

The Impact of Curiosity and External Regulation on Intrinsic Motivation: An Empirical Study in Hong Kong Education

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The purposes of this paper are to identify: (1) the factors affecting the intrinsic motivation of university students in Hong Kong; and (2) gender differences in the perception of intrinsic motivation in Hong Kong higher education environment. The factors of curiosity and external regulation with intrinsic motivation are taken into investigation in this study, because these factors and intrinsic motivation of the local university students have seldom been examined. This study adopting a survey of 162 sampled students, was conducted in a local university in 2011. Findings showed that students with curiosity could lead to their higher intrinsic motivation, but external regulation was not found to be related to intrinsic motivation. In addition, there are no gender differences on the level of intrinsic motivation.

Keywords: intrinsic motivation, curiosity, external regulation, Hong Kong

Introduction

Most Hong Kong people spend more than 20 years learning as much knowledge as they can to get high academic qualifications. Among all students, there is a question about how students can gain more than others when being in the same learning environment. Motivation is an essential element to affect students' learning and performance directly.

Some students may feel that they are not active but under obligation to learn. It is due to their lack of motivation in learning, which would not result in good performance. According to Olsson (2008, p. 7), motivation is a reason or set, or reasons for engaging in a specific activity, especially in human behavior. The reasons can be basic needs, an object, or a goal.

Deci and Ryan (1985; 1991) stated that SDT (self-determination theory) is currently one of the most comprehensive theories of motivation. According to SDT, intrinsic motivation is defined as the doing of an activity for its inherent satisfactions rather than for some separable consequence (Xie, Debacker, & Ferguson, 2006). It is the degree to which an individual chooses to accomplish an activity for pleasure and enjoyment (Olsson, 2008, p. 2). This type of motivation is known as the most optimal kind of motivation as being entirely autonomous (Noels, Clement, & Pelletier, 2001; Remedios & Lieberman, 2008; Gao, 2008). Students with intrinsic motivation complete tasks for fun or challenge instead of external stimuli, pressures or rewards. They often have more interest, confidence and excitement in doing the task.

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According to Brophy (2010), intrinsic motivation emphasizes on motivation as self-determination of goals and self-regulation of actions rather than motivation as response to feel pressures. In view of this emphasis of intrinsic motivation, this study tries to investigate different aspects affecting students' learning so that the students can learn through their self-regulation of actions without pressure. With this improvement, their academic performance can be enhanced at the same time.

Some previous studies showed that curiosity has positive relationship with intrinsic motivation (Litman, 2005; Shroff, Vogel, & Coombes, 2008). Curiosity causes internal desire or need to learn new information or acquire information that learners missed. This factor can directly affect students' intrinsic motivation as well as their academic performance. As few studies had focus on Hong Kong students, this study tries to investigate whether curiosity also has relationship with intrinsic motivation for students in Hong Kong.

In contrast to improving students' intrinsic motivation, there is an investigation of external regulation that could lead to being unmotivated or downgrading of intrinsic motivation by several researchers (Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009; Boekaerts, 2002; Boekaerts & Cascallar, 2006; Vansteenkiste, Zhou, Lens, & Soenens, 2005). External regulation refers to some students feeling obliged to study and have external pressured contingencies (Vansteenkiste et al., 2009; Pisarik, 2009). Vansteenkiste et al. (2009) and Pisarik (2009) were mentally pushed to put effort into their studies. All these previous studies had not been conducted in Hong Kong. Therefore, this study tries to look into the relationship between external regulation and intrinsic motivation among university students in Hong Kong.

Narayanan, Rajasekaran, and Iyyappan (2007) showed that females have higher intrinsic motivation in learning English than males do among engineering university students. Meanwhile, Shang (1998) found that females have lower intrinsic motivation in physical education classes than males do. In addition, Schatt (2011) focused his study on the subject of music and found that female students have higher instrumental musical practice rate than males; and the amount of time spent on practice correlates significantly with intrinsic motivational beliefs. It raises a question whether females possess higher intrinsic motivation, which is investigated in this paper.

