Effectiveness of Online Reading Platform For History Education by Confusion Matrix Analysis

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Abstract

The Education Bureau of HKSAR had organised the Junior Secondary History e-Reading Award Scheme in 2020 to integrate subject-based e-reading and self-directed learning to promote 'reading to learning History. A research in its effectiveness is conducted by using confusion matrix to determine the influential factors for attracting junior secondary students to read on a cloud-based reading platform. The result showed that e-book is very effective to motivate students to read history article. Faster reading speed of an e-book is one of the reasons for students to prefer reading e-book rather than traditional book. On the other hand, e-book could also arise their interests in reading which is another factor for students to prefer e-book over traditional books. The accuracy of these findings are 86.7% and 93.9% respectively.

Keywords: ebook; history education; e-reading; confusion matrix

Background

Reading in the twenty-first century is also moving toward electronic format, many believe ereading will become more prevalent in the near future (Hurlbert, 2010). Therefore in order to support the implementation of the revised History Curriculum Guide (Secondary 1-3) with effect from September 2020, and to encourage students to broaden their knowledge base and widen their history learning experiences through 'reading to learn' as promoted in the updated Secondary Education Curriculum Guide (2017), the Curriculum Development Institute of the Education Bureau of HKSAR had organised the Junior Secondary History e-Reading Award Scheme from March to June 2020. It aimed to integrate subject-based reading, e-reading platform and self-directed learning to promote 'reading to learning History in the academic year 2019/20. This initiative included a series of training workshop for teachers from participating schools and with the provision of professional training programmes. A research on the issues and impacts of 'reading to learn History' had been conducted and the result is summarized in this research paper.

The objectives of this initiative are as follow:-

i)   to support the implementation of the revised History Curriculum Guide (Secondary 13) with effect from September 2020.

ii)   to arouse students' interest in world history by encouraging them to read historyrelated materials and develop students' ability to learn history through self-directed learning to pursue historical knowledge on an e-learning platform;

iii)   to help History teachers develop strategies to promote 'reading to learn History' and initiate knowledge exchange among experts, students and History teachers through conducting professional development programmes held by experts and scholars; and

iv)   to conduct research on the effectiveness of using e-reading on the learning and teaching of History and produce resource materials to promote 'reading to learn History'

1. Introduction

In March 2020, the project team launched an online reading competition among Hong Kong local junior high schools. The aims of the project is to promote students' interest to learn history through reading on an e-learning platform, and create a favorable reading atmosphere and culture in school; and to arouse students' interest in history and encourage them to engage in selfdirected learning and pursue historical knowledge. A total of 103 schools with more than 2200 students participated in the project, the number of student participants varied for each school. Each student is required to finish 3 compulsory Chinese articles and 3 selective ones (Chinese or English). An online reading platform has been designed by the project team; students can read the articles and answer questions by simply log in their own accounts. 1369 students have completed all 6 articles (3 compulsory and 3 elective), a school report has been summarized with detailed students performance for each school. Students are also suggested to finish an online survey, 1074 in total have responded.

The research questions are:

i) Do students really prefer e-reading more than traditional reading？
ii) As the online reading platform, what could be improved?
iii) What the Relationships between Reading Skills and accuracy?

2. Literature Review

How reading and study of history is relevant? As history learning is not a one-way process, reading plays the key role of studying history. When you read history or do history-related research, it is aiming to achieve the following results, such as knowing how to ask questions, knowing that you have insufficient knowledge, or paying attention to background or details. In other words, the more you read, the more you know that you don't know enough, and that will motivate you to learn more. This is a good process. And he believes good history reading will

lead to these results. Therefore, it is important to know how knowledge is produced, that is to say the production process of historical knowledge, rather than just knowing how the event happened, or even how knowledge about this historical event was produced. Eventually, the more you see, the greater your acceptance is. (Tolerance of difference, ambiguity, and complexity) Why? Because it's easier for everyone to understand that history is either black or white. People with different backgrounds and different times will have different experiences, so this is an unavoidable thing to deal with when reading history.

