

Comparative Study of GenAI (ChatGPT) vs. Human in Generating Multiple Choice Questions Based on the PIRLS Reading Assessment Framework

Speakers: Prof Samuel Chu Kai Wah &
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Co-constructing data/information by human and Generative AI

"Enhancing Students' Abilities in Reading,
Writing, Questioning & Criticising"



Quality Education Fund: Knowledge Overlord - A self-sustaining AI game-based online platform to enhance student's literacy ability and 21st century skills, 1,220,000 USD (Sep 2023 - Aug 2028)

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collaborative battle for human and AI

bundle of joy feeling, outlaw country



DisconcertedMegaphone6164

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October 22, 2024 at 2:15 PM v3.5

Reading Battle helps students develop reading interests, habits and abilities with proper gamification.

It satisfies the 3 essential psychological needs of learners: autonomy, competencies and relatedness.

It can turn reluctant readers into book lovers!

With Generative AI, we can make Reading Battle better by creating questions at least 10 times faster!

With Generative AI, we can have Writing Battle that encourages students to write book summaries and books with consistent characters and songs created in seconds!

Questioning Battle enables students to learn to ask questions like Socrates - following PIRLS to ask 4 kinds of questions - information retrieval, making inferences, integrating ideas and making interpretation, and evaluation.

Finally, Criticizing Battle foster critical thinkers and comments by engaging them in criticizing questions and book summaries created by other players!

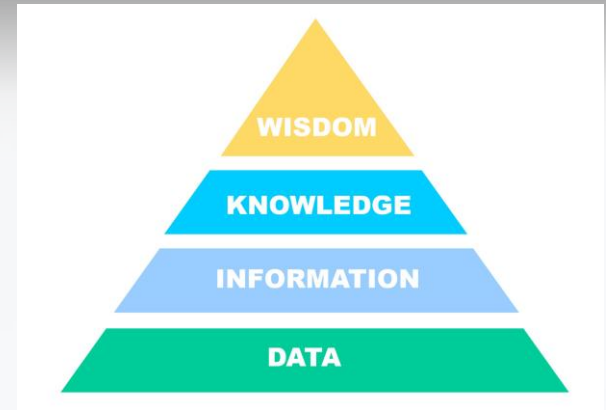
Gamification, GenAI and suitable data and information in Knowledge Overlord can help create more knowledgeable students with great wisdom!



Preview of Sam's talk: <https://suno.com/song/48d62f79-2ec2-4e72-8d7f-67a42238214c>

Data

- “are raw material produced by abstracting the world into categories, measures and other representational forms”
- “constitute the building blocks from which information and knowledge are created”
- “e.g., numbers, symbols, images, sounds, electromagnetic waves, bits and text” (Kitchin, 2014, p.1)



Source:

<https://www.shonellerton.com/20191016-dikw-pyramid/>

Reading is the basis for most learning

Reading is essential to all forms of knowledge acquisition and serves as the foundation for both language development and critical thinking across discipline



“Today a reader, tomorrow a leader.”

Margaret Fuller (1810-1850)

- An American critic, teacher,



“A book is a dream that you hold in your hand” Neil Gaiman (2014)

- An English author of short fiction, novels, comic books, screenplays in the 21st Century

Enhance reading abilities through reading comprehension exercises with questions & answers

- **Vygotsky's Zone of Proximal Development** emphasizes that reading challenges students just beyond their current abilities, pushing them toward cognitive growth when provided appropriate support (e.g., through comprehension exercises/ Q&A) **(1978)**
- One of the most important aspects of comprehension exercises is the **use of questions (Scaffolding Theory, Vygotsky 1978)**



Lev Vygotsky (1896-1934)

Traditional Reading comprehension exercises with questions & answers - Problems?

- Over drilling students with comprehension exercises at schools can lead to many problems!



