Student-faculty interaction: Mediating between student engagement factors and educational outcome gains

Hu, Yueh-Luen
Department of Education, National ChengChi University, Taiwan (joyhu@nccu.edu.tw)

Hung, Chao-Hsiang
Department of Education, National ChengChi University, Taiwan (aka0518@gmail.com)

Ching, Gregory S. ✉
Graduate Institute of Educational Leadership and Development, Fu Jen Catholic University, Taiwan (gregory_ching@yahoo.com; 094478@mail.fju.edu.tw)

Abstract

The concepts of engagement have long been said to bring forth positive outcomes on students' university schooling. The reports of the National Survey for Student Engagement (NSSE) in the US have opened up various discussions on the benefits of such meaningful activities. On the other hand, the reemergence of the Chinese academies called *Shuyuan* or residential colleges have been spreading to both the East and West. It is said that the concept of having students living together with their faculty would instill a sense of belongingness that fosters learning. More important, both models of learning have within them the notion of student-faculty interactions. To dwell further on these concepts, the current study shall focus on the analysis of residential college students in Taiwan. A total of 724 students from four key universities that practices the model of residential colleges were surveyed. Structured equation modelling was accomplished resulting in the verification of a model of learning. Results show that student-faculty interaction successfully mediated the effects between the student engagement factors and students' educational outcome gains. The current results further provided an empirical proof of the importance of quality student and faculty communications and interactions. The current study hopes that the findings will be able to help educational administrators, policy makers, and researchers in designing future curriculum programs that fosters meaningful learning.

Keywords: student engagement; student-faculty interaction; residential colleges; Shuyuan; academies; educational outcome gains

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1. Introduction

During the turn of the 20th century, the concept of students' school engagement have become an important topic of discussion (Hu & Ching, 2012; Hu, Ching, & Chao, 2012). More important are the series of studies focusing on the National Survey of Student Engagement (NSSE) by Kuh and his associates (Kuh, 2001, 2003, 2009; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008). These series of studies reported various findings brought about by five effective educational practices, such as: level of academic challenge, active and collaborative learning, student-faculty interaction, enriching educational experiences, and supportive campus environment. The totality of these experiences are said to outweigh the perceived benefits of which institution students attend (Kuh, 2009). This means that whether what school students are enrolled in, the quality of educational experiences matters the most.

The inherent ideas within student engagement are the purposeful activities that are geared towards a wide range of student outcomes, such as persistence, satisfaction, achievement, and academic success (Pascarella & Terenzini, 1991, 2005). Such notion of student engagement explains the various indications that even in within a challenged school district students are able perform better (Lawson & Lawson, 2013). To make it simpler, the idea behind student engagement is that the more students spend time engaging with a subject, the more they should be able to understand and learn from it. Hence, learning takes place. More important, when students are interacting more with their peers and faculty regarding their lessons, the more students are able to apply their learning.

Looking into the ideas within *Shuyuan*, Chinese academies or residential colleges, wherein students and faculty learns and lives together as a community (Hu, Hung, Ching, & Liao, 2013). This concept can be traced back to ancient Chinese history from the East, while the prototype colleges of the University of Oxford and Cambridge from the West. As early as during China's Tang Dynasty (AD 618-907), the concepts of *Shuyuan* started and proceed to become the dominant educational institution during the Song Dynasty (AD 960-1279); these institutions eventually played a significant role in shaping China's higher education (Min, 2004, p. 56). Within the *Shuyuan* model of education, freer discussion and debates are undertaken by the students and their mentors (Qiang, 2012, p. 453). More important, is the notion that a students are guided (or instructed) by one or more scholars (or mentors/faculty) (Hawkins, 2013, p. 59) Actually, there is since a revival of such practices in China's current higher education system (Wen, 2014).

In reality, the Chinese academies or *Shuyuan* is actually very similar to the early European concepts of residential colleges (Hayhoe, 1989). In that era, educational institutions are not just considered a place for teaching and learning, but are noted as a place where students and teachers lived and learn together (Ryan, 1993). In today's western higher education system, the concepts of *Shuyuan* or residential colleges can be found in the form of decentralized academic societies composed of faculty and student members (Duke, 1996). Similar to the Chinese models, residential colleges practices the concepts of having freshmen students residing with their seniors. These enriching educational experiences is found to be crucial in assisting the students' academic, social, or personal development (Durrani & Sohaib, 2009). In essence, the concept of *Shuyuan* as applied to the East, while residential colleges (or living-learning center, theme house, and residential learning community) of the West both promises a type of interaction amongst teachers and students that fosters educational development. It is hoped that the current study shall provide a more empirical point of view with regards to the actual effects of such interaction.

