Part B: Project Summary

(1) Goals: The goal of this project is to develop a learning package with educational card game, learning videos, teaching notes and online assessment which enhance mathematics learning. There are three objectives in the project, i) uplift learning motivation, ii) increase self-regulated learning time, and iii) increase learning confidence.

(2) Targets: Beneficiaries would be all form 1 and 4 secondary schools students in Hong Kong in coming 5 years. According to EDB's statistics in 2020, it is expected that there are approximately 300,000 and 260,000 form 1 and 4 secondary students in this period of time. Prior to public release of the educational game, the project team will invite more than 200 secondary school students in the partner secondary schools for trial run and evaluation.

(3) Implementation Plan- Duration: 1 Jun 2023 – 31 Aug 2024

(i) Process/Schedule

No.	Functions and processes	Period
1.	Preparation work	Jun – Jul 2023
2.	Education Card Game design and development	Jun – Oct 2023
3.	Tutorial development	Jun – Oct 2023
4.	Assessments for each topic	Sep – Nov 2023
5.	Consolidate as a whole learning package	Sep – Dec 2023
6.	Trial run and preparation of game competition and survey	Sep 2023 – Feb 2024
7.	Production of final Educational Card Game	Feb – Apr 2024
8.	Implementation of game competition and feedback collection	Apr - Jun 2024
9.	Evaluation and recommendation report	Apr - Aug 2024

(ii) Closely collaborative secondary school partner – *Lee Kau Yan Memorial School*

(iii) Other participating secondary schools

St. Stephen's Church College and HKCWC Fung Yiu King Memorial Secondary School

(4) Deliverables

(i) Deliverables/outcomes:

Learning package including 3 design of educational card game, 10 sets of learning notes containing concept introduction, explanation with examples, class exercises, students' common errors, and 30 sets of self-learning videos, 100 multiple choice questions in online assessment system covering 10 Mathematic units. More deliverables include a game competition held in the partner school and students' feedback report on blended learning mode.

(ii) Dissemination of deliverables/outcomes:

2 sharing sessions will be conducted to introduce the blended learning approach and share our experience in this project to secondary schools. The learning package will be available in project website which will be available to the public.

(5) Budget: (i) staff cost: 182,700; (ii) Services: 52,435; (iii) equipment: 51,000; (iv) general expenses: 8,072; (d) contingency: 3,193 *(Total: 297,400)*

(6) Evaluation:

Focus group interview, students' perception survey and observation by teachers will be completed to evaluate the attainment of project goals and objectives. Other objective measurements includes number of usage and no. of students participating in the game competition would also be taken into consideration during evaluation.

Project title: Apply Blended Learning with Educational Card Game on Mathematics in Secondary Education

Part C : Project Details

1. Needs Assessment and Applicant's Capability

1.1 Needs Assessment

Blended learning is an effective pedagogy for 21st century students

Blended learning is a hybrid mode of learning which combines online teaching materials and face-to-face interactive learning activities. Effective setup of blended learning could significantly improve student's learning ability (Bringula et al, 2017). It uplifts students' learning motivation and enthusiasm in the learning process (Rafiola, R., Setyosari, P., Radjah, C., & Ramli, M., 2020 and Wang & Towey, 2013), fosters an interesting, interactive and informative learning environment (Kwan et al, 2015) to facilitate active participation from students, which also enables the enhancement of learning retention (Jong, Lee & Shang, 2013). With thorough design of blended learning activities, students' autonomy in learning could be highly increased (Yi & Chu, 2017 & Yeh, 2013) resulted in improvement in learning performance and effectiveness (Singh, H., 2021).

Gamification enables a pleasant and relaxing classroom atmosphere

Students expressed that game element is a "Must have" item in class (Jong, Lee & Shang, 2013). A well-designed gamified task could cultivate a positive learning attitude (Kiili, Devlin & Multisilta, 2015), highly engage students in the learning process (Kalloo & Mohan, 2012), and keep students' curiosity to explore more on the units (Jong, Lee & Shang, 2013). It creates a lively and funny classroom atmosphere (Huang, Huang & Wu, 2014) to attract more attention from learners (Shashoua, 2012), which could eventually meet the needs and interests of 21st century students (Uzun et al 2013). Providing feedback in learning process is another crucial factor. Jong et al (2011) reported that giving feedback in debriefing sessions could facilitate learning reflection, while in the study of Huang, Huang & Wu (2014), it revealed that gamification enables cognition and rethinking process for students' improvement in repetitive learning loop with feedback and debrief. Rule-based, responsive gamified elements with challenging goal could foster cumulative learning result (Jong, Lee & Shang, 2013).

Blended learning with Gamification cultivates students' self-directed learning

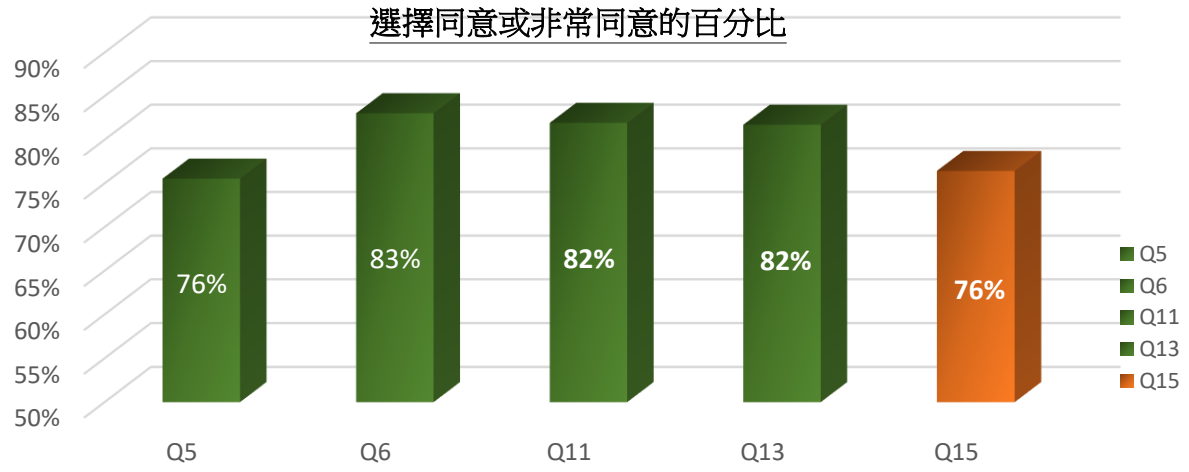
Self-directed learning indicated the ownership of the learning process. It would be more effective if students could be encouraged learning outside the classroom (Daher, 2010). To achieve it, teachers have to prepare both formal learning and informal learning opportunities, and develop strong links in between (Pulla, 2017), enable students' easy understanding in a leisured environment, resulted in satisfied learning experience with high engagement with peers in the blended learning mode (Bouilheres, F. & et al, 2020). In a gamified unit, students could observe the others and learn the playing skills, which is related to the application of prescribed knowledge. Under these circumstance, an effective channel has been built aiming at bridging up formal and informal learning (Kukulska-Hulme, et al, 2009), facilitating observational learning among students (Kwan et al, 2015), and embedding small games throughout the teaching unit (Yi & Chu, 2017) to provide different ways of understanding and application of knowledge. Together with practicing under a delighted environment to enhance learning attitude (Chu et al, 2015), integrating Mathematics directly into gaming activities (Kiili, Devlin & Multisilta, 2015) could eventually cultivate students to perform self-directed learning more proactively.