Source: <https://www.scmp.com/news/hong-kong/education-community/article/1978131/parents-anger-over-continued-drilling-tsa-exams>

A Gamified Reading Comprehension Exercise System - Reading Battle

- Strengthening students' reading comprehension ability (both Chinese and English) through developing children's literature e-quiz bank on cloud, Quality Education Fund, HKD2,846,000 / USD366,230 (May 2013 - Oct 2015)
- **Reading Battle (2014-2024):** A successful gamified system that has proven to be effective in helping students to develop reading interests, habits and abilities



- Released in Feb 2014
- 20% HK primary schools have used it

Territory-wide System Assessment (TSA) vs Reading Battle - 1



TSA hated by students and parents



Reading Battle is welcome by students & parents



A sharing by students/parents about Reading Battle (with subtitles in English): <https://youtu.be/SyLWg0CA-pY?t=328>

Territory-wide System Assessment vs Reading Battle - 2

Two interviews with Gordon on Reading Battle

Reading Battle: Changed a reluctant reader into a book lover - caught up 4 years of Reading curriculum in 5 months!

- Out of curiosity, I started to use Reading Battle...
- Since then, I've used RB to develop my English/Chinese reading habits.
- During my secondary school years, my English was in the top 10%,
 - and my Chinese was ranked the first in the entire form.
- I have an honor to work as an editor for my school's magazine



Gordon as a primary 4 student



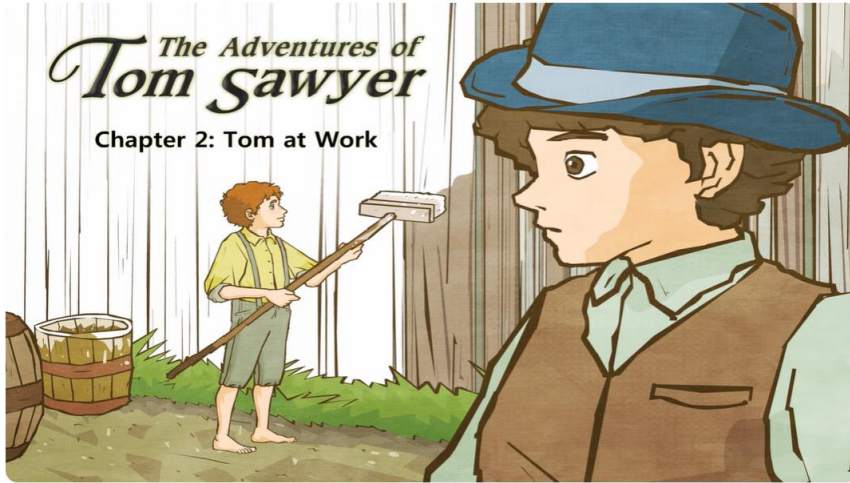
A sharing by students/parents about Reading Battle (with subtitles in English): <https://youtu.be/SyLWg0CA-pY?t=328>

Gordon as a secondary 3 student



Source: <https://www.youtube.com/watch?v=p9eACNiSums>

Tom Sawyer “gamified” the boring painting job



The Adventures of Tom Sawyer 2 | Stories for Kids
| English Fairy Tales

<https://www.youtube.com/watch?v=6ykeQHsQlZA>
(from 2:43)

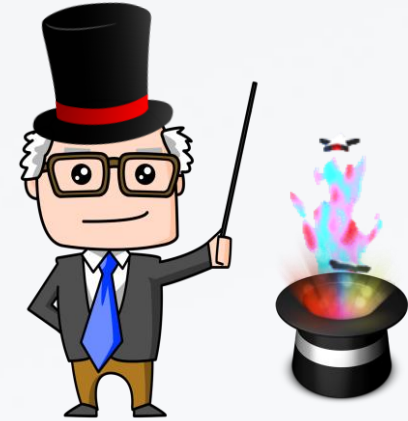
Reading Comprehension Assessment System

How did we gamify Reading Battle? -1



Proper gamified reading is like magic!

- Can Turn reluctant readers into book lovers!



<https://www.hiclipart.com>

Magician David
Copperfield flying
through 2 rotating hoops

How did we gamify Reading Battle? - 2

Attractive books selection

Reading Battle covers all sorts of books!

By Primary School Students

new

When Sophie gets angry--really, really angry

Author: Molly Bang
ISBN: 0-590-18979-4
Publisher: The Blue Sky Press
Book ID: 2101

Reading Level:

★★★★☆
1361 vote(s)

Start Battle  **Read e-book**



4756 vote(s)

腦先生和手小姐

Author: 鍾佩芝及朱啟華博士團隊

Publisher: StoryJumper, Inc.