The Internet is an inherently disruptive information and communication technology that has changed lives in profound ways in every nation. These changes affect both the nature of reading and the sources of information that we use for learning (Le Bigot & Rouet, 2007). In addition to being able to read traditional texts, we now require the skills, strategies, and practices that enable us to read and learn online. In response to this changing dynamic, IEA's TIMSS & PIRLS International Study Center has developed a new assessment of online reading, ePIRLS.

Why should anyone invest a tremendous amount of effort, time, and resources to develop and use an assessment of online reading? There are many reasons.

First, between 40 and 50 percent of the world's population currently has access to the Internet (UNESCO, 2014). At the current rate of adoption, all, or nearly all, of the world's population will have access in just eight more years.

Second, students have increasing access to online information at home and on mobile devices and they use these often.

Third, students are unskilled with reading information online to learn.

Fourth, research indicates that online reading comprehension is not isomorphic with offline reading comprehension (Afflerbach & Cho, 2010; Coiro & Dobler, 2007).

Finally, issues of equity have become increasingly important and a separate online reading achievement gap is appearing.

3. **Methodology**

The researchers grouped the reading questions into 4 categories to get a better understanding of how students' reading skills are varied, these are: identifying evidence and argumentation; summarizing content; distinguish options and understand the purpose and limitation.

After students have completed the 6 articles, they are also requested to complete an online survey. There are 6 groups of questions. First group of questions is about students' experience of using the reading platform and followed by the second group of questions, which is about the general feedback of articles the researchers chose. The third group of questions is about student's opinions on individual articles. Students' reading habit and particularly history reading habit are categorized as the fourth and fifth group of the questions. The last question is a student's selfreflection about their own history reading skills. In total, 1074 students have responded.

4. Results

There were two sets of questions. There are 9 questions in the first set (Set A), which is related to the overall feedback about the Reading Award Scheme from the student's participants. Another set of 7 questions (Set B), related to the reading habit and influential factors for the incentives of reading among the participants.

4.1 The Set A questionnaire

The Set A survey questions QA1-QA9 are listed as follow:-

	Chinese	English
QA1	今次的閱讀平台操作方便易用。	The reading platform is easy to use this time.
QA2	今次的閱讀平台系統指引清晰。	The reading platform system guidance is clear this time.
QA3	篇章內容與導讀問題並排顯示的方式有助我的閱讀。	The side-by-side display of the content of the chapter and the guide question helps me to read.
QA4	整體而言，我滿意今次閱讀平台的設計與運用。	Overall, I am satisfied with the design and use of the reading platform this time.
QA5	從內容深淺程度而言，今次計劃所選取的篇章程度合適。	In terms of the level of content, the level of the selected chapters in this plan is appropriate.
QA6	從篇章數量（3篇必讀、3篇選讀）而言，今次計劃的安排合適。	In terms of the number of chapters (3 required readings and 3 optional readings), the arrangement of this plan is appropriate.
QA7	從深淺程度而言，導讀問題設計合適。	In terms of depth, the guide question is designed appropriately.
QA8	從數量而言，每篇章的導讀問題安排合適。	In terms of quantity, the guide questions for each chapter are arranged appropriately.
QA9	整體而言，我滿意今次閱讀平台的篇章選擇與導讀問題設計。	On the whole, I am satisfied with the chapter selection and guide question design of the reading platform this time.

