Effects of ability grouping and self-perceived performance on secondary school students' self-concept: An investigation of the big-fish-little-pond theory in Hong Kong

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Abstract:

The present study attempts to investigate the effects of academic achievement and ability grouping on students' self-concept. While ability grouping is a common and convenient practice to group students into classes or schools on the basis of their academic performance, its effect on the students' performance and self-esteem has been highlights of concerns. A total of 359 Secondary 3 to 4 (grade 9 to 10) students were sampled from three schools ranging from Band 1 to Band 3. Participants completed a global measure of self-esteem (General Self) and the academic and social self-concept subscales (Intellectual Self and Social Self) of the Chinese Adolescent Self-Esteem Scales (CASES) and made self-ratings on their academic achievement; information of their ability grouping in terms of schools (Bands) and of classes (Streams) was collected and analyzed. Results showed that self-perceived academic achievement had the strongest and positive effect on self-concept, while stream and band would have less though significant effects. The social self-concept was found to have a curvilinear relationship with the stream of class. Furthermore, the moderating effects of band and stream were found in academic self-concept but not on other self-concept facets or global self-esteem, and were more apparent among average and low performers but not quite on high performers. Findings and implications were discussed in the light of the Big-Fish-Little-Pond effect theory.

Keywords: *Big-Fish-Little-Pond Effect, ability grouping, academic achievement, self-concept and self-esteem*

In general, academic achievement has been found to be positively associated with one's self-esteem (e.g. Byrne, 1986; Ghazvini, 2011; Mahakud & Joshi, 2016; Marsh & Hau, 2004; Skaalvik & Skaalvik, 2002). The association is even stronger when the measurements of self-esteem and the domain of performance are matched (e.g. Marsh & Köller, 2004). However, the mechanism or process underlying the relationships between achievements and self-concept seems to be more complicated than they appear (e.g. Cheng, 2014; Jonkmann et al., 2013; Marsh & Köller, 2004). Instead of making objective evaluation of oneself based on his/her actual achievement and thus the relationship between success and self-esteem should be positive and linear, an individual's self-concept (or self-esteem) is continually moderated by different kinds of social comparisons that he/she has taken. The pattern of association between academic achievement and self-esteem may even vary across different cultures (Cheng, 2014). All in all, social comparisons or frames of reference, in particular, have been studied as an important role underlying the process of self-evaluation (Hattie, 1992; Jonkmann et al., 2012; Marsh, 1987, 1990, 1994; Skaalvik & Skaalvik, 2002).

Marsh (1987, 1990) coined the term "Big-Fish-Little-Pond" effect (BFLPE) to explain the internal/external mechanism of frame of reference that a student may use in comparisons with the abilities of other students in his/her reference group as a basis for evaluating his/herself. According to the BFLPE theory, a student will have higher self-concept when comparisons are made to less able students, but a lower self-concept when comparisons are made to more able students. This effect is particularly salient in the relevant domain, such that academic achievement is more strongly associated with academic self-concept than with a global measure of self-esteem (Marsh & Craven, 2006; Marsh & Köller, 2004). The effect is also more apparent when the measurement of performance is based on internal, self-perceived ratings rather than external objective scores (Hattie, 2009). Overall, empirical evidence in Western/European countries has been in line with the BFLPE prediction (e.g. Marsh, 1990; Marsh & Köller, 2004; Skaalvik & Skaalvik, 2002). For example, Marsh (1994) found that students attending schools where the average ability level of students was high tended to have lower academic self-concept. Prior self-concept in each school subject had positive effects on achievement in the same subject, but negative effects of achievement in the other school subject (Marsh & Koller, 2004). Yet, the negative effect of achievement may be moderated by the learning environment (Cheng. 2014). Moreover, recent research found that the negative effect of BFLPE (i.e. high school achievement associated with low academic self-concept) could be moderated significantly with narcissism (Jonkmann et al., 2012).