Book ID: 2135

Reading Level:

Start Battle



Read e-book

Reading Battle 閱讀大挑戰

Battle Result Ranking Profile Report Contact

Welcome, Teacher  Logout

e-books

new

Hayden Man Saves The World

Author: 梁啟哲及朱啟華博士團隊
Publisher: Academy 22
Book ID: 2201
Reading Level:

★★★★☆
642 vote(s)

Start Battle  **Read e-book**

new

拯救公主記

Author: 黃梓瑤及朱啟華博士團隊
Publisher: Academy 22
Book ID: 3020
Reading Level:

★★★★☆
218 vote(s)

Start Battle  **Read e-book**

new

善良的怪物王子

Author: 吳日軒及朱啟華博士團隊
Publisher: Academy 22
Book ID: 3013
Reading Level:

★★★★☆
246 vote(s)

Start Battle  **Read e-book**

new

Best Friends

Author: 黃心怡及朱啟華博士團隊
Publisher: Academy 22
Book ID: 2206
Reading Level:

★★★★☆
175 vote(s)

Start Battle  **Read e-book**

International Award Winner



How did we gamify Reading Battle? - 3

Attractive books selection

Students will read a
book first



"Hayden Man Saves the World" 🔊

 Y.C. Leung

a RB (reading battle)book.
the book talks about a retired superhero called Hayden Man
saved the world from the bad virus of V-2022 and Dr.Virus,the
greatest bad guy of all times .
(42 pages)

Privacy level: FAMILY
Teacher can see this book

 572 reads ★ 5 fans



How did we gamify Reading Battle? - 4

Application of psychological theories



Then answer questions
on Reading Battle

Student can “battle” with a
book up to 3 times



How did we gamify Reading Battle? - 5

Application of psychological theories

A hint is provided
when a question is
answered incorrectly

The screenshot displays the 'Reading Battle' (閱讀大挑戰) game interface. At the top, there is a navigation bar with icons for Battle, Result, Ranking, Profile, Report, and Contact. A user is logged in as 'teacher' with a 'Logout' button. The main content area shows a question titled 'Hayden Man Saves The World'. Below the title is a row of question buttons labeled Q2 through Q10. Q2 is selected. The question text is '[Information Retrieval] Who threw the glitter at Dr. Virus ?'. The options are: a. News Reporter, b. Dr. Smart, c. Police, and d. Hayden Man. Option b is marked as incorrect with a red 'x'. A hint is provided: 'Hint: P.21-25'. At the bottom, there is a 'Try Again' button and a 'Worm Catcher' section with a tip.

Reading Battle
閱讀大挑戰

Battle Result Ranking Profile Report Contact

Welcome, teacher
Logout

Hayden Man Saves The World

Challenging Question Challenging Question

Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10

[Information Retrieval]
Who threw the glitter at Dr. Virus ?

☐ a. News Reporter
☒ b. Dr. Smart ✗ Hint: P.21-25
☐ c. Police
☐ d. Hayden Man

Try Again

Worm Catcher Tips of worm catcher

How did we gamify Reading Battle? - 6

The screenshot shows the Reading Battle interface. At the top, there's a navigation bar with icons for Battle, Result, Ranking, Profile, Report, and Contact. A welcome message for a teacher is also present. The main area features a yellow header with the title "Hayden Man Saves The World". Below this, a row of question icons (Q1-Q10) is shown, with Q1 highlighted in red. A red circle highlights the label "[Information Retrieval]" next to the question. The question is "Who threw the glitter at Dr. Virus ?". The options are: a. News Reporter, b. Dr. Smart, c. Police (marked with a red X), and d. Hayden Man. An explanation box at the bottom states: "Hayden Man threw some glitter at Dr. Virus".

Reading Battle
閱讀大挑戰

Battle Result Ranking Profile Report Contact

Welcome, teacher
Logout

Hayden Man Saves The World

Challenging Question Challenging Question

Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10

[Information Retrieval]

Who threw the glitter at Dr. Virus ?

