan: analyze the learning task and formulate a plan to complete it

Perform: maintain concentration and interest through the use of strategies as when working on the learning task

Monitor: judge the task and formulate reasons for the results

Reflect: build a clear understanding of the adequacy and quality of the work.

CHALLENGES

Biostatistics is a core subject for all second-year Biomedical Engineering (BME) Diploma students at TP. The subject needed to be driven by an authentic and challenging problem statement. The statistical project required students to complete a series of tasks over a span of 15 teaching weeks. They had to articulate their proposed course of action, carry out statistical experiments, analyze their results using appropriate statistical techniques, justify and explain the benefits or improvements to be expected from their recommendations (see Figure 1).

According to Larmer et. al. (2015), the gold standard for project-based learning requires the inclusion of features of sustained inquiry, allowing for students' voices and choices, and room to critique, reflect and revise, while delivering a product or artifact. This is far from reality. Regular subject reviews consistently reiterate students' difficulty in completing their project, abiding to the guidelines of the project brief and having sufficient consultation time with the tutor.

Biostatistics GO was designed to appeal to 19-year-old, second-year Biomedical Engineering students who come from different educational backgrounds: Express, Normal Academic and Technical Streams of the secondary schools, and the Institute of Technical Education. Firstly, we had to

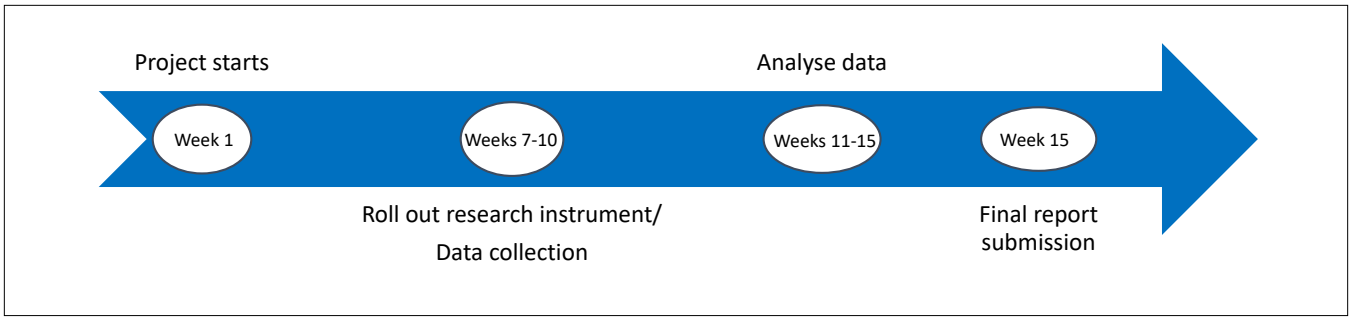

FIGURE 1. Recommended project timeline.