To summarize, empirical evidence based on Western samples is in general supporting the frame of reference effects predicted by the BFLPE theory, but is still quite inadequate in non-Western countries (Chen et al., 2013; Cheung & Rudowicz, 2003). For example, a large scale study in Hong Kong by Cheung and Rudowicz (2003) revealed that ability-grouping had no significant effect on the students' self-esteem and academic self-concept. Students attending schools of higher banding did not have lower self-evaluation or vice versa as predicted by BFLPE; yet, they found that students studying in high-banding schools did have higher test anxiety. Another study by Wong and Watkins (2001) also found some results inconsistent with the BFLPE predictions, in particular, school band did not have significant effect on

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students' self-esteem. However, Wong and Watkins' (2001) study utilized only two polarities in ability grouping both in terms of school band and class stream, i.e. high/low band and high/low stream, and thus their study prevented analysis of non-linear relationships.

The Hong Kong Context. Whether or not to group students in homogenous ability groups either at class (streams) or school levels (bands) has long been a controversial area for educational policy makers in many regions of the world, though it has been pointed out that ability grouping should be beneficial to teaching and learning (Gamore et al., 1995). In Hong Kong, all publicly funded schools are classified into three bands, viz Band 1, Band 2, Band 3 schools according to the academic achievement ratings compared within the same geographical region. In most cases though not all schools, students of the same grade are also grouped into different classes (class streaming) according to their internal examination scores. Such information of school band and class stream are known to the community. Hence, the frame of reference effects, if any, should be attributable to school band and class stream in the Hong Kong context.

Hypothesis 1: Based on the literature and the Chinese culture that academic achievement is of paramount importance to personal success, it was predicted that students who have higher self-perceived performance would have higher self-esteem regardless of whatever school band or class stream (i.e. the pond) he/she was in.

Hypothesis 2: Students studying in high stream classes would have higher self-esteem than those studying in lower stream.

Hypothesis3: Similar to stream, school band as another social comparison factor would have similar but smaller effect, as it was more distant than the stream factor from the student's perspective.

Hypothesis4: According to the BFLPE theory, the performance main effect would be moderated by the contextual factors of ability grouping factors, namely, class stream and school band, particularly on the academic facet of self-concept.

All of the above hypotheses should apply to both global self-esteem and the academic and social facets of self-concept. Given that the three independent variables were directly related to the academic domain, we could anticipate that the effects would be greatest on intellectual self-concept than on global self-esteem and social self.

I. METHOD

Sampling

A stratified cluster sampling approach was adopted in which a public secondary school was drawn from each cluster representing Band 1 (top performance), Band 2 (average), and Band 3 (poor performance) schools, and then a class from grade 9 (Form 3) or grade 10 (Form 4) was drawn from each participating school. A screening-in criterion was that the participating schools had ability group for classes of the same grade (i.e. class stream). Totally there were 359 students studying Form 3 or Form 4 (i.e. middle levels in secondary school) were randomly drawn, among them 155 were males and 204 were females, mean ages of males and females were 15.3 (sd=2.4) and 15.2 (sd=2.0) respectively.

Instruments

A self-report pencil and paper questionnaire was administered. The questionnaire consisted of a self-esteem instrument, namely, Chinese Adolescent Self-Esteem Scales (CASES) (Cheng, 2005; Cheng & Watkins, 2000) and a section on demographic variables and self-ratings of academic achievement. The CASES is a 60-items instrument emic-etically developed to measure the adolescent's self-esteem (General Self) and self-concepts in six domains (i.e. Intellectual Self, Social Self, Family Self, Moral Self, Physical Attractiveness Self, and Physical Abilities Self). For the present study, only the General Self (global self-esteem), Intellectual Self (academic self-concept), and the Social Self (social self-concept) subscales were used. The CASES has been widely used for the measurement of self-esteem for the Chinese adolescents in Hong Kong (EMB, 2003) and has proved to have strong psychometric properties (Cheng & Watkins, 2000; Wong & Watkins, 2001; Wu, 2005). The three subscales have demonstrated good internal consistency reliability in the present study (Cronbach's alphas ranging from .80 to .89).