- a. News Reporter
- b. Dr. Smart
- c. Police ✗
- d. Hayden Man

Explanation: Hayden Man threw some glitter at Dr. Virus

Worm Catcher Tips of worm catcher

4 types of Questions

The screenshot shows the Reading Battle interface for an evaluation question. The header is yellow with the title "Hayden Man Saves The World". Below this, a row of question icons (Q1-Q10) is shown, with Q10 highlighted in red. A red circle highlights the label "[Evaluation]" next to the question. The question is "How is each bubble of virus created?". The options are: a. When Dr. Virus makes it in his lab, b. Whenever Dr. Virus eats one cup of ice cream (marked with a green checkmark), c. It is not mentioned, and d. When Dr. Virus uses his Virus Gun. An explanation box at the bottom states: "A bubble of virus appears whenever Dr. Virus eats a cup of ice cream".

Hayden Man Saves The World

Challenging Question Challenging Question

Q1 Q2 Q3 Q4 Q5 Q6 Q7 Q8 Q9 Q10

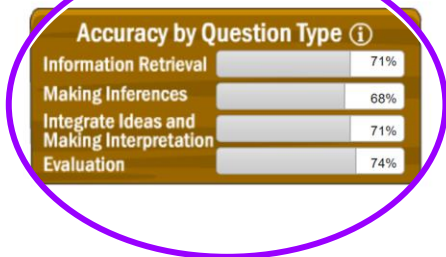
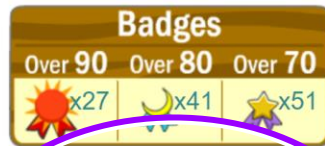
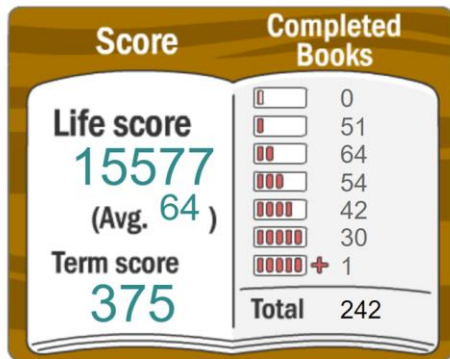
[Evaluation]

How is each bubble of virus created?

- a. When Dr. Virus makes it in his lab
- b. Whenever Dr. Virus eats one cup of ice cream ✓
- c. It is not mentioned
- d. When Dr. Virus uses his Virus Gun

Explanation: A bubble of virus appears whenever Dr. Virus eats a cup of ice cream

How did we gamify Reading Battle? - 7



Reading journey of each student!

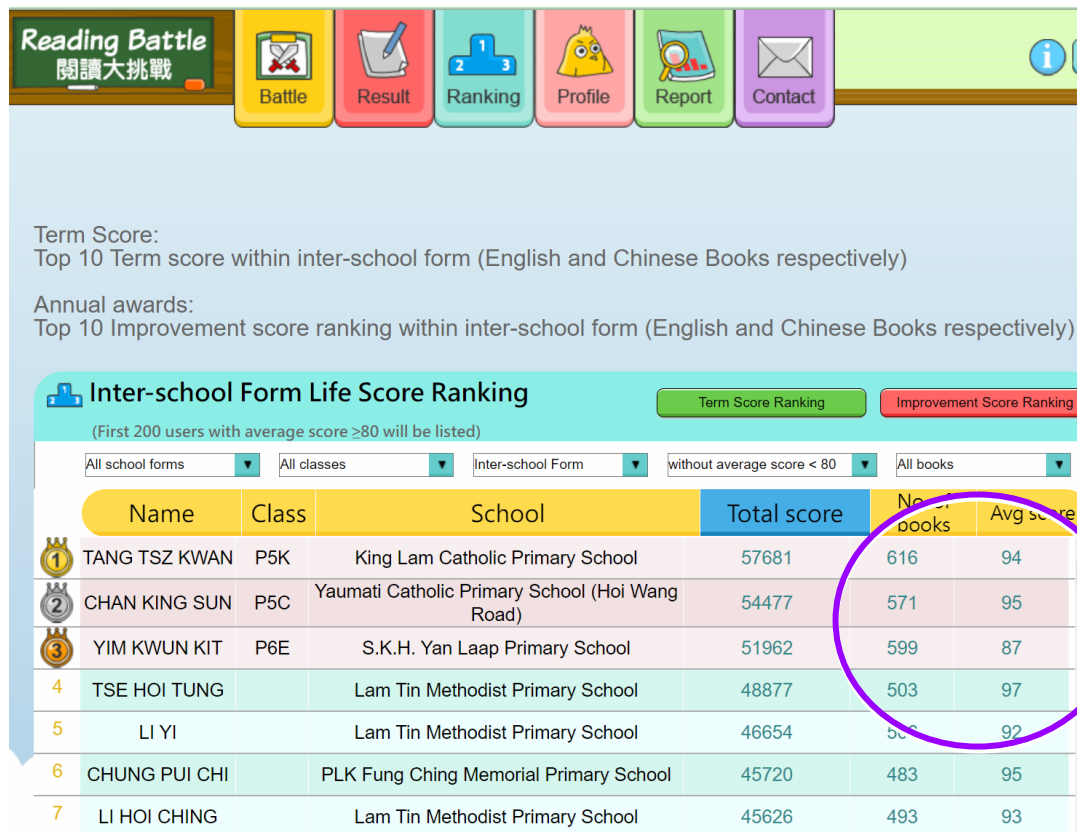
4 Types of Questions (PIRLS framework)