Experience from previously related project

In a previous project (QEF 2017/0862: Using digital game to enhance Mathematics learning in Secondary Education), 76% out of 454 students expressed that gamification could improve their Mathematics learning ability, while over 80% highlighted their interest and willingness to have video tutorial, gamified tasks and exercise in Mathematics unit, they

also desired more learning opportunity outside the classroom. Detailed finding could be found in Figure 1 below. These finding matched the result described in this needs assessment.

Figure 1: Survey result of gamification in previous project (QEF 2017/0862)



Q5. 在遊戲及教學影片的輔助下，我更願意學習數學
Q6. 我希望其他數學課題也加入影片教學、遊戲模式及練習
Q11. 此數學程式(apps)令課堂以外有更多機會學習數學
Q13. 我希望使用此數學程式(apps)來重溫過往的數學課題
Q15. 總括以言，透過此數學程式能夠增強我學習數學的能力。

(問卷選項：非常同意 / 同意 / 不同意 / 極不同意)

參與學生人數
N=454

The use of Educational Card Game improves students' learning effectiveness

Applying Educational Card Game in the learning process could foster competitive learning (Barros, Tanevska, & Sciutti, 2021) which build up a reward system to increase student's learning motivation (Chen, Kuo, Chang & Heh, 2009). In the study of Franco Mariscal, Oliva Martínez & Bernal Márquez (2012), a well card game design could engage students more intensively and stimulate students' learning interest better than traditional approach based on memorization. Similar findings are reported from Su, Cheng & Lin (2014), the use of Education card game setting had positive perception and provide a more interesting class than the traditional setup. As a result, a supportive, constructive and motivational context of Education card game could highly encourage students to learn (Kordaki, 2011), this kind of integration of games with learning context are crucial to the blended learning mode (Cronje, J., 2020). Moreover, blended learning could contribute to students' team collaboration and knowledge exchange (Smith, K., & Hill, J., 2019) while they are learning through Educational card game as a group.

Conclusion of needs assessment

To sum up, it is essential to offer different learning experiences in a blended mode in order to meet different learning needs of students. From our experience, students are motivated and eager to learn through gamified content, resulted in uplifting their learning confidence, effort, as well as performance. In this project, our team suggests the creation of blended learning package, combining Educational card game, teaching videos and online assessment with step by step gaming activities to integrate learning with gamification. Not only does it bring joy and learning to the classroom, it is beneficial to students' learning and the overall effectiveness of inside and outside-the-classroom learning are promising.

1.2 Significance of the Project

This project will design and develop a learning package with 3 sets of educational card game, 30 sets of learning videos, 10 sets of teaching notes and online assessment which embedded into 10 Mathematics units, aiming at increasing motivation, self-regulated learning time, as well as learning confidence. It is expected that more informal learning activities will be recorded outside the classroom which contribute to improvement of students' academic performance.

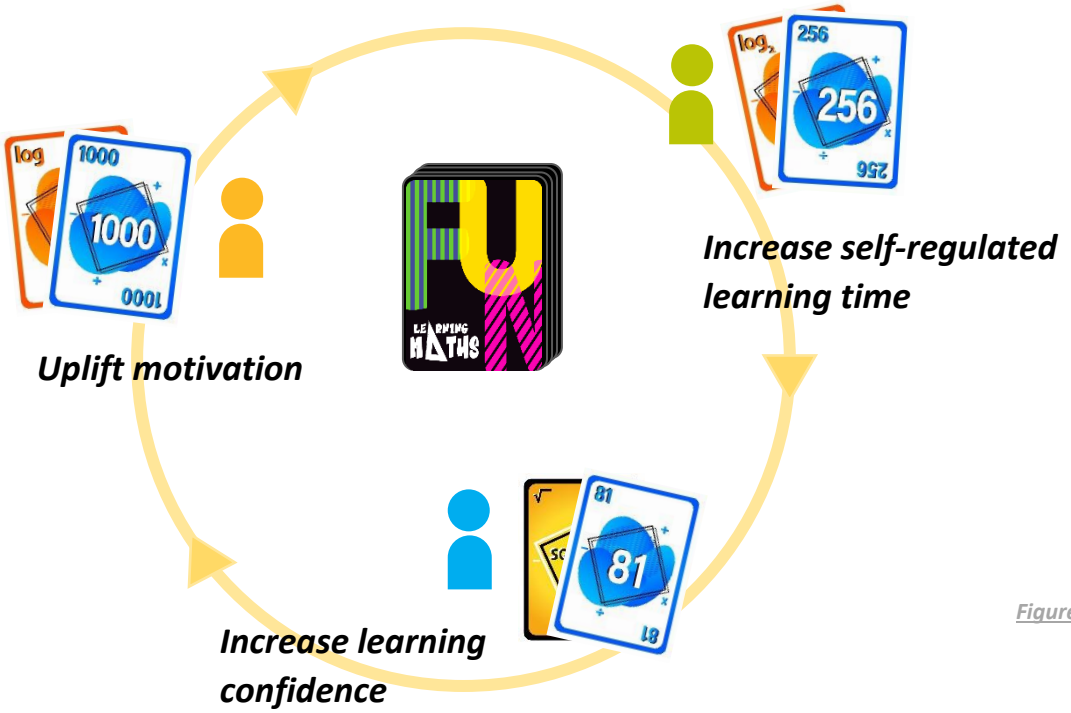


Figure 2

1.3 Applicant's Capability

Recently, our teaching team has completed 4 projects on Mathematics learning, including mobile learning apps, AR apps and flipped classroom. Details are as follows.