Besides self-concept measures, the respondent was to answer questions relating to their age, sex, grade of study, and examination performance which was rated on a 5-point scale from 1 (poor) to 5 (distinction). Information regarding Band and Stream were available from the participating schools. The data collection was administered by teacher in classroom during normal class periods. Normal procedure of informed consent and assurance of confidentiality was exercised.

II. RESULTS

The descriptive statistics (means, standard deviations) of the self-esteem scores (general, intellectual, social) across performance levels, streams, and bands are shown in Tables 1 to 3. There was no gender difference on dependent variables (self-esteem scores). To analyze the effects of academic performance, streams, and bands, both univariate ANOVA and multivariate MANOVA were conducted, polynomials tests were conducted where overall F-tests were significant.

Performance Effects

Self-concept means across levels of performance, bands, and streams are summarized in Tables 1 to 3. One-way significance tests showed that self-perceived performance had the strongest effect on Intellectual Self and General Self but only mildly on Social Self (see Table 1). The effect sizes were as predicted: academic performance had the greatest effect on academic self-concept ($F(2, 352) = 88.46$, $p < .001$, η^2 ≈ .34), followed by general self-esteem ($F(2, 352) = 17.86$, $p < .001$, $\eta^2 = .092$), while the smallest effect was on social self ($F(2,853) = 2.87$, $p = .05$, $\eta^2 = .016$). Polynomial tests showed that the effects of performance on these three self-concept scores were all linear. That is to say, the higher a student perceived his/her own academic performance, the higher self-concept (self-esteem) he/she had. This is true in both the global self-esteem and the domain specific self-concepts (see Figure 1). Hence, the first hypothesis was supported, that is, self-perceived performance has the strongest and positive effect on student's self-concept.

Class Stream Effects

One-way test of significance showed that class streaming had significant effects on general self-esteem, intellectual self, and social self (see Table 2). The effect size was largest on intellectual self ($F(2, 269) = 8.0$, $p < .001$, $\eta^2 = .056$) and social self ($F(2, 269) = 4.2$, $p < .01$, $\eta^2 = .03$), but not quite on general self-esteem though statistically significant ($F(2, 269) = 2.92$, $p = .05$, $\eta^2 = .021$). Polynomial tests showed that the effects of class streaming on academic self-concept and general self-esteem were linear as predicted, however, the effect of stream on social self-concept seemed to fit with a quadratic fashion (see Figure 2). Students from middle stream classes were found to have higher social self-concept than those from lower or middle streams.

Table 1: Self-concept scores across performance levels

	Low M (SD)	Medium M (SD)	High M (SD)	F-test (df=2, 352)	Polynomials Contrast
General Self	4.12 (.99)	4.55 (.98)	5.17 (.90)	17.86***	1
Intellectual Self	3.27 (.78)	4.16 (.83)	5.09 (.94)	88.46***	1
Social Self	4.67 (.87)	4.87 (.90)	4.95 (.88)	2.87*	1

Notes: * $p \leq .05$, ** $p < .01$, *** $p < .001$, ns = non-significant; polynomial contrasts 1=linear, 2=quadratic

Table 2: Self-concept scores across streams

	Stream A M (SD)	Stream B M (SD)	Stream C M (SD)	F-test (df=2, 352)	Polynomials Contrast
General Self	4.67 (1.03)	4.40 (1.00)	4.22 (.96)	2.92*	1
Intellectual Self	4.17 (1.07)	3.86 (.93)	3.51 (.89)	8.01***	1
Social Self	4.56 (.78)	4.93 (.95)	4.65 (.83)	4.21**	2

Notes: * $p \leq .05$, ** $p < .01$, *** $p < .001$, ns = non-significant; polynomial contrasts 1=linear, 2=quadratic