Ning and Downing (2010) had conducted a research study among 581 university students in Hong Kong and found that the students' motivation is the strongest predictor to their academic performance, while few attempts to investigate more specific factors such as curiosity and external regulation that whether they affect intrinsic motivation among university students in Hong Kong, the relationship between these factors and intrinsic motivation are deeply investigated so as to improve students' intrinsic motivation. Also, whether males or females are with higher level of intrinsic motivation is also studied. These serve as the purpose of this paper. The authors attempt to fill in the research gap by asking the following research questions:

- (1) What is the impact of curiosity on intrinsic motivation for Hong Kong university students?
- (2) What is the impact of external regulations on intrinsic motivation for Hong Kong university students?
- (3) Is there any difference in the level of intrinsic motivation between males and females for Hong Kong university students?

Theory Background and Hypothesis

Students in Hong Kong study in a highly competitive, examination-oriented, and large classes with excessive amount of homework (Moneta & Siu, 2002). Moreover, English is regularly widely promoted to be essential for individuals' social and career development (Gao, 2008; Davison & Lai, 2007). English is the

medium of instruction among all universities in Hong Kong. These are the characteristics of Hong Kong education system, which tends to require students to remember all the knowledge and apply all the knowledge to the paper for the examination. Hong Kong students always have surface learning. They will engage in the shortcuts allowed in some courses and attain it till the end without deeper understanding (Moneta & Siu, 2002).

According to a study conducted by Ning and Downing (2010) in Hong Kong, which focused on investigating the relationship between intrinsic motivation and academic performance among university students, it was found that the relationship is positive. Besides, another research by Afzal, Ali, Khan, and Hamid (2010) among 342 university students in Pakistan generated the same findings that intrinsic motivation can promote more optimal learning and better academic performance.

In this fast-paced society, people need to have high competitiveness, wide range of knowledge, and high capabilities in order to achieve eminent performance. Students who have good academic performance were found to have higher intrinsic motivation. To improve students' academic performance via improving intrinsic motivation, investigation of factors affecting individual's intrinsic motivation is needed.

In this research, the focuses on elements influencing ones' intrinsic motivation are curiosity and external regulation. University students are the targeted group. Means of examining and identifying those factors contributing to improvement of students' general performance, relationships between each factor and students' intrinsic motivation will be investigated and discussed as follows. Factors analyzed are curiosity, goal, and external regulation.

Curiosity

Curiosity is defined as the intrinsic desire to know, to see, or to experience something, which motivates information seeking behavior (Zelick, 2007, p. 147). Acquiring knowledge out of curiosity is considered to be intrinsically rewarding and highly pleasurable, since it eliminates states of ignorance and uncertainty (Litman, 2005).

There are two main theoretical accounts of curiosity. These two accounts of curiosity may seem different and incompatible. In the context of this circumstance, another theoretical approach, the I/D model ("interest/deprivation" model), will be presented later on. This model that can reconcile these two seemingly incompatible views was suggested by Zelick (2007).

The first one is CDT (curiosity drive theory), which expresses the concept of curiosity as a drive state that arouses intrinsic motivation to seek information with the intention of reducing unpleasant feelings concerning uncertainty, in another word, it is curiosity reduction (Litman, 2005). The second one is OAT (optimal arousal theory), which states individuals who have intrinsic motivation to search for new information aim at maintaining and enhancing pleasurable feelings of interest. Organisms that are under-aroused are motivated to seek for new stimulation that can excite their curiosity (e.g., complicated sight, or events).

The flaw in both CDT and OAT is that they missed considering that both inducing and reducing curiosity can motivate information seeking behavior. To reconcile both theories, the I/D model is suggested. There are two types of curiosity which are I-type and D-type curiosity within this I/D model. I-type curiosity motivates learners to acquire new knowledge since it induces positive feeling of interest. D-type curiosity can also motivate learners to acquire new information since it reduces negative feelings associated with uncertainty. For I-type curiosity, learners do not feel that they are lacking any information, but have recognition of an opportunity to learn something new or amusing. Contrarily, D-type curiosity motivates learners to learn as they

feel that they are missing essential information that can improve their understanding.

In other words, curiosity can involve both searching for information expected to be interesting (I-type) and searching for missing information resolving uncertainty (D-type).

Disregarding which type of curiosity students possess, curiosity can be intrinsically motivated. It is an important element to drive learning activities such as academic behavior (Osterloh & Frey, 2009). It is common for university students to have assignments and projects that need research work from various sources. Osterloh (2009) suggested that this behavior is mainly curiosity-driven. Intrinsic motivation is a main determinant for the scholarly behavior. In accordance with the agency theory, it only includes people's interest as the main motivator.