Project 1: QEF Project (2017/0862) - Using digital game to enhance Mathematics learning in Secondary Education (2019-2021)

This project achieved the three key objectives, which were: i) uplift students' learning motivation, ii) fostered students' self-regulated learning, and iii) increased students' confidence in learning Mathematics. In general, students were highly appreciated the experience of the gamification approach in the learning process. From students' perspective, both learning motivation and confidence were increased when using the application. It also revealed that students were eager for more similar learning experience and they are willing to spend more time to learn through the gamification approach. Funding amount is $912K. You may refer to https://www.qef20170862.com/ for more details.

Project 2: VTC funded project - Step through Mathematics (2015)

Our teaching team has completed a VTC funded project (>$200k) on creating an interactive and student-centered mobile learning tool on basic polynomials. Target students of the project are mainly at around age 15. In the mobile app, Mathematics concept is visualized in a step by step approach for students to learn in their own pace. With significant evidence collected throughout the project, we successfully achieved the project outcomes including i) Improved students' learning result, ii) Uplifted students' motivation in Mathematics classes, and iii) Increased students' confidence level in learning Mathematics.

「互動教學筆記」學代數 成績提升兩成

【大公報訊】記者徐曉彤報道：職訓局青年學院曉彥文游（珠寶設計及工藝）課程學生余瑞禧表示，自中一起數學科長期不及格，他表示老師主要以黑板教學，感覺沉悶，而自己也不敢發問。他運用了職訓局教學中心與青年學院老師研發的「互動教學筆記」網上程式學習後，在代數部分第一次提升至超逾及格分數。

「互動教學筆記」程式現集中於拆解數學代數的運算步驟，設提示功能，以圖像和短片方式解說，提高學生學習動機。有關方面安排一百名學生在使用程式前後作比較，顯示其代數成績平均提高約20%。該程式花一年時間研發，青年學院九龍灣分校電子計算及數學組講師嚴耀宗是團隊一員。

嚴耀宗等團隊成員發現不少學生對數學科缺乏興趣，從而構思設計「互動教學筆記」程式。他解釋，程式內置多道代數數學題，學生透過網站登入後，便可以滑鼠點擊、拖動等方式，依循解題步驟，找出答案。當學生出錯或不明白時，程式設有提示功能，讓學生選擇以筆記、圖像解說或影片三種形式，針對性地了解該計算步驟所涉及的數學概念。「學生之間存在學習差異，例如有學生透過視覺學習，吸收效果會更好，程式則能以多感觀學習模式，切合不同需要。」余瑞禧指出，以前不敢主動問老師，現在可以自己上網站，多方嘗試，提高了自學信心。青年學院問卷調查也反映，學生普遍認為數學題目較以往簡單，更有信心應付，反映學生學習動機大大提高，不再抗拒數學科。

嚴耀宗稱，未來團隊會研究將程式製作成手機應用程式，不再局限於在電腦室才能用到程式，方便教學，預計五月可以完成，之後希望將程式推廣至八間青年學院數學課程，供逾千名學生運用。

▲余瑞禧（右）使用由嚴耀宗（左）研發的「互動教學筆記」 大公報記者徐曉彤攝

Figure 3

Project 3: VTC Project – The Study of Student Learning Behavior Using Learning Analytics on Mathematics (2016)

In this project, two e-learning aids namely AR apps for visualization of 3D geometric models and videos for step-by-step illustrations were created and used in classroom. The purpose of this project is to understand and optimize learning and the environments in which it occurs by measuring, collecting, analyzing and consolidating data about learners and their contexts. At the same time, it aims at examining whether e-learning can enhance teaching and learning. Methodology of the research involved literature review, observation of learning behaviors, pre-tests and post-tests, questionnaires and feedback forms and unstructured interviews with teachers and students. The result showed that the students in the target group who used the AR apps and watched the instructional videos outperformed the control group by 22% in the post-test. The target group also showed a 27% improvement when comparing the pre- and post- test results. Funding amount of Project 3 is >$200k.

Project 4: VTC funded project - Flip the Mathematics classroom using video clip (2015)

Flipped classroom method was customized in this VTC funded project (<$100k) to support those academically less competent students in learning Mathematics. In this project, authentic examples were introduced in the video clips to illustrate Mathematics concepts to enhance motivation and foster deeper understanding by connecting the Mathematics concepts to the real world. An educational video production competition was successfully held and was proved to arouse students' interest and motivation in learning.

2. Goals and Objectives

The goal of this project is to develop an effective and integrated learning package with video tutorials, gamified elements and online assessment to enhance Mathematics learning in secondary education. The three objectives are:

A. Uplift learning motivation

Three sets of Mathematics learning card game will be designed and developed. The proposed game required students to calculate by applying prescribed mathematics concept. Combining the gamified elements with relevant video tutorials and assessment in the teaching package, it provides a gamification approach for students to learn Mathematics in an interesting way. Our project team aims at uplifting students' motivation in learning Mathematics and helping low-achieving students to mitigate Mathematics anxiety.

B. Increase self-regulated learning time

The customized Mathematics card games will be designed to facilitate self-regulated learning outside the class. Students could be grouped, picking up one topic with designed gamified elements to play through practicing, learning and discussing. This design will provide an opportunity to extend the gaming activities outside the classroom despite the absence of teachers. Once students enjoy the learning experience of using our proposed card game in class, these motivated students will likely be stimulated to play the game even in their leisure time and eventually increase the amount of time of their self-regulated learning outside the class.