With the primary focus of understanding the role of student-faculty interaction with the residential model of

learning; the following section of this paper shall focus on the literature review of the student-faculty interaction, while followed by the methodology section. Then after the statistical results and discussions together with its implications are given; while the concluding section provides some final concerns for future studies and researches.

2. Student-faculty interaction

Dunleavy and Milton (2009) mentioned that the change in the role of teachers (faculty); perhaps a newer role for teachers themselves, are quite crucial in fostering effective teaching and transforming the learning environments. This fact further strengthens the importance of faculty in the academic lives of students. Student-faculty interaction is actually the quality of communication between student and faculty (Kuh, 2001, 2009). Quite simple yet deep in its meaning and implications; Pascarella and Terenzini (1977) started to test the various types of student-faculty interactions. Among the six reasons why students interact with their faculty, namely: *to get basic information and advice about my academic program, to discuss matters related to my future career, to help resolve a disturbing personal problem, to discuss intellectual or course-related matters, to discuss a campus issue or problem,* and *to socialize informally* (Pascarella & Terenzini, 1977, p. 543), statistical analysis show that students *discussion with regards to intellectual or course-related matters* have the highest predictive power for students who will persists in their studies. Hence, as students interact academically with their faculty, learning happens.

The early findings of student-faculty interaction studies noted that the quality of engagement matters (Kuh & Hu, 2001). Endo and Harpel (1982) mentioned the importance of student-faculty interaction as reflected on students' intellectual and personal (including social) outcomes gains during college. There findings suggest that student-faculty interactions must not be limited to the formal academic advising. These interactions should also include the informal; friendly contacts that are more on a personal level (Endo & Harpel, 1982; Fusani, 1994; Lamport, 1993). In addition, these out-of-class contacts are said to be able to foster students' motivation (Jaasma & Koper, 1999). More important, informal student-faculty interactions are able to help students improved their overall attitudes toward the school, academic achievement, intellectual and personal development (Pascarella, 1980).

Some early studies also hinted the existence of gender differences within the student-faculty interaction that leads to different classroom performances (Cornelius, Gray, & Constantinople, 1990). More recent studies even further the findings of the differences within frequency of student-faculty interaction across students' race, gender, and social classes (Kim & Sax, 2009; Lundberg & Schreiner, 2004). Such findings are a bit alarming, since faculty should not differentiate the students because of their ethnicity or gender. As with the quality of student-faculty interaction matters, it would be fair that faculty should be able to provide equal amount of time to all of their students. In addition, some studies also mentioned that the provision of ample space (or location) wherein faculty are able to meet students and talk are also crucial in establishing quality student-faculty interaction (Zweigenhaft, 1976).

In a more recent study, it is proposed that faculty should take advantage of various social-network media to further the student-faculty interactions medium and opportunity (Li & Pitts, 2009). Laird and Kuh (2005) reported that information technology plays an important role in enhancing effective student–faculty interaction. A study actually reported that students nowadays preferred the digital format for student-faculty interaction (Li, Finley, Pitts, & Guo, 2011). In addition, the study suggests that the communication technology need not be very fancy (multi-media rich) even with just the use of email for communication is considered effective (which has been around for a very long time), as long as students are able to get an on-time reply, students are satisfied.

Cox and Orehovec (2007) found out that within the model of residential learning five distinct interactions are present, namely: *disengagement, incidental contact, functional interaction, personal interaction,* and *mentoring*. These findings suggest that almost all types of student-faculty interactions have a positive effect on

students. Even the non-academic informal interactions between faculty and students are said to be able to provide meaningful results. Furthermore, Cotten and Wilson (2006) mentioned that there are three distinct issues with regards to student-faculty interactions, such as: *the frequency and nature of the interactions, the impact of academic and social interactions,* and *the lack of student cognition towards the institution.* Although their findings also noted that most students prefer not to interact with their faculty. Not to mention the even minimal contact with faculty outside the classroom. In reality, students are not aware that interactions have an overall positive impact on their academic studies (Cotten & Wilson, 2006).