From a research study on factors promoting students' intrinsic motivation in online discussions based on individual-level done by Shroff, Vogel, and Coombes (2008), it was found that curiosity is positively related to students' intrinsic motivation. Furthermore, the study also showed that intrinsic motivation positively affects learning and academic performance. Therefore, it proves that improving curiosity can lead to higher intrinsic motivation, which in turn improves students' learning and academic performances.

Based on the above evidence, the authors hypothesize:

H1 (Hypothesis 1): Curiosity can positively affect students' intrinsic motivation.

External Regulation

External regulation is the most pressured and controlled type of motivation and is described as external perceived locus of causality, owing to its controlled nature with feelings of inner compulsion and conflict with those externally regulated students (Vansteenkiste et al., 2009; Olsson, 2008, p. 147). It is a kind of extrinsic motivation, as same as introjected regulation (Noels, Pelletier, Clement, & Vallerand, 2000; Gao, 2008). These two kinds of regulation can be combined and subsequently called as controlled motivation, which generates a series of undesirable outcomes of learning.

Externally regulated students study to avoid punishment, to obtain rewards, or to meet external expectations (Vansteenkiste et al., 2009; Xie, Debacker, & Ferguson, 2006; Olsson, 2008, p. 147; Boekaerts & Cascallar, 2006). They feel that they are obliged to study. With the external pressured contingencies, they are mentally pushed to put effort into their studies. They tend to be less adaptive, engaged and concentrated, more anxious about tests and procrastination, and lower achievement.

From a research study on the relationship between external regulation and the academic performance for Japanese students by Vansteenkiste, Zhou, Lens, and Soenens (2005), it was found that external regulation has a negative relationship with academic achievement and it predicted a work-avoidance orientation, while autonomous motivation has positive relationship with academic achievement, deep-level of processing, and mastery orientation.

Moreover, according to Pisarik (2009), it was found that high levels of burnout among university students have high levels of external regulation and low levels of intrinsic motivation.

Also, persons who have greater levels of intrinsic motivation experience higher levels of efficacy and lower levels of exhaustion and cynicism. People with lower levels of exhaustion and cynicism experience lower level of external regulation. One reason for this finding is a trend found in this study that students obtaining college education are for vocational rewards such as getting a better job instead of moral and intellectual training.

Based on the above evidence, the authors propose:

H2 (Hypothesis 2): External regulation would lead to lower students' intrinsic motivation.

Difference in Gender

Most of the previous researches are apt to suggest that females have higher motivation and more desirable learning than male students do. Narayanan, Rajasekaran, and Iyyappan (2007) found that female university students who studied engineering or technology have higher motivation in learning English than males do. It was concluded that female students learn English better than male students do (Narayanan, Rajasekaran, & Iyyappan, 2007).

Further to the explanation provided by Narayanan, Rajasekaran, and Iyyappan (2007), females have better listening skills, more concerned with input, i.e., listening, and tend to have better attitudes towards learning. Contrarily, males are less sensitive, more concerned with output, i.e., talking, and think in a more analytical way than females do. These may be the reasons explaining why females perform better in learning.

It should be noted that the above research is for university students in learning English. There is a research focusing on another subject—music, conducted by Schatt (2011). The study showed that female students have higher instrumental and musical practice rate than males do while the amount of time spent on practice correlated significantly with intrinsic motivational beliefs. Motivational beliefs are guides of students' thinking, feelings and actions in learning some subjects, and can lead to success in learning (Boekaerts, 2002; Clayton, Blumberg, & Auld, 2010).

Another research focusing on the subject of physical education, its result is different. One study by Shang (1998) in Taiwan focusing on physical education classes in high and also junior high schools, it was found that female students have lower intrinsic motivation which is relevant to their interest or enjoyment and perceived competence than male students do in most of the sub-scale of the study, but have higher effort put into the learning tasks. It not only proves that learning environment is different for male and female students, but also emphasizes that males perceive the learning environment as more challenging and competitive, while females perceive higher threat than males do in physical education classes (Shang, 1998).

According to several researchers investigating the levels of intrinsic motivation of students on different subjects, it resulted in different genders having higher intrinsic motivation towards various subjects. Therefore, it should not have any conclusion, saying that a particular gender is inclined to have higher motivation on all subjects.

Based on the above evidence, the authors predict:

H3 (Hypothesis 3): There should have no differences between males and females on the level of intrinsic motivation.

The proposed theory framework and hypotheses formation are shown in Figure 1.