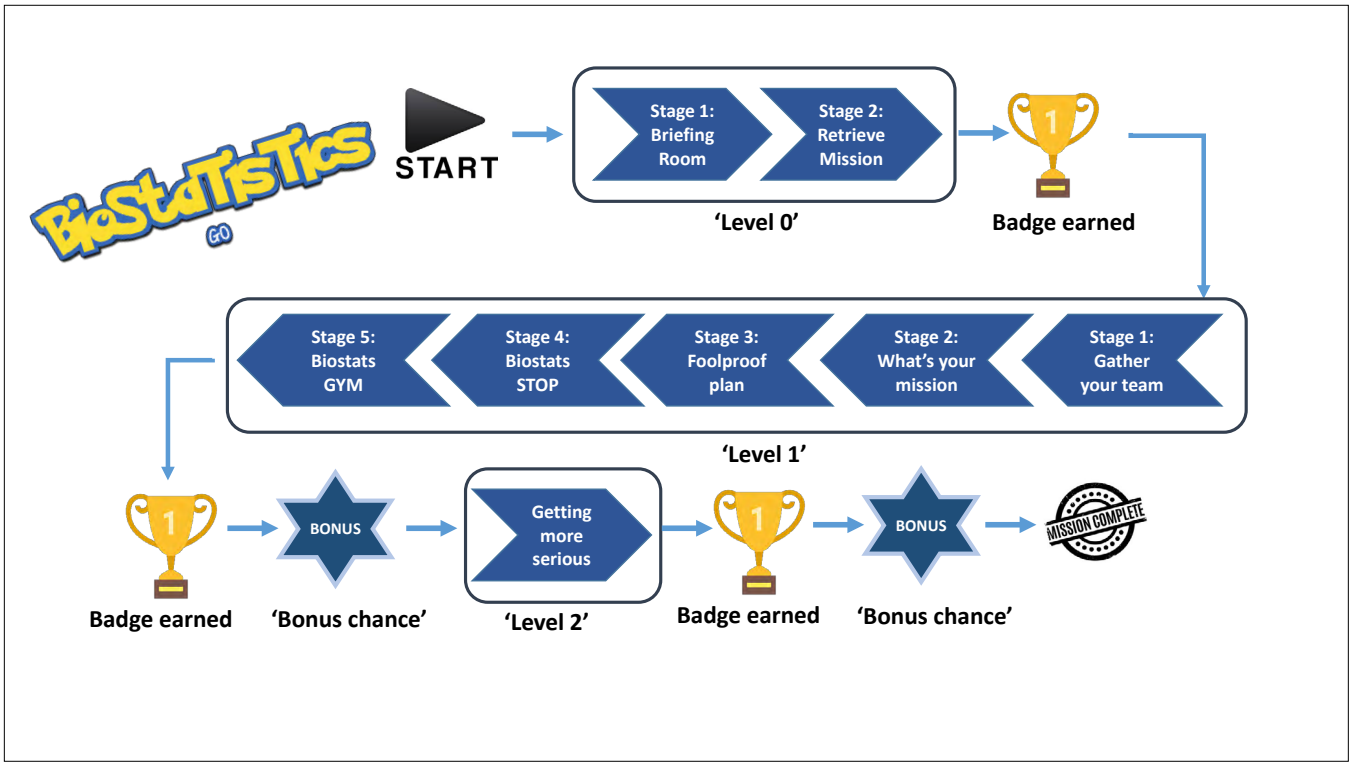

FIGURE 2. Overview of *Biostatistics GO* (Zhang & Fang, 2019).

make learning available in bite-sized, meaningful units to encourage learning at the individual, group and class levels, as well as support the acquisition of knowledge for application in a group project. Secondly, we had to design activities that would incorporate the element of fun whilst promoting learning. We incorporated gamification elements to generate group competition and increase motivation. Gamification provided the immediate gratifications through extrinsic motivation, and opportunities to deepen knowledge in a paced manner.

Students needed a good grasp of the fundamentals of statistics. With that solid foundation, they would be able to apply their knowledge for their project. They also needed to learn how to critique their own work. Oftentimes, the preoccupation of "doing" the project overshadowed the more meaningful activities of reflecting, providing and/or receiving feedback. It was hoped that the gamified activities would allow the tutor to shape their learning in the following ways:

- approving their research topics
- endorsing their peer-reviewed research instruments
- appraising the critiques
- sharing new (software) tools
- guiding their report writing.

Biostatistics had been offered over several years and hence, was an established subject. The tutor only needed to transform the project tasks into gamified, goals-focused activities. The performance aka assessment tasks (e.g. progress review report, final report) remained the same. This paper explains how redesigned activities incorporating gamification elements could enhance the learning of Biostatistics for

second-year BME students. We hoped it would surpass surface learning (associated with memorization and the regurgitation of information), and lead to deep learning.

THE DESIGN

The design of *Biostatistics GO* involved the following:

- Three game levels (0, 1, 2) with different stages at each game level.
- Two bonus chances to reward the students in Levels 1 and 2 (see Figure 2).

According to the project timeline (see Figure 1), the schedule was as follows:

- Week 7: Completion of Levels 0, 1 and the first bonus chance
- Week 12: Completion of Level 2
- Week 13: Receipt of second bonus chance
- Week 15: Submission of report and accomplishment of 'mission'.

The above activities were accessed through the Blackboard Learning Management System (LMS) (see Figure 3). Each level is implemented using the 'Content Folder' function. The levels were made available using the 'Adaptive Release' function.

Pedagogical Bases and Design Outlook

Three basic game elements, namely goal-focused activities, reward mechanisms, and progress tracking, were used. They ensured the achievement of major milestones, and enhanced student outcomes in the affective, behavioral and cognitive domains (Lee & Hammer, 2011).

Biostatistics GO began at Level 0 where students "entered" a briefing room and were provided with an interactive presentation (developed using Articulate Studio). They learned about the project objectives, specifications, and timelines. They then proceeded to 'retrieve' their 'mission' from another interactive presentation (created using Articulate Studio).