4.2 The Set B questionnaire

The Set B survey questions QB1-QB7 are listed as follow:-

|	Chinese	English
QB1	我有恆常閱讀的習慣。	I have regular reading habit
QB2	我喜歡閱讀	I like reading
QB3	在一般情況下，驅使我閱讀的原因是滿足他人 (例如家長、老師)。	In general, the motivation for me to read is to please others (e,g, parents or teachers)
QB4	相比於閱讀傳統紙本書籍，我更喜歡閱讀電子書。	Comparing with paper books, I prefer reading e-book
QB5	相比於閱讀傳統紙本書籍，我閱讀電子書更快。	Comparing with paper books, reading e-book is faster
QB6	相比於閱讀傳統紙本書籍，電子書令我對閱讀更感興趣	Comparing with paper books, reading e-book makes me more interested to read
QB7	我喜歡閱讀與歷史有關的讀物	I like reading articles related to History

4.3 Statistical results of Set A

Majority of the students show positive feedback about the reading platform and chosen content.

Set A questions : The raw results are as follow:-

	VD	%	D	%	N	%	A	%	VA	%
QA1	20	1.9%	43	4.0%	319	29.7%	424	39.5%	267	24.9%
QA2	22	2.1%	49	4.6%	256	23.9%	422	39.3%	324	30.2%
QA3	36	3.4%	66	6.2%	337	31.4%	383	35.7%	251	23.4%
QA4	28	2.6%	41	3.8%	312	29.1%	446	41.6%	246	22.9%
QA5	30	2.8%	97	9.0%	402	37.5%	429	40.0%	115	10.7%
QA6	28	2.6%	94	8.8%	349	32.5%	395	36.8%	207	19.3%
QA7	37	3.4%	99	9.2%	400	37.3%	389	36.3%	148	13.8%
QA8	35	3.3%	57	5.3%	386	36.0%	410	38.2%	185	17.2%
QA9	32	3.0%	70	6.5%	353	32.9%	439	40.9%	179	16.7%

N=1073, (VD= Very Disagree, D=Disagree, N= Neutral, A= Agree, VA = Very Agree
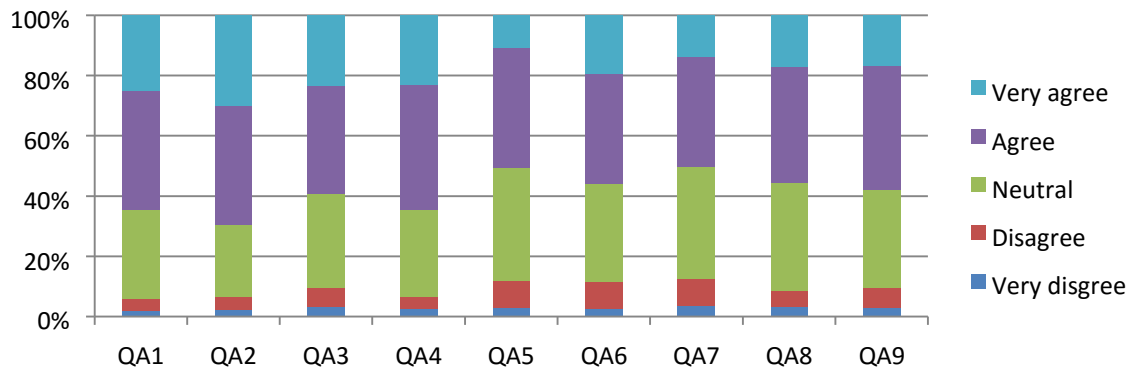
4.4 Statistical results of Set B

Set B questions : The raw results are as follow:-

	VD	%	D	%	N	%	A	%	VA	%
QB1	71	6.6%	148	13.8%	452	42.1%	288	26.8%	114	10.6%
QB2	50	4.7%	113	10.5%	342	31.9%	342	31.9%	226	21.1%
QB3	239	22.3%	268	25.0%	329	30.7%	170	15.8%	67	6.2%
QB4	221	20.6%	244	22.7%	333	31.0%	175	16.3%	100	9.3%
QB5	161	15.0%	218	20.3%	332	30.9%	222	20.7%	140	13.0%
QB6	180	16.8%	264	24.6%	348	32.4%	162	15.1%	119	11.1%
QB7	100	9.3%	161	15.0%	368	34.3%	274	25.5%	170	15.8%