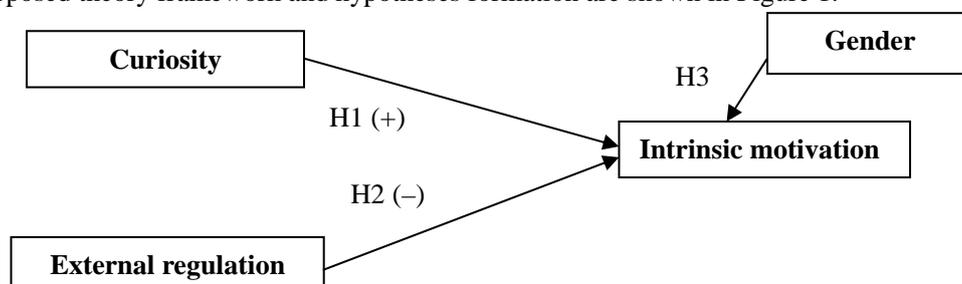


Figure 1. Proposed theory framework and hypotheses formation.

Note. H3 is related to comparison of perceptions of intrinsic motivation between males and females.

Research Method

Survey research among university students is used in this study to test the hypotheses stated above since the questionnaire as an instrument for studying research problems is a survey tool for collecting data from people about themselves, such as attitudes, thoughts, behaviors, and concerning a social unit such as a school (Lanthier, 2002; Siniscalco & Auriat, 2005). The research was completed in three universities in Hong Kong.

Before the survey was mass produced and used to gather real data, a pilot study was carried out to disclose problems and refine the wording, ordering, etc. (Litwin, 1995; Hoinville, Jowell, & Associates, 1978). Ten of the author's friends were asked to complete the questionnaires and give feedback independently about the questionnaires.

The survey was then conducted by distributing questionnaires with covering letter to explain the purpose of the research to the university students individually. The questionnaire was averagely completed within 10 minutes. Subsequently, 200 questionnaires were given out to undergraduates from various universities in Hong Kong. A total of 162 responses (with a return rate of 81%) were achieved, and the usability rate was 100% since no incomplete questionnaires were found.

There are nine statements (see Table 1) for three variables: curiosity (Mot_3, Mot_5, Mot_6, Mot_7 and Mot_8), external regulation (Mot_1 and Mot_2), and intrinsic motivation (Motivator_3 and Motivator_4). Those statements were taken from three questionnaires from three journals (Albrecht, Haapanen, Hall, & Mantonya, 2009; Vansteenkiste et al., 2009; Lepper, Corpus, & Iyengar, 2005). Four-point Likert-type scale which is a common rating format especially for educational survey research was assigned to all statements (Siniscalco & Auriat, 2005; Allen & Seaman, 2007). Removing mid-point category from Likert scale can reduce social desirability bias that arose from respondents (Garland, 1991). Statements in questionnaire were ranked at: (1) "Very true"; (2) "Sort of true"; (3) "Not very true"; and (4) "Not at all true".

Table 1

Statements for Three Variables

Variable	Statement
Curiosity	Motivator_3—I work hard in some courses because this represents a meaning choice for me.
	Motivator_5—I work hard in some courses because I think I can apply what I learn to my future career.
	Motivator_6—I work hard in some courses because I want to learn new things.
	Motivator_7—I work hard in some courses because good results in school can help me get a better career.
External regulation	Motivator_8—I work hard in some courses because this is an important life goal for me.
	Motivator_1—I work hard in some courses because that is what others (parents, friends, etc.) expect me to do.
	Motivator_2—I work hard in some courses because that is what others (parents, friends, etc.) force me to do.
Intrinsic motivation	Motivator_3—I work harder when I like the teacher.
	Motivator_4—I work harder when the subject is interesting and useful.

Data Analysis

The purpose of this study is to test correlation between three variables and gender differences on level of intrinsic motivation. SPSS version 17 is used to analyze the data in this study. This is sophisticated software for many scientists and other professionals to analyze statistics.

Data analysis including frequency distribution is used to analyze the personal data of respondents. After that, mean and standard deviation are used to study the perception of curiosity, external regulation and intrinsic motivation that university students have. Independent-samples *t*-test is then used to test the H3 (third hypothesis)—to see if there is any differences between males and females on the level of intrinsic motivation. This test is followed by correlation analysis that tests H1 and H2—to check if there is any relationship between the two elements (curiosity and external regulation) and intrinsic motivation.