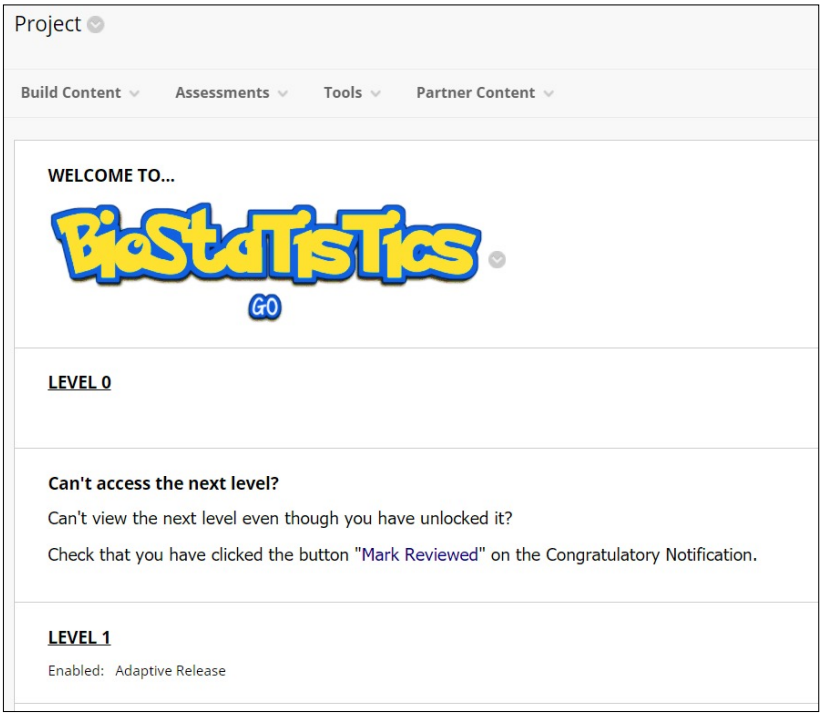

FIGURE 3. *Biostatistics GO's* Outlook in LMS.

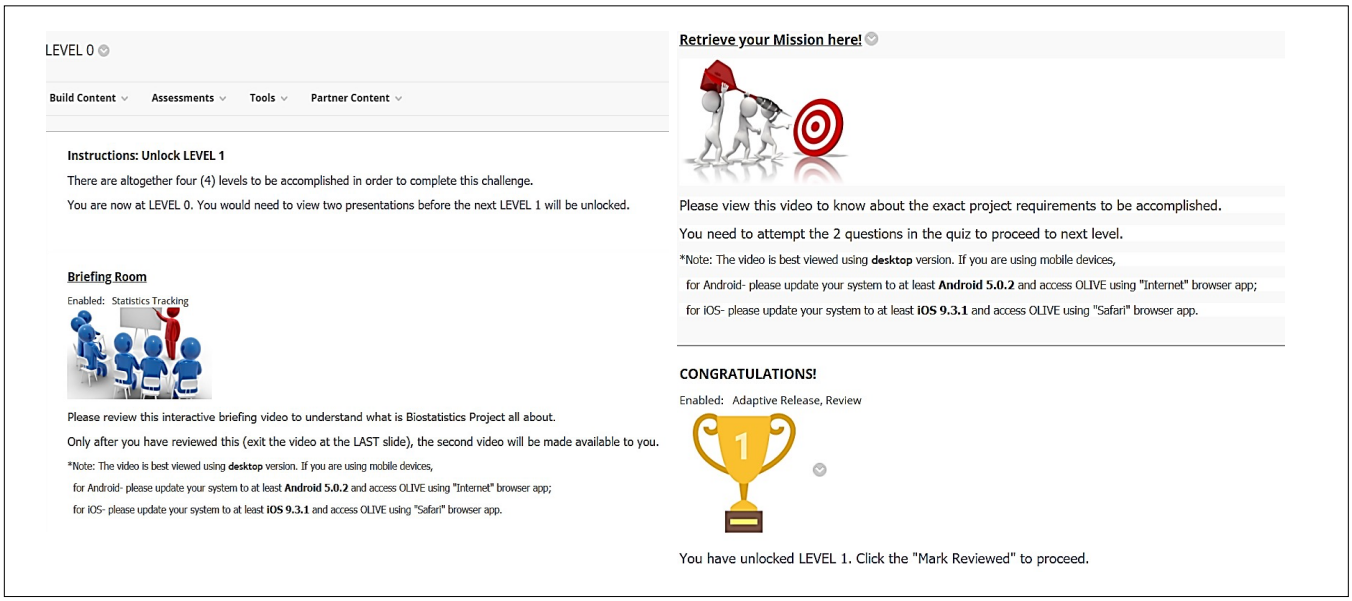

FIGURE 4. Stages in Level 0 (Briefing Room; Retrieve your Mission; Congratulatory Note).

They also learned about possible healthcare-related statistical areas and topics, the Do's and Don'ts, and the desired outcomes (see Figure 4). On completing the Level 0 stages, students earned their first badge and proceeded to the next level.

Gamification: Goal-focused activities

Getting to the next level is often the motivator for continued effort (Gåsland, 2011). People can be motivated to perform better in work-related tasks by setting and monitoring goals. Optimal performance is observed when these activities have specific objectives and require considerable effort (Tondello et al, 2018). In goal-setting theory, the choice or direction (Locke & Latham, 2002) is one such mechanism, while 'effort', 'persistence' and 'knowledge' affect performance. Hence, *Biostatistics GO* incorporated three levels of goal-focused activities, each leading to increased challenges.

Level 0 was designed to provide clear goals and ways to orientate around goal-focused activities in the form of a 'mission' or 'quest retrieval'. Level 1 allowed students to form their own teams, select their research topic and decide on the scope of work. Stages 3 and 4 of Level 1, and Level 2 were put in place to allow the students to acquire the much-needed skills (such as developing research instruments and learning software analysis skills) to attain performance.