C. **Increase learning confidence**

Sometimes students cannot understand certain Mathematics concept after reading the textbook. The video tutorial in the learning package provides students an alternative way. Practices by using game also fostered discussion and collaboration among students which enhance the learning result. When students gained more successful experience while applying Mathematics concept in gamified elements, their learning confidence would finally be increased.

The achievement of these objectives will nurture a proactive learning attitude among students and lead students into the cycle of sustainable growth.

3. Targets and Expected Number of Beneficiaries

Targets

All form 1 and 4 students in secondary schools will be the targets of the proposed project. Approximately, there are 60,000 and 52,000 form 1 and 4 students respectively in 2020 (Education Bureau, 2021). In the trial run, more than 200 students from participating schools will be invited to participate in different learning tasks offered in the learning package. The major purpose of the proposed project is to evaluate the effectiveness of the blended learning approach in Mathematics.

Expected number of beneficiaries in secondary schools

Beneficiaries would be form 1 and 4 students in the coming 5 years. According to EDB's statistics in 2021, it is expected that there are approximately 300,000 and 260,000 form 1 and 4 secondary students respectively in this period of time. Furthermore, if the methodology is proven to be effective, it will be shared to the public. The learning package will be made available to everyone who would like to learn the 10 Mathematics topics.

4. Conceptual Framework and Innovation

Many students like playing card games, for example, UNO, Monopoly, Big 2, Rummikub, Bridge, 6 nimmt, one night werewolf (狼人殺) and so on. However, none of the above-mentioned games are closely related to Mathematics education. In this project, our team would like to invent three innovative card game package, together with teaching notes, video tutorial and online assessment, which embedded into 10 Mathematics units. Students are firstly required to study the video tutorial and teaching notes, then they will be grouped into 3-5 for playing a prescribed card game for 10-15 minutes. During the gamified task, students are needed to apply the Mathematics knowledge they have just learn in order to win the game. Afterwards, they will work on an online assessment to check if they can pass the unit. If not, discussion among peers is then facilitated to exchange knowledge and skills, aiming at improvement to achieve the assessment next time.

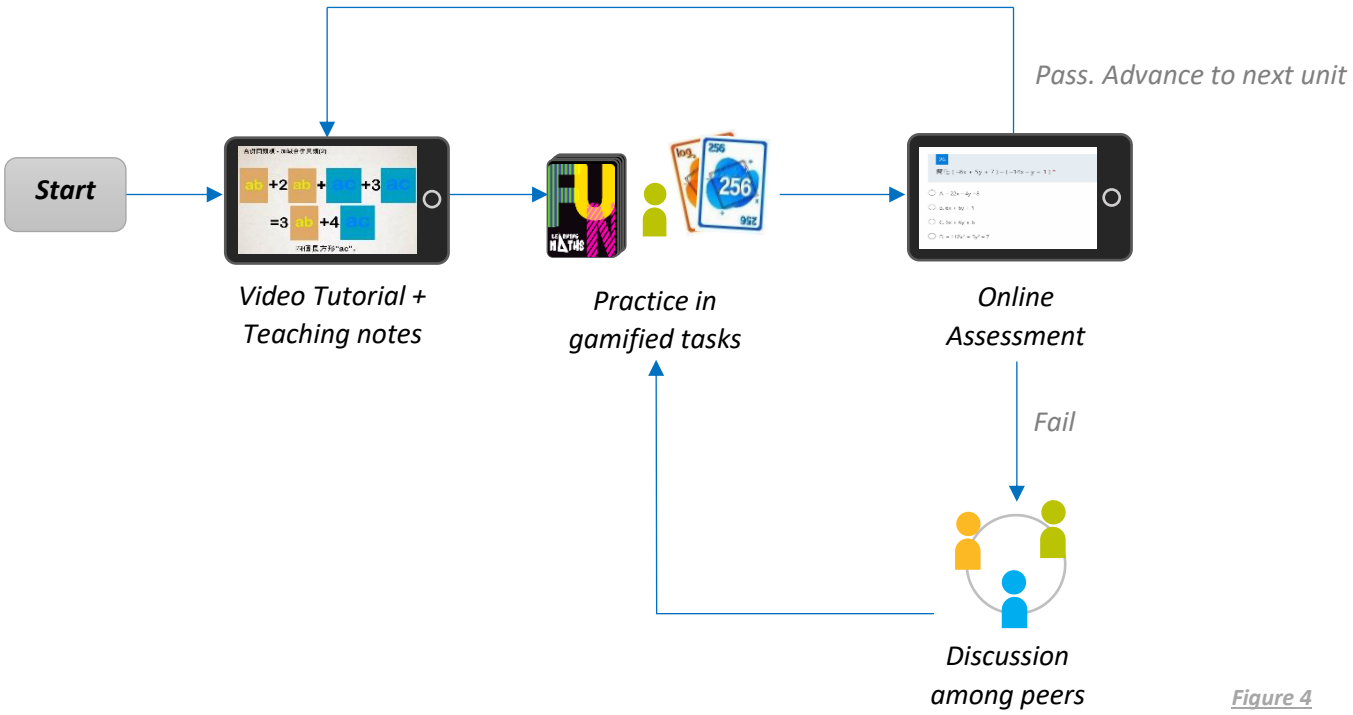


Figure 4

As a result of the design of gamified tasks with video tutorial and online assessment, it shifted the traditional teaching method into a blended learning mode as shown in figure 5 below, which will significantly increase students' learning motivation, confidence and time as well as their performance.

