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A Free Land is Hard to Find: On Huckleberry Finn's Escaping from Civilization

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Abstract: "The Adventures of Huckleberry Finn" is Mark Twain's representative novel, in which the black slave Jim's personal liberty has been the focus of critical attention. However, the white boy Huckleberry Finn's freedom is taken for granted and therefore seldom mentioned. It can be argued that Huck can neither find real freedom in the seemingly civilized society nor at its opposite side. This thesis divides Huck's adventure process into three parts, tracing his escaping from his father's and the widow Douglas' parenting patterns, his rifting journey down the Mississippi River on the raft and to the island as well as his vagrancy in mob-ruled communities. By doing so, it attempts to demonstrate the infeasibility of gaining individual freedom, the freedom of life and the civil freedom accordingly.

Keywords: The Adventures of Huckleberry Finn; Huck's freedom; Civilization

Online publication: September 9, 2022

1. Introduction

"While one may escape from legal bondage, there is no escape from the cruelties of this 'civilization'…There is no promised land where one may enjoy absolute personal freedom…Indeed, the novel suggests that real individual freedom, this land of the free, cannot be found. American 'civilization' enslaves and exploits rather than liberates" [1]. Previous studies have discussed the impossibility of the black slave Jim's acquiring the real freedom in the novel, as is argued by David L. Smith that "this land of the free, cannot be found" [1]. Their focus is on Jim's personal liberty; while another protagonist, the white boy Huckleberry Finn's (hereafter referred to as Huck) freedom is taken for granted and therefore seldom mentioned. However, it seems that Smith's unfortunate but somehow reasonable conclusion should apply equally to the uncivilized boy who is unwillingly restricted and bounded to a seemingly civilized country. Presumably, he can never find real freedom at the civilized side. Worse still, even his drifting journey down the Mississippi River on the raft is not necessarily synonymous with "freedom", despite all the effort he and Jim have made. With regard to such an abstract, vague notion of "freedom", they two have their own interpretations in its simplest and most modest way. Jim dreams of "I own myself," [2] such kind of fantasy has been proved by David L. Smith as being impossible, considering the ideology of the extreme racial discrimination, even though Jim was legally free at the end of the story. While it seems that Huck's freedom is easy to confirm, only if he figures out a way to escape from the so-called "civilized" society so as to get rid of all the dismal social norms. Nevertheless, it can be argued that what is opposite from civilization cannot be verified as real freedom.

2. Genteel or barbarian adulthood: denial of individual freedom

At the very beginning of the story, Huck appears to be extremely uncomfortable with the idea of getting "civilized" and the dreadful biblical stories penetrated with death images widow Douglas imposes on him. Clean clothes, good manners and decent language and whatever belongs to the civilization side are merely bondage for such an unbridled and even innocent boy. He seems to be allergic to anything related to civilization, to the genteel culture of adulthood. But this does not mean Huck should deservedly fit in with its ultimate opposition: the barbarian life style of adulthood represented by his father. Violence, anti-education opinions, alcoholism, impiety and some other corrupted actions against the enterprising spirit of America, against Puritanism also force him to flee his father's domain and try to find another way out. Therefore, it can be concluded that both the genteel and the Barbarian parenting modes and the lifestyle of adulthood is essentially suffocating Huck's individual freedom.

He then fakes his own death, which explicitly indicates the denial of his social position of being someone's son and the renouncement of his socially-constructed identity. Such metaphoric action also resonates with his constant employments of various pseudonyms in his following travel. Will he manage to be free from the fetters of social relations since the boy named Huck has been legally declared dead? Well, to "keep pap and the widow from trying to follow me" [2], to escape from these two opposing grown-up life patterns in the civilized side, a drifting journey for freedom officially starts.

Nevertheless, the river and what it stands for also appear to be incomprehensible for Huck.

3. The river, raft and the island: a threat to life freedom

The Mississippi River, at first glance, appears to be in contrast with what the offshore civilization stands for. It offers a tranquil landscape of nature, as is depicted in the novel, "Not a sound, anywhere—perfectly still—just like the whole world was asleep, only sometimes the bull-frogs a-cluttering, maybe" [2]. In this sense, the undisturbed and unexploited river is in stark contrast with all the adulthood violence Huck has suffered before, let alone the nonsensical feuds and chaos of the mobs he will witness or experience later on land. Since the river is traditionally interpreted as an embodiment of nature, perhaps it is only through the purest child-like perspective, the beauty of river, of nature can be appreciated. Untutored as Huck is, he can also depict the nature with a poetic tone: "the nice breeze springs up, and comes fanning you from over there, so cool and fresh, and sweet to smell, on account of the woods and the flowers" [2]. Here the river serves as a harbor, nurturing as well as refreshing life. As Henry David Thoreau believes, living by the river can refresh and "renew thyself completely each day," and he himself is used to "getting up early and bath in the pond" [3]. For the water always symbolizes the power of purification, offering a kind of "Katharsis," as is first recorded by Plato in "Poetics" [4].

However, such tranquility is transitory and doomed to be broken. Arguably, no one can escape from the curse of an old saying: "no man is an island". Even the recluse Thoreau had had to leave temporarily his Walden, either for mundane trifles like shoes-repairing or civil duty. Though, Thoreau did struggle for what he understood as freedom by living in seclusion in order to "live deliberately", as he put it. Or by refusing paying tax, if only he would not be put into jail. It is clear that an educated adult's fighting against civilization and fighting for freedom is so hopeless, let alone an unsophisticated child's battle against the secular world of civilization.

Both the prestigious critics Lionel Trilling and T.S. Eliot argue that there exists a river of god in the novel. Though it is neither benignant nor bad, it does have a kind of humanity, pushing the plot forward and leading the protagonist towards goodness. At this point, it is true. Readers are continually reminded of the river's power and its capriciousness, as well. But still, its moral function remains obscure. Civilized society has its complexity, so does nature. The river also demonstrates its dangerous aspect. There are dead bodies floating by. And a steamboat once threatens to destroy the raft. It is also the turbulent currency and

unexpected fog that separate the two companions. "…Away we went, a sliding down the river, and it did seem so good to be free again and all by ourselves on the big river and nobody to bother us" [2].

Unfortunately, far from being the embodiment of the freedom, the river is depicted to be a real threat to individual's life, a threat to Huck's chasing freedom. It is much ironic: What Jim has feared before their journey ultimately comes true, owing to the unmeant malevolence of the river. He is being sold down the river, for missing the steamboat to Cairo. Instead of fleeing to the free states northward, Jim and Huck travel deeper and deeper into the heart of the south, the heart of the darkness for slave. And it is exactly the river that sends them bounty hunters and lets the uninvited guest "the King" and "the Dauphin" join them, with whose company Jim suffers a lot as a mean slave and Huck is actually reduced to an oppressed subject, as well.

Then, how about their transport? "We said there warn't no home like a raft, after all. Other places do seem so cramped up and smothery, but a raft don't. You feel mighty free and easy and comfortable on a raft" [2]. What the widow's or his father's house cannot grant him, say, a sense of freedom, is found exactly on the raft. In addition, it is the raft that offers a chance for Huck to look at the starry firmament and even to contemplate upon certain philosophical questions. "It's lovely to live on a raft, we had the sky up there, all speckled with stars, and we used to lay on our backs and look up at them, and discuss about whether they was made or only just happened" [2]. Given this, the raft serves as a medium, a channel, through which Huck is invited or at least lured to communicate with a somehow higher being, who actually evokes a sense of sublime. As Immanuel Kant puts it: "Two things fill me with constantly increasing admiration and awe, the longer and more earnestly I reflect on them: the starry heavens without and the moral law within [5]." Nature, with its embodiments like starry sky, has been mystified, romanticized and even deified. In this sense, the god of star, the god of river, along with the god of raft, or any other gods derived from nature, overwhelming human beings with awe or at least with curiosity. So, can Huck find real freedom from them?

Since the sky is beyond human beings' reach, how about the raft? It is still difficult to jump to the conclusion that the raft stands for real freedom. For it is the raft that drives Huck out of a paradise-like island at the beginning of his adventure, where Huck says to Jim that the raft is nice and he would not want to be anywhere else. Huck and Jim do feel transiently free on the raft while it in return restricts freedom. The fact is, the raft cannot guarantee their security on the river. Compared with the magnificence of the Mississippi River, both their transport and themselves are too insignificant.

The island which leaves Huck good impression cannot be counted as a free land, either. On the contrary, it is much problematic. Firstly, it is highly possible that Huck's finding of the island indicates a subtle intertextuality with Peter Pan's looking for Never Never Land (Peter Pan, the imaginary character written by Scottish playwright and novelist J. M. Barrie. He is a mischievous little boy who can fly and would not grow up starts his adventures on the Never Never Land). The similarity lies in the protagonists Huck and Pan's childish innocence, with which they can hardly see through the sophistication of adulthood. But once they withdraw from the island, they have to encounter with the adulthood world. Peter Pan has chosen to be a child the whole life, while Huck is driven to leave the island, by certain mysterious, ineffable forces which he cannot escape from [6]. Second, the island was once inhabited by someone else, who occupied there and left his living traces or more exactly, his remains of civilization. Huck, in other words, should merely be regarded as a visitor or even an invader who comes from the opposite side of the civilization. Most importantly, the location of the island is too close to the civilized side, to what Huck is trying to escape.

4. Other communities of mobocracy: abusing of civil freedom

Since Huck cannot find real freedom near his hometown, what if he leaves far away from his family of origin and starts a brand-new life in another human community? It is not likely that Huck will not be disappointed after seeing various darkness within human beings. Instead, the side of civilization makes him

experience a kind of disillusionment. Murders, killings, feuds, frauds and lynches fill his journey. Huck is exposed to so many human-made tragedies that a juvenile is not supposed to witness. Strangely, he does not become misanthropic but maintains innocent, performing even like an angel. For instance, after seeing "the King" and "the Dauphin" are caught and tarred and feathered, he is definitely not pleased. Even they have abused him and sold Jim. I am not willing to judge him from a moral high ground or accuse him as being "Tom Sue"—an Internet Buzzword used to describe the male characters who lose normal moral values like "praising virtue and punishing vice," whose female counterpart is "Mary Sue". Now that he is able to summon sympathy for the evil side, how can he allow Jim to suffer a lot? How can the protagonist Huck be reduced to a supporting role, to a sidekick of Tom Sawyer again? In this regard, this thesis agrees with Jane Smiley, in that Huck's performance fails to prove "his affection for and responsibility to Jim" [7]. Therefore, his monologue verifies that the characterization of Huck is not out of character. On the contrary, it shows his unsophistication again: he is too naïve to believe in Tom or other people's authority.

Furthermore, it reveals something so insightful that forces adults to meditate and rethink the rationality of the already-established social constitution and some other relevant questions such as the boundary of civil freedom. And these eternal questions on individuals' happiness and the welfare of a state have long puzzled numerous philosophers. "Well, it made me sick to see I," says Huck, "and I was sorry for them poor pitiful rascals it seemed like couldn't ever feel any hardness against them any more in the world. Human beings can be awful cruel to one another" [2]. To some degree, the cruelty of lynch, of the multitude echoes with Colonel Sherburn's thought-provoking speech when people were shouting to avenge Bogg's death. Sherburn scorns at the mass, saying: "You don't like trouble and danger. But if only half a man—there—shouts 'Lynch him, lynch him!' … afraid you'll be found out to be what you are—cowards... The pitifulest thing out is a mob; that's what an army is—a mob; they don't fight with courage that's born in them, but with courage that's borrowed from their mass, and from their officers. But a mob without any 'man' at the head of it, is 'beneath' pitifulness" [2]. It makes sense: the mob blindly follow certain leader, some authority or opinions of the majority lest their disagreement or non-conformity will drive them out of the mainstream society. In the novel, obviously, Huck stands for the minority of non-conformists who dare to deny the value recognition of the majority. But unfortunately, he is influenced by the community and cannot escape from its ideology such as authority worship or racism discourse, the latter has been proved by David Smith. Again, Huck will never find his own human agency, let alone freedom in such a mob society.

Moreover, Bogg's suffering also reflects a common situation backing at that time. It was a society in which average people lose their voice. Being "the best naturedest old fool in Arkansaw—never hurt nobody, drunk nor sober" [2], Bogg's expressing of ideas in public causes disaster of being killed by an unqualified embodiment of authority. It must be Twain's satire on American democracy, which fails to meet expectations of numerous intellectuals. Taken Mark Twain's contemporary John Stuart Mill for example. Mill stresses the ultimate of liberalism, insisting on individual liberty. In his masterpiece "On liberty" [8], he claims that people share "the freedom of opinion," "of the expression of opinion" and the power of coercion is illegitimate. Unluckily, what happens in the novel exactly betrays it. Instead of encouraging civil freedom, the society of seeming democracy but essential mobocracy is suffocating it.

5. Conclusion

Fortunately, Huck's adventure results in neither a comedy nor tragedy, but somehow a sense of uncertainty. "I reckon I got to light out for the Territory ahead of the rest, because Aunt Sally she's going to adopt me and civilize me and I can't stand it. I been there before" [5]. Huck realizes that he has to escape again and have to seek out a new region in which to feel free. His failure seems to indicate a fatal destiny no one can escape from. No one can find a land of freedom. Hopefully, there still exists some hope, hoping Huck can

find his way out, some day in the future.

But still, it is not so explicit. What if such kind of uncertainty is virtually leading to a much blur, gloomy destination? It remains a mystery whether the white boy can find his freedom in Territory, with the appearance as "the other" image, a probably unwelcomed intruder in an Indian domain. Given that, the thesis disagrees with Eliot's claim, that "Mark Twain is a native, and the River God is his God. It is as a native that he accepts the River God, and it is the subjection of Man that gives to Man his dignity" [9]. How can it be the river of the white? How absurd it is to regard white people as natives on the American continent and see the river as their own god. For the continent is not inhabited primarily by white people and the name of Mississippi was originally derived from the real Native Americans, that is, from the Indians. By far, it can be concluded that a free land is hard to find.

Disclosure statement

The author declares no conflict of interest.