Having multiple stages in each level also anchors on the goal-setting theory (Locke & Latham, 2002) which encourages students to exert effort in relation to the goal difficulty, to increase motivation and sustainability. At Level 1, students needed to clear these five stages:

- **Stage 1 'Gather your team'**
  Students formed their own team (with a maximum of three members) using the self-enrollment feature in the LMS.
- **Stage 2 'What's your mission'**
  Students discussed in their respective threads in the LMS discussion forum (accessible only to the same team members) to agree upon the topic they would embark on.
- **Stage 3 'Foolproof plan'**
  Using Google Sheets, each team created a task list and

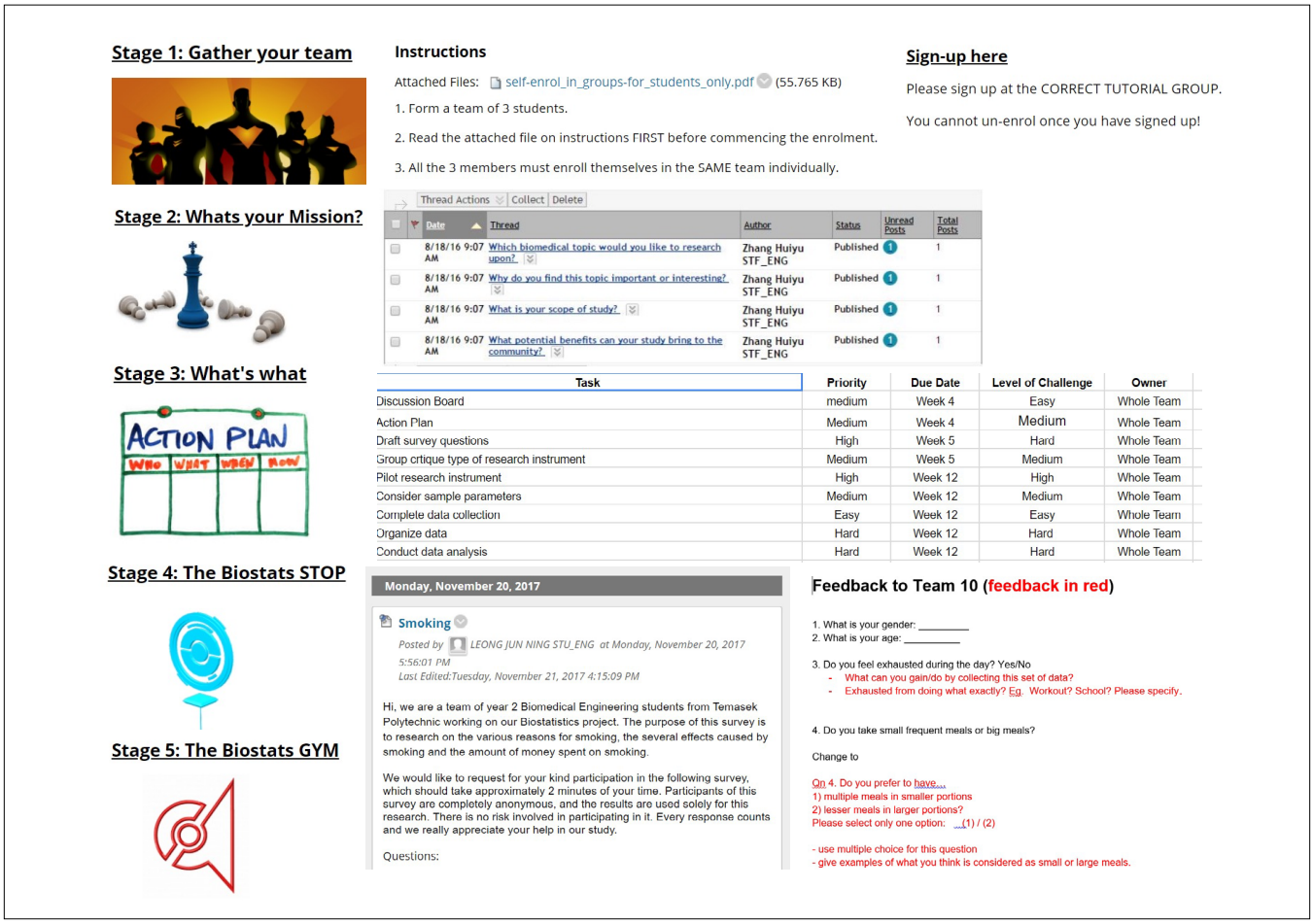

FIGURE 5. What students would see and do for the various stages in Level 1. (Top to bottom: Stage 1 'Gather your team'; Stage 2 'What's your mission'; Stage 3 'Foolproof plan'; Stage 4 'The *Biostats Stop*' and Stage 5 'The *Biostats Gym*').

assigned ownerships to the different tasks, log schedules and other project management details.