N=1073, (VD= Very Disagree, D=Disagree, N= Neutral, A= Agree, VA = Very Agree
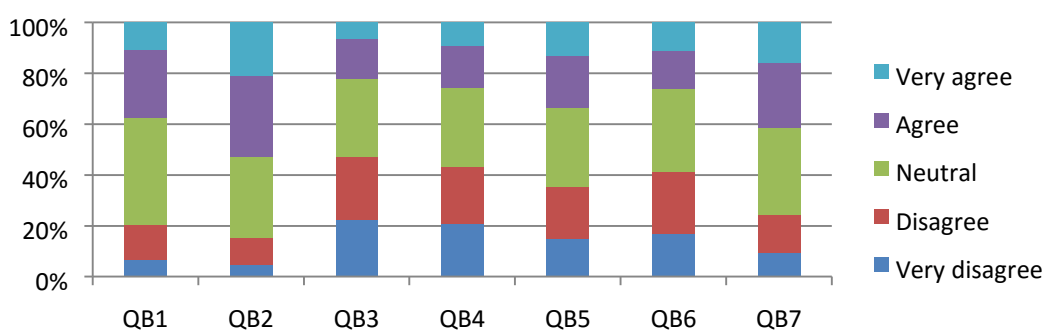
5. Data Analysis

38% of the students participants agreed that they have reading habit, 53% of them likes reading, 22% of them mentioned the reason why they read is to satisfy others (ie. Parents or teachers) meanwhile 47% of them are the opposite. 26%of them prefer e reading, when 43% of them still prefer reading on papers. 34% of students agree e-reading is faster than paper reading. 26% of the students think compare with traditional reading; they found e-reading more interesting. 41% of the students like reading history related content.

Students are required to read three compulsory articles and their title as listed as follow:-

Article	Title	Type
A1	顧杏卿：《歐戰華工回憶錄》（節錄）	Compulsory
A2	姚德華：〈馬可勃羅沒到中國？〉	Compulsory
A3	丁新豹：〈香江有情：東華三院一百四十年〉	Compulsory
B1	鄺智文、蔡耀倫：〈香港的戰略地位與防務考慮的變遷 （1860-1970）〉	Elective
B2	劉智鵬：《香港早期華人菁英》及《香港華人菁英的冒起》（選讀）	Elective
B3	麥勁生：〈冷戰時期的防衛性重建：西歐的經濟協作和地區整合（1945 至 2000 年）〉（節錄）	Elective

5.1 Factors of difficulties

Among the 3 compulsory articles, Articles A1 is considered as the most difficult, the top three reasons are 1. The article is too long 2. Lack of background knowledge about this topic and 3. It is a complex text.

Articles A2 is considered as the easiest article to the students, the top three reasons why students think it is the easiest are: it is not a complex text (65.4%), the wording and vocabulary is easy to understand (51.9%) and 3. students have certain background knowledge about this topic (37.7%)

87.8% of the participants chose Chinese selective articles, Article B1 is ranked the most difficult to understand, reasons are: students have certain background knowledge about this topic (54.6%); it is a complex text (49.8%) and the article is too long (47.7%)

On the other hand, students consider Article B2 the easiest article, reasons are: the language is easy (54.5%), the wording and vocabulary is easy to understand (45.3%) and students have some background knowledge about this topic (42.6%)

5.2 Factors of interests

Article B1 is students' least interested article and Article B2 is the article student feel the most interested about.

In terms of the English articles, Tschanz, D. W. "The Islamic Roots of the Modern Hospital" seems to be the most difficult one as well as the least interested one for students, reasons are also: 1. the wording and vocabulary is easy to understand(60.3%) 2. The article is long (55.1%) and 3. It is a complex text (54.4%)

Selected Reading from Letters from the First World War, 1915 in the National Archives, UK is ranked as students' most interesting and easiest article :1. students have some background knowledge about this topic (52.2%) 2. It is not a complex text (44.9%) and 3. the wording and vocabulary is easy to understand (39%).