Before the analysis, the collected data were examined to ensure that it is valid and reliable. It involves checking the usability and the validity of the responses on the questionnaires collected. Subsequently, reliability analysis by using Cronbach alpha, which is a measure of internal consistency about how close elements are related to each other, is carried out to test the reliability of the variables (Nunnally, 1978; Prater & Ghosh, 2006). The test means the freedom from random error (Alreck & Settle, 1985). The Cronbach alpha values (see Table 2) of curiosity, external regulation, and intrinsic motivation are 0.753, 0.640, and 0.671, respectively. A value of 0.60 is also used as the practical lower bound (Narasimhan & Jayaram, 1998). Therefore, reliability figures in this study, which exceed the value of 0.60, can be perceived as acceptable. This study can be considered as reliable.

Table 2

Mean, Standard Deviation and Cronbach Alpha Figures of Three Variables

Items	Mean	Standard deviation	Cronbach alpha
Curiosity	2.0494	0.51078	0.753
External regulation	2.8210	0.65137	0.640
Intrinsic motivation	2.0463	0.62007	0.671

Note. *N* = 162.

Apart from reliability testing, factor analysis was also utilized to establish construct validity. Results of factor analysis can be used to ensure that questionnaires used in this study are valid (Field, 2005). Factor loading is used to analyze the validity of measurement scales with the general value of acceptance as 0.30 (Anderson & Gerbing, 1998; Fornell & Larcker, 1981).

The variable of curiosity includes five items. The factor analysis for those items was conducted for the five items. Factor loadings ranged from 0.325 to 0.594.

The variable of external regulation includes two items. Factor loadings are 0.738 for both items in the factor analysis.

The variable of intrinsic motivation includes two items. Both factor loadings are 0.753. All values of factor loadings in the questionnaire are higher than 0.30. Hence, this scale is retained.

As a result, it can be concluded that the measurement scale is valid and reliable.

Findings

The demographic statistics of the respondents were analyzed. Table 3 shows the background of totally 162 respondents, of whom 61.7% are males. Sixty four point eight percent are between 21 and 25 years old. Half of them are university students in Grade 2 to university through JUPAS (Joint University Programmes Admissions System), which indicated that they have been studying and encountering different levels of motivation in learning for at least 18 years for education system in Hong Kong.

All respondents completed a questionnaire by asking their reasons of study in terms of whether they

perceive the specific statement as: (1) "Very true"; (2) "Sort of true"; (3) "Not very true"; and (4) "Not at all true". The reasons in the questionnaire pertain to the three variables (curiosity, external regulation, and intrinsic motivation) investigated in this study.

Table 3

Descriptive Statistics of Personal Data of Respondents

	<i>N</i>	Minimum	Maximum	Standard deviation	Frequency	Cumulative percent
Gender	162	1.00	2.00	0.48756		
Male					100	61.7
Female					62	100
Age	162	1.00	3.00	0.48791		
Below 21					56	34.6
Between 21 and 25					105	99.4
Above 25					1	100
Year	162	1.00	5.00	0.69131		
Year 1					14	8.6
Year 2					81	58.6
Year 3					65	98.8
Graduated in recent three years					2	100
Promotion	162	1.00	2.00	0.48901		
JUPAS					99	61.1
Non-JUPAS					63	100
Valid <i>N</i> (list wise)	162					

Mean and standard deviation were used to examine the level of the perception of the variables. The values of mean, standard deviation, and Cronbach alpha are shown in Table 2. Results showed that university students have slight perception towards having curiosity and intrinsic motivation, except external regulation. It is indicated by the mean score of 2.0494 for curiosity, 2.8210 for external regulation, and 2.0463 for intrinsic motivation.

Correlation analysis was then used to test the relationship between curiosity or external regulation and intrinsic motivation. The relationships investigated are shown in Table 4.

Table 4.

Correlation Between Factors of Curiosity and External Regulation and Intrinsic Motivation

Variables	Intrinsic motivation
Curiosity	0.185*
External regulation	0.024

Note. Correlation is significant at * $p < 0.05$.

H1: This hypothesis predicting that curiosity leads to higher intrinsic motivation was supported since there were positive empirical relationships between them ($r = 0.185$, $p < 0.05$).

H2: This hypothesis predicting that external regulation leads to lower intrinsic motivation was not supported by the results ($r = 0.024$, $p > 0.757$).