- **Stage 4 The *Biostats Stop***
  Each team had to upload their draft research instrument (which was either a survey questionnaire or interview questions) with the wiki tool in the LMS. At the *Biostats Stop*, the research instrument was seen as the most important component in a statistical study. Collected responses and data in *Biostatistics GO* were the *Lures* collected at the *PokéStop*.
- **Stage 5 The *Biostats Gym***
  Pokémon trainers could sharpen their skills and battle their *Pokémons* against the Pokémons of other players. Likewise, a team could critique another team's research instrument using the rubrics provided in this *Gym*. The critiquing team would award the critiqued team one of three *Pokémons* to indicate their overall assessment of the quality of work: Dratini (More work needed), Dragonair (Almost there) or Dragonite (Great to go). At this level, students would only earn their second badge and proceed to the next level after completing the five stages, once permission was indicated on the leaderboard (see Figure 5).

To keep activities simple while preserving the essence of evolution (akin to reflection for improving learning outcomes), only the *Stop* and *Gym* were included.

Gamification: Rewards

Biostatistics GO students were to be motivated by the badges and the leaderboard. The signal to proceed to the first Bonus chance, termed 'Level up', was indicated by a flag on the leaderboard (see Figure 6). Congruent to the main

Team	Level 1 Stage 4	Level 1 Stage5	Peer Rating	Level up
1			'More work needed'	
2			'More work needed'	
3			'Almost there'	
4			'Almost there'	
5			'Almost there'	
6			'Almost there'	
7			'Almost there'	
8			'Almost there'	
9			'Almost there'	
10			'Almost there'	

FIGURE 6. Leaderboard of the teams.

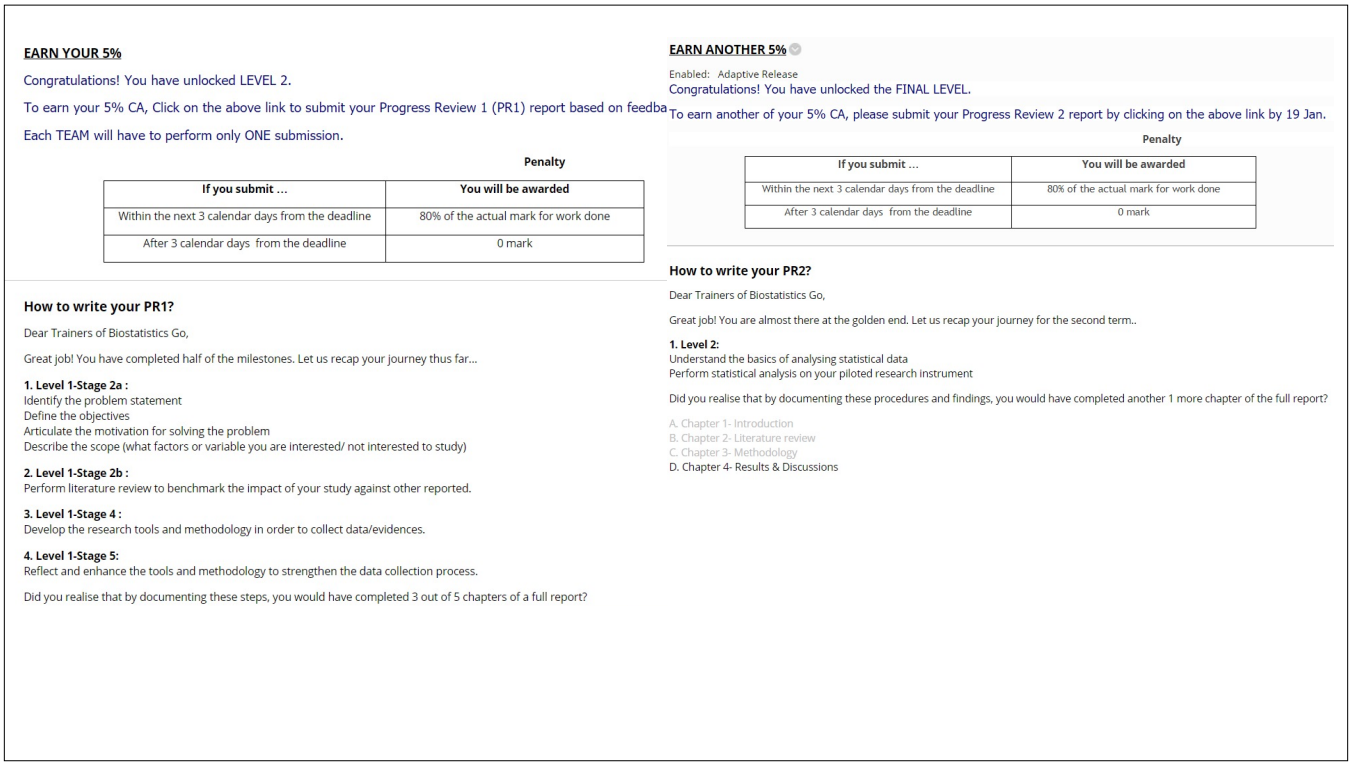

FIGURE 7. By submitting progress reports, students earned their bonuses (Left to right: EARN YOUR 5%—first Bonus chance; (R) EARN ANOTHER 5%—second and last Bonus chance).