Table 3: Self-concept scores across bands

	Band 1 M (SD)	Band 2 M (SD)	Band 3 M (SD)	F-test (df=2, 352)	Polynomials Contrast
General Self	4.61 (1.09)	4.27 (.96)	4.38 (1.00)	1.88 ns	n/a
Intellectual Self	4.11 (1.14)	3.95 (.99)	3.69 (.93)	5.17**	1
Social Self	4.66 (.83)	4.63 (.89)	4.87 (.88)	2.76 ns	n/a

Notes: * $p < .05$, ** $p < .01$, *** $p < .001$, ns = non-significant; polynomial contrasts 1=linear, 2=quadratic

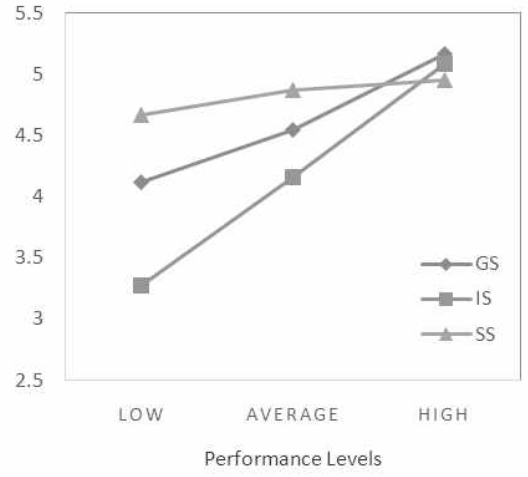

Figure 1. self-esteem, intellectual and social self-concepts across academic performance

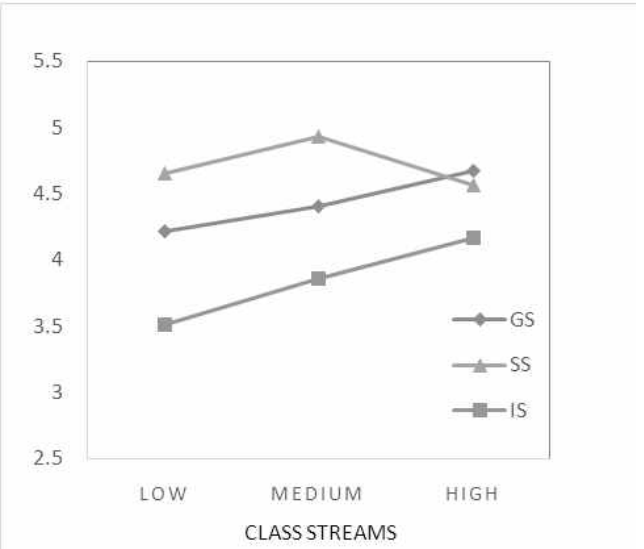

Figure 2. Self-esteem, intellectual and social self-concepts across class streams

School Band Effects

The effect of school banding was only significant on intellectual self ($F(2, 269) = 5.17$, $p < .01$, $\eta^2 = .029$) but not general self nor social self. Contrary to the prediction of BFLPE, students of different ability groupings (bands) did not differ significantly on their self-esteem ($F(2, 269) = 1.88$, $p > .05$, $\eta^2 = .011$).

Moderating Effects of Ability Grouping

In order to check for any moderating effects of the ability grouping factor (class stream, school band), factorial MANOVA was conducted to test the interaction effects between academic performance and the two ability grouping factors on self-concept variation. Among all testable interaction effects, only the three-way interaction (performance x stream x band) was significant, all two-way interaction effects (performance x stream; performance x band; band x stream) were not significant. Subsequent analyses indicated that the source of variance was accounted for by the three-way interaction effect on intellectual self only ($F(5, 245) = 4.29$, $p = .001$) but not on general self-esteem or social self. That is to say, only when the effects of the two ability grouping factors (stream and band) were combined with the academic performance, the ability grouping factors would have moderating effect on intellectual self (but not on general self-esteem or social self-concept).Careful inspection suggested that the moderating effect of band and stream was most apparent in the "average performers" and "low performers". For the "average performers", studying in a Stream A class of a Band 1 school would have the most negative impact on their intellectual self-concept (see Figure 3), and hence showing the effect of a "small fish in big pond". On the contrary, "average performers" studying in a Stream A class of a Band 3 school would be the happiest (highest intellectual self) and thus they were the "big fish in little pond".

