



Higher Education Research and Development Society of Australasia Inc

Research and Development in Higher Education: Higher Education in a Globalized World

Volume 37

Refereed papers from the
37th HERDSA Annual International Conference

7 - 10 July 2014
Hong Kong Baptist University
Hong Kong SAR, Peoples Republic of China

Zhao, Y. & Huen, J. (2014). A tale of two cohorts: Measuring and understanding the learning experience of the double cohort. In A. Kwan, E. Wong, T. Kwong, P. Lau & A. Goody (Eds.), *Research and Development in Higher Education: Higher Education in a Globalized World*, 37 (pp 342 - 352). Hong Kong, 7 – 10 July 2014.

Published 2014 by the
Higher Education Research and Development Society of Australasia, Inc
PO Box 27, MILPERRA NSW 2214, Australia
www.herdsa.org.au

ISSN 1441 001X
ISBN 978-0-908557-96-7

This research paper was reviewed using a double blind peer review process that meets DIISR requirements. Two reviewers were appointed on the basis of their independence and they reviewed the full paper devoid of the authors' names and institutions in order to ensure objectivity and anonymity. Papers were reviewed according to specified criteria, including relevance to the conference theme and sub-themes, originality, quality and presentation. Following review and acceptance, this full paper was presented at the international conference.

Copyright © 2014 HERDSA and the authors. Apart from any fair dealing for the purposes of research or private study, criticism or review, as permitted under the Copyright, Designs and Patent Act, 2005, this publication may only be reproduced, stored or transmitted, in any form or by any means, with the prior permission in writing of the publishers, or in the case of reprographic reproduction in accordance with the terms and licenses issued by the Copyright Licensing Agency. Enquiries concerning reproduction outside those terms should be sent to the publishers at the address above.

A tale of two cohorts: Measuring and understanding the learning experience of the double cohort

Yue Zhao

The University of Hong Kong, Hong Kong SAR, China

myzhao@hku.hk

Jenny Huen

The University of Hong Kong, Hong Kong SAR, China

jmyhuen@hku.hk

The present study examines the extent of variation in learning experience between two concurrent cohorts of first year students as a result of Education Reform in Hong Kong (known as the *double cohort*): students under the existing academic structure being admitted to the old three-year curriculum and students under the new academic structure being admitted to the new four-year curriculum. The Student Learning Experience Questionnaire (SLEQ), an instrument designed to measure students' learning experience in higher education was validated in the present study in a sample of 3102 first year students at a Hong Kong university, including 1445 students of the three-year cohort and 1657 students of the four-year cohort. Results from the confirmatory factor analysis showed that the scales of students' perceptions of learning environment (*active learning, feedback from teacher, motivation, clear goals and standards, and appropriate assessment*) in the SLEQ measured correlated constructs in a five-factor structure. In the comparison between the two cohorts on the factorial structure, results from the multiple-group confirmatory factor analysis imply that the two cohorts interpreted and responded to the studied scales in a similar manner. However, group difference existed between the two cohorts in their perceptions on *feedback from teacher* and *clear goals and standards*. These findings could enhance teaching and learning through a better understanding of the learning experience perceived by the double cohort. Implications of the present study to *re-thinking higher education research, professional development and evaluation in globalized world* (sub-theme of HERDSA 2014) will be addressed.

Keywords: measurement, student learning, higher education

Background

The education system in Hong Kong is undergoing a once-in-a-lifetime reform in its academic structure for senior secondary and higher education starting from the 2012/13 academic year. Prior to the reform, the students in Hong Kong were expected to complete seven years of secondary education and take two public examinations (known as the Hong Kong Certificate of Education Examination, HKCEE, and the Hong Kong Advanced Level Examination, HKALE) before they could apply for admission to undergraduate degree programmes offered by local universities. Under the new academic structure (for details, see *The New Academic Structure for Senior Secondary Education and Higher Education – Action Plan for Investing in the Future of Hong Kong*, Education and Manpower Bureau, 2005), all students in Hong Kong are required to complete six years of secondary education (divided into 3 years of junior secondary curriculum & 3 years of senior secondary curriculum) and take one public examination (known as the Hong Kong Diploma of Secondary Education Examination,

HKDSE); and the normative length of study for the undergraduate degree programme is extended from three to four years. During the transition period from 2012/13 to 2014/15, the Hong Kong universities are concurrently accommodating a double cohort of students, which consists of the last graduating class of students from seven years of secondary education at the Advanced level (a.k.a. the *3-year cohort* who will undergo a 3-year curriculum in tertiary education) and the first graduating class of students from six years of secondary education at the Diploma of Secondary Education level (a.k.a. the *4-year cohort* who will undergo a 4-year curriculum in tertiary education). This change in the academic structure for senior secondary and higher education can align Hong Kong with a number of higher education systems globally, including the United States and the Mainland China, and on the other hand it enables the revamp to the curriculum towards the global trend of promoting students to learn with a broadened knowledge base and generic skills such as critical thinking and creativity (Education and Manpower Bureau, 2005).