In light of the aforementioned issues, it seems that students must at first be able to have an environment wherein student-faculty interactions are seen as a normal day to day activity. In addition, the quality and frequency of the interactions should also be maintained no matter what type of medium it may be, or whether it is in-class or out-class (informal). Therefore, the current study shall provide the findings of the experiences of residential colleges in Taiwan that practices the concepts of student-faculty interactions.

3. Methodology

The current study uses the statistical method of structured equation modelling in testing the relational model of student-faculty interaction within the *Shuyuan* in Taiwan. Structured equation modelling is a highly used tool in testing relationships among the latent and observes variables (Schreiber, Stage, King, Nora, & Barlow, 2006). The framework of the study primarily builds on the construct of a dataset called the Taiwan's Higher Education Students Survey, wherein Hu et al. (2012) managed to develop a Taiwan Student Engagement Model. In addition, the current study also uses the construct of the NSSE (Kuh, 2001, 2009) selected and grouped together under the five educational benchmark practices and three educational outcome gains factors. Lastly, local contextual items that are unique with the *Shuyuan* model of learning are also included.

3.1 Hypothesis

For the current study, it is hypothesized that the new model of learning in *Shuyuan* or residential colleges in Taiwan are mediated by the student-faculty interaction. Let us assume that student engagement factors as the latent independent variable, student-faculty interaction as the latent mediator and the educational outcome gains as dependent variables. Note that within the study *Shuyuan* and residential colleges are interchangeably used, however, pertains to the same concepts. Figure 1 shows the hypothesized mediated model for the residential college students in Taiwan. The initial hypotheses are as follows:

➢ **Hypothesis 1**. For residential college students, both student engagement and student-faculty interaction have significant positive effect on educational outcome gains.

➢ **Hypothesis 2**. For residential college students, student-faculty interaction mediates the relationship between student engagement and educational outcome gains.

3.2 Participants

The current study involved 724 undergraduate students enrolled in residential college from National Tsing Hua University (37.7%), Tung Hai University (20.5%), National Chung Cheng University (17.4%), and National Cheng Chi University (24.4%). The sample included 440 (60.8%) women and 284 (39.2%) men. Of the participants, 30.8% were freshmen, 26.1% were sophomores, 26.1% were juniors, and 17.0% were seniors. For the various background information of the four residential colleges used in the current study please read Hu et al. (2013) wherein a comparison of the various objectives and strategies of four key institutions are accomplished.

3.3 Measures

Student engagement (SE) is used to describe what college students are doing. Four observed variables were

used to measure the latent variable student engagement, including Active and collaborative Learning (ACL), Enriching Education Experiences (EEE), Cross Field Learning (CFL), and Citizenship. Within each observed variables, a subscale of 4 to 6 items were used. All of the items use a 7-point Likert scale ranging from 1 to 7. Four scales are reliable and valid, while the coefficient alpha ranging from .70~.89 and the explained variance ranging from 51%~71%.

Student-faculty interactions (SFI) are the factors used to describe the quality of interactions between students and faculty. Five items were used to measure the latent variable student-faculty interaction, sample items are *teachers are able to provide written or oral feedbacks for my school works*. All of the items use a 7-point Likert scale ranging from 1 to 7. Reliability of the scale is computed to have a coefficient alpha of .86, while the explained variance is 78%.

Educational outcome gains (EOG) are the items use to describe what college students have learned. Four observed variables were used to measure the latent variable educational outcome gains, including General Education Gains (GEG), Practical Competence Gains (PCG), and Personal Social Gains (PSG). Each of the observed variables are composed of subscale with 3 to 6 items, all of the items use a 7-point Likert scale ranging from 1 to 7. Four scales are reliable and valid with the coefficient alpha ranging from .82~.90, and the explained variance ranging from 52%~73%.
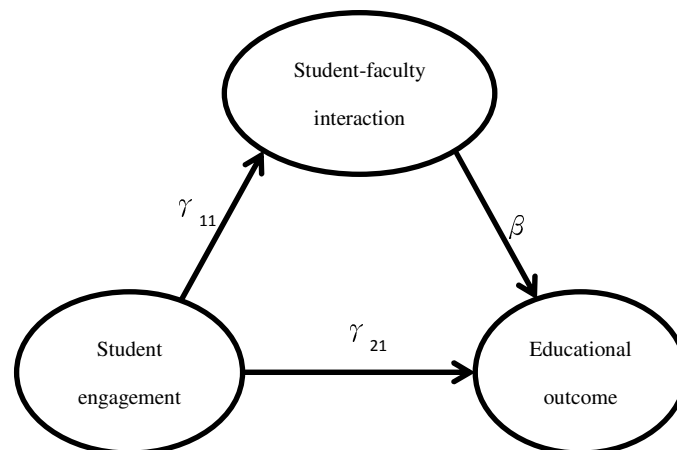