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The Investigation and Thinking of China-US Trade Friction: Taking Lu'an Import and Export Enterprises as an Example

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Abstract: In recent years, with the escalating trade friction between China and the United States, especially in 2018, the trade war between China and the United States has caused a greater impact on the development of China's foreign trade. Combined with the current situation of export trade in Lu'an City under the China-US trade friction and the impact on import and export enterprises, a linear regression model is established using SPSS software, and an empirical analysis of export trade in Lu'an City is conducted to explore the main factors of China-US trade friction on export trade in Lu'an City and put forward substantial countermeasures and suggestions.

Keywords: China-US trade friction; Lu'an City; Import and export enterprises; Countermeasure suggestions

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1. Introduction

This study is done to analyze the important impact of the escalation of trade friction between the U.S. and China on import and export enterprises in Lu'an City.

1.1. Research Background and Significance

Since the establishment of diplomatic relations between China and the United States in 1979, the trade friction between the two countries has not ceased[1], and since the United States of America announced the imposition of tariffs on Chinese imports in 2018, the trade friction between China and the United States has further escalated to a trade war between China and the United States[2] . In the case of Lu'an City, its foreign trade develops late and most of them are small and medium-sized enterprises, which urgently need the government's guidance and support to help them overcome the difficulties[3]. This project analyzes the current situation of import and export enterprises in Lu'an City under the Sino-US trade friction, and uses SPSS software to find out the main influencing factors of Sino-US trade friction on export trade in Lu'an City, so as to put forward suggestions and countermeasures to provide theoretical support and guidance for the development of foreign trade in Lu'an City.

2. The current situation of the foreign trade export industry in Lu'an

Based on the research theme, this paper mainly provides an overview of the current situation of the foreign trade export industry in Lu'an City.

2.1. The total exports of Lu'an City since 2013

Through the total exports of Lu'an City from 2013-2019 available in the Commerce Bureau of Lu'an City, it can be found that the total exports of Lu'an City show an obvious trend of first decreasing and then increasing. In 2014, the decrease was significant which is by 14.6% compared 2013; in 2017, the increase was especially significant, which is by 20.4% compared to 2016. It can be seen that the total exports in recent years are on an upward trend, but more slowly.

2.2. Lu'an City exports of major commodities accounted for the proportion of the city's exports

Lu'an City exports mainly mechanical and electrical products, high-tech products, labor-intensive products, pharmaceuticals and more. Among them, the largest proportion of exports are electromechanical products and high-tech products, whereas medical and pharmaceutical exports account for a relatively small proportion. It can be seen that the city of Lu'an has an advantage in the export of electromechanical products and high-tech products, and the export of labor-intensive products, textile and garment products have seen the most significant increase[4].

2.3. The main export markets in Lu'an

As of December 2020, the export data of Lu'an City can be found. It shows that in 2020, the export of Lu'an city to Singapore, Saudi Arabia, Iran and The United Kingdom has increased significantly compared to the same period in 2019, while the export to the United States and Japan has a small increase, while the main export countries of Lu'an City are still the United States and Japan[5]. It can be seen that due to the impact of trade friction between China and the United States, Lu'an will resort to exporting to Asia, Africa and Europe and other regions, but in the meantime, the United States is still the main export market in Lu'an City.

3. The impact of trade friction between the United States and China on the import and export enterprises in Lu'an

The impact of the trade war between the United States and China on the import and export enterprises in Lu'an City is multifaceted.

3.1. The direct impact is relatively minor

Lu'an City's exports to the United States accounted for 27% of the city's exports in 2017 and 23% of total exports in 2018, which shows that the overall direct impact of the trade friction between China and the United States on Lu'an City's exports is small. The reason is that the main export products of Lu'an are generally non high technology products, and the U.S. trade war between China and the United States is mainly restricted to China's middle and high-end products[6], so the vast majority of these products are not in the taxation list, thus the direct impact on the foreign trade export enterprises in Lu'an City is light.

3.2. Difficult to replace mature markets

Some of the negative effects of the trade friction between the US and China have caused exporters in Lu'an to actively shift their attention to other Asian, African and European countries[7]. However, replacing the originally mature market is not easy. This is because although in recent years there has been an obvious increase in exports from Lu'an City to other countries, the United States is still the main export market.

3.3. New problems faced in "going global"

In recent years, the investment process of "going global" has not been smooth[8]. Instead, it has become more difficult due to the trade friction between China and the United States. There are two reasons for this

which are as follows: firstly, the risk of outbound investment has increased; secondly, it is difficult to understand the information of foreign investment.

3.4. Traditional model is unsustainable

Application of the traditional "two-headed" trade model is bound to put Chinese enterprises at a disadvantageous position in the international market. For one thing, many foreign trade enterprises in Lu'an City reflect that the biggest problem they face is the increase in raw materials and labor costs followed by logistics, exchange rates and other aspects of the cost of unfair transfer[9]. Besides, the business operation is flawed.

4. Analysis of the impact of trade friction between China and the United States on the export trade of Lu'an City

There must be reasons for the existence of these problems, thus this paper briefly analyzes the causes of the problems.

4.1. Variable Selection

In order to study the impact of export trade in Lu'an City by trade friction between China and the United States, the total exports of Lu'an City are taken as the dependent variable (Y) for modeling. Since there is a great variety of factors affecting foreign trade exports, and by browsing much literature, we find that scholars pay special attention to the factor of exchange rate[10], the average monthly exchange rate of US dollar to RMB is considered as the independent variable (X_1). Since modeling can be subject to pitfalls such as endogeneity and multicollinearity, the GDP of Lu'an City and the intensity of tariff increase can be selected as control variables of this model to eliminate these pitfalls[11].

4.2. Build a linear regression model

The ordinary least squares estimation model was first performed and found R^2= 0.97 close to 1, indicating a good fit. Then a multicollinearity test was performed and it is found that GDP of Lu 'an city is highly correlated with USD-RMB exchange rate as an independent variable. Therefore, the control variable of GDP of Lu'an City is excluded, leaving the intensity of the tariff increase considered as a control variable (X_2).

Constructing regression models: $\ln Y = \beta_0 + \beta_1 lnX_1 + \beta_2 \ln X_2 + \mu$, where: β_0 is a constant term, μ is a random term, Y and X_2 the unit of measurement of the sum is billion.

4.3. Correlation test and heteroskedasticity test

By calculating the Pearson correlation coefficient among the variables and the significance test of the correlation[12], it can be seen that: there is a significant positive correlation between the exchange rate of US dollar to RMB and total exports of Lu'an City, while the intensity of tariff increase and total exports of Lu'an City is also positively correlated, but not significantly. The modeling in this paper was tested for heteroskedasticity by White test, P=0.153>0.05, indicating that the results accept the original hypothesis that the model does not have heteroskedasticity.

4.4. Analysis of results

A linear regression analysis was conducted with the total exports of Lu'an City as the dependent variable and the US dollar to RMB exchange rate and the intensity of the tariff increase as independent variables[13]. By R^2= 0.947, F=77.277 and p=0.000<0.05, VIF=3.491<5, D-W=1.668, it means that at least one of the USD-RMB exchange rate and the intensity of the tariff increase will have an impact relationship on the

total exports of Lu'an City and there is no multicollinearity problem.[14].

The regression coefficient of US dollar to RMB exchange rate is 1.322 (t=7.019,p=0.000<0.01), rejecting the hypothesis that there is no correlation, indicating that the US dollar to RMB exchange rate has a significant positive influence on the total exports of Lu'an City. The regression coefficient of the intensity of tariff increase is 133.224 (t=0.679, p=0.516>0.05), accepting the hypothesis that there is no correlation, indicating that the tariff revenue does not have an impact on the total exports of Lu'an City.

The exchange rate of US dollar against RMB and total exports of Lu'an city are positively correlated, while too high exchange rate will lead to instability of RMB, large capital outflow and serious loss of foreign exchange reserves; the price surge of materials of national importance leads to inflation, which is a fatal blow to both people and enterprises. In short, the exchange rate of the US dollar against the RMB can only be controlled within a certain range and must not be too high[15].

5. Countermeasures and suggestions

From the current foreign trade situation in Lu'an City, measures should be taken to minimize the impact of fluctuations in the exchange rate of the U.S. dollar against RMB.

5.1. Establishing core technologies

The government should encourage enterprises to increase the development and application of technology, increase support for the introduction of talents, and help enterprises to connect with universities or research institutes[16]. Besides, the government should also encourage enterprises to strive to create their own brands, accelerate the creation of new advantages in foreign trade with brands, services and intellectual property rights as the core, increase the added value of their own products[17], and strive to change from processing trade to general trade and improve profits.

5.2. Actively guide enterprises to develop domestic sales market

With the improvement of the epidemic, as China's domestic economy began to recover, it was proposed that the "gradual formation of a new development pattern of domestic circulation as the main body, domestic and international double circulation" [18]. Therefore, foreign trade enterprises in Lu'an should firmly grasp this opportunity, and with the expansion of domestic demand in the domestic market, the government should actively guide enterprises to develop domestic sales market to avoid over-reliance on foreign markets and suffer bankruptcy.

5.3. Government support

The development and growth of private enterprises cannot be achieved without the government's support in all aspects. The government should reduce taxes and relax loans to give enterprises more start-up capital and improve product quality. For small and medium-sized enterprises with low risk prevention and control ability and poor prevention and control foundation, export tax rebates and export credit insurance can be used to help enterprises reduce business risks and accelerate capital operation[19].

5.4. Optimize industrial structure

On one hand, using scientific and technological innovation to increase the export of new high-tech and high value-added products and reduce the proportion of exports of heavy pollution products[20]. On the other hand, Lu'an has many characteristic primary industries, which can be combined with intelligent technology, taking advantage of the Hefei Economic Circle and the Yangtze River Delta "Innovation Circle" plan to open up diversified export markets.

Disclosure statement

The authors declare no conflict of interest.

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Analysis of the Competitiveness of Chongqing Tourism Industry and Research on Measures to Improve It

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Abstract: With the increase of per capita income, people's demand for quality of life also increases, more and more young people's "savings thinking" fades, they use of their income to experience life instead of saving in the bank. In addition, for daily pastime activities such as playing Script Kill, watching movies, partying, people also choose to use weekends or holidays. Besides, weekends are also spent in traveling to the provinces, making the corresponding "weekend trips" and "short-distance trips" which are becoming popular practices. The current situation of tourism in Chongqing to find out the problems are analyzed in this paper, and make some policy suggestions are made.

Keywords: Tourism; Competitiveness; Chongqing

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1. Introduction

China is now at the stage of new economic normal, the tourism industry is increasingly promoting national economic growth and vigorously developing tourism. This is not only conducive to opening the doors to promote the development of foreign opening, increase employment opportunities, reduce the gap between the rich and the poor, but it also can improve the quality of life of people through the improvement of income and living environment optimization of the tourist places. However, China's research on tourism competitiveness started late, and for many years, the objects of research on tourism competitiveness are mostly cities with the highest economic development, such as the North region, Shanghai and Guangzhou, and there are few studies on Chongqing City [1]. The study on Chongqing is still relatively small. Therefore, many aspects of Chongqing's tourism industry need to be studied in depth in order to increase the contribution of tourism to the city's economic growth.

Based on extensive reading of literatures, it was found that many scholars have done research on tourism competitiveness. For example, Kumar Sushant and Dhir Amandeep disaggregated data from 73 countries by regression and cluster analysis to investigate the relationship between destination tourism competitiveness and national culture [4]. Jia Hui believes that tourism resources are the basis of local tourism development, and she proposes to exploit the differences in tourism resources to develop special tourism [5]. Liujie Shi and Bingjie Shen analyze the red tourism industry in Yan'an based on factor analysis and randomly distributing questionnaires to tourists [6]. Yang Dejin et al. empirically analyzed four aspects of competitiveness from the characteristics of marine-based tourism cities and proposed a path to enhance it

[7] . By constructing the evaluation index system of tourism competitiveness in Fujian Province, Luo Shasha et al. conducted an analysis of tourism competitiveness level measurement, spatial and temporal evolution and rank classification [8].

2. Analysis of the current situation of tourism development in Chongqing

2.1. Analysis of tourism market demand

The number of visitors, tourism revenues and business conditions are important indicators of market demand in tourist destinations, and this section demonstrates the demand in the tourism market in Chongqing in recent years by analyzing these aspects.

2.2. Status of domestic tourists

Looking at the development of tourism in Chongqing from 2010 to 2019, it can be seen that the number of domestic tourists in this decade increased from 160,365,700 in 2010 to 652,960,900 in 2019, and domestic tourism revenue increased from RMB 86,836 million in 2010 to RMB 556,461 million in 2019, with annual average growth rates of 18.7% and 24.1% respectively. Through the annual growth rates of visitor numbers and tourism revenue, it is clear that since 2013, the growth of visitor numbers in Chongqing has slowed down and is not as rapid as in previous years.

2.3. Status of foreign visitors

The number of foreign tourist arrivals increased from 1,370,200 in 2010 to 4,113,400 in 2019, and foreign exchange earnings from tourism increased from $703 million in 2010 to $2,525 million in 2019, with average annual growth rates of 15.1% and 17.1%, respectively. Also, from 2013, the rate of growth in the number of foreign visitors and foreign exchange earnings decreased and fell below 10%, while in 2016 it rose again to more than 10%.

2.4. Tourism business operation

Two important statistical indicators of tourism enterprises are star-rated hotels and travel agencies [9]. During the period from 2010 to 2019, the growth rate of the number of travel agencies fluctuated, and although the overall trend is on the rise, the increase is small, which indicates that the tourism reception capacity of Chongqing has increased during the decade, but the growth of travel agencies in the city is slow.

By the end of 2019, Chongqing had 173 star-rated hotels. From 2010 to 2019, the development of star-rated hotels in Chongqing is not optimistic, and the number of star-rated hotels has been on a decreasing trend since 2013. The operating revenue of star-rated hotels has also decreased in these years, and the operating revenue of star-rated hotels in Chongqing is RMB 2.293 billion in 2019, which is a 51.3% decrease compared to 2018.

3. Overview of the problems in tourism development

Although the tourism industry in Chongqing has been developing and gaining momentum in recent years, there are still many key issues that limit the pace of Chongqing's competitive position in domestic tourism, mainly in the form of low internationalization, low tourism publicity, and low business capacity of tourism enterprises and serious industrial competition.