Traditional Teaching method

Learning activities	*Proportion*
Teacher explains the Maths concept to the class	50%
Students work on exercise in Textbook	40%
Teacher checks the answer with students	10%

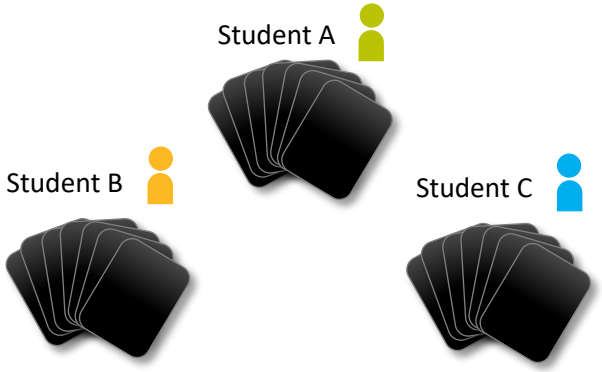
Blended Learning mode

Learning activities (Suggested)	*Proportion*
Teacher explains the Maths concept to the class	30%
Students watch the **learning video**	10%
Students work on **gamified tasks** in group	25%
Discussion and debriefing of gamified tasks	10%
Student work on **online assessment**	20%
Teacher checks the answer with students	5%

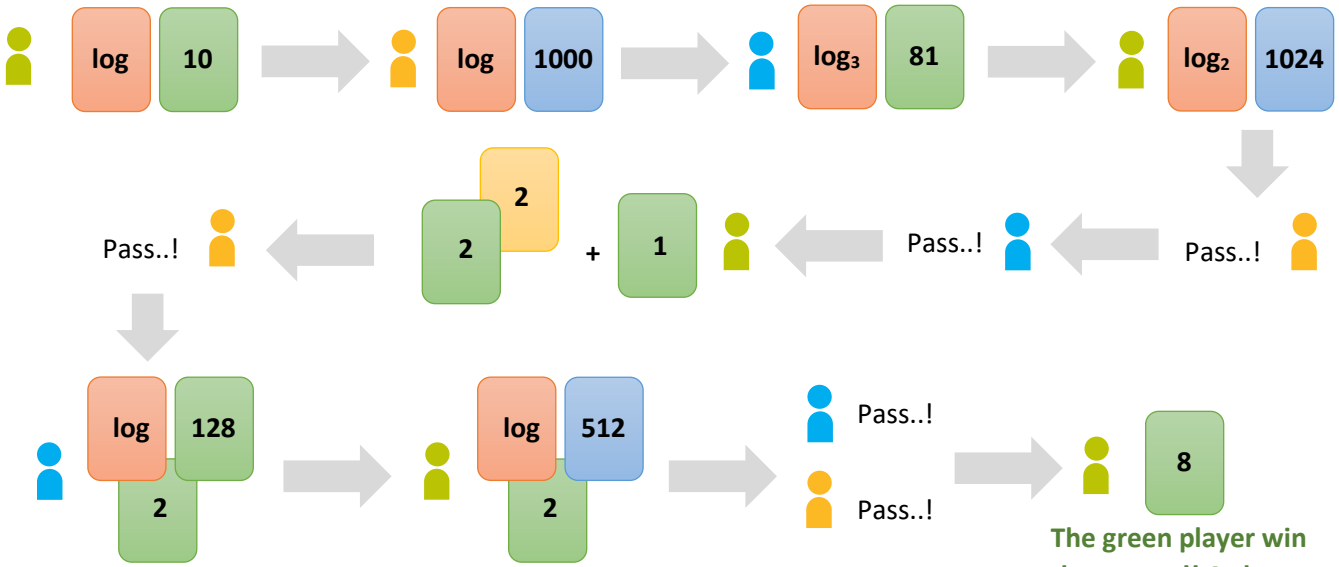
Figure 5

Use the learning topic "introduction to Logarithm" as an example, teacher explains the required Logarithm concept with examples to the class. Students then watch the learning video to understand more on the calculation. Afterwards, 3-5 students will be grouped, and they are required to apply the learned knowledge and follow prescribed rules to enjoy the gamified task.

A sample of educational card game setting



Here is an initial idea for Logarithm topic. Suppose 10 is the agreed as the maximum value in this game. Students are required to apply Logarithm to build a card set and present it. The "Climbing-up" game rule applied: player must play card set with a higher value, but not exceeding the maximum, than the previous player, and also follow the same number of cards in the same trick. Players can select to pass, but they are required to draw a new card from the deck.



In above illustration, student A (Green) started with log 10, which is equal to 1. Student B (Orange) presented with a higher value log 1000 = 3, then student C (Blue) responded with $\log_3 81 = 4$ and Green played the maximum value which is $\log_2 1024 = 10$. All other players then passed. In the next round, Green selected to play three cards with $2^2+1 = 5$, Orange passed while Blue came out with $\log_2 128 = 7$. Green responded with $\log_2 512 = 9$. All other players passed again. Finally, Green played with his last single card 8 to finish the game as he already presented all his cards on hand. This learning tasks enables students to apply the learned knowledge in a gamified activity. Through discussion and confirmation, students calculate their own cards in hand and speak up to confirm the trick. An interesting, interactive and informative learning environment (Kwan et al, 2015) would be setup to facilitate active participation from students. You may also refer to the link or QR code on the right hand side to watch a sample demonstration.

In this project, gamified tasks with learning notes, video and online assessment will be designed and run throughout the 10 Mathematics units. It aims at uplifting learning motivation, increasing self-regulated learning time and increasing learning confidence.

5. Pedagogical strategies

Traditionally, teachers will deliver the Mathematics topics using the mode of lecturing. During the lecturing process, the examples will be given to illustrate the Mathematics concept and the calculation skills. The knowledge and skills that students have just learnt during the lesson will be strengthened by using exercise and the learning achievement will be evaluated by assessment.

The process of lecturing is a single direction of interaction that has very limited interactions if students are not very proactive raised their hands and ask questions. Therefore, teachers are very difficult to handle different learning needs existed in large group of students.

On the other hand, students are not very active in having drilling exercises to familiar with the skills they have just learnt. Therefore, when more challenging questions appeared to them, they are difficult to retrieve those Mathematics skills to solve the problem.

By using our Blended Learning approach using card games (Figure 5 in previous section), we try to reduce the lecturing time and provide more opportunities for student-student and teacher-student interaction. During the game time, teacher will be released from single way of delivery and they have more rooms to answer students' enquiry or discuss with students on their learning. Students will be divided into groups and they will also have rooms to watch learning video according to their individual needs and increase the self-regulated learning time at the same time.