For low performers, those studying in Stream A class of lower bands schools (Band 2 or Band 3) tended to report higher intellectual self, even higher than those from Band 1 schools, despite the fact that their actual performance was lower (see Figure 4). Similar to "average performers" in Band 1 school, "low performers" in Band 1 school and Stream A class also reported lower self-esteem in the intellectual facet. Hence, hypothesis 4 was partially supported.

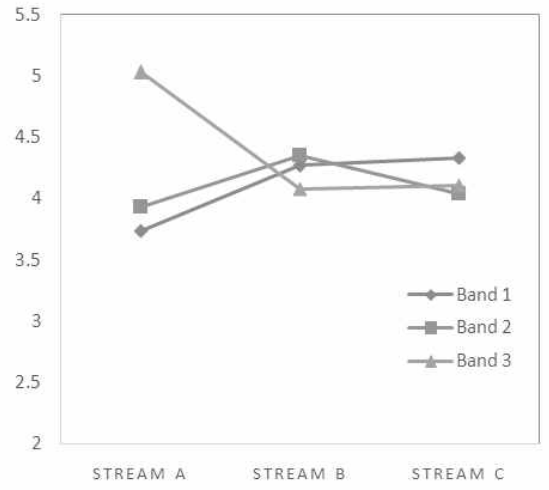

Figure 3. Intellectual Self-concept of Average Performers by Band and Stream

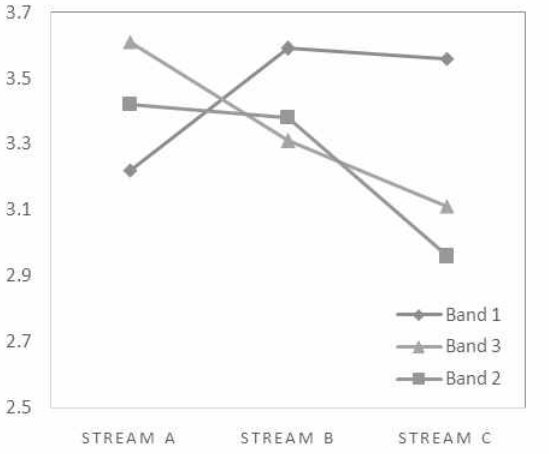

Figure 4. Intellectual Self-concept of Low Performers by Band and Stream

III. DISCUSSION

The present findings showed that self-concept (global, intellectual, social) tended to be associated most strongly and positively with self-perceived performance. The self-perceived performance had the strongest effect and the effect was in a linear fashion, followed by the ability grouping of classes (stream), whereas ability grouping of schools (band) seemed to have the smallest effect on students' self-concept. These findings partially supported the first three hypotheses (H1 to H3) and no gender difference was shown. While the effect of performance was straight forward and had a positive association with self-concept, the effect of stream was more complicated and showed different effects on different self-concept facets. Using a multilevel indication of class streams, our study allowed discovery of nonlinear relationship between variables. It was found that, unlike the global measure of self-esteem or academic self-concept, the social facet of self-concept (social self) manifested a curvilinear relationship with streams. In particular, students studying in middle stream classes tended to have higher social self than those studying in higher stream (Stream A) or lower stream (Stream C) classes. This finding has extended previous research on the effect of ability grouping on multidimensional self-concept (e.g. Prackel & Brull, 2010; Wong & Watkins, 2001). Perhaps students studying in middle stream would have less academic pressure or examination stress than those studying in high stream class, and at the same time their social status was less at risk than those studying in lower stream class. This interesting finding would call for further investigation in future research.