3.1. Low internationalization of tourism

The number of domestic tourists in Chongqing in 2019 was 652,960,900, while the number of international tourists was only 4,113,400, indicating a growth rate of 6%, which is also smaller than the number of domestic tourists with a growth rate of 10%; the growth rate of domestic tourism revenue in 2019 was

32.5%, while the growth rate of international tourism revenue was 15.3%, which was only half of the domestic revenue. It can be seen that the outward development of tourism in Chongqing is low, and the tourism image is weak in the international arena.

3.2. Low tourism publicity

From the perspective of the content of communication, Chongqing's regional culture is significant in the country, but this regional culture has not been significantly reflected in the promotion of Chongqing's image. With the development of science and technology, the frequency of using the Internet in today's society is increasing, and people's access to information in life mainly comes from the Internet, so it is important to increase the publicity on the Internet platform.

3.3. Low business capacity of tourism enterprises and serious industrial competition.

Although Chongqing is growing rapidly in recent years, most enterprises are still small, scattered and weak, and the overall efficiency from the development of travel agencies is moderate, but the number of travel agencies ranked 15th among these 16 provinces and cities, which is only one-fifth of the first Guangdong Province and the second Beijing Municipality, and one-fourth of the third Zhejiang Province. Chongqing travel agency business model is outdated, failing to effectively adapt to the changing market, and there is also malicious competition between enterprises within the cluster, which cannot well play the overall cooperative advantage [12,13].

4. Measures to Improve Chongqing's Tourism Competitiveness

4.1. Strengthen external regional cooperation and help enhance international influence

Chongqing is in a special location, in the upper reaches of the Yangtze River in the southwest of China, and many of its neighboring regions are rich in resources and has unique features, such as Hubei, Hunan, Sichuan, Shaanxi, etc. If the mutual cooperation among these regions can be strengthened, not only can the competitiveness of tourism be increased but the development of the province can also be benefited. In addition to domestic cooperation, Chongqing also needs to increase its influence abroad and reach out to more international allies to truly promote the charm of Chongqing. In 2020, Chongqing officially joined the World Tourism Alliance (WTA), a comprehensive, non-profit, non-governmental international tourism organization initiated by China to strengthen the global tourism industry through tourism for development, tourism for peace, and exchange and strengthen the cooperation [14]. Chongqing should take full advantage of this platform, focus on the goal of building a world-renowned tourist destination, and continuously strengthen exchanges and cooperation with its members to enhance its brand image and international reputation.

4.2. Innovative tourism publicity, establish a good brand image

The use of Internet platforms should be increased, and the "Internet + tourism" model should be developed to improve the competitiveness of Chongqing's tourism industry by innovating the tourism ecology through the operation of information technology [17]. To improve the current situation of publicity in platforms such as Xiaohongshu and Oasis, which has not been in the public eye for a long time, the content published needs a certain degree of novelty due to the large proportion of young people among its users. While microblogging and Weibo which have been established for a long time, the users' ages are varied, so the information released should be rich in variety. Not only does it need to have fresh content, but also have a publicity mode in line with the reading habits of slightly older users. Besides, Chongqing tourism agencies can also collaborate with certain authoritative travelers on the platform, with the help of their accounts to promote Chongqing's tourism projects, to achieve the purpose of improving visibility [18-20].

4.3. Standardize industry rules increase corporate cohesion

Chongqing should actively and effectively improve the attractiveness and efficiency of each tourism enterprise, and promote the group development of tourism enterprises to form a network of tourism enterprise groups. Special information service coordinating agencies can be set up to help enterprises compete and promote each other's growth in order to change the situation of their competitiveness is lagging behind, so that they can strengthen the joint collaboration between enterprises in the state of cooperation and improve the tourism value chain system; and continuously improve the internal operation mode of enterprises in the state of competition and compete to bring out their respective advantages.

Disclosure statement

The authors declare no conflict of interest.

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Study on the Effects of Concentration of Rhodamine B in CPPO Solution on the Chemiluminescence Intensity

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Abstract: In chemiluminescence reactions (CL), the electron jumps to a higher energy level when the fluorescent dye is excited. Dye in an excited state emits light by electrons jumping back to the ground state. In this review, indirect CL was studied with the main focus on the curve of CL intensity due to different concentrations of Rhodamine B (RhB) in bis(2,4,5-trichloro-6-carbopentoxyphenyl) oxalate (CPPO) solution with hydrogen peroxide (PO-CL). The experiments were analyzed directly using a camera and programming because the light produced after the excitation of the dye by CPPO-CL is visible. It was observed experimentally that the CL intensity would increase and then decrease with an increasing concentration of RhB. The resulting data were partially consistent with a Gaussian fit, but after excitation, the trend was more likely to fit consistently with that of logarithmic functions. As the CL intensity was reduced at an RhB concentration of 0.05g/20ml, there is a possibility that the quenching effect exists in the reaction of a high RhB concentration with CPPO. The difference in emission wavelengths and the time to reach maximum brightness are also discussed in this report.

Keywords: Rhodamine B; Concentration; CPPO/H_2O_2; Intensity; Wavelength

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1. Introduction

The earliest natural bioluminescence, that of a glow worm, was recorded in Chinese writing more than 3,000 years ago [1]. However, artificial chemiluminescence was not reported until the 17th century [1]. In recent years, the use of CL has become more widespread, such as photodynamic therapy for tumor detection [2], and quantification of membrane protein shedding on mammalian cells [3].

Of the many systems, peroxyoxalate is the one most often used. It has a quantum yield of up to 60% and is used extensively in fluorescent rods [4]. In 2017, Romanyuk, A.V. et al. [5] discovered that PO-CL response can eliminate tumor cells in medical treatment. The CPPO/H_2O_2 system, one of the most widely used PO-CL with high output photons [6], then served as an indirect energy donor for the dye in this experiment. The luminescence principle is to produce 1,2-dioxetanedione, a high-energy intermediate, and two molecules of alcohol by the reaction of CPPO and hydrogen peroxide [1,2,6]. Since 1,2-dioxetanedione was generated, it is likely due to a nucleophilic attack by hydrogen peroxide on the carbon marked with "*" on the benzene ring of CPPO [1] (**Figure 1**). After bimolecular nucleophilic substitution (SN2), the high-energy intermediate was used to excite the fuel and release two molecules of CO_2 [1, 6, 7].

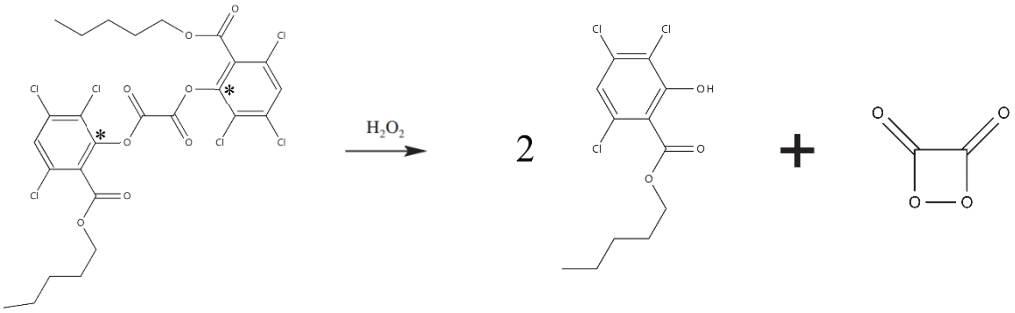

Figure 1. The overall reaction of CPPO and H_2O_2

The fluorescent receptor RhB (shown in **Figure 2**) used in the experiments is a carcinogen and poses a risk to aquatic organisms at high concentrations [8]. Therefore, it cannot be discharged directly to the sewer, but must first be treated in a particular process, such as using Fenton reagent. RhB appears rosy in water, and can emit bright-red light under certain conditions. The electrons of the excited RhB jump from the first excited singlet state to the ground state and then fluoresce [9]. Kristoffersen et al.'s study shows that when RhB is excited with light at 850–1020 nm, wavelengths approximately in the range of 440–650 nm will be emitted [10]. Aromatic heterocyclic compounds like rhodamine may normally undergo rearrangement after photoexcitation, and likely a similar reaction occurs under chemiluminescent conditions.

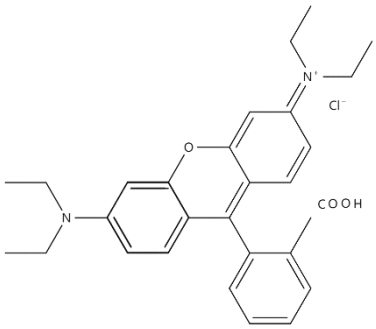

Figure 2. Skeleton formula of RhB

Since the twenty-first century, Chinese studies on CL have gradually increased, but only a few have been translated into English [1], so I started a discussion on the effect of RhB concentration on the CPPO/H_2O_2 system based on previous studies. This report emphasizes the impact of the variation of CL light intensity and also speculates on the possibility of experimental results, including quantum leap, fluorescence quenching, and hydroxyl radical oxidation of RhB.

2. Method

2.1. Experimental apparatus and other tools

RhB, $C_{28}H_{31}ClN_2O_3$, Analytical Reagent (AR), Kermel Chemical Reagent Company; CPPO, $C_{26}H_{24}C_{16}O_8$, AR, Shanghai Aladdin Bio-Chem Technology Company; H_2O_2(30%), AR, Xilong Chemical Company; dibutyl phthalate (DBP), $C_{16}H_{12}O_4$, AR, China National Pharmaceutical Group Corporation; sodium acetate, $CH_3COONa \cdot 3H_2O$, AR, Tianjin Zhiyuan Fine Chemical Plant Company; balance, beakers (50ml), Cylinders(50ml), and so on.

2.2. Preparation

0.01g, 0.02g, 0.03g, 0.04g and 0.05g of RhB, and five portions of 0.05g of sodium acetate were weighed, respectively. A completely light-proof environment with a controlled temperature of 24℃ was created. The camera was fixed at one meter above the beaker and was then turned on.

2.3. Experimental procedure

CPPO is easily deliquescent, thus, 1 g of CPPO was measured, then put into a beaker before the start of each group of experiments and the CPPO was kept in a cool place for the rest of the time. 10ml of H_2O_2 and DBP was measured in measuring cylinders A and B, respectively. Liquid B was poured into the measuring cup and stirred until CPPO was dissolved. Solution A, 0.05g of sodium acetate and RhB were added into the beakers in order, and was stirred until well mixed.

2.4. Analysis method

2.4.1. Intensity

The video images were set to the size of 1170 ×1700 and then analyzed by Python to find the average pixel brightness within 13 pixels of the maximum brightness (using a Gaussian blur to obtain the data). The average pixel brightness was analyzed in the maximum brightness area with a radius of 13 pixels by Python.

2.4.2. Wavelength

The standard (red, green, blue) (sRGB) values were read (including the brightness maximum and the surrounding luminescent colors) and converted to Hue values by using Python according to the formula:

$$Hue = \frac{(650 - \text{wavelength}) * 240}{650 - 475}$$

Then, the wavelength was obtained.

2.4.3. Graph

Gaussian fitting, logarithmic fitting, linear fitting and others were used to find the fitted line on the scatter plot that best fits the trend of the scatter and ignore the points that may have significant errors to arrive at a better R^2 value, which indicates the goodness of fit.

3. Results and discussion

3.1. Variation of time

The variation of chemiluminescence intensity from 0.01 g to 0.05 g of RhB under the reaction with the configured CPPO solutions against time by experiment is shown in **Figure 3**.

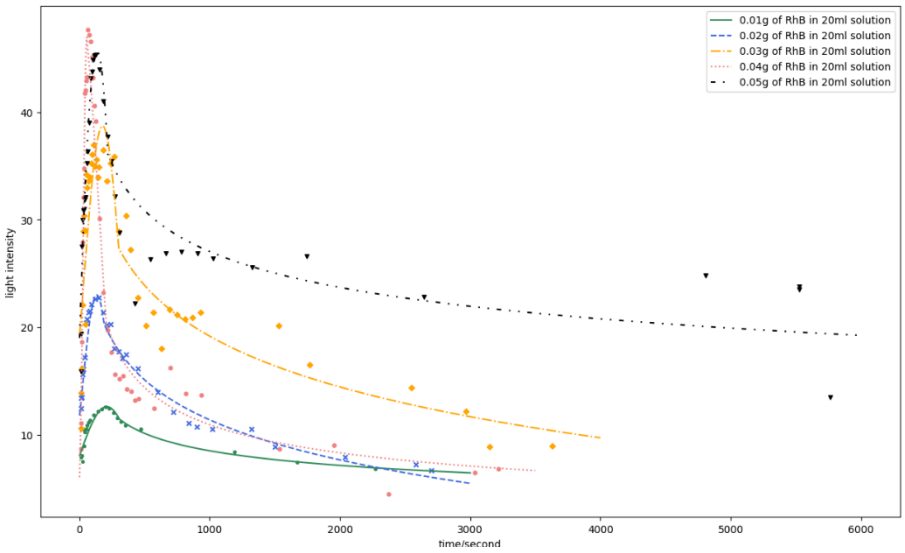

Figure 3. Change in intensity of light emitted by different concentrations of RhB solution

Figure 3 shows that the magnitude of the gradient given by the solution for each concentration is greater before reaching the maximum fluorescence brightness than after. In a previous experimental study, it was shown that after adding imidazole as a catalyst, the brightness of PO-CL varied with time similar to **Figure 3** [5]. The CL lifetime also prolongs with increasing concentrations. An exception was a rapid decrease in brightness when the RhB concentration reaches 0.04 g/20 mL, with the CL lifetime lesser than the one of 0.03 g/20 mL of RhB solution.

In all concentrations, the wavelength of luminescence of the solution visible to the naked eye gradually decreased, approximately from red to orange. **Figure 4** shows the change in color of the solution's luminescence. Since the fluorescence color of RhB differs in different solvents and pHs, like a red shift at pH 2 and a blue shift at pH 6 [11, 12], the color change may be caused by the production of new substances during the experiments that changed the luminescent properties of RhB. The generation of alcohols, as surfactants, due to reaction between CPPO and H_2O_2 may react with the solvent and resulting in a change in color, which will be discussed. Moreover, it is possible that the electron in the higher-energy excited state is initially in the triplet state, so it takes some time to convert from the triplet state to the singlet state and then return to the ground state to emit light. Therefore, this explains the change in the color of the RhB luminescence with time.