objective of gamifying learning, the flag was to impart a sense of gratification in the participants to sustain their level of engagement. The leveling up mechanisms also allowed students to keep a tab on whether they were on target with respect to the recommended timeline to complete the project. The rationale behind having Bonus chances was not only to provide the extrinsic motivation to sustain and complete the game, but also to reduce the cognitive load and stress of the students by pacing themselves to manage these difficult goals. The whole class was able to view the leaderboard.

Studies have shown opposing outcomes of using extrinsic rewards to drive participation and engagement. Bielik (2012) observed negative effects on motivation when choice and self-reported interest were absent, congruent with self-determination theory (Deci, 1972). However, the negative aspects could be attributed to the poor design instead (Bielik, 2012).

On the other hand, Barata et al. (2013), de Freitas & de Freitas (2013), Kumar & Khurana (2012), and Todor & Pitică (2012) found reward mechanisms such as badges, points, leaderboards, produced positive results in student motivation of science and technology subjects. These helped to enhance qualities such as "self-competence and self-efficacy" with the social and individual achievement status brought about (Zhang & Fang, 2019).

After having earned their second badge, teams would have the first one-time chance to gain 20 marks for their project. The team could win their first Bonus by submitting a progress review report that summarized their progress in Level 1, and their second Bonus for Level 2 (see Figure 7). Students then had to watch an instructional video on using a statistical software in order to cross over to Level 2 'Getting more serious'. They would use the statistical software to analyze data collected via the research instrument. They should have mastered it after clearing Level 2. The teams were automatically awarded their third badge and presented with the second Bonus chance.

The 'mission' was considered complete upon the submission of a formal group report that consolidated the processes and outcomes, broadly following the universal guidelines of these sections: 'Introduction', 'Literature Review', 'Methodology', 'Results and Discussions', 'Conclusion' and 'References. This "product" was worth 60 marks, since the "process" worth 40 marks had been awarded in the two Bonus chances.

Gamification: Progress Tracking

Biostatistics GO enabled the moving away from the usual pen-and-paper assessment mode. As every activity was compulsory, it facilitated the online tracking of the learning process. Achieving the desired learning outcomes in the instructional context parallels identifying the remaining tasks required to win in the game context. The progress-tracking tool used here was inferred from the reward mechanisms.

We used badges and a leaderboard to serve as "signposts" indicating the students' progress and areas of focus or improvement. Every team could view their ranking in this three-tiered leaderboard, determined by the tutor based on their performance in Stage 4 (the quality of the draft research instrument) and Stage 5 (the extent the critique was objective, actionable, and constructive). For effort in Stage 4, each team was awarded a gold, silver, or bronze star according to merit. Similarly for Stage 5, they received emojis that were grinning, slightly smiley, or unhappy, according to the effort they put in when providing critiques. They also viewed the rating provided by their peers.

By letting the students know how they ranked, we hoped that they could self-monitor, keep tabs on their work and identify the gaps to be bridged through the lenses of the tutor and peers. Huang & Hew (2015) found that points, badges and leaderboard helped to increase their students' cognitive engagement in a SPSS module that was similar in context with our Biostatistics course. Hence, we designed Stages 4 and 5 to immerse students in an in-depth reflective learning cycle to achieve the assigned goals. The opportunity to rate their peers using *Pokémons* simply added some fun to this process.

REFLECTIONS ON DESIGNING

Trade-Offs

There were highs and lows. Not everyone reacted in the same way. Firstly, some enjoyed the learning journey more than others. Zhang and Fang's (2019) study revealed that although the participants were more involved in the game, one particular participant kept a distance and did not want to learn from the game. Secondly, while the leaderboard was intended to provide feedback and increase motivation, not all considered it useful because their performance of their tasks was publically displayed. This highlights the issue of whether mandatory fun is still fun (Mollick & Rothbard, 2014, Hanus & Fox, 2015).

The length of the game was also a concern to the students. Many students found the time-consuming game levels tedious as they had to constantly stay focused on the activities while juggling work from other subjects as well. On the other hand, they provided students with small goals to achieve, encouraging them to revisit and refine their work at each stage.

The design enabled learning from various sources, i.e. themselves, tutor and peers. Even the least-liked leaderboard provided the groups with a sense of where they stood in class, what they were lacking in, and that encouraged them to clarify their doubts. The *Biostats Stop* and *Biostats Gym*

sustained a community of learning that was both aspirational and practical. Students were able to share results, help identify blind spots, learn from each other and revise the work accordingly. The ability to rate their peers objectively and accurately and provide constructive feedback during the *Biostats Gym* varied greatly. This is one area the design team could look into for future implementation. For instance, in addition to providing the rubrics, samples on how to critique and respond could be included so that all students would be able to benefit from this process, affectively, behaviorally and cognitively.