The time for students to complete in-class exercise individually will be transformed into game time to uplift their learning motivation. The learning process is changed from practice what they have learnt individually to practice and assess together with other game players. The game nature and the newly available student-student interaction in the game will extend the concentration span of students and uplift the motivation of practicing their Mathematics skills. Since the game provided chance of repetition for those essential skills in more interesting approach, students' self-regulated learning time will be increased. It is expected that students are more familiar with those Mathematics knowledge and skills through playing games as practices. As a result, their learning confidence will be increased with enough practices.

After the game time, students are supposed to have enough practice on the basic knowledge and skills for a topic. The discussion and debriefing by teachers can either help students to clear those misunderstanding or provide more challenging tasks to enhance students' learning.

Once students have solid foundation knowledge and skills through the game, their confidence will be increase. The online assessment for their revision will becoming meaningful and their self-regulation learning might be realized in the future.

For design on the activities to cover more advanced skills in Mathematics topics, card games provided flexibility for teachers in customization. The card sets are just the medium for the teachers to set the boundary of learning context and the game rules are the embedded knowledge and skills that teachers are willing to delivery to their students. Teachers can use their own ideas to have new set of rules to create a new game for more advanced topics.

Like we use standard 52-card deck to play Poker, Big 2 and so on. Besides, it is feasible for teachers to introduce extension card set to cover more advance topics. For example, when students can use the game that successfully handle the linear equation with one known. Teachers can add extension card set with quadratic equations context to support their students' learning.

6. Implementation Plan with Timeline

No.	Functions and processes	Period
1.	**Preparation work**	
1.1	Recruit the project staff	Jun 2023
1.2	Prepare equipment, software and server for development of learning package	Jun - Jul 2023
2.	**Education Card Game design and development**	
2.1	Design the learning content, rules and components of the card game	Jun – Aug 2023
2.2	Create the graphic for the card game	Jun – Aug 2023
2.3	Conduct internal testing and refinement	Aug – Oct 2023
2.4	Print out the prototype version	Aug – Oct 2023
3.	**Tutorial development**	
3.1	Develop learning notes for all 10 units (including concept introduction, explanation with examples, class exercises and students' common errors)	Jun – Sep 2023
3.2	Develop flipped Mathematics videos for all units	Jun – Sep 2023
3.3	Integrate all tutorials into the online learning package	Sep – Oct 2023
4.	**Assessments for each topic**	
4.1	Design assessment for all topics	Sep – Oct 2023
4.2	Integrate all assessment into the online learning package	Nov 2023
5.	**Consolidate as a whole learning package**	
5.1	Consolidate learning notes, video, card game and online assessment as a whole learning package	Nov – Dec 2023
5.2	Conduct final testing and refinement	Nov – Dec 2023
5.3	Develop the project website	Sep – Dec 2023
6.	**Trial run and preparation of game competition and survey**	
6.1	Conduct Trial run	Jan 2024
6.2	Refine and improve the learning package	Jan 2024
6.3	Design and prepare a competition of the Educational Card Game	Sep 2023 – Feb 2024
7.	**Production of final Educational Card Game**	
7.1	Print the final version of Educational Card Game	Feb – Apr 2024
8.	**Implementation of game competition and feedback collection**	
8.1	Conduct the game competition and collect students' feedback with participating school	Apr – Jun 2024
9.	**Evaluation and recommendation report**	
9.1	Evaluate the result of trial run, game competition and students' feedback	Apr – Aug 2024
9.2	Make recommendation and compile the project report	Jun – Aug 2024

7. Teachers' and Principals' Involvement in the Project

Formation of project team of Youth College

This project team is consisted of 8 staff, including 7 existing teaching staff from 3 different Youth Colleges and one project staff who will be employed.

No.	Role	Position	Major role and responsibility
#1	*(Principal investigator)*	Senior Lecturer, VTC Youth College (Kowloon Bay)	▪ Overall in-charge ▪ Project team and resources management ▪ Networking and liaison with all external stakeholders ▪ Preparation of Project Reports, Finance, Presentations and Publishing
#2	*(Chief investigator)*	Senior Project Officer, VTC Youth College (Kwai Chung)	▪ Leader of Team 1 *(Tutorial and Assessment team)*, which will undertake all tasks in function 3, 4, 5 and 9 in Section 5 of this proposal
#3	*(Chief investigator)*	Lecturer, VTC Youth College (Kwai Chung)	▪ Leader of Team 2 *(Educational Card Game development team)*, which will undertake all tasks in function 2, 6-8 in Section 5 of this proposal
#4	*(Investigator)*	Assistant Lecturer, VTC Youth College (Kowloon Bay)	▪ Member of Team 1. He will assist on implementing function 3, 4, 5 and 9 in Section 5 of this proposal
#5	*(Investigator)*	Assistant Lecturer, VTC Youth College (Kowloon Bay)	▪ Member of Team 1. He will assist on implementing function 3, 4, 5 and 9 in Section 5 of this proposal
#6	*(Investigator)*	Assistant Lecturer, VTC Youth College (Kwai Chung)	▪ Member of Team 2. He will assist on implementing function 2, 6-8 in Section 5 of this proposal
#7	*(Investigator)*	Assistant Lecturer, VTC Youth College (Pokfulam)	▪ Member of Team 2. He will assist on implementing function 2, 6-8 in Section 5 of this proposal
#8	*Project Assistant (To be employed by the project funding)*	Executive Assistant, VTC Youth College (Kowloon Bay)	▪ Assist the Principal Investigator on all project activities and processes ▪ Also be the member of both Team 1 and 2. He/She will assist on implementing all project functions

Formation of project team in collaborating secondary school

In Lee Kau Yan Memorial School, a project team has been formed for collaboration with Youth College.

No.	Role	Position	Major role and responsibility
#9	*(Project Co-investigator)*	Mathematics Panel, Lee Kau Yan Memorial School	▪ Overall in-charge for the collaboration with VTC Youth College ▪ Promote and foster the use of learning package created in this project ▪ Lead the team to give valuable feedback for project function 2-7, which is stated on Page 8, Section 5 of this proposal

#10	*(Member)*	Assistant Mathematics Panel, Lee Kau Yan Memorial School	▪ Participate in Tutorial and Assessment development by giving valuable feedback to the project team regularly. ▪ Collaborate with VTC Youth College to design and conduct the game competition to foster learning ▪ Participate in trial run and refinement of the learning package ▪ Conduct students' perception survey
#11	*(Member)*	Mathematics teacher, Lee Kau Yan Memorial School	▪ Participate in Educational Card Game development by giving valuable feedback to the project team regularly ▪ Collaborate with VTC Youth College to design and conduct the game competition to foster learning ▪ Participate in user acceptance test and refinement of the game ▪ Collaborate to manage the use of project equipment purchased in this project

Project consultant

There are five project consultants in this project. They will give advices on strategic direction to the project team.