The new senior secondary curriculum (for details, see *Senior Secondary Curriculum Guide*, Curriculum Development Council, 2009) was designed to promote students to learning in a broad and balanced curriculum with core subjects, elective subjects, and other learning experiences. In particular, one of the core subjects, Liberal Studies, was designed to prepare students for the general education programmes in higher education. On the other side, the higher education institutions in Hong Kong reviewed and revised their general education programmes and designed non-disciplinary specific courses for a more rounded general education curriculum, which constituted around 25% to 30% of the entire undergraduate curriculum (University Grants Committee, 2013). Some of the institutions also introduced the general education programmes and/or non-discipline-specific courses into the three-year curriculum so as to enable students of the three-year cohort to benefit from the enhancement of teaching and learning brought by the new curriculum as well.

Though with years of careful planning for the transition, the new curriculum had to be implemented with much unknown on how the two cohorts would differ in terms of their readiness to learn in the undergraduate curriculum. Specifically, it was highly questioned whether the students of the four-year cohort could be comparable to the three-year cohort in their learning given that they have received one less year of secondary school education and have been exposed to one less high-stake examination. From the student learning perspective (e.g. Marton & Säljö, 1976; Prosser & Trigwell, 1999), the learning experience of the two cohorts of students may vary due to the potential differences in their prior experience of teaching and learning in secondary education. The two cohorts have undergone different secondary school curricula as described earlier, and this difference in their secondary school background may result in substantial difference in their learning experience in higher education. There is thus an impending need for research into higher education of Hong Kong to undertake institutional research on the learning experience of this double cohort. The key research question to be addressed is whether the two cohorts of students are experiencing their learning in a similar way under the three-year and four-year undergraduate curricula. These findings could inform the curriculum design that will cater for the learning needs of both cohorts of students.

The Student Learning Experience Questionnaire (SLEQ)

A number of universities in Hong Kong conduct institutional surveys on students' learning experiences on a regular basis. One of the institutional surveys, named as the Student Learning Experience Questionnaire (SLEQ), aims to find out how undergraduates have experienced their learning at the University, with the focus on students' experience in respect

to teaching and learning in the curriculum of their discipline as a whole. The questionnaire is modelled on the Course Experience Questionnaire (CEQ), a well-established instrument which has been validated in various studies (e.g. Byrne & Flood, 2003; Ginn, Prosser, & Barrie, 2007; Webster, Chan, Prosser, & Watkins, 2009; Wilson, Lizzo, & Ramsden, 1997), based on the works by Ramsden (1991) within the context of Australian higher education institutions. A number of universities around the world adapted the CEQ. For example, the University of Sydney modified the CEQ to focus on students' experiences at the degree level and renamed the questionnaire as the Student Course Experience Questionnaire (SCEQ; University of Sydney, Institute for Teaching and Learning, 1999); whereas the University of Oxford added some institution-based questions to the CEQ and renamed the questionnaire as the Oxford Student Course Experience Questionnaire (OSCEQ; University of Oxford, Institute for the Advancement of University Learning, 2002).

Webster and her colleagues (2009) validated the SCEQ (a modified version of the CEQ and an initial version of the SLEQ) in the context of Hong Kong. Specifically, they reported that when administered to the Hong Kong undergraduate students, the SCEQ was of good reliability on most scales: *Good teaching* ($r_c = .837$), *clear goals and standards* ($r_c = .575$), *appropriate assessment* ($r_c = .794$), and *appropriate workload* ($r_c = 0.620$) (Note: r_c denotes the composite reliability). With regard to the construct validity of the SCEQ, the scale structure of the SCEQ was confirmed by both exploratory and confirmatory factor analyses.