Students show strong interests in certain subjects like history of art and music, followed by historical figure biographies. Favorite topics are Early human civilization, World War I & II and European classical and medieval civilizations.

5.3. Relationships between Reading Skills and accuracy

The authors grouped certain questions from each article into four reading skills, such as : Identify evidence and argumentation ; Summarize content ; Distinguish option and understand the purpose and limitation.

Based on the students' reading performance, the average accuracy of each skill for compulsory and elective articles are as following,

According to the survey, most of the students are comfortable with the designed questions.

Reading skills	Accuracy in compulsory articles	Accuracy in elective articles
Identifying evidence & argumentation	54%	45%
Summarizing content	63%	46%
Distinguish option	60%	37%
Understand the purpose and limitation	26%	48%
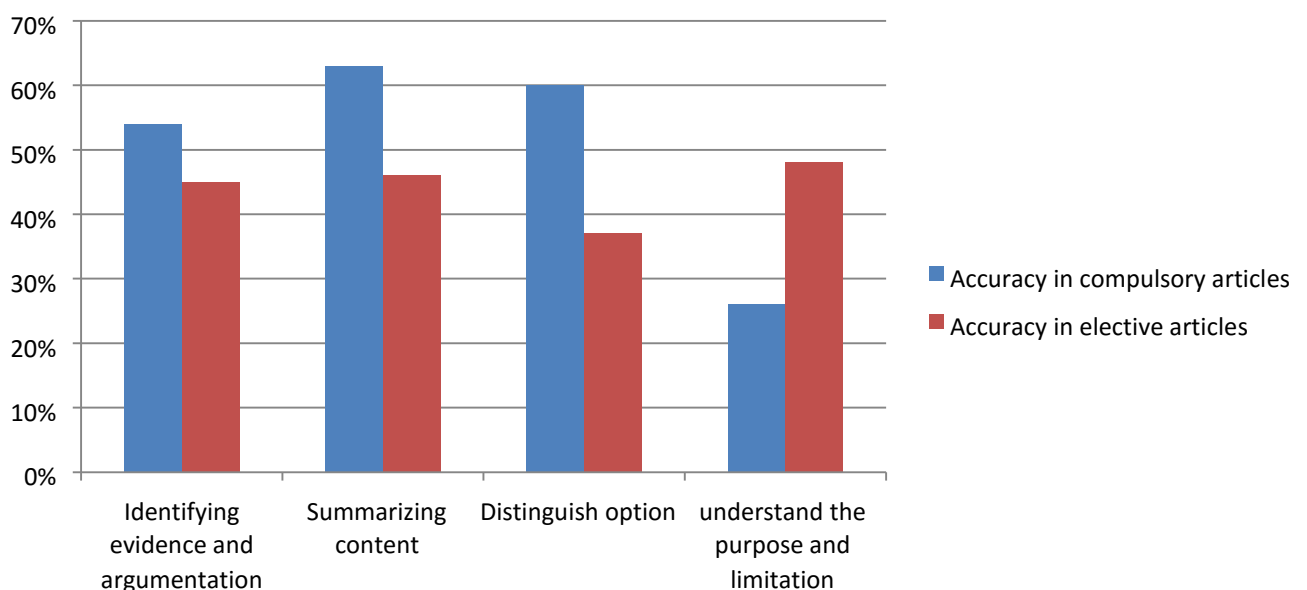
5.4. Understanding the purpose is an essential factor for accuracy

In the survey, students also agree that understanding the purpose and limitation of the article is the most essential factor for their answers' accuracy. This factor is more significant when the results of the compulsory and elective articles are compared. It is found that the accuracy for elective articles (48%) are in general much higher than those for the compulsory articles (26%)

It is believed that in general students would choose those articles which they can understand the purpose and drop those they could not understand. Therefore the performance accuracy of their elective articles are much better than those compulsory articles.