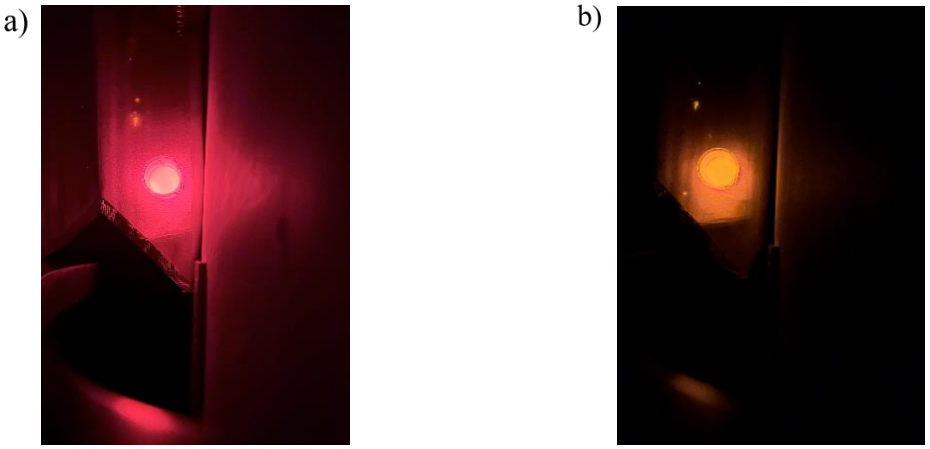

Figure 4. a) Photo of solution with 0.03g RhB that have just started glowing, b) Photo of solution with 0.03g RhB that have been illuminated for about 20 minutes

3.2. Change in maximum wavelength

At the maximum light intensity, the fluorescence color was always rosy red as observed by the naked eye, while the wavelength of the most intense part of the light intensity is not always red. As shown in **Figure 5**, the surrounding color (color of beaker due to reflection) that are the non-luminous parts of liquid and concentration were linearly related with an R^2 of about 0.97302. The trend of the result is consistent with the color change of RhB dissolved in water, based on the reddening of the color of the residue with a higher concentration of RhB after the disappearance of the CL reaction. It may be caused by the increase of unreacted RhB molecules with concentration and dissolution in the waste solution. Hence, when emitting light, the red light obtained from the reaction inside the liquid passes through the liquid more easily. A similar situation was shown in the data of a study done by Min J. et al [13]. They suggested that the red-shift is due to a lower energy level jumps in RhB molecules through π bond interactions to form dimers or polymers, which leads to energy transfers between component molecules [11, 13]. Since intermediates produced CPPO and H_2O_2 was used to provide energy for the dye in this study, which was different from the experiments of Min J. et al. [13], the conclusion above remains to be verified.

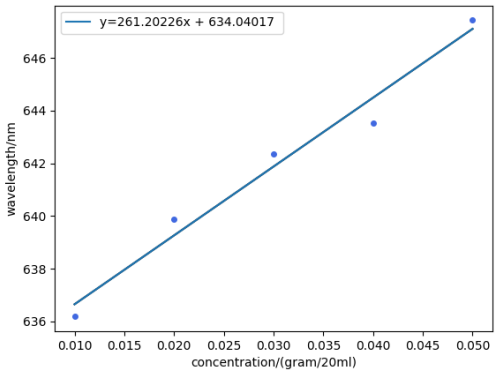

Figure 5. Wavelength of light emitted at maximum brightness (reflections taken from the beaker)

Figure 6 shows a negative correlation between the wavelength at the maximum light intensity emitted from the solution as the RhB concentration increases within the range of 0.01–0.05g/20ml. Disregarding the outlierat the horizontal axis coordinate is 0.02, the best fit line in **Figure 6** has an R^2 of 0.9121.

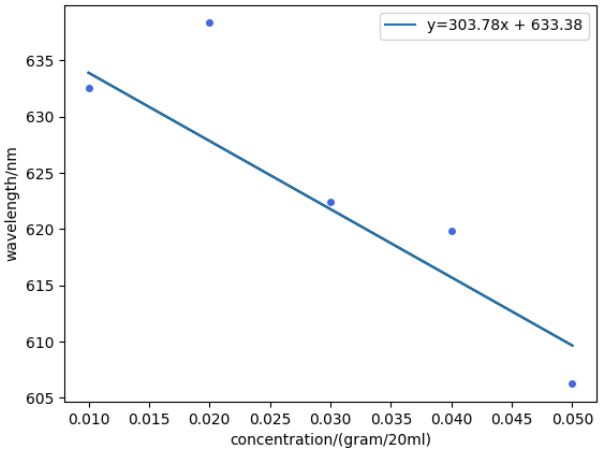

Figure 6. Wavelength of the maximum brightness part in the liquid

When the electron absorbs enough energy to jump to a higher energy level, the wavelength obtained by dropping down to the ground state will be shorter. Theoretically, the substances that provide energy are

of the same mass, and the total energy obtained from each portion of dye should be the same. If we consider the case of increased RhB molecules (previously mentioned), the experimental results and the theory proposed are then contradictory. The change in wavelength might also be correlated with the intensity of CL because the intensity increases when the concentration increases. In the fluorescence reaction, the shorter the emission wavelength (between 500 nm and 650 nm), the higher the brightness [9, 11, 13]. However, the changes in the intensity of the emitted light may only apply to differences in excitation light.

Figure 7 shows that the color of the liquid is not the same as the color of the dispersion in all directions. The resulting wavelength varied depending on the different position of the liquid and the wall of the cup. For example, white light was emitted at approximately the center of the liquid, while red light was observed at the sides of the liquids. The reason for this needs to be further investigated in the future.

Figure 7. Pictures of solutions containing 0.01g/0.03g/0.05g of RhB glowing at maximum brightness

3.3. Change in maximum intensity

Figure 8 shows that all coordinates can be fitted perfectly with a cubic equation in the range of RhB concentrations taken, which shows the CL intensity increasing and then decreasing. At low concentrations, the fluorescence intensity was proportional to the concentration and theoretically what is shown in the **Figure 8** should have been a straight line. However, the slope of the image initially rises and then falls, owing to the possibility of other factors, such as the pH value. Chen and Knutson also pointed out this problem in their report, but it is difficult to define specific best fit lines due to uncertainties in other substances [14].

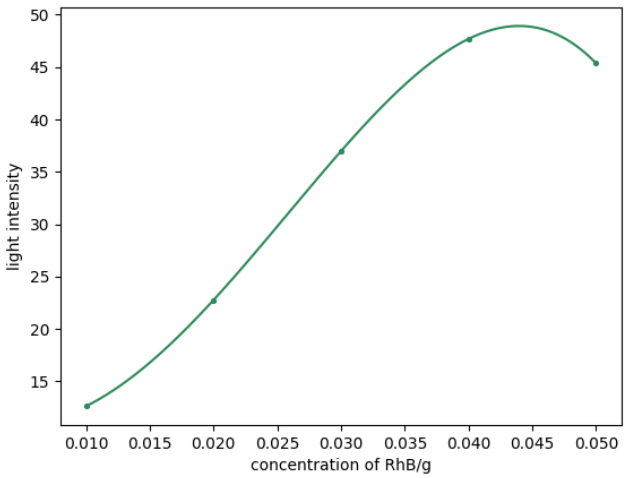

Figure 8. Variation of maximum brightness with concentration

The addition of the dye allows more RhB molecules to collide with the high-energy intermediate, thus better enabling energy transfer from the intermediate to the dye molecule. According to the equation of intensity and Planck-Einstein's law,

$$I = \frac{P}{A}$$
$$E = \mathrm{hf}$$

increase in both number and energy of photons will increase the intensity of light. More RhB molecules in the excited state and also according to **Figure 8** (shorter wavelengths of photons have higher energy), higher energy and more photons are emitted. In this aspect, it may give rise to an increase in CL intensity at low concentrations of RhB.

Considering that under the collision of different molecules will cause the generation of quenchers, energy transfer and dynamic quenching may occur. An increase in concentration induces generation of quenchers, which returns the excited molecule to the ground state, thereby reducing the CL intensity. If this trend is followed, the quenching effect can be observed clearly starting at 0.45g/20ml of RhB concentration. In other studies, it has been determined to be able to produce quencher with amines, causing a reduction in fluorescence brightness, and RhB in saturated solution produces a self-quenching effect [15, 16]. From the remaining liquid after the reaction, the solution was not in the saturated state when 0.01g of RhB was added, but a saturated solution was formed at 0.02 g. The CL intensity still rises after reaching saturated solution, probably because the quencher is not produced much when there are not many RhB molecules, so the self-extinguishing effect is relatively insignificant. The quenching effect is obvious only after a certain concentration is reached.

3.4. Time to reach maximum brightness

Figure 9 demonstrates the time to reach the maximum fluorescence intensity in different concentrations of RhB solution. The overall trend is downward, except for a increase in time at 0.05 g/20 mL, whereas the R^2 of the best fit line derived from the other four points is 0.7714. An increase in the concentration of the substance increases the rate of reaction. Therefore, the collision between the dye and the high-energy intermediate increases when the concentration of RhB increases. Consequently, the electrons in the excited state of the dye will jump to the ground state earlier and emit light. The production of quenchers also affects the dye in the excited state; therefore, it can be that the continuous production of the quencher makes the fluorescence drop more quickly, which can lead to a shorter time to reach the maximum brightness. The results of 0.05 g/20 mL concentration of RhB solution was not consistent with the prediction, so it is not discussed here.

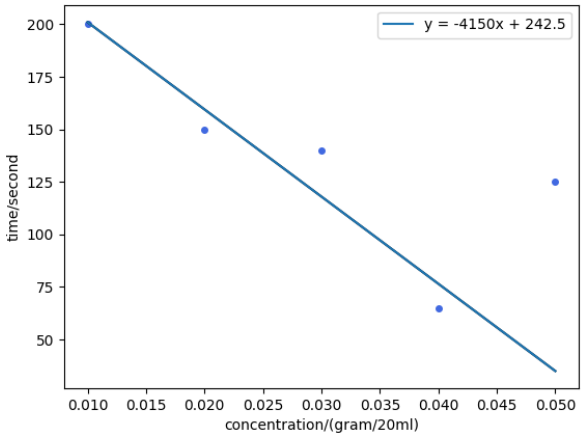

Figure 9. Change in time to reach maximum brightness

3.5. Change in color of residue

In the experimental waste solution, it can be found that with the increase of RhB, the residue color became redder and appeared milky white when there was only 0.01g of RhB whilst the original liquid before the reaction is transparent.

Hydrogen peroxide is unstable, so it will form hydroxyl radicals (as shown below) after receiving heat, ultraviolet light, or other conditions.

$$H_2O_2 \rightarrow 2 \bullet OH$$

In Fenton's reagent, hydroxyl radicals can be generated to oxidize RhB to degrade/decolorize it, and increasing dye concentration also increases the concentration of hydroxyl radicals [17, 18]. Although there was no Fe^{2+} ions to promote the production of hydroxyl groups in the experiments performed in this study, the small amount of hydrogen peroxide decomposition was still sufficient to degrade RhB. The principle is that the hydroxyl radicals attack the central carbon of RhB, destroying its conjugate structure and thus disabling its chromophore, including unsaturated bonds [19]. At the same time, the N-Ethyl group, an auxochrome, is also attacked by hydroxyl radicals, so the destruction of the conjugated structure can also be achieved [20]. As a result, the residue did not appear red after the reaction. However, due to the increase in concentration, the hydroxyls derived from the decomposition of hydrogen peroxide were probably not sufficient to decolorize all of the RhB. Thus, there was some color left. The following **Figure 10** from left to right shows the residual solution of RhB from 0.01g/20mL to 0.03g/20mL concentration respectively, which gradually turns red to the naked eye.

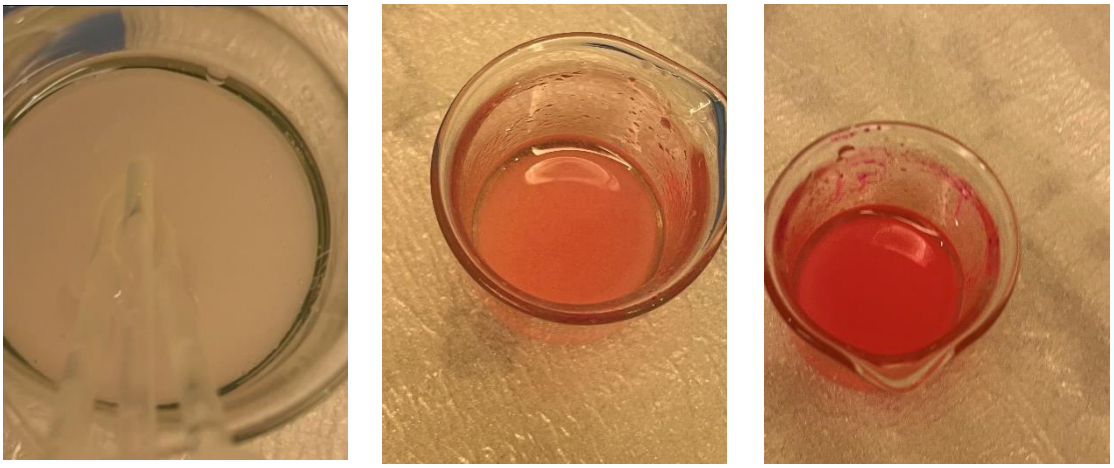

Figure 10. Pictures of waste solutions that adding 0.01g, 0.02g, 0.03g RhB

The generation of the milky solution may be due to the emulsification of the alcohols, produced by the reaction between CPPO and H_2O_2, and an oily liquid, dibutyl phthalate. This reaction occurs because the resulting alcohol may be a surfactant, in addition to the presence of water in the H_2O_2.

4. Conclusion

(1) Fluorescence brightness increases with increasing concentration in the interval from 0.5 g/L to 2 g/L, whilst beyond 2 g/L the CL intensity decreases as the concentration decreases. This may be explained by the fact that an increase in RhB molecules led to an increase in efficiency of the CPPO/H_2O_2 system, and a larger proportion of the dye was excited and only a small fraction of the energy was dissipated into the surrounding environment. Whereas high concentrations of RhB will react with the liquid to produce a quencher, thus reducing the fluorescence intensity.