Self-Directed Learning (SDL)

To promote life-long learning, much effort has been put to instill self-directed learning competencies with our gamification. Having described the *Biostatistics GO* design in the earlier sections, we will discuss how these game mechanics supported SDL (see Figure 8) in Table 1.

Sensing Learning

As the reflective process is complex, given the close interrelation and interaction of feelings and cognition, it was important to find out how students felt about their learning

STAGE	MECHANICS IN *BIOSTATISTICS GO*	HOW SDL WAS SUPPORTED
PLAN analyzing the learning task and formulating a plan to complete the task	• Goal-focused Level 1 Activities: Stage 1 'Gather your team' Stage 2 'What's your mission' Stage 3 'Foolproof plan'	• This stage required students to set goals that had to be specific, measurable, attainable, relevant and timed. • This was achieved by getting the students to choose their preferred team mates, discuss intentionally what should be the theme of the project, and the scope of study (specific and attainable), the benefits the study could bring to the community (realistic), and set task list to manage project details (timed). • These activities provided the measurable goals for the students to complete.
PERFORM maintaining the concentration and interest through the use of strategies as when working on the learning task	• Goal-focused Level 1 Activity: Stage 4 '*Biostats Stop*'	• Students researched on their own while acquiring content knowledge in types of statistical data, tests and analyses in class so that they could develop a valid and reliable research instrument, e.g. survey or interview.
MONITOR judging the tasks and formulate reasons for the results	• Badges & Level Up • Leaderboard	• By achieving the badges and being able to proceed to the next level, students were given the platform to monitor whether they were on target with respect to the recommended timeline to complete the project. • The 'Flag' in the leaderboard also signaled whether the tasks were adequately performed.
REFLECT building a clear understanding of the adequacy and quality of the work	• Goal-focused Level 1 Activity: Stage 5 '*Biostats Gym*' • Leaderboard	• In the *Biostats Gym*, as students critiqued their peer's research instrument based on given rubrics, they were able to unearth their own blind spots and benchmark their current work against others. The feedback also helped them enhance the quality of work, be it just the way the survey questions were phrased, or the use of language. • The tutor's ratings reflected on the leaderboard provided timely feedback, allowing students to assess where they stand and how much more effort needed.

TABLE 1. Game mechanics supporting SDL phases.

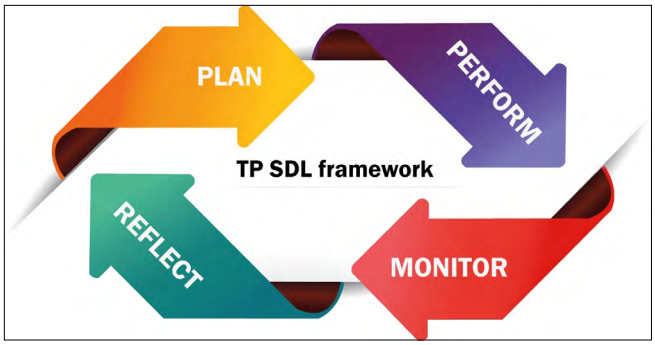

FIGURE 8. TP's SDL Framework.

as well. Accepting that some people learn better than others (Marton & Booth, 1997) and "only learners themselves can learn and only then can reflect on their own experiences" (Boud, Keeogh & Walker, 1997, p.11), we wanted to find out if students equated learning with an increase in competence in writing their report.

To derive a sense of learning from each student's perspective (Marton & Booth, 1997), a self-reflection activity was incorporated in the later part of the semester. Students were asked to list their perceived problems with writing a report and rate their perceived competency (on a scale of five ranging from 'Very competent', 'Competent', 'Average', 'Below average' to 'Poor) in report writing before and after writing the report in weeks 11 and 14 of the subject respectively (see Appendix B for the self-reflection activity). From the data collected, we observed shifts in their perception, and described them as:

- Positive shift (+1): if there was a perceived increase
- No shift (0): if there was no change in the ratings.
- Negative shift (-1): if there was a perceived decrease.

These shifts could be cross-tabulated against their group grades.

When Zhang and Fang (2019) plotted 28 participants' group grades against their perceived shifts in their competency ratings, they uncovered interesting insights:

- Positive change: 7 participants who received lower group grades ('4' – '9') perceived that they had increased competency in writing the report.
- No change: 16 participants who scored highest to lowest group grades ('1' – '10') perceived no change in competency in writing the report.
- Negative change: 5 participants who received higher group scores ('2', '3' and '6') perceived that they had decreased competency in writing the report.

For the above findings, number '1' indicated the group with the highest grade and the number '10' indicated the group with the lowest grade. In Figure 9, each participant is represented by a hexagon.