The ability grouping of schools (band) did not seem to have significant effect on self-esteem or social self-concept, but only on the relevant facet of self-concept (i.e. academic self-concept). The effect of ability grouping of schools (band) was less than that of class stream, and its effect was specific and limited to academic self-concept but not on the global self-concept or other facets of the self. This finding echoed with the finding of another study with the Chinese samples that ability grouping did not seem to have detrimental effect on self-esteem (Cheung & Rudocwicz, 2003), though it did show significant impacts on how a student evaluate him/herself on the academic domain (academic self-concept).

Regarding the moderating effects of BFLPE, the present study found significant evidence for the framing effects of ability grouping (band and stream) on academic self-concept. However, the ability grouping factor (band or stream) did not exhibit BFLPE on students' self-concept as a whole, but rather on the relevant facet (i.e. academic self-concept). Even the moderating effect of BFLPE was evident, it was apparent among the average or low performers but not so much for the high performers. For high performers, the effect of academic performance was not moderated by either the band or the stream factor. The only exception might be the "high performers studying in Band 1 schools but assigned to average stream class", who reported the lowest academic self-concept (M=3.22, SE= .76), even lower than other classmates (average or low performers) in the same school band or stream. However, all two-way interaction effects testing this were non-significant statistically.

To conclude, the BFLPE was evident when the two ability grouping factors (i.e. both streaming of classes and banding of schools) were present, and the effect was only significant on the relevant facet of self (i.e. academic self-concept) and was apparent only for average performers and low performers.

Implications and Limitations

The present study attempted to investigate whether an organizational variable under the control of policy makers, i.e. ability grouping in terms of school banding and class streaming, would have important impacts on individual student's self-concept. Ability grouping (by school bands and/or class streams) seems to be a sensible way of organizing students as it allows teachers to focus instructional strategies on students with similar ability and hopefully similar learning problems (Gamore et al., 1995). On the other hand, scientists and educationalists have expressed concerns on the potential negative effects of ability grouping and the effects could be sustaining for an extended period of time (e.g. Marsh et al., 2003; Marsh et al., 2016).

Our findings confirmed that self-perceived performance had the strongest impact on students' self-concept, while ability grouping (band, stream) would have certain but not an overriding effect on students' self-concept. The most vulnerable students were those who were studying in a high band school (Band 1) but believed themselves to be only average or below average academically (see Figure 3). It is not the "big fish in little pond" that should be concerned, but the "little fish" may feel belittled and would have higher anxiety and stress in the "big Chinese pond". Hence, educational professionals may pay more attention to these students and render support to them more readily, such as organizing peer support groups to enhance their sense of belonging and social connectedness. Another way of diffusing the negative effects of ability grouping is to avoid "labelling effect" in the class streaming process, such as using neutral terms (e.g. names of flowers) instead of ordinal names (A, B, C etc.) for ability grouping of classes.

Lastly, the present study had some limitations which could be addressed in future research. First, only the global self and the social and academic facets of the self-concept construct were measured, it is not known whether other aspects of self-conceptions (such as family self-concept, self-efficacy, emotional stability) would be related to one's academic success. Furthermore, while the present study found some support for the BFLPE on students' academic self-concept, in particular the average and lower performers' self-concept, we had not measured their academic stress and anxiety. Future research may include students' academic stress and anxiety in investigating the effects of ability grouping. Thirdly, we used the "self-perceived" levels of academic performance instead of the actual performance scores in the current study. This method of measurement has inherent limitation in its reliability, though researchers have confirmed the strength of using "self-perceived measure" of performance (e.g. Hattie, 2009; Marsh & Craven, 2006). Lastly, due to practical constraints the sampling of the current study was confined to three schools and the sample size was relatively small. Preferably, a larger and representative sample should benefit more powerful statistical analysis.

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