Independent sample *t*-test was used subsequently to test if there is any difference on the level of intrinsic motivation between males and females.

H3: This hypothesis predicting that there is no significant difference on the level of intrinsic motivation between males and females was supported since the t value is 1.140 and the significant value is 0.256, which is higher than 0.05. With the mean difference of 0.11419, it shows that there is no significant relationship between males and females.

Discussion and Implication

More detailed discussion and implications for practice are elaborated in the following.

Possessing Slight Perception of Curiosity

The level of curiosity tends to be high since all-round education in Hong Kong from primary school to university provides students with various sorts of knowledge that can boost their interest in learning different subjects. Thus, students can find their interest easily and their curiosity will not be too low. However, the common target for all students is to get high marks in examinations and get a good job for their lives. Education in Hong Kong tends to be examination-oriented, which requires students to remember all knowledge and apply all the knowledge to the paper for the examination. Hong Kong students may always have surface learning that they will engage in the shortcuts, which are allowed in some courses, and will attain it till the end without deeper understanding (Moneta & Siu, 2002). It makes their curiosity lower than what they expected.

Slightly Not Possessing Perception of External Regulation

External regulation is the most pressured and controlled type of motivation (Vansteenkiste et al., 2009; Olsson, 2008, p. 147). Externally regulated students study to avoid punishments, to obtain rewards, or to meet external expectations (Vansteenkiste et al., 2009; Xie, Debacker, & Ferguson, 2006; Olsson, 2008, p. 147). Meeting external expectation is the most common and possible reason why some of the university students in Hong Kong have stress in learning. However, students do not have high level of external regulation, because they are trained to remember knowledge even without the complete understanding and within the logic. When they have good scores in tests for their memorization of knowledge without the complete understanding of them, it would not subsequently produce much external pressure to students.

Possessing Slight Perception of Intrinsic Motivation

As for the tendency of students to have slight perception of intrinsic motivation, this result is consistent with the result suggesting that students have slight perception of curiosity and slightly lower level of external regulation.

Correlation Between Curiosity and Intrinsic Motivation

The result showed that curiosity has significant relationship with intrinsic motivation. Students having higher level of curiosity possess higher intrinsic motivation. It supports H1 predicted above. It is consistent with previous research by Shroff, Vogel, and Coombes (2008) whose previous research suggested that curiosity as one of the six individual factors examined is positively related to intrinsic motivation. Improving curiosity leads to higher intrinsic motivation and in turn, improves students' learning and academic performance. Moreover, according to Litman (2005), acquiring knowledge out of curiosity is considered to be intrinsically rewarding and highly pleasurable since it eliminates states of ignorance and uncertainty.

With Hong Kong unique educational system and its pattern of learning, students need to learn a wide range of subjects. It makes them easier to have curiosity about some particular subjects. Once they develop their curiosity about some subjects, their intrinsic motivation towards acquiring knowledge in these subjects is

higher. As a result, their performance can be improved.

Correlation Between External Regulation and Intrinsic Motivation

There are many previous studies which stated that external regulation is associated with negative classroom learning (Vansteenkiste et al., 2009; Boekaerts, 2002; Boekaerts & Cascallar, 2006; Vansteenkiste, Zhou, Lens, & Soenens, 2005) and lower level of intrinsic motivation (Pisarik, 2009). Students who have controlled motivation tend to be less adaptive, engaged and concentrated, and more anxious about tests and procrastination, and have lower achievement. Boekaerts and Cascallar (2006) pointed out that controlled motivation is associated with students who comply with the task due to some external encouragements, rewards, or social pressures.

One interesting finding in this study is that external regulation is not significantly related to intrinsic motivation. For most Hong Kong university students, they have been experiencing high pressures from their parents, teachers, and even peers for more than 15 years. Therefore, it can be comprehended that there is no significant relationship between external regulation (i.e., social pressure or external encouragement) and intrinsic motivation since they have got accustomed to the study stress (Gao, 2008). This phenomenon can be further interpreted by the education system in Hong Kong that emphasizes much on scores of tests and examinations (Moneta & Siu, 2002). Contrary to the education system in other countries, the emphasis of education is placed on the understanding of the students.

The above analysis can explain the reason why H2 stating that external regulation leads to lower level of intrinsic motivation is rejected in this study.