Details:

Books	Trial Scores			Best Score	School Average	World Average
	1st	2nd	3rd			
大雄的神奇魔法油		88		88	88	86
Nice Jelly		79		79	79	74
暖爐放寒假		46		46	46	71
與龍的友誼		79		79	79	78
王子拯救小王國		83	50	83	83	79

How did we gamify Reading Battle? - 8

RB motivated many students to read hundred of books



The screenshot shows the Reading Battle website interface. At the top, there is a navigation bar with icons for Battle, Result, Ranking, Profile, Report, and Contact. Below the navigation bar, there is a section for Term Score and Annual awards. The main content area is titled "Inter-school Form Life Score Ranking" and includes a table of student rankings. A purple circle highlights the "No. of books" and "Avg score" columns in the table.

Reading Battle
閱讀大挑戰

Battle Result Ranking Profile Report Contact

Term Score:
Top 10 Term score within inter-school form (English and Chinese Books respectively)

Annual awards:
Top 10 Improvement score ranking within inter-school form (English and Chinese Books respectively)

Inter-school Form Life Score Ranking

(First 200 users with average score ≥ 80 will be listed)

All school forms All classes Inter-school Form without average score < 80 All books

	Name	Class	School	Total score	No. of books	Avg score
1	TANG TSZ KWAN	P5K	King Lam Catholic Primary School	57681	616	94
2	CHAN KING SUN	P5C	Yaumati Catholic Primary School (Hoi Wang Road)	54477	571	95
3	YIM KWUN KIT	P6E	S.K.H. Yan Laap Primary School	51962	599	87
4	TSE HOI TUNG		Lam Tin Methodist Primary School	48877	503	97
5	LI YI		Lam Tin Methodist Primary School	46654	503	92
6	CHUNG PUI CHI		PLK Fung Ching Memorial Primary School	45720	483	95
7	LI HOI CHING		Lam Tin Methodist Primary School	45626	493	93

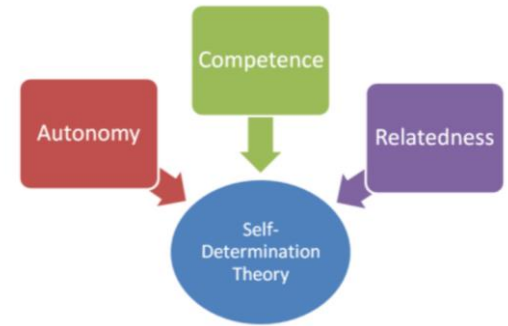
3 Kinds of
Leaderboards
Suit the Needs of
Different Learners

Why “Reading Battle” Works Like Magic? - 1

Fulfills human’s 3 essential psychological needs

It fulfills human’s 3 essential psychological needs: **autonomy**, **competence**, & **relatedness** (Deci & Ryan, 2012).

- **Autonomy** refers to a feeling of being in control of or self-determination in activities.
- **Competence** implies a need to improve abilities or to develop a feeling of mastery. Pink (2009) described “mastery” as a desire for “getting better at something (e.g., performance, competence, skills, time)”.
- **Relatedness** is defined as a social need to connect with others and a sense of belongingness.