- Principal Lecturer of VTC Youth College (Kwai Chung)
- Manager In Charge, VTC Pro-Act Training and Development Centre (Electronics)
- Deputy Head (Information Technology) of VTC Youth College (Kwai Chung)
- Chief Instructor, VTC Pro-Act Training and Development Centre (Printing)
- Mathematics Panel, Lee Kau Yan Memorial School

Support by School Principals

Principals from VTC Youth College (Kowloon Bay) and Lee Kau Yan Memorial School highly support the proposed project and will initiate cross-institution collaboration and sharing of the new pedagogy to the education sector.

Support by other secondary schools

Besides collaboration with Lee Kau Yan Memorial School, the project team invited two more secondary schools to be participating schools, they are St. Stephen's Church College and HKCWC Fung Yiu King Memorial Secondary School. They will contribute in giving valuable opinion in the trial run period and promote the blended learning package within the school.

8. Budget

The overall budget

Budget Item	Expenditure Detail (Including breakdown for budget items)			Justifications
	Item	AY22/23	AY23/24	
		1/6/2023 - 31/8/2023	1/9/2023 - 31/08/2024	
		Amount ($)	Amount ($)	
i) Staff	Project Assistant (12 months, from 1/9/2023 to 31/8/2024)(Monthly salary: ($14,500 +725(MPF)) X 12	$0	$182,700	An Project Assistant will be employed to assist project investigators and members. The staff is responsible to work with project investigators in preparation work, card game design and development, tutorial development [1] , assessment development, consolidation of the whole learning package, testing and preparation of game competition and survey, production of finally designed card game and implementation of game competition and survey. Required qualification and experience: (a) A recognized degree in Design / Information Technology / Mathematics, or equivalent; (b) Good knowledge of video editing, learning application design, and webpage development. (c) Preferably with Educational project / Learning package development / Module assessment experience (d) Strong commitment to serve the youth and preferably with experience in teaching; and (e) Good communication and presentation skills in both English and Chinese.
ii) Services	Printing fee of the game package	$0	$52,435[2]	Each package will be covered 10 Mathematics topics. <u>Stage 1 for game prototype building:</u> 80 game packages will be printed with the estimated costs of $21,760 ($272 per package). Each participating school will be allocated 20 sets out of 80 for testing and trial run. <u>Final Stage after trial and refined:</u> 150 game packages will be printed with the estimated costs of $30,675 ($204.5 per package). Each participating school will be allocated 40 sets out of 150 sets.

[1] For both card game design and tutorial development, Youth College will use its own software including Adobe Premiere Pro 2022, Adobe illustrator 2022 and Microsoft Office to develop the learning package

[2] The total estimated printing cost is $21,760 + 30,675 = $52,435.

Budget Item	Expenditure Detail (Including breakdown for budget items)			Justifications
	Item	AY22/23	AY23/24	
		1/6/2023 - 31/8/2023	1/9/2023 - 31/08/2024	
		Amount ($)	Amount ($)	
iii) Equipment	15 tablets[3]	$0	$51,000	The purchase of 15 tablets are used for the trail run in the secondary schools. (Including working on video tutorials, online assessment and marks entry in gamified tasks)
iv) General expenses	Audit fee	$0	$5,000	/
	Web server	$0	$3,072	It includes the purchase of a domain name and web hosting service for the project. The setup of project website will foster the promotion of this project.
v) Contingency	Management reserve for the whole project	$0	$3,193	Around 3% of total project fund Remark: Excluded staff and audit items
Total Grant Sought ($):		**$297,400**		

9. Expected Project Outcomes

A. Achievement of Project objectives

As stated in Section 2 on Page 4 and 5 of this proposal, there are three objectives for this project, which are, i) Uplifting students' learning motivation, ii) Increasing students' self-regulated learning time, and iii) Increasing students' learning confidence. Students' feedback will be collected on the three objectives as well as the overall satisfaction to the gamified activities in order to analyse our project objectives are achieved or not. Besides, teachers' observation on the use of learning package will also be recorded to evaluate the learning effectiveness of the blended learning approach.

B. Project deliverable

i) Learning package with educational card game, learning videos, notes and online assessment

Learning package will be created for the topics. Three sets of educational card game will be designed and developed to cover all the topics. Moreover, for each topic, there will be a set of learning note containing concept introduction, explanation with examples, class exercises, students' common errors and three learning videos. Online assessment will also be created for each topic.

ii) Competition

A game-based learning competition will be held in the collaborating secondary school (Lee Kau Yan Memorial School). The objective of this competition is to promote and foster the use of gamified tasks to learn Mathematics outside the classroom, and also collect feedback from students for further improvement. Our project team had experience in conducting similar competition in Secondary schools.

[3] For easy portability and effectiveness in students' gamified tasks, the tablets should be less than 500g, with LED-backlit Multi-Touch display with IPS technology. Youth College and the participating schools will also use its existing tablets to support this project.

iii) Report on Students' feedback

Further to the information mentioned in Part 8A, a student feedback report will be compiled to reveal students' perception on the blended learning mode. Focus group interview and/or questionnaire survey will be conducted to collect students' feedback. An evaluation summary will also be consolidated to reflect the effectiveness of the project and propose improvement action.

10. Project Evaluation

The learning package consists of video tutorials, games and online assessments will be evaluated by focus group interviews and questionnaire for 3 stated objectives. We expected the (a) learning motivation of students will be uplifted, (b) students' self-regulated learning time and (c) learning confidence will be increased. The ideas of project evaluation methodologies are mentioned as below.

Students' focus group interview

To evaluate the attainment of project objectives, at least 5 students' focus group interview will be conducted, to collect feedback on the usage of the learning package. Our project team had solid experience in collecting qualitative data from students. Similar practice will be used to ensure the quality of data collected to improve the project.