Difference on Level of Intrinsic Motivation Between Males and Females

Results indicate that the level of intrinsic motivation for students in Hong Kong is nearly the same between males and females. It can be interpreted by the same education environment for both genders. They received the same education approaches under the same education system, which contributes to possess the same level of intrinsic motivation towards learning.

Supported by several researchers with this result, Narayanan, Rajasekaran, and Iyyappan (2007) concluded that female students studying engineering or technology learn English better than male students do. Meanwhile, according to a research of Shang (1998) in Taiwan focusing on the physical education classes, it was found that females have lower intrinsic motivation than males do, but with higher effort put into the learning tasks. Another research conducted by Schatt (2011) focusing on the subject of music found that female students have higher instrumental musical practice rate than males do, while the amount of time spent on practice correlates significantly with intrinsic motivational beliefs.

Therefore, it should not have any conclusion, saying that a particular gender is inclined to have higher motivation on all subjects since university students always involve studying English, Chinese culture, and their major subjects together. The result of this research shows that there is no difference between males and females on the level of intrinsic motivation, which supports the H3.

Relationship Between Combined Variables (Curiosity and External Regulation) and Intrinsic Motivation

For the effect on intrinsic motivation by the combined factors of curiosity and external regulation, it is the same as that by curiosity alone. This phenomenon may be due to Hong Kong students' learning atmosphere. In Hong Kong, students are trained to study under the pressure from others such as their parents and teachers, which make the students have no significant effect on their intrinsic motivation when external regulation is

combined with curiosity.

Implication for Practice

The implication for practice in this study is to let universities identify different practical methods to improve students' curiosity and try to reduce their external regulation so that students' intrinsic motivation can be improved. The universities' professors and students should be aware of their ways of teaching or learning, and what methods should be used to strengthen the intrinsic motivation of students in Hong Kong higher education. Universities should think about changing the learning environment, shifting courses' emphasis from marks in examinations to students' understanding to the knowledge such as doing projects to develop deeper understanding among students.

Limitations and Future Opportunities

There are mainly two limitations in this project. Firstly, the sample size of some subgroups is not even. The sample size of males is 100 while that of females is 62. The significant level may be influenced, owing to unbalanced distribution of sample size. Also, the distribution of sample size among the five universities in Hong Kong providing engineering fields of study is not even either. With one of the universities accounting for a larger part of the samples, the survey result may not be representative to the general situations of university students in Hong Kong.

The second limitation of this study is that the sample size is not large. Less than 200 samples were collected. It may make the survey result not representative enough to show the general learning environment for university students in Hong Kong.

Apart from the limitations, there are several future research opportunities from this study. The first is to examine other factors that may also affect intrinsic motivation, such as ages, fields of engineering, etc.. This study only examined two factors (curiosity and external regulation) among university students. Whether there is a relationship between intrinsic motivation and students' academic performance among university students in Hong Kong can also be investigated.

Secondly, this project focused on improving intrinsic motivation among university students. This type of research can also be applied to similar research studies in primary schools, secondary schools, overseas schools, or among students studying associate degree in Hong Kong. The factors contributing to their intrinsic motivation or discouragement may be different.

This research study also lacks deep investigation. This study that involves only quantitative research is empirical. The survey was conducted in form of questionnaires, without face-to-face interviews. The focus of the investigations in this study is on the existence of the relationships. Further research can be done concentrating on deeply investigating why there are relationships between the elements and intrinsic motivation. For example, it was found in this research study that curiosity can promote intrinsic motivation. Thereby, all these can be a further research for the future development of education.

Conclusions

Throughout the study, factors of curiosity and external regulation have been examined as tools to improve intrinsic motivation of university students in Hong Kong. A survey was conducted to find out the perceptions of the targeted group towards their curiosity in learning and their external regulation.

With investigation of relationships between the two elements and intrinsic motivation, there are also some

comparisons between males and females to see if either of the genders possesses higher curiosity, lower external regulation, and higher intrinsic motivation.

The survey results also support two of the three hypotheses defined in this research study. Firstly, curiosity leads to higher intrinsic motivation (H1). Secondly, external regulation has no significant relationship with intrinsic motivation, which rejects H2. Thirdly, there is no significant difference on the level of intrinsic motivation between males and females, which supports H3.

Finally, more specific factors that may affect students' intrinsic motivation are investigated among university students in Hong Kong so that students' academic performance can be enhanced with higher level of intrinsic motivation (Afzal, Ali, Khan, & Hamid, 2010; Ning & Downing, 2010).

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