Source:
https://en.wikipedia.org/wiki/Self-determination_theory

Source:

Li, X. & Chu, S.K.W. (2021). Exploring the effects of gamification pedagogy on children's reading: a mixed-method study on academic performance, reading-related mentality and behaviors, and sustainability. *British Journal of Educational Technology*. 52(1), 160-178.

Why “Reading Battle” Works Like Magic? - 2

Based on sound scientific research

- Li, X. & Chu, S.K.W. (2021). *Exploring the effects of gamification pedagogy on children’s reading: a mixed-method study on academic performance, reading-related mentality and behaviors, and sustainability*. **British Journal of Educational Technology**. 52(1), 160-178. Rank: 23/267 – within top **3%** (JCR – Edu & Edu Res, 2023)
- Contains 3 studies
- Study 2 addressed the question of how students/parents/teachers perceive students’ motivation and gaining in the use of the gamified platform.



Why “Reading Battle” Works Like Magic? - 3

Help students in many aspects

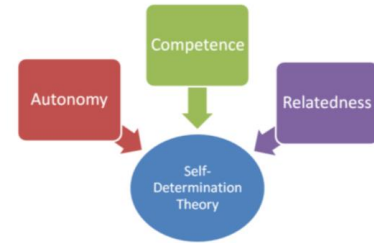
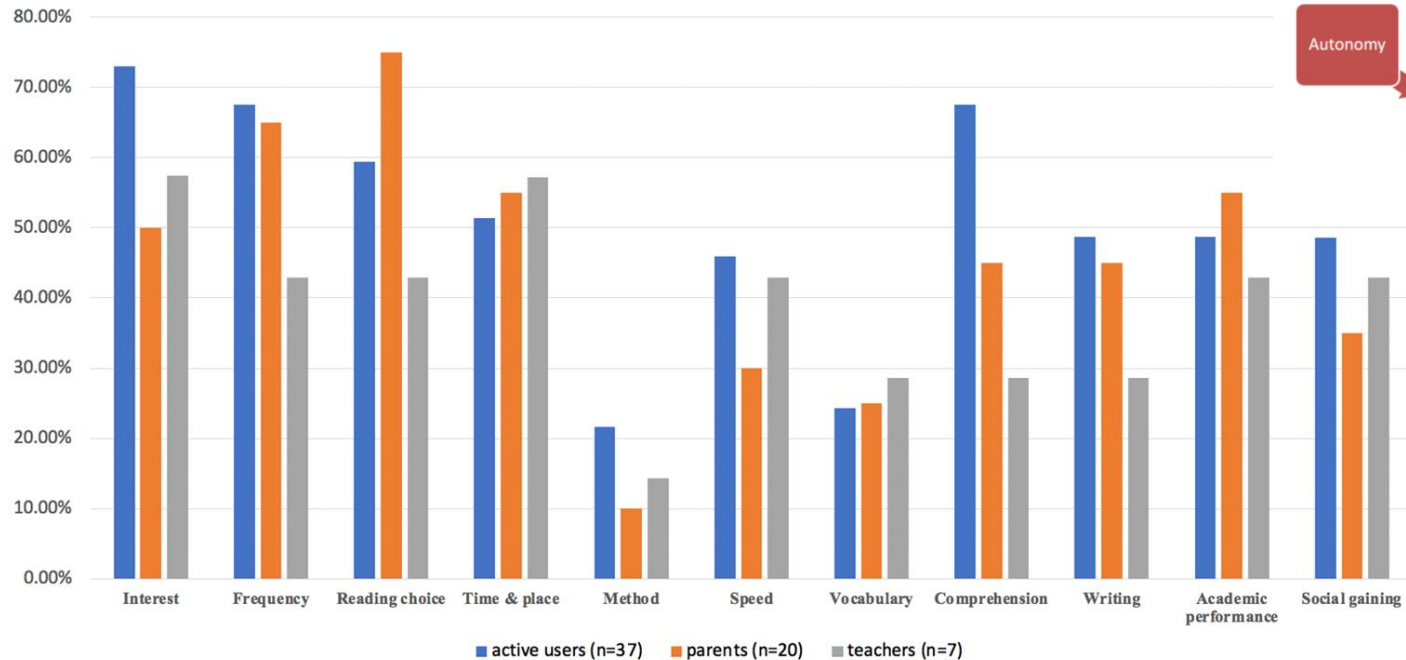