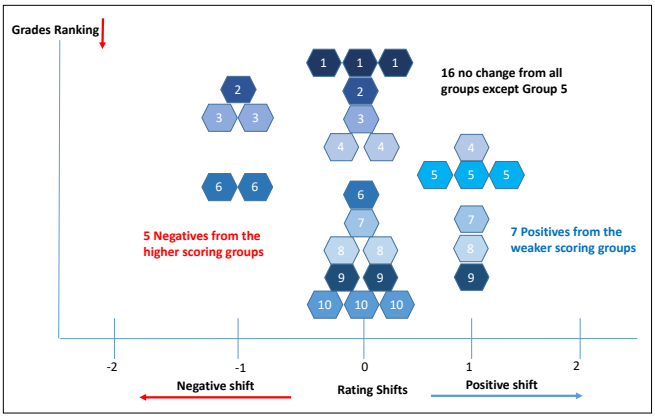

FIGURE 9. Cross-tabulations of grades against perceptions.

To fully understand their responses, the participants were interviewed in their project groups (see Appendix C for the interview questions). Those who ranked their competence as higher realized that they had learned from the *Pokemon* activities. Those who ranked their competence as lower at the end of the project seemed to realize how much more quality work they could have done for the project or were aware of their shortcomings and limitations. This should be taken as a sign of having learned much more, beyond the knowledge of the subject.

Tutor Insights

It is essential to understand learning through the lens of the students and what they experience (Marton & Booth, 1997). It is also important to consider that individuals learn differently, and from a variety of sources: friends, online resources and tutor. Learning is varied and can be deep (Marton & Booth, 1997). In this project, learning can be considered to have happened at these points:

- When there is some accomplishment, e.g. mastery of skill, acquisition of knowledge, or ability to apply
- Where there is an awareness of potential room for improvements and identification of limitations and shortcomings.

To the teaching team, tapping on the inherent structure that gamification helped to facilitate the instructional scaffolds for the students in project-based learning. The challenges such as overwhelming cognitive load, group dynamics, and motivation levels, (Helle, Tynjälä, & Olkinuor, 2006), can be managed through the use of rewards and progress tracking game mechanics. Similar to the findings by Barata et al. (2013), Kumar & Khurana (2012), and Todor & Pitică (2012), there were positive effects on the students' achievements. This structured gamification approach, with goal-focused activities and levelling-up mechanism, facilitated the attainment of the manifold objectives of project-based learning. The mastery of concepts, application, critical thinking and

problem-solving would otherwise not have be feasible for students to focus on them all.

CONCLUSION

We found that it was possible to infuse gamification in online materials for lessons there were effective. We found that the work required to transform activities with gamification was justified given the extra opportunities we were able to build in for coaching and feedback. There was more effective use of time and energy, compared to that required in traditional text-based tasks. Although there seemed to be endless promise in gamification, we discovered in this project that we should have heeded Kapp's (2015) caution that the game should be balanced. The method we used was to "give all players an equal opportunity to win every time they play". We also decided that the rules and contexts needed to be laid out clearly before the start of the game, and that all the students should start with the same resources, although they are opportunities where a lead student can fall behind and a far-behind student can catch up.

The gamification project designed to keep the students motivated and learning, ensured that the lessons were not just something "cool" but also effective. It showed the designers that the additional work was worth it as it provided the opportunity for deeper learning.

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APPENDICES

Appendix A: Project Marking Scheme

CRITERIA	WEIGHTAGE	DESCRIPTORS
Objectives & Benefits of Study	10%	• How clear and creative is the objective of study • How significant are the benefits of the study
Statistical Methods & Analysis	35%	• The correct application of number of relevant statistical methods • The accuracy and impact of the analysis
Depth of Research: Understanding of Issues	25%	• How well supported, accurate and meaningful is the discussion
Collaborative Learning: Critique of Research Instrument	20%	• How clear and valid is the critique
Report Format	10%	• How well organized is the report

Appendix B: Self-Rating Task

Question 1: *How do you rate your ability to write a formal report?*

	YOUR RESPONSE (WEEK 11)	YOUR RESPONSE (WEEK 14)
Very competent		
Competent		
Average		
Below average		
Poor		

Question 2: *Which section or sections did you have difficulty writing?*

	YOUR RESPONSE (WEEK 11)	YOUR RESPONSE (WEEK 14)
Introduction		
Lit Review		
Methodology		
Results & Analysis		
Conclusion		
Reference		

Appendix C: Semi-Structured Interview Questions

1. How did you find the subject in general?
2. How did you find the project work?
3. How you find the online set-up for the project?
4. Either: Can you give me examples of how the online set-up helped you to prepare for your project and why?
   Or: Can you give examples for how they did not help you in your project and why?
5. What role did the leaderboard play in helping you prepare for the project?
6. What helped you achieve in this subject?
7. Any other comments?