(2) As the concentration increased, the maximum brightness was reached more quickly. A greater amount of substance will shorten the reaction rate due to increased collisions between molecules, thus shortening the reaction time.

(3) The maximum emission wavelength increased with increasing concentration, whilst the wavelength at the brightest point decreased at decreasing concentrations. This may be attributed to the generation of more aggregates, which results in the occurrence of red-shift and consequently change in luminescence intensity.

5. Limitation

This experiment was not performed in the laboratory, but laboratory conditions were mimicked as much as possible. Nevertheless, the limitations of the study are still significant. The main limitations are divided into three parts, the experimental apparatus, the experimental reagent and the other is the experimental data. As the conditions were limited and the range of wavelengths emitted belongs to a visible spectrum of light, professional experimental equipment such as fluorescence spectroscopy was not used in the experiments. Hence, the measured data and the actual wavelength RhB luminesce range differed, though the overall range was not too different, as they were within about 50 nm. The camera automatically changes the brightness and hue according to the surrounding environment, thus also affecting the calculation of data.

Usually, the experiment requires the addition of tert-butanol as a solvent. Tert-butanol is highly toxic, flammable, and not necessary for CL reaction, so this step was omitted in the experiment. There were also some consequences. The CPPO dissolved unevenly and affected the measured fluorescence intensity, for

example, causing the intensity to be high in certain areas. Therefore, a slight incompatibility between water and oil may have occurred in the experiments, thus the usual brightness may have not been achieved after adding tert-butanol.

For the accuracy and reliability of the experimental results, the experiments should have taken more groups of independent variables for the study and include repetitions of the experiments. However, this initiative was not carried out because the experimental process was time-consuming, thus, it led to errors in the experimental data.

This review only included the possible reactions of the CPPO/ H_2O_2 system, and the proposed mechanism is yet to be validated. To increase accuracy, data with possible errors were disregarded in the analysis. In future studies, more professional instruments and standardized experimental procedures should be used to better investigate the patterns of the data.

Disclosure statement

The author declares no conflict of interest.

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The Need for Innovative Sustainable Development in Chinese, Mathematics and Science Subjects in China and Malaysia

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Abstract: 21st-century learning is seen as a huge transformation in education. It is a transformation that meets the needs of today's education in terms of sustainable development and has a huge impact on education. This article discusses a blend of interesting and impressive high–quality teaching and learning innovations based on three different subjects, such as Chinese, Mathematics, and Science. This innovative approach to sustainability will help students to understand the process or concept and increase their spirit and motivation to learn and promote their appreciation of educational innovation in China and Malaysia.

Keywords: Sustainable development; Education; Chinese; Mathematics; Science; Innovation

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1. Introduction

Sustainable development is defined as development that not only meets the needs of the present but also does not compromise the needs of future generations. Sustainable development is a goal promoted by the United Nations, and this includes the development of the educational field [1]. Sustainable development in teaching is a comprehensive and innovative education, which has innovated the learning content, and teaching methods and changed the learning environment [2]. It was originally proposed as a solution to our concern about the impact of human society on the natural environment. However, the concept of sustainable development can also be applied in the field of education. Education is a very important tool in sustainable development. Sustainable development in education promotes and facilitates knowledge, creates the right values, and creates a sustainable world for us as human beings. In the past time, a plethora of education sustainable development proposal has been rapidly developed in all aspects of society. Educators have developed models for curriculum innovation and integration of sustainability [3].

As a teacher, we can use innovative approaches in teaching and learning. For example, using recycled materials to create teaching materials to achieve the goal of sustainable development. In this article, we use innovative teaching and research applications in different subjects such as Chinese language subjects, mathematics, and science.

2. Innovation in education in China

Chinese education has evolved over the decades, and Chinese high schools and universities have begun to

focus on curriculum and instruction. However, the lack of innovation and creativity in teaching and learning in China has always affected education development. In 2016, nearly 80% of Chinese universities offered compulsory and elective courses on innovation and entrepreneurship. Today, innovative education and innovative activities are being adopted at all levels of teaching in China [4]. In 2020, the Chinese Ministry of Education reformed the existing education system. For example, community service and social practice. Innovative methods have been introduced in Chinese high schools and universities. When we were in high school, a method of teaching called "high-efficiency class" was used in classroom teaching. It replaces traditional teaching methods and uses a classroom structure that suits the teacher and the students, improves students' attention in class, maximizes their learning and, enhances their ability to learn [5].

2.1. Design thinking in teaching and learning

Design thinking can be seen as an innovative approach capable of generating creative and effective solutions. It emphasizes human-centered solutions. Teachers can use design thinking to design lessons and teaching methods. Design thinking can be used effectively in many subjects by making students plan and implement a project in the classroom. For example, designing a recyclable product for school students [6]. This involves designing something for others to use. In this type of project, students not only have to design a great recyclable product, but also had to consider the needs of the students, the materials that could be used, the budget, and the impact of the product on the school environment. Design thinking can be applied to different stages of teaching and curriculum in China. Design thinking can also be used in conjunction with teachers' teaching techniques, allowing students to investigate and collaborate on solutions to problems as they arise. Many teachers use design thinking to design their lessons to help students solve practical problems in the classroom [7].

2.2. Virtual reality technology for online classes

For chemistry, physics, and biology classes in high school, virtual reality technology is used for teaching and learning, especially during the Covid-19 pandemic. Virtual reality technology can increase student interest and engagement in learning. The start of virtual reality education is changing the way educational content is delivered. Virtual reality technology creates a virtual world that is close to reality—one in which students can see and practice. Compared to traditional online teaching, virtual reality teaching is innovative, interactive, immersive, and imaginative [8,9].

Many educators have developed several educational applications for virtual reality technology. ThingLink, for example, offers virtual reality courses that include languages and science. The downside of these courses is that it is not possible to conduct experiments in science subjects such as chemistry. However, virtual reality technology fills this gap by allowing simulated experiments to be carried out, which also reduces the potential risk that it is safe and stable. The biggest problem with virtual reality technology is the cost, which is why it is not commonly used around the world. However, we believe that in the future more schools will use this method or technology.

2.3. Creativity, innovative, and critical thinking skill subject

By offering subjects involving creativity, innovation, and critical thinking, students can develop their thinking, innovation, and creativity skills [10]. In Chinese schools, students only listen to the ideas of their teachers when dealing with problems and do not think for themselves. This will limit students' imagination and creativity. This results in students are not being able to look at problems from multiple perspectives [11]. Both teachers and students can eliminate old ways of thinking and gradually develop new ways of thinking and explore new things to get different results. Critical thinking enables students to look at things rationally and improve their thinking skills. During our undergraduate studies, we were asked to make things out of

recycled materials. For example, cabinets, juicers, school supplies, teaching aids and so on [12,13].

2.4. Storyboard teaching strategy

A storyboard can be used while reading the text aloud. The purpose of a storyboard is to give a visual representation of how the teacher's teaching experience will unfold step by step [14]. Storyboarding in the classroom can guide teachers on how to achieve their goals, prepare content, break large goals into smaller goals, assess their students, etc. In high school history, Chinese and politics classes, storyboards are used to engage students in a creative and visual learning process that brings history to life [15].

Storyboards can be used to help students by providing templates or designing their drawings. Students describe the main points of the story by drawing pictures and giving short explanations. The storyboard can then be shared and compared to help students understand as much as possible the ideas in the text and to help them analyze which ideas are important [14]. As students and teachers alike know, innovation in teaching and curriculum is not an easy process and it takes time and effort over a long period to achieve.

2.5. Innovation in mathematics subject

Learning the concepts and skills of Mathematics subject is a process that is not only about calculating or remembering all the formulas, but also about being innovative and creative in problem-solving. Mathematics is an important and challenging subject for most students. Innovative, strong contributions and moral support from teachers in the teaching and learning process will encourage students to enjoy their learning and to improve their skills in the subject. Sustainability in the subject of Mathematics, therefore, needs to be achieved in line of 21st-century learning. Besides, sustainability is essential to help students construct certain topics in the classroom to solve problems creatively. Examples include integer topics, and addition and subtraction calculations [16].

3.1. Innovative learning in integers

Integers are commonly used in our daily lives. For example, temperature. The temperature of the water boiling is 100℃ and the cold or freeze level is 0 ℃. Then the temperature below 0 ℃, for example, 5 degrees below 0, is written as –5 ℃. Meanwhile, in Mathematics subject, integers are whole numbers, where numbers greater than zero are called positive integers, and numbers less than zero are called negative integers. number 0 is located between –1 and 1. It can be understood as shown below (**Figure 1**):

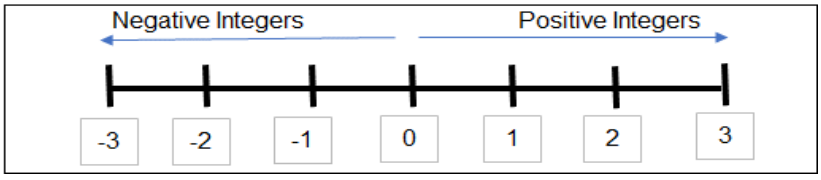

Figure 1. Negative integers and positive integers

This concept is related to integer operation, especially for addition and subtraction exercises and how students can develop this concept using their cognitive domain such as remember (basic addition and subtraction), understand (the concept), apply (once understood, how they use it) and create (to create the solution in an innovative way). Without these features, it cannot be expected that they will further understand the content and subject matter. Students always have difficulty in understanding the basic formula like this:

The general difficulty is the recognition and understanding of the symbols (+ and -), the differentiation of calculation operation function (addition and subtraction) with integer marks, and the replacement of

negative numbers [17]. For example, −7−(−3) = −4. How to solve this problem? By using normal calculation:

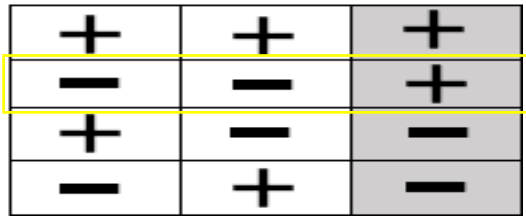

Figure 2. Normal calculation step one

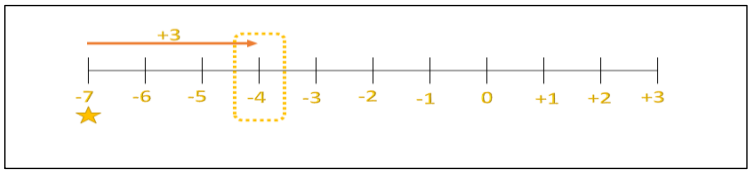

Figure 3. Normal calculation step two

Thus, the answer is −4.

The above solutions are not interactive and students don't enjoy solving the problem as there are too many procedures to draw to find the answer. To make the integer concept more interactive and innovative, we strongly recommend that teachers create an alternative way of solving problems and develop innovative solutions, such as using emoji emojis to solve problems. Students will still need to calculate integer problems but in a more interactive and enjoyable way. The introduction to integer problem solving can be divided into three stages as follows:

(1) Use symbolic formulas to analyze problems.
(2) Through creative concepts and ideas shown here, students categorize when the emoji smile can be used to represent a positive integer and the sad emoji can be used to represent a negative integer.
(3) Matching between two emojis and then students get the answer. Take the same example as mentioned above, −7 −(−3).

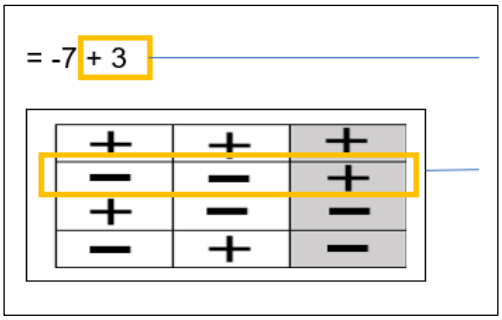

Figure 4. Emoji calculation step one

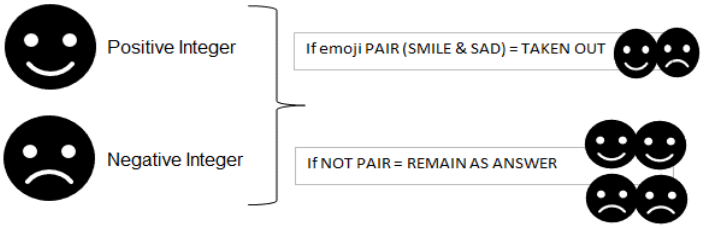

Figure 5. Emoji calculation step two

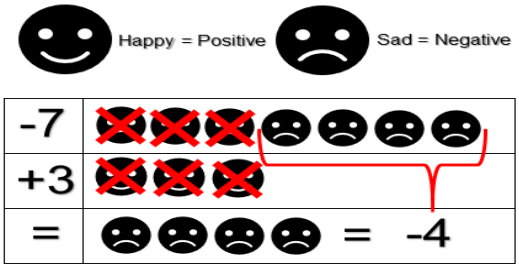

Figure 6. Emoji calculation step three

This innovative approach is simple and fun, meaningful and relatable. This approach can be described as below:

(1) Simple and fun. Apply simpler and more interesting techniques based on the rules of emojis. Now that the rules are in place, the concept of integers can be understood and conveyed by the students. This approach can also be achieved by playing games. Use recycled items such as boxes and paper to draw emojis to create a meaningful and fun learning experience.

(2) Meaningful. Learning becomes more meaningful when students recognize amounts to support this alternative approach to problem-solving. It also helps students to recognize and remember useful ideas that they have learned in the classroom through innovative ways of learning.

(3) Relatable. This innovative concept can be related to a student's way of life by imagining the feeling of the emoji either a happy or sad situation. There are always ups and downs in life, easy and difficult situations, and so on; these situations or emotions can be utilized in teaching students to solve problems regarding positive and negative integers.

In short, problem-solving skills are fundamental in our lives. It enables students to learn various ways of solving problems and helps students transfer their knowledge gained in the classroom into real situations.