Figure 1. Hypothesized mediated model

3.4 Data analysis

The collected sample was then separated into two parts using random distribution as follows: 33% sample, *n*=241; 67% sample, *n*=483. 33% sample size was used in the measurement model (for the computation of the Confirmatory Factor Analysis, CFA), while the remaining 67% sample size was used in the structure model (path analysis and mediation test). Descriptive statistics and correlation estimated using the SPSS version 21, while the composite reliability (CR) and average variance extracted (AVE) were used to prove the reliability and validity of measurement model. Structure model was used to explain the relationship and effect among latent variables. Structure equation modeling was estimated using the maximum-likelihood method in the AMOS 20 program (Arbuckle, 2011).

4. Results

4.1 Preliminary analyses

Means, standard deviations (SD), and zero-order correlations for the 11 measured variables are shown in Table 1. Since the numbers of items are not equal in each of the variable, standard practice is to show the mean

values instead. Table 1 shows that all of the means of observed variables ranging from 3.67~5.18, while SD ranging from 1.00~1.73. In addition, the multivariate normality test was accomplished to test whether the data met the assumptions for normality underlying the maximum-likelihood procedure used to test the models. The results of the multivariate normality test indicated that the data are within the normal range, while multivariate kurtosis of < 3. Therefore, maximum-likelihood method is appropriate.

Table 1

Means, standard deviations, and zero-order correlations matrix (N=724)

Variables	Mean	*SD*	1	2	3	4	5	6	7	8	9	10	11	12
ACL	5.00	1.13	1											
EEE	4.81	1.00	.62	1										
CFL	5.11	1.13	.58	.58	1									
Citizenship	3.67	1.40	.47	.58	.49	1								
SFI_1	4.15	1.73	.28	.28	.20	.23	1							
SFI_2	4.81	1.52	.39	.34	.31	.23	.67	1						
SFI_3	4.51	1.56	.33	.31	.26	.23	.54	.64	1					
SFI_4	4.82	1.54	.34	.31	.31	.20	.51	.56	.62	1				
SFI_5	4.75	1.67	.37	.29	.31	.24	.57	.64	.67	.64	1			
GEG	4.68	1.08	.41	.49	.41	.37	.38	.48	.51	.48	.52	1		
PCG	4.21	1.02	.37	.42	.35	.31	.45	.46	.48	.47	.47	.77	1	
PSG	5.18	1.10	.42	.44	.44	.31	.35	.49	.52	.50	.51	.85	.70	1

Note. All values of correlation are significant ($p < .001$)

4.2 Measurement model

Before a structural model is tested, Anderson and Gerbing (1988) proposed the use of a CFA to examine whether the measurement model provides an acceptable fit to the data. Once an acceptable measurement model is developed, the structural model can be tested. As suggested by Tucker and Lewis (1973) and Byrne (2001) five fit indices were used to assess goodness of fit for the model. Table 2 shows the results of the model fit values. Such as: the goodness of fit index (GFI; values > 0.90 which indicate good fit), the comparative fit index (CFI; values > 0.90 which indicate good fit), the Tucker-Lewis Index (TLI; values > 0.90 which indicate good fit), the non-normed fit index (NFI; values > 0.90 which indicate good fit), and the root-mean-square error of approximation (RMSEA; values < 0.08 which indicate good fit).