Figure 4. Coding results of interviewees' perceived effects of RB in Study 2

Why “Reading Battle” Works Like Magic? - 4



Student Wong's sharing -1

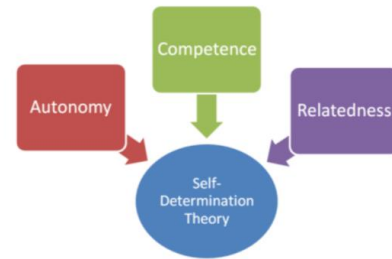
Why is Autonomy so important in motivating students to read?

- When you ask a teacher or your parents for book recommendation, they usually suggest you to read those famous and award-winning books or the books that can help improve your writing skills.
- But this is not helpful to to motivate students to read and this is my personal experience. **That's why I really hate reading books before primary 4.**
- The Reading Battle platform has a wide variety of books which provides **Autonomy** for me to choose my favourite books.



Source:

<https://www.youtube.com/watch?v=p9eACNlSumS>



Why “Reading Battle” Works Like Magic? - 5



Student Wong's sharing

Relatedness in Reading battle?

- I can relate my performance with other students on RB via the leaderboard
 - and this becomes a big motivation for me to read as I tried to compete with them
- Every day, after finishing my homework, I will do RB
- I even attempted difficult books in RB as there no more books to read
- And this leads to a huge improvement in my academic results!

Reading Battle -> Reading interest -> Good development

Why “Reading Battle” Works Like Magic? - 6



Student Wong's sharing

Competency in Reading battle


- I started having interest to read, form a good habit in reading (this helps build competency)
- After I finish my homework every day, I read the books, and do the battles on the Internet. In the last few months I even ran out of books to read, so I started selecting books higher than my literacy levels
- "After two years, my academic performance has improved greatly, both in reading and writing."
- "If I hadn't been exposed to reading battle before, I wouldn't have liked reading

Reading Battle -> Reading interest -> Good development

Data/Information created for Reading Battle

- Data/Information created for RB includes questions, answers, hints and explanation
- Takes a long time to develop a set of around 30 questions, with usually 1 correct answer and 3 incorrect answers, with hints and and explanation for each question

View Book

Book ID	Language	Status	Book cover	Title	Icon	Question statistics						
						No. of questions	No. of quiz attempts	No. of Submission	Avg. quiz score	No. of Likes	Added By	Question statistics
200212	ENG Current: ENG	Launched		40 Things to Do during Self Isolation 3	N/A Current: N/A	57	0	0	66	0	admin	View

Multiple Choice Question

#	ID	Question Type	Correctness	Difficulty	Question	Audio URL (Eng)	Audio URL (Chi)	Answer	Option #1	Option #2	Option #3	Hint	Explanation	Operations(s)
1	40607	Information retrieval 資訊檢索	100%	1	What can we do during self-isolation?			Keep in contact with family and friends online	Gather and eat with family and friends	Go to a good restaurant to relax	Play at a friend's house	p. 6	We can keep in contact with family and friends during self-isolation.	Update Delete
2	40608	Information retrieval 資訊檢索	100%	1	What is FAIL the short form of?			First attempt in learning	Final attempt in learning	First attempt in losing	First attempt in laughing	p. 15	FAIL is the short form of first attempt in learning	Update Delete
3	40609	Information retrieval 資訊檢索	100%	1	What are examples of priorities in our lives?			All of the choices	Health	Family	Freedom	p. 20	Health, family, freedom are examples of priorities in our lives	Update Delete
4	40610	Information retrieval 資訊檢索	100%	1	What do we want to enhance when we exercise?			All of the choices	Our strengths	Our weaknesses	Our brain	p. 13	We want to enhance our strength	Update Delete

Figure: Screenshot of the Reading Battle 2.0 MCQs database

Displaying the data structure in the book 1: Buddysaurus Comics Collection volume 7: 40 Things to Do during Self Isolation