3.2. Sustainable learning of simple addition and subtraction

One of the initiatives to implement sustainable development is through the learning process of using recycled items. Students innovate by using several recycled items, such as straws, paper cups, boxes, and more. These recycled materials are an essential step towards sustainability as a way to protect the environment and the environmental, social, and economic concerns are unparalleled. This method is applied to simple mathematical addition and subtraction as shown in the diagram below (**Figure 7**).

Figure 7. Application of recycled items in mathematical addition and subtraction

In class, the teacher can instruct students to bring in recycled materials to build things using their creativity and innovation. The teacher will then give a simple question and ask them to find the answer through these "magic box" math.

(1) Addition: What is the correct answer of 5 + 4? First, students can pick 5 straws and put them in the correct cup, which is cup number 5; do the same for 4. Then, students count all the straws and put the final answer in the correct cup, the answer is 9.
(2) Subtraction: What is the correct answer if 7 – 2? Again, students can pick 7 straws and put them in cup number 7, then pick up only 2 straws and put them back in their original place, count the remaining straws which is 5, and then move 5 straws to the correct cup.

The emphasis on the concept of sustainable development becomes the main focus and needs to start from the early stages of education; at home and school [18,19]. Therefore, this awareness will be indirectly present and improved if students are exposed to such innovative and creative activities, as well as understanding and manifesting them in the form of proactive and positive behaviors, especially through more sustainable development practices in their lives.

4. Innovation in teaching science subjects

The Standards Document for Curriculum and Assessment (DSKP) for primary science subjects emphasizes the cross-curricular elements or EMK. the DSKP states that EMK refers to value-added elements applied in the teaching and learning process, rather than those specified in the content standards. These elements are applied to enhance desired human capital skills and competencies as well as to be able to address current and future challenges. One of the elements of EMK is innovation. It is the application of creativity through the modification, refinement, and practice of ideas. Creativity and innovation are intertwined and are necessary to ensure the development of human capital that can face the challenges of the 21st-century [20,21]. Expressions about innovation are not only concerned with seeing innovation in the work of students. Innovation also emphasizes the teaching methods implemented by teachers. Teachers themselves need to be innovative, creating effective teaching methods or improving the existing ones to make learning more interesting for their students.

In this article, teachers' innovations in teaching methods are linked to sustainable development. In addition to innovation, another element of the DSKP science subject known as EMK is environmental sustainability. Sustainable development is defined as development that is implemented to avoid the abandonment of resources and to ensure minimal damage to nature [3]. According to the DSKP Science statement, the elements of environmental sustainability are described as a sense of love and care for the environment that should be fostered in the souls of students through the teaching and learning of all subjects. Knowledge and awareness of the importance of the environment and global sustainability are important in shaping an ethic

of appreciation for nature in students.

4.1. The importance of sustainability in innovation in science teaching

The importance of sustainability in innovation in science teaching and learning was discussed earlier in this paper. What follows is that the application of sustainability in education innovation is important. One aspect of sustainability in innovation in teaching methods is recycling. Creating teaching aids for science teaching by recycling waste materials. The thematic content of science subjects focuses heavily on the application of available materials. In science subjects, students are expected to use science process skills such as making observations by seeing, touching, hearing, smelling, or feeling an object. In addition, students are expected to use science process skills through experimentation and manipulation of tools.

The practice of recycling can therefore protect the environment from pollution. Teaching aids made from recycled materials are also more helpful in stimulating students' interest in the subject being taught. The use of recycled teaching aids can help improve the quality of teaching and learning for both teachers and students. Another benefit of producing recycled teaching aids is of course the costs saved for not having to spend more money on aids. In addition, depending on the creativity of the teacher, they can be made easily and quickly, without any difficulty, using only recycled materials that are available at home [22]. When it comes to saving, the use of recycled materials in teachers' teaching indirectly helps to save money on waste disposal costs. This method is more economical than maintaining the country's ever-growing landfills.

What is the importance of this sustainable development for innovative approaches to teaching science? Through the subject of science, students use inquiry to satisfy their curiosity about the world around them. One of the attributes or values that pupils should embody is the appreciation of the balance of nature. Teachers should therefore plan and develop their teaching strategies wisely with the concept of sustainability in mind. The theme of sustainability is not emphasized in the content of every DSKP science syllabus. However, teachers can diversify their teaching and learning activities with the concept of sustainability in the teaching of each topic. The concept of sustainable development in education, especially in science education, emerged as a way of developing awareness of the importance of protecting and preserving the old environment. Sustainable development in education is an educational mission [23]. The importance of innovation in creating appropriate teaching aids and sustainable concepts is an important factor in ensuring that teaching is delivered perfectly and effectively increases students' understanding of the subject matter being taught.

Every implementation is sure to have challenges and problems. Similarly, there are challenges and obstacles as far as the application of sustainable development in this educational innovation is concerned. The focus on digitalization in teaching and learning has to some extent reduced the interest of teachers in achieving sustainability in teaching and learning innovation. Teachers are more interested in using media tools, such as interesting, usable, and fast animated videos [24]. Teachers can download any teaching aid from the internet or create videos or quizzes using applications that offer a variety of templates. Even students enjoy animated videos featuring the content of the topics they are studying. In addition to the disastrous situation that befell the country, the Covid-19 pandemic forced the closure of schools and forced teachers and students to use the Internet medium to receive the teaching and learning process at home. As a result, these factors made teachers less interested in innovating or developing teaching strategies related to sustainable development [25]. Due to the requirement of the Malaysian Ministry of Education that the teaching and learning process must follow the new norms of being conducted online, teachers and students are more interested in quiz-based exercises such as Wordwall, Kahoot, quizzes, and learning through video programs on Youtube [26,27].

The challenges can be overcome to develop sustainability in teaching and learning. Teachers can use

used materials during online teaching by recycling them. Students can still use their senses to see and try to understand what the teacher is presenting through online learning. Therefore, sustainability in education is still possible even with online teaching.

5. Conclusion

In conclusion, there are ample areas for innovation to be applied in the classroom process. The creation of innovation requires the interconnection of one element with another to gain a powerful impact. Using Information and Communications Technology (ICT) and combining it with natural elements allow innovations to be translated more widely and be more easily understood by students. Innovation needs to be developed in action, slang, and language that can be easily understood. However, it is often taught in a way that is difficult to be understood, let alone apply. Sustainable development in education is an important requirement for China and Malaysia. Education about the environment cannot be separated from the preservation of nature in the pursuit of becoming a technologically sophisticated nation. For the sake of future generations, the environment must be safeguarded and preserved. Most significantly, without sufficient environmental education, today's youth would not understand the need of preserving the environment. Without understanding the importance of environmental preservation, the environment might be destroyed by the technological prowess of future generations. Therefore, it is the responsibility of educators to create and improve instructional strategies through work on sustainable development thus achieving balance in terms of technological advancement and environmental growth.

Disclosure statement

The authors declare no conflict of interest.

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A Structural and Harmonic Analysis with Performance Implications of Tchaikovsky's "June: Barcarolle" from "The Seasons, Op. 37a, No. 6"

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Abstract: Tchaikovsky is known as the "master of melody." His melodies are extremely rich, and he is good at using small musical forms to express rich and deep emotional feelings. The musical form and structure of "June: Barcarolle" in Tchaikovsky's piano collection "The Seasons" will be discussed in this paper.

Keywords: Structure; Harmonic analysis

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1. Introduction

Peter Ilyich Tchaikovsky (1840–1893) has gained the distinction of being one of the most famous Russian composers and music educators of the 19th century. Often referred to as "Russia's music master" and "Melody master," he is without doubt one of the most influential musicians in the history of Russian music. Tchaikovsky was born in Watkins, Ural in 1840. His father was an engineer and director of a metallurgical factory. Influenced by his environment and family, Tchaikovsky learned music since his childhood [1].

The awakening of Russian national consciousness during the latter half of the 19th century promoted the development of national music to a certain extent. National music is the soul of a nation and is closely related to people's life. Folk music reflects people's social life at that time and expresses people's psychological feelings. The golden age of Russian music began in the 1830s, marked by a new level in the works of Glinka, the pioneer of Russian music. Glinka's composition laid a solid foundation for the development of Russian nationalist music and helped shape its future direction [2]. This golden period was born on the fertile soil of Russian folk music, under the premise of the development of church professional music and the creative exploration of a series of previous composers. It experienced a long process of historical accumulation, thus forming a fruitful result [3].

Tchaikovsky is known as the "master of melody." His melodies are extremely rich, and he is good at using small musical forms to express rich and deep emotional feelings. His works embody the simplicity of folk songs, the poetic recitation, and the delicate expressive force of harmony. The musical form and structure of "June: Barcarolle" in Tchaikovsky's piano collection "The Seasons" will be discussed in this paper.

2. The creative background for "Barcarolle"

The idea for this piece's title was suggested by N. M. Bernard, the publisher of the magazine "Nouvellist,"

with whom Tchaikovsky had collaborated since 1873. Around November 1875, Bernard sent Tchaikovsky a commission for a piano cycle. Bernard's letter has not been preserved, but its contents can be easily imagined on the basis of the composer's reply of November 24, 1875: "I have received your letter. I am very grateful for your kind willingness to pay me such a high fee. I will try my best to fulfill all your requirements. I will send you the 1st piece soon, and maybe two or three at once. If nothing prevents it, it will soon be done: I am very much disposed now to take up piano pieces. Yours, Tchaikovsky. I will keep all your titles." Consequently, the names of the pieces, that is, the plot–pictures, were offered to the composer by the publisher [4].

As a composition, "Barcarolle" is full of those musical traits, which made Tchaikovsky famous: a beautiful melody with luscious, haunting harmonies. Like the rest of the pieces in "The Seasons," it is composed in ternary form. The middle part brings a contrast, a distinct animation to the somewhat melancholic mood of the outer parts. The middle part is in major, its movement according to the composer's remark is somewhat livelier, and further, in the course of the development, the music becomes enthusiastic. This middle section has given rise to differences in interpretation associated first with the text that yield different renditions of the work. Besides, it shows differences in emotional expression, as evidenced by the performance of different pianists.

Already during the life of Tchaikovsky, "Barcarolle" became a very popular work. Sharing with N. von Meck considerations about the prevalence of his works abroad, the composer wrote on March 19, 1878, "I even found a surprise there completely unknown to me hitherto arrangements, such as the arrangement of the piano "Barcarolle" (g-moll) for violin and piano and the Andante of the first quartet for flutes [5]."

3. Structural and Harmonic Analysis of "June: Barcarolle"

June is in compound ternary form, and the structure of the form is as follows (**Table 1**):

Table 1. The structure of the June: Barcarolle

Introduction	A			B			A'			Coda
	a+b+a'			c + d		Transition	a+b+a'			
1-2	3-12	13-22	23-32	32-39	40-51	52-53	54-63	64-72	73-83	84-99
g	g-B flat-g			G			g-B flat-g			g

Most of the early boat songs (the "Barcarolles" of Mendelssohn and Chopin, for example) are in 6/8, which is to show the rhythmic characteristics of rowing or water waves, but in Tchaikovsky's piano collection "The Seasons," "Barcarolle" uses a stable 4/4 time signature, which breaks through the previous use of the beat of boat songs. 4 / 4 is used to show the scene of the boat rowing evenly in the water, which has a long and quiet feeling [6].

Introduction (mm. 1–2), Andante, these two bars are in G minor. The quiet atmosphere and the sparkling artistic conception are created with the calm, soothing tone and rhythmic arpeggio chord of the left hand.

3.1. Part A (mm. 3–31)

The section A (mm. 3–11) of the opening part is composed of parallel sections in g minor, and the mood of the work is further revealed under the rocking motion of the left–hand chords. Bars 3–6 are composed of 2 + 2 bars, mm. 7–12 are composed of two small sentences, and the last few bars fall to its relative major. At m.11 Tchaikovsky creates some dissonance through the use of fully diminished chords and suspensions before resolving to the tonic G minor, and bar 12 resolves to the G minor. Three parts should be clearly

reflected in the voice part: the melody lines of the high part are clear and gentle; the low part of the lowest part should keep the smooth lines of singing, just like a bass instrument playing; although the middle part is accompanied by harmony, sometimes, there are some short melodies corresponding to the high part. Although it is very short, but it cannot be ignored, and needs to be emphasized, because it has a certain emotional tone, so that people feel the warmth and enthusiasm of the music. Especially in bars 7–10, the melody lines of the high voice part should be clear, coherent, and bright, which should be louder than the harmonic accompaniment of the middle voice, so they should not be mixed. In the 11th bar, each voice has its own melody trend, and the melody lines of the high voice part should be more brilliant. In this bar, the rhythm can be made appropriately, and the harmony accompaniment can be perfectly integrated into the melody.

The "b" section (mm. 13–22), the small opening part is in B flat major, and in the last 22 bars it goes back to the original g minor harmony. This passage continues the theme content of the "a" section, increases the four–degree mold into the theme of the "a" passage, forms parallel sentences with it, and makes the music color consistent with the "a" passage. The decomposition chord of the left hand also contains short melodic segments corresponding to the theme melody of the right hand, and moves along with the melody of the right hand. In 22 bars back to G minor, with the left–hand melody weakened to pave the way for a passage to appear again. The connection of the two hand melodies should be easy, so as to make the appearance of the next reappearance section "a'" very natural.

The "a'" section (mm. 23–31), which is a strict reproduction of "a," enters its homophonic G major at the end of the passage [7].

3.2. Part B (mm. 32-53)

Section "c" (mm. 32–39) is composed of two parallel four bar phrases. The speed of music is gradually accelerated, presenting a cheerful and clear scene. The accompaniment of left–hand splitting chord warms up the musical atmosphere, portraying a scene of people playing on the river in the hot summer night. The sound of carefree laughter and water splashing is hidden in the melody. At the beginning of bar 36, some small segments appeared in the middle part, and the melody echoed with the theme lines of the right hand, which pushed the music to the climax of "d" segment.