Table 2

Model Fit Indices

Indices	Measurement model	Structural model	Criteria
N	241	483	
χ^2	92.62	178.07	
df	51	51	
GFI	.94	.95	>.90
CFI	.96	.97	>.90
TLI	.95	.96	>.90
NFI	.95	.96	>.90
RMSEA	.071	.068	<.08

For the test of the measurement model resulted in a relatively good fit to the data with $\chi^2 = 115.03$, df = 41, GFI = .94, CFI = .96, TLI = .95, NFI = .95, and RMSEA = .071; while all of the standardized loadings of the measured variables on the latent variables were greater than .66 and statistically significant at $p < .001$ (please see Table 3). CR of the latent variables ranging from .84~.94, while the AVE ranging from .56~.84, both CR and

AVE values are within the standard accepted value (Fornell & Larcker, 1981; Hair, Anderson, Tatham, & Black, 1998; Hair, Black, Babin, Anderson, & Tatham, 2005; Hair, Black, Babin, & Anderson, 2010). Therefore, all of the latent variables appear to have been adequately operationalized by their respective indicators. In addition, correlations among the independent latent variables, the mediator latent variable, and the dependent latent variables were all statistically significant with $p < .001$ (see Table 4).

Table 3

Factor loadings for the measurement model (33% sample, n = 241)

Factor/Item	Standardized factor loading	error	t	AVE	CR
Student engagement (SE)				.56	.84
ACL	.77				
EEE	.83	0.05	18.29		
CFL	.73	0.06	16.35		
Citizenship	.66	0.07	14.79		
Student-faculty interaction (SFI)				.62	.89
SFI_1	.72				
SFI_2	.80	0.06	17.45		
SFI_3	.81	0.06	17.56		
SFI_4	.77	0.06	16.77		
SFI_5	.82	0.06	17.88		
Educational outcome gains (EOG)				.84	.94
GEG	.95				
PCG	.91	0.03	26.56		
PSG	.89	0.03	32.72		

Note. All standardized factor loading are significant ($p < .001$)

Table 4

Correlations matrix for the measurement model (33% sample, n = 241)

Latent Variables	1	2	3
1. Student engagement(SE)	1		
2. Student-faculty interaction (SFI)	.50	1	
3. Educational outcome gains (EOG)	.69	.66	1

Note. All values of correlation are significant ($p < .001$)

4.3 Structural model for testing mediated effects

Taking the factor student engagement as the latent IV, student-faculty interaction as the latent mediator, and the educational outcome gains as the dependent variables; the results showed a good fit for the model with χ^2 =178.07, df = 51, GFI = .95, CFI = .97, TLI＝.96, NFI= .96, RMSEA = .068, while all the effect size of structural paths were computed to be of medium ($\gamma_{11} = .50$, $\beta_1 = .48$, $\gamma_{21} = .37$) and are significant with the significant value $p < .001$ (see Table 5).
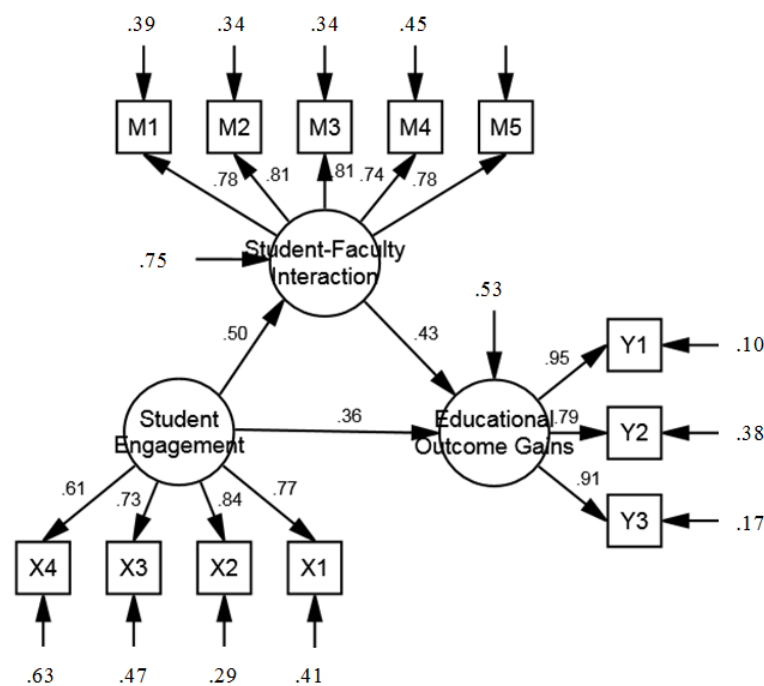
Table 5

Bootstrap analysis of structural model (67% sample, n = 483)