6. Big data analysis of the survey results with Confusion Matrix

6.1. Methodology

In order to discover the correlations between different factors related to the reading habit and the driving incentives, the confusion matrix is used for the analysis. The number of counts on the corresponding score for factor X and factor Y are record in the corresponding rows and columns respectively. For example, for analyzing the correlation between "I like reading" (factor X) and "I have regular reading habit" (factor Y), there are a total of 35 counts that rate both factors "very disagree VD", a number 35 is put in column 1 row 1. On the other hand, there are 4 students who are "Very Agree" with "I like reading" but they "Very disagree" that "I have regular reading habit", so a number 4 is recorded in row 5 and column 1 in the following confusion matrix. Other combinations of VD, D, N, A, and VA of these two factors are recorded and a 5x5 matrix is formed.

		Factor X: I like reading				
		VD	D	N	A	VA
Factor Y I have regular reading habit	VD	**35**	**13**	9	10	4
	D	**11**	**55**	58	18	5
	N	3	37	234	152	23
	A	0	8	35	144	101
	VA	0	0	3	18	93

For the ease of data analysis, this 5x5 matrix is reduced to 3x3 matrix by combining the number of counts of VD+D to Negative and A+VA to Positive. Those Neutral N results are not included in the analysis as it could not indicate their preference.

		Factor X		
		VD+D= Negative	N	A+VA = Positive
Factor Y	Negative	**114** (True Negative)	67	37 (False Positive)
	N	40	234	175
	Positive	8 (False Negative)	38	356 (True Positive)

6.2 Finding 1: Those who like reading have regular reading habit

As the numbers on the diagonal row is much larger than the off-diagonal numbers, it can conclude that Those who like reading have regular reading habit. The accuracy is 91.3% [i.e.= (True Negative+ True Positive) / Total counts (neglected the Neutral)] . Although this finding is very obvious and logical, it is shown here for the validation of the data and methodology.

6.2 Finding 2: "Reading e-book is faster" vs "I prefer reading e-book" is highly correlated

		Factor X: Reading e-book is faster				
		VD	D	N	A	VA
Factor Y: I prefer reading ebook	VD	134	38	27	9	13
	D	16	118	71	28	9
	N	5	46	195	67	18
	A	4	11	31	104	25
	VA	2	4	6	13	75

Reducing to a 3 x3 matrix, the result is as follow

		Factor X: Reading e-book is faster		
		Negative	Neutral	Positive
Factor Y: I prefer reading ebook	Negative	306	98	59
	Neutral	51	195	85
	Positive	21	37	217

This finding shows that many participants preferred reading e-book as they also agreed that reading e-book is faster than reading traditional paper books. The accuracy of this finding is 86.7%

6.3 Finding 3: "e-book makes me more interested in reading" vs "I prefer reading e-book"

Then the two factors "e-book makes me more interested in reading" and "I prefer reading ebook" were compared. The confusion matrix is built as follow:-

		Factor X: e-book makes me more interested in reading				
		VD	D	N	A	VA
Factor Y: I prefer reading e-book	VD	144	60	11	3	3
	D	23	144	61	11	3
	N	8	46	216	50	11
	A	2	11	50	80	32
	VA	3	1	8	18	70

Reducing to a 3 x3 matrix, the result is as follow

		Factor X: e-book makes me more interested in reading		
		Negative	Neutral	Positive
Factor Y: I prefer reading ebook	Negative	371	72	20
	Neutral	54	216	61
	Positive	17	58	200

This finding shows that many participants preferred reading e-book and they also agreed that ebook makes them more interested in reading. The accuracy of this finding is 93.9%.

7. Conclusions

e-Book is a quite new for learning a traditional subject like history. This study shows that e-book is very effective to motivate students to read history article. Students participated in this scheme had feedback that it is faster for them to read e-book comparing with traditional book and therefore they prefer reading e-book. e-book could also arise their interests in reading which is another factor for them to prefer e-book rather than reading traditional books.

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