Observation by teachers

Comparison of students' attention, motivation and learning attitude between normal Mathematics lesson and gamified classroom are also crucial evidence for this project. These aspects are to be recorded on the observation report. Our project team will liaise with teachers for observation result.

Quantified measurement

Table 7

Items		**Area of assessment**	**Criteria of achievement**
1	Learning package with the educational card game	No. of set of learning note	10 sets of learning notes created, with concept introduction, explanation with examples, class exercises and students' common errors.
		No. of learning video and online assessment	At least 30 learning videos developed, with 100 multiple choice questions covering the 10 Mathematics units
		No. of Educational Card Game	3 sets of Educational Card Game designed and developed. Each school will get at least 40 copies of card game
		Availability to public	A website is created for the public to download all the learning package and also the source file of Educational Card Game design
2.	Trial run	No. of usage by students	At least 200 students participate in the trial run
3.	Students' feedback	Focus group interview, and/or questionnaire survey	i) 5 focus group interviews conducted ii) 70% of students participated in providing feedback and suggestion. iii) 70% of responses showed the positive result or improvement in the 3 project objectives: - uplift learning motivation - increase self-regulation learning time - increase learning confidence iv) All students' feedbacks are consolidated in the final report

4.	Teachers' feedback	Observation report	70% of responses showed the card game can help their students in learning and facilitate their teaching.

11. Sustainability of Project Outcomes

Build once, use forever

Once the proposed learning package has been created, it will be shared through the project website for public access. Our project team will refine the blended learning approach by acquiring and consolidating feedback from stakeholders continuously.

Develop a mobile app for the educational card game

If the methodology is proven to be effective, it could be further developed as a mobile app version, embedding with online learning notes, videos and assessment. The platform could provide an even better learning experience to students.

Extend to more Mathematics topics

Furthermore, the blended learning approach could be extended to other Mathematics topics. Similar learning content supported by specific gaming activities, tutorials and assessments could be designed for students. For example, Probability, Measures of Central Tendency, Simple and Compound Interest. Through the methodology of blended learning, more mathematics concepts could be introduced in a step by step approach with gamified activities. Furthermore, this blended learning approach can possibly be extended to primary school. Mathematics topics like L.C.M., H.C.F. and prime number could be applicable in the class to provide gaming elements to suit more learning needs.

Extend to other subjects like language and STEM

The use of Educational Card Game could be even extended to other subjects like IT, Geography and Economic, for examples, trouble shooting of a computer system, sequence of programming tasks, identification of different landscape, choice and opportunity cost, scenario-based studies, and etc.

12. Dissemination/Promotion of Project Outcomes

- Our project team will conduct at least 2 sharing sessions to introduce the gamification approach and share our experience in this project to secondary schools other than the collaborating secondary school. If any secondary schools are interested to use it, we are glad to give guidance for any required setup and application.
- The completed learning package will be available in the STEM center of VTC Youth College (Kowloon Bay), and also the participating secondary schools. Other secondary schools are welcome to visit us for exchanging new pedagogies. Moreover, the completed learning package will be uploaded to the project website. Everyone can download and learn a prescribed Mathematics topic with gamified tasks.

13. Asset usage plan after completion of project

Category	Item Description	No of units	Total cost	Proposed plan for Deployment
Equipment	Tablets	15	$51,000	The tablets will be kept by Youth College (Kowloon Bay) for further enhancement of the learning package. The College will continue to utilize the equipment to conduct learning and teaching activities for enhancing students' learning experiences.

The organization commits to submit proper reports in strict accordance with the following schedule:

Project Management (Should be submitted via the "Electronic Project Management System" (EPMS))		**Financial Management** (Hard copy together with supporting documents should be submitted to the QEF Secretariat by mail or in person)	
Type of report and reporting period	**Report due on**	**Type of report and reporting period**	**Report due on**
Progress Report 01/06/2023 - 30/11/2023	31/12/2023	/	/
Progress Report 01/12/2023 - 31/05/2024	30/06/2024	/	/
Final Report 01/06/2023 - 31/08/2024	30/11/2024	Final Financial Report 01/06/2023 - 31/08/2024	30/11/2024

Part D Details of Collaborating/ Participating Organisations

<u>李求恩紀念中學</u>

李求恩紀念中學於一九六四年創校，以紀念校祖聖公會港澳教區首位華人會吏長李求恩博士對社會及教會的重大貢獻。本校是一所由香港聖公會東九龍教區辦理的政府資助中文中學，兼收男女學生。

本校以基督精神為本，提供全人教育，培育出六育兼備的人才，為香港及祖國服務。

Part E Declaration

[The head/person-in-charge of the applicant organization should confirm the organisation's eligibility for application and declare that all the information given in the application is true and accurate and there is no duplication of funding from other Government sources for the same activities. Should the application be approved, he/she is also required to pledge to participate actively in project promotion, publicity and dissemination activities in respect of his/her project.]

Youth College confirmed the copyrights of the deliverables developed should be vested with the QEF. The deliverables, including the Education Card Game and related learning and teaching resources, will be shared with other schools including all VTC member institutions after the completion of the project. Developing schools have the right to re-print and produce the Education Card Game.

We understood that the expenditure items funded by the QEF are one-off. We would bear recurrent expenditure incurred, including maintenance costs, daily operation costs, etc. and the possible consequences that may rise.

We would ensure that all procurement of goods and services and appointment of project staff is conducted on an open, fair and competitive basis with measure taken to avoid conflict of interests in the procurement process.

We acknowledged the acceptance of the QEF Intellectual Property Rights Policy and confirm that the copyrights of the deliverables/materials should be vested with the QEF. Any reproduction, adaptation, distribution, dissemination or making available of the deliverables to the public by any parties for commercial purposes is strictly prohibited.

If the services to be procured by Youth College involve the appointment of external staff/tutors, we would make appropriate arrangements in accordance with the requirements as promulgated in circulars, instructions and guidelines issued by the Education Bureau from time to time, including relevant recommendations in Education Bureau Circular No. 7/2021 on Sexual Conviction Record Check Scheme, to safeguard the well-being of students.