Direct effect			Indirect effect		Total effect	
γ_{11}	β_1	γ_{21}	$\gamma_{11}*\beta_1$	95% CI	$\gamma_{21}+\gamma_{11}*\beta_1$	95% CI
.50***	.48***	.37***	.24	.18～.30	.61	.53～.69

Note. *** $p < .001$

MacKinnon, Lockwood, Hoffmann, West, and Sheets (2002) uses various approaches in examining the

mediation for consideration of Type I errors and statistical power. They found that the most often used strategy is the one used by Baron and Kenny (1986) which has the least power for both γ_{11} and β_1 to be significant. In addition, many studies also uses the approach that relies on the Sobel test (1982) to examine the significance of the mediation effect ($\gamma_{11}*\beta_1$ have to be significant). However, if there are evidences that the distribution of mediation effect is not normal; Sobel test, which assumes a normal distribution when examining the mediation effect, is not appropriate (MacKinnon & Dwyer, 1993). Therefore, it suggested that the use of the bootstrap method can be a better way to examine mediation (Shrout & Bolger, 2002). Bootstrap method acquires 95% of the confidence intervals (CI) for the indirect effect by resampling procedure. Based on central limit theorem, bootstrap method is robust even when the distribution of mediation effect is not normal. Using Shrout and Bolger (2002) suggested value, if 95% of the CI is used for the estimates of the indirect effects based on 5000 indirect effect estimates; which does not include zero, then it can be concluded that the indirect effect is statistically significant at the .05 level. Therefore, after the structural models were examined through the AMOS 20 program, the bootstrap procedure was used to test whether or not the indirect effects are statistically significant.

Wherein:
M1︰My teacher guides/assists me in accomplishing my school related tasks
M2︰My teachers provide me with written or oral feedbacks for my school works
M3︰My teachers give suggestions regarding my future career
M4︰When I have difficulty with my lessons, I know where to look for resources and/or ask for assistance
M5︰Besides academic related issues, my teachers also show concern toward other extracurricular activities

X1: Active and collaborative Learning (ACL)
X2: Enriching Education Experiences (EEE)
X3: Cross Field Learning (CFL)
X4: Citizenship

Y1: General Education Gains (GEG)
Y2: Practical Competence Gains (PCG)
Y3: Personal Social Gains (PSG)

Figure 2. Structural model

Mediation effect is also referred to as the indirect effect ($\gamma11*\beta1$), which is .4; while the 95% CI for the estimates of the indirect effects ranging from .18~.30 does not include zero. Therefore, it can be concluded that

the indirect effect is statistically significant at the .05 level. For residential college students, student-faculty interaction plays a role as mediator between student engagement and educational outcome gains. Wherein the total effect is the summation of direct effect and indirect effect ($\gamma21 + \gamma11*\beta1$), the total effect is computed to be .61, while the 95% CI for total effects ranging from .53~.69 does not include zero. Hence, the total effect is statistically significant at the .05 level. In sum, the results of the structure model (see Figure 2) shows that the theory model can explain the educational outcome gains for *Shuyuan* or residential college students in Taiwan. Therefore, both of the proposed hypotheses are supported. In addition, according to Baron and Kenny (1986) if the direct effect is still significant, the model is considered a partial mediation, wherein there may be other effective mediator that can be taken into consideration in the future.

5. Conclusion

The current study uses the statistical method of structured equation modelling in providing an empirical explanation between the relationship of student engagement factors, student-faculty interaction, and educational outcome gains. As the study shows that the student-faculty interaction acts as a mediator between student engagement and educational outcome gains; denoting that the quality of interaction between faculty and students as instrumental for students' improvement. Such results imply that schools should create an atmosphere of positive and healthy student-faculty interactions. Even though that educational institution provide opportunities for active and collaborative learning and enriching education experiences, these engagement are enhanced with the help of student-faculty engagements.

As for the uniqueness of *Shuyuan* model of learning in Taiwan, it is noted that among the different colleges (4 residential colleges used in this study), key developmental focus of engagement are not that similar (Hu, Ching, & Hung, 2015). However, the core method used is still the same, which is student-faculty interaction. Further studies can be made with the graduates of these academies, as the notion of student engagement is said to persists, comparison between the normal (traditional) educational systems' graduates should shed light in better understanding the effectiveness of *Shuyuan* and student-faculty interaction.

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