Section "d" (mm. 40–53), Allegro, is composed of two parallel sentences of five bars and seven bars. The music enters the climax, and the music becomes clearer and clearer, forming a very sharp contrast with the previous theme melody. The first beat of every bar in this passage should be played very lightly, so as to lead to the singing melody of two or three beats. The phrase in section 42 is repeated four times, and the speed is faster and faster, and the emotion is stronger and stronger. Stanzas 48–49 use a series of minor seventh chords to produce tonal instability. In bar 49–50, the continuous eight times minus chord arpeggio is continuously transposed upward, which makes the music to the climax, and the excited mood also reaches the highest point, just like the splash of water caused by waves and accompanied by people's boisterous laughter. To ensure the clarity of the melody line of the high voice part of the right hand, each sound played by two hands cannot be vague and should be clear. Then, the melody to the last chord needs to be pushed all the time, and use the pedal to continue the last chord for two beats. After a short pause, in the 52nd bar, the tonality returns to the functional chord in G minor, playing out the connective sentences here with powerful semitone staccato. These slow decomposing chords should be full, but not rash, just like the ripples caused by the waves slowly passing away. Next, the chord of the second beat of the 53rd bar should be played very steadily. The extension of the chord must stay long enough. A gradually weak extension of the sound should be used to calmly connect the reproduction section "a'." These two sections are well prepared for the appearance of the reappearance paragraph "a'" and lay a rich emotional tone [8].

3.3. Part A' (mm. 54–83)

The reappearance goes back to "a," but there are some changes. Compared with paragraph "a," the author's cleverness lies in changing the accompaniment of the left hand to the arpeggio of breaking down chords, expanding the middle part of the left hand and adding a polyphonic part corresponding to the melody part of the right hand, which makes the music feel fuller and more undulating. The Polyphony echo part of the left hand and the melody part of the right hand speak to each other, which further expresses people's feelings in this dialogue. Therefore, the middle part of the left hand is more important than paragraph A. While emphasizing the melody lines of the right hand, the middle part of the left hand should be very coherent and fluent.

3.4. Coda (mm. 84–99)

In bars 84–86, the echo part of the middle part appears again in the left hand, slowly playing a continuous downward chord, and the three parts interweave to construct different colors of the combination of virtual and real, which is like the harmonious scene of people's laughter after rowing across the water. Bars 87–91 are the same as the previous three bars. The middle part of the left hand matches each other, and a series of syncopation rhythms of the right hand are like the scene of a boat paddle. The weakened melody is just like that when people are drifting away but cannot help looking back, reluctant to give up, leaving endless disappointment and longing. 92–96 bars, the last time the music gradually strengthened, the sound area gradually goes upward in the form of arpeggio, the highest part of the right-hand chord always kept echoing with a low part, until the music gradually disappeared. The time value of the last chord in bar 99 can stay a little longer. With its gradually weak overtone, it creates an atmosphere that people gradually leaving by boat. Only the lonely night sky and the shadow of stars shining on the river are filled with beauty in this silent night.

4. Performance Suggestions

Section A, bars 1–12. The left–hand accompaniment group should simulate the continuous singing of bass instruments, while the right hand is the bright and soft main melody of high voice part. When playing the left–hand accompaniment part, we should pay attention to the natural transition of sound, concentrate the strength evenly, and relax the arm, so that the force can be naturally transmitted to the fingertips, resulting in a transparent sound. When performing the transition of the left–hand accompaniment part, we should be careful distinguish the timbre, analyze the level of the music and the line trend of the accompaniment group melody, just like rowing, the wrist is gentle and soft, the force transfer is smooth, the color of harmony of the chord is better expressed, and the line sense and singing quality of the sentence are ensured when the cross–tone performance, making the timbre full of vitality. While playing this part, the coordination of the two parts is the key as well the difficult point. The left arm and wrist should be relaxed, the palmar joint supports and relieves the tension caused by running. The right high voice part sings the main melody lyrically. These parts are more emotional. a little rubato can be added, and the pedal can be replaced to ensure the clarity and consistency of harmony melody. In this part, the relaxation of the palm is important, so that the sentences of the left and right hands can be expressed clearly, and end the first passage to the second [9].

After entering the 12th bar, the flow of the right–hand scale makes the melody lines broader, and the tonal conversion also makes the melody more dramatic with ups and downs, pure and simple, which paves the way for a lively night. In the process of moving forward the left–and–right–hand consonants, they are connected freely and full of emotion, which makes the music expression warmer and touching. In this paragraph, the right hand plays a leading role in high pitched melody lines, leading the left hand to accompany part of the ups and downs. In this paragraph, the way of touching the key should be controlled, the finger pulp should be light, the key should be dropped and the key should be stuck. Every two sounds in

the sentence should be closely connected, just like a gecko crawling on the wall, so as to ensure the consistent expression of singing. Before the performance, the speed and the movement direction of the body should be arranged, so that the timbre of this series of connected sounds in the performance process is real but not empty, transparent but not bulky.

In the performance of 52 bar non–legato, it is very natural to transfer the B section to the "a'" section of the reproduction section of the complex trilogy. With bar 52 as the introduction bar, energico needs to be played, a little rubato can be allowed, with very expressive natural transition. Compared with paragraph "a", the reproduction part is more like having questions and answers, while paragraph "a" is more like expressing love for nature and praise of beauty. The melody is more malleable than before.

In the Coda part (bars 83–99), a bright melody line is formed in the descending process of the high part of the chord, and then the left hand echoes a middle part melody. After several tacit echoes, starting from bar 92, from the bass area up, each bar is molded into an octave, until the Boeing arpeggio line at the end of the song, it becomes more and more popular. In this part of the performance, the key and difficult point is to show the harmony color of the part of the chord. Here, all the notes in the chord must not be played down solidly. If there is no primary or secondary, the audience will not be able to appreciate the melody line of the work. Therefore, while practicing this part, the chord needs to be decomposed the main melody line needs to be analyzed, and then be put it into practice. The changing trend of harmony color needs to be listened carefully.

5. Conclusion

Through the above analysis, the musical structure of Tchaikovsky's "June: Barcarolle" is composed of compound ternary form. The music reflects Tchaikovsky's early creative style, uses lyrical and poetic melody to move people's hearts, and depicts the pleasant, quiet and natural scenery. The happiness of Russians in the field in this piece is also exquisitely expressed in Tchaikovsky's works. Its melody exudes a warm, simple atmosphere, fresh and smooth, lyrical and charming melody with some melancholy and sentimental tone. The composer's exquisite creation technology also makes it an enduring music work, which is widely played and used in teaching.

Disclosure statement

The author declares no conflict of interest.

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Development of Management Science from 1991 to 2021: Review of Publications Indexed in WoS

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Abstract: Management is a discipline that has existed for as long as humans have, but its theoretical underpinnings are relatively new. There was already evidence of the creation and use of management ideas since 2900 BC, when Egypt was deploying over ten thousand people to build the pyramids. During the Middle Ages, the Greek, Roman, and Chinese empires all created their own versions of management theory. Modern management throughs were a 20th-century phenomenon, and management was only recognized as a formal study since the late 19th century. In this paper, the development background, thoughts and schools, existing problems, research methodology, discipline branches, and functions of management as a social science are systematically discussed and elaborated. A systematic review approach was used to summarize and analyze the 2,772,999 publications included in the Web of Science from 1991 to 2021 to find out the overall trend of publication, the published organization or institution, and the high-frequency research areas.

Keywords: Management science; Qualitative research; Literature review; Systematic review, Web of Science (WoS)

Online publication: September 26, 2022

1. Introduction

1.1. Industrial revolution and emergence of scientific management

The industrial revolution started in the middle of the 18th century which made great progress in social productivity and management thought. The functions of planning, organizing, and controlling came into being one after another. During this period, Adam Smith published his masterpiece "The Wealth of Nations," [1] and the notion of division of labor served as a critical theoretical cornerstone for the development of the management science.

Social stratification, social interactions, and inter-personnel activities were all evolving into increasingly sophisticated forms in pre-industrial civilization. In capitalist countries, the contradiction between labor and capital was becoming more and more prominent, and the level of productivity was also increasing. As a result, finding a solution for enhancing factory and workshop management has become a pressing issue. A set of systematic management theories and scientific management techniques were urgently needed to adapt to it. At that time, Frederick W. Taylor continually believed that resolving the conflict between labor and capital was necessary, and he saw the pursuit of economic interests as one of humanity's most fundamental necessities [2]. Henri Fayol, in the meanwhile, conducted a comprehensive study of the companies, methodically proposed 14 principles, defined 5 management roles, and developed the organization management theory [3]. This systematic, theoretical approach is what gives the management system structure. It takes ongoing management level improvement in the industrial economy

to adjust to the changing business environment due to the quick socialization of production, the rapid enhancement of productive forces, the constant market growth, and the harsher competitiveness of firms. As a result, a large number of management academics, sociologists, and psychologists are actively involved in management research, leading to the establishment of several new management theories and the emergence of a management theory jungle.

1.2. Socio-cultural shifts and revolution of management science

The assumption of human nature in management has shifted from that of economic man, social man, and decision maker to that of complex man as a result of the global economy's fast shift from an industrial economy to an information economy. According to Maslow's hierarchy of needs hypothesis, the existence of personal purpose, preference, and interests mean that people will have a range of desires [4]. To satisfy the demands of each individual's self-development, self-realization, and self-improvement, these needs will create a range of motives and actions. Human nature has grown incredibly complicated as a result of cultural and moral evolution. Organizational efficiency cannot be significantly increased if managers fail to promptly analyze the situation, implement incentive mechanisms, and honestly collaborate with employees to satisfy their needs and fully realize their potential. The assumption of human nature in management will therefore overcome the assumptions of the economic man, social man, and decision-maker as the information economy period comes into being, sublimating to the complex human hypothesis.

2. Decisive concepts and problems of management science development

2.1. Decisive concepts for management science

Numerous management techniques have been developed since the advent of management philosophy, thanks to the contribution of hundreds of authors and practitioners. According to the major concepts and schools of management science, Koontz and Weihrich summarized the major contributions with corresponding management writers and practitioners which are considered decisive of management science [5].

The formation stage of management is more or less controversial, but it normally has two ways of classifying, which are by time and by schools. Firstly, Hitt et al. divided management theories into three major categories according to the progression of time: classical management theory, neo-classical theory, and modern management theory [8]. The second is according to the classification of schools of management theory, among many scholars, Koontz`s work was well recognized who classified the management theories into five schools, namely "Scientific Management," "Modern Operational Management Theory," "Behavior Science, Systems Theory, Modern Management Thought" [3].

The three management theories listed by Hitt et al. [4] are currently popular and deemed sufficient to address this issue. As summarized in **Figure 1**, the "Classical Management Theory" evolved in the late 19th century and early 20th century that consists of a group of similar schools, as Scientific Management, Administration Management and Bureaucratic Management, on the management of organizations with the emphasis on managing workers and organizations more efficiently.

The "Classical Management Theory," which emphasized a more human-oriented approach and centered on the time needs, desires, behaviors, and attitudes of individuals, served as the foundation for the Neo-Classical Theory, which arose between the 1900s and 1950s. The main contributions for this classification were Human Relations School and Study of Behavior Science.

With the end of World War II, the modern management theory, the "Modern Management Theory" came on the stage. It drew attention to both the complexity of the organization and the variety of needs, drives, ambitions, and potentials among people. During this period of development, the most significant milestone was the beginning of use of mathematical and statistical methods for increasing quality of

managerial decision-markings. The contemporary management theory has made substantial contributions by extending the application of management expertise into fields other than business, including education, government, and health.

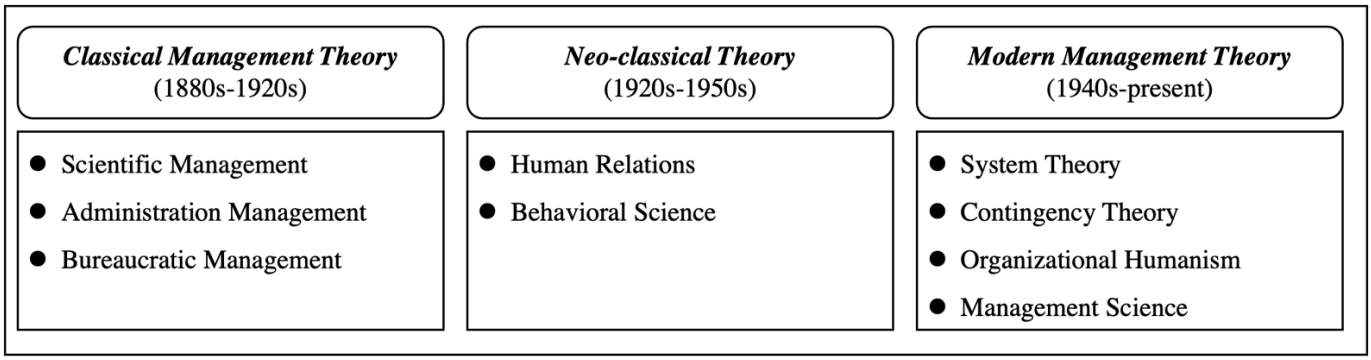

Figure 1. Management classifications by time (source: edited based on Hitt *et al.* [6])

As shown in **Table 1**, there are five general management thoughts or schools contributed to its original emergence and further development of management science. The main authors of "Scientific Management" were Frank and Lillian Gilbreth, Henry L. Gantt, and Frederick W. Taylor. Hugo Munsterberg, Max Weber, Vilfredo Pareto, Roethlishberger F. Jules, and William W. Dickson were the major behavioral science scholars; Chester Bernard made contributions to "System Theory"; Henri Fayol founded the "Modern Management Theory of Operation"; Peter F. Drucker and others were "Modern Management Thought" practitioners and scholars.

Table 1. The emergence of management thoughts (source: edited based on Koontz and Weihrich [5])

Major contribution to management	Major contributors	Major works
Scientific management	Frederick W. Taylor	[2]
	Henry L. Gantt	[7]
	Frank and Lillian Gilbreth	According to [5]
Modern operational management	Henri Fayol	[3]
Behavioral sciences	Hugo Münsterberg	[8]
	Walter Dill Scott	[9]
	Max Weber	[10]
	Vilfredo Pareto	[11]
	Roethlishberger F. Jules and William W. Dickson	[12]
Systems theory	Chester Barnard	[13]
Modern management thought	Peter F. Drucker	[14]
	W. Edward Demining	[14]
	Peter Laurence and Raymond Hull	[16]
	William Ouchi	[17]
	Rober Waterman and Thomas Peters	[18]

2.2. Problems in management science development

The phrase "the management theory jungle" accurately describes the turmoil brought on by the proliferation of management ideas [5]. There are two major problems of management sciences that are recognized by scholars in contemporary society, namely "Time Validity of Applied Theories," and "Shortage of Coherent

Theoretical Concept of Its Own."

Certain concepts and methods evolved in certain historical contexts. It is possible that similar circumstances still exist now. There are various ideas and methods of management, and each has advantages and disadvantages. There is therefore no perfect management theory. The management practices of today are both a reflection of and a response to earlier management philosophies [6].

A major obstacle to the creation of a coherent and integrated management theory is the inadequacy of idea generation. Since management is an applied discipline without its own cohesive theoretical notions, developing management concepts has proven to be challenging. Since the 1940s, the development of quantitative management theories started to involve other disciplines as statistics and mathematics, which made management theories symbiotic. In addition, management is more practical than theoretical in the field of psychological and philosophical research [19].

Other than the above-mentioned problems, in my opinion, the geographical effectiveness across countries and cultures is a serious problem. As mentioned previously, the so-called management theories and schools are mainly developed and examined by western scholars and industrial practitioners. The western management approaches' suitability for use in underdeveloped economies has been contested by academics [20], and many of them have called for investigation of the phenomenon in different contexts particularly in non-western countries [21].

3. Research methodologies in management science

Management science is a social science; therefore, management science also adopts the research methods of social sciences, namely qualitative and quantitative research methods.

Günther summed up that qualitative research is frequently described as being the antithesis of quantitative research [24]. When collecting and analyzing data for qualitative research, words are prioritized above numbers, i.e., a non-mathematical approach is used [25]. The interpretivist or constructivist qualitative research, which primarily adopts the inductive technique, acknowledges that people create a constructed reality by interpreting their social environment [26]. Contrarily, quantitative research places a strong emphasis on quantification for data gathering and analysis, for example, its widespread use of statistical techniques. The primary goal of the deductive quantitative research approach is to test theories or hypotheses, and it makes the assumption that the universe is accessible to rational explanations [24].

According to Lichtman, Johnson and Christensen, the items "criteria of research method" are used to distinguish the differences between the two described methods [25,26]. In contrast to quantitative research, which aims to test hypotheses to determine causes and effects for future predictions, qualitative research, for instance, aims to comprehend and analyze social interactions.

4. Branches and functions of management science

Koontz and Weihrich pointed out that while the structured knowledge that underpins the practice is a science, managing the practice is an art [5]. Art should advance with science, just as the physical and biological sciences have. The science of management is undoubtedly imperfect and rudimentary since there are so many intricate factors that needs to be controlled. However, managerial practice may undoubtedly be enhanced by such management expertise. Without the aid of management science, executives are forced to rely on chance, instinct, or prior experience.

Early management theories were more like specific behaviors or experiences than true ideas. Like in any other areas, practitioners have no other place to look for meaningful advice than the body of knowledge that underpins their work unless they want to learn by trial and error. As a social science, management has developed its own branches, most of which borrow and apply techniques or concepts from other disciplines, for example, statistics and mathematics [19]. The significant branches of management have been evolving

in a symbiotic relationship with relevant disciplines. Some examples of branches of management are operational management, financial management, human resource management, innovation and technology management, and more. Despite the variant branches of management, there have been various definitions and discussions of management functions since the beginning of the last century. Four most recognized definitions are summarized in **Figure 2.**

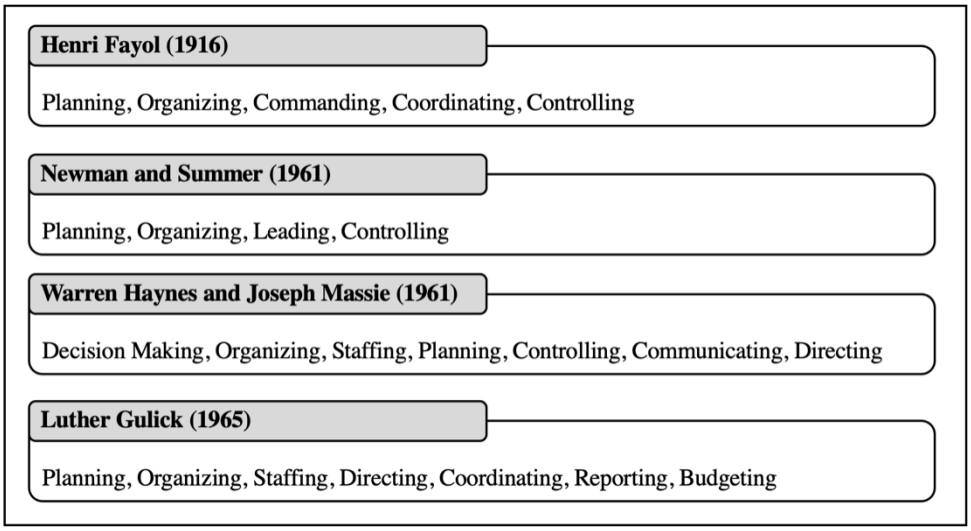

Figure 2. Functions of management

5. Systematic review of management-related publications indexed in Web of Science (WoS)

In order to have a deeper understanding of the development of management in different fields, provide research directions for subsequent researchers in related fields, a systematic review approach was applied to analyze the publications from 1991 to 2021 indexed in the Web of Science (WoS), through the aspects of the volume of publications, publications by organizations (or institutes), and top research areas.

5.1. Volume of publications

Taking one of the largest citation databases, Web of Science as an example, as of the twenty-second of December 2020, there have been 2,772,999 publications including books, scientific papers, conference proceedings, notes of literature, of management science across multiple disciplines. As shown in **Figure 3**, a significant increase in scientific publications related to management science. From 1989 to 2020, there was a spurt in the research on management-related fields. Surprisingly, the number of pre-accepted publications in 2021 has already reached 200,000.

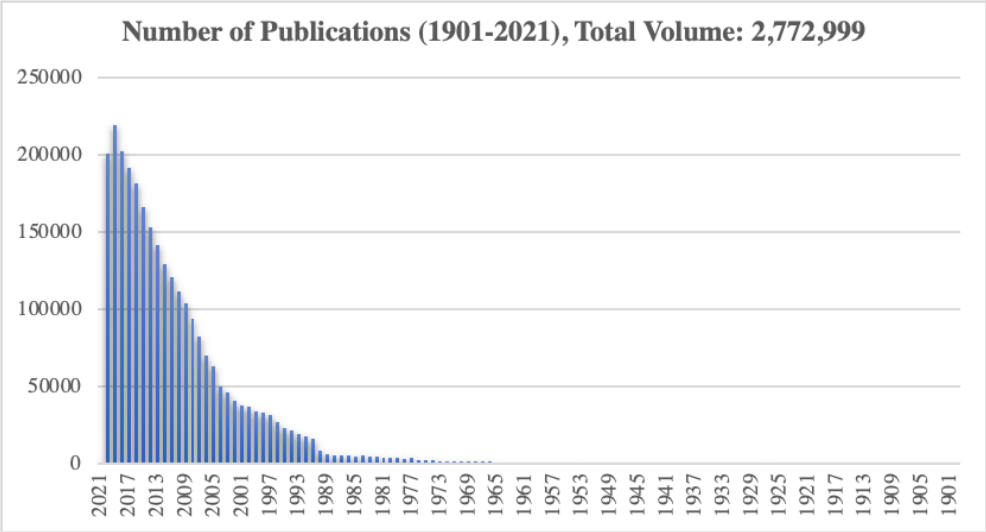

Figure 3. Number of publications by year, management-related science (source: Web of Science, 22 December 2020)

5.2. Publications by organizations

Among these 2,772,999 publications across multiple disciplines (see **Figure 4**), the University of California System owns 58,569 publications ranked the first among all other organizations (university, academy, etc.); followed by the University of London (42,541), Harvard University (39,686), and University of Texas System (31,095).

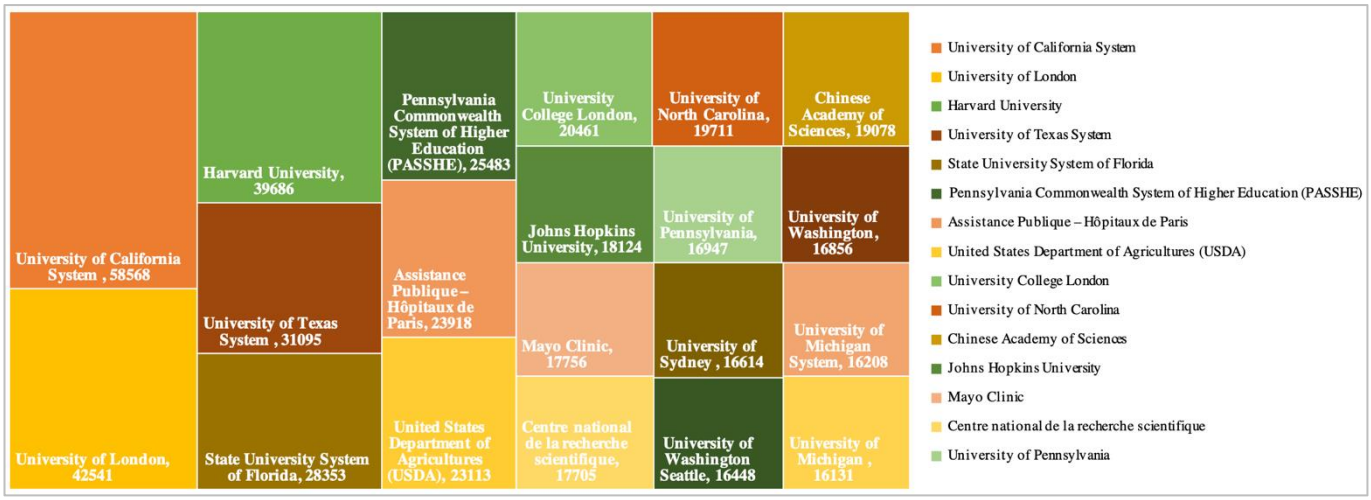

Figure 4. Organizations of publications related to management science (source: Web of Science, 22 December 2020)

5.3. Top research areas

As for applied sciences, management has been widely recognized and applied all over the world, including multiple disciplines, such as business management, engineering management, education management, and so on. Management provides a conceptual framework for scientific disciplines and industry standards. **Figure 5** provides the top 25 research areas related to management science that were stored in the Web of Science database. Interestingly, the field of engineering possesses the most publications (327,589) of management science; followed by the field of business economics (260,144), computer science (238,126), and environmental science ecology (219,373). The evidence reveals that management as an applied science is not only helpful in social science but also has a profound impact on other disciplines.

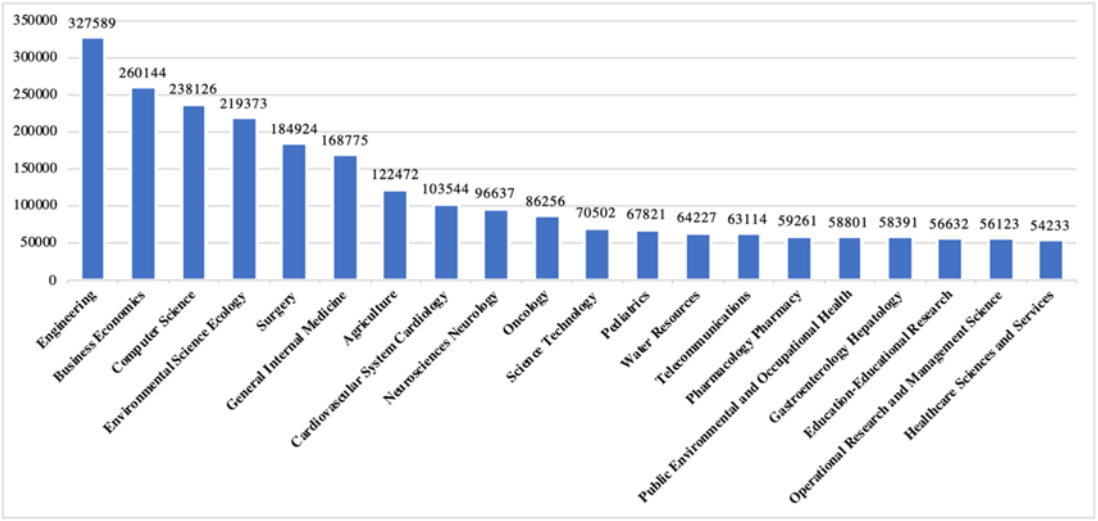

Figure 5. Top 25 research areas related to the management sciences (source: Web of Science, 22 December 2020)

6. Conclusions

The constant progress of society and the economy drives the development of theories in management science. As a social science applied to practice, management science is steadily updated and iterated with the development of time and the progress of the industry. As a scientific theoretical framework summarized from practices, it will also optimize its role in different areas. By analyzing the data from the Web of Science, we could also observe that the theoretical and conceptual outputs of management in engineering were more than the outputs in the business economy, and the volume of outputs in computer science was also very intensive and surprising. Therefore, more in-depth research and analysis in this field should be conducted using a systematic review approach or a bibliometric approach with more complex or integration of all databases, for example, Scopus and Google Scholar.

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Disclosure statement

The author declares no conflict of interest.

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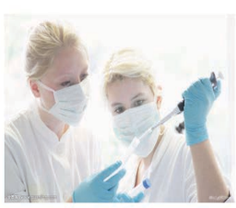

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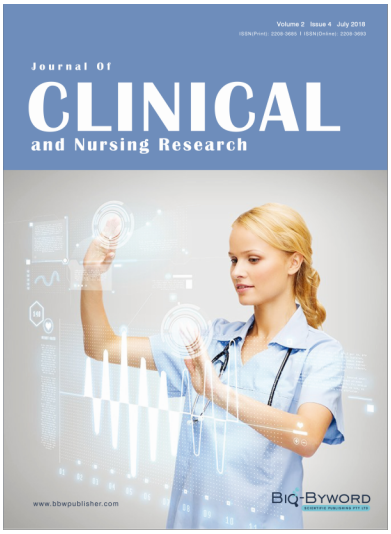

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