Despite a validation study on the SCEQ has already been conducted by Webster et al. (2009), evaluation of psychometric properties of the SLEQ (a modified version of the SCEQ) is necessary because the questionnaire has gone through a number of item and scale revisions over the years in address of developments in contemporary institutional focuses and practices. Moreover, whether the construct being measured by the SCEQ/SLEQ is applied similarly to different cohorts has not been studied in the context of Hong Kong, in particular on the double cohort. Measurement invariance will be examined in the present study to ensure that the SLEQ is measuring students' perceptions of their learning experience in a same manner and the underlying constructs being measured by the SLEQ share the same theoretical structure across the two cohorts, and such that the observed group differences, if any, between the two cohorts reflect the differences of the underlying constructs being measured by the SLEQ.

Research Questions under Consideration

Taken together, the present study aims to address three research questions:

1. Does the SLEQ demonstrate sound psychometric properties and fit into the hypothesized factor structure?
2. Does the SLEQ function equivalently across the three-year cohort and four-year cohort in measuring their learning experience?
3. Are there substantial differences between the three-year cohort and four-year cohort in terms of their own perceptions of learning environment?

Methodology

Participants and Data Collection

Data was collected towards the end of the second semester of 2012/13, which is the first academic year of the transition period. All enrolled first year students in a Hong Kong

university were invited to complete the Student Learning Experience Questionnaire on-line. An overall response rate of 79.6% was achieved. The high response rate reduces sample bias, increase generalizability of findings, and allows advanced statistical analysis that requires large sample size. After a removal on the aberrant responses and responses from students who did not undergo local secondary schooling, the sample size used for subsequent data analyses in the present study is 3102 (including 1445 students of the 3-year cohort and 1657 students of the 4-year cohort). Aberrant responses (i.e. responses in a pattern of uniform rating for all survey items) may be a potential threat to the validity of the measurement, and thus they were removed from the current study. Respondents not undergoing local secondary schooling were also excluded from the current study in a view that only students who received local secondary education were subject to the changes brought by the education reform.

Instrument

The Student Learning Experience Questionnaire (SLEQ) mainly comprises: (1) scales on students' perceptions of learning environment in the curriculum of their discipline as a whole (based on the adapted scales from the CEQ, Ramsden, 1991) and (2) scales on students' perception of achievement of the institutional level educational outcomes. Since the present study focuses on the study of students' learning experience, the results of the latter will not be reported in the present study.

The scales on students' perceived learning environment have a total of 15 items, in 5-point Likert scale with the rating categories "Strongly Disagree", "Disagree", "Neutral", "Agree" and "Strongly Agree". One sample item is illustrated below for each of the five scales.

- Scale 1: Active learning
 - No of items: 3
 - Sample item: "I was given the chance to participate in a variety of activities in class."
- Scale 2: Feedback from teacher
 - No of items: 4
 - Sample item: "The teachers normally gave me helpful feedback on my progress."
- Scale 3: Motivation
 - No of items: 2
 - Sample item: "The teachers of the degree curriculum motivated me to do my best work."
- Scale 4: Clear goals and standards
 - No of items: 3
 - Sample item: "I usually have a clear idea of where I am going and what is expected of me in this degree curriculum."
- Scale 5: Appropriate assessment

- No of items: 3
- Sample item: “I am assessed on how well I can apply what I have learnt to new situations.”

Analyses

A number of psychometric properties were being examined with a focus on reliability and validity. The internal consistency of each scale was examined using Cronbach’s alpha. The internal structure of each scale was evaluated separately using a principal component analysis (PCA) of the individual items. In order to determine if the aforementioned 15 items in the SLEQ follow the hypothesized five-factor structure, a correlated five-factor model was constructed to incorporate all the five scales of students’ perception of learning environment and all the corresponding items within each scale, assuming the scale-related factors to be correlated with each other. A good model fit in confirmatory factor analysis (CFA) would support the five-factor structure. Next, measurement invariance of the 15-item SLEQ across the three-year and four-year cohorts was evaluated by fitting a series of multiple-group confirmatory factor analysis (MG-CFA) models. The MG-CFA models to be tested are, in sequence of:

- Model 1 (baseline model): Configural invariance (same pattern of fixed and free parameter estimates, without any equality constraints)
 - To test if the number of factors and the pattern of the factor structure are comparable across the three-year and four-year cohorts
- Model 2: Metric invariance / Weak factorial invariance (imposing equality constraints on factor loadings)
 - To test if each item associates with its corresponding factor in the same unit of measurement across both cohorts
- Model 3: Scalar invariance / Strong factorial invariance (imposing equality constraints on factor loadings and item intercepts)
 - To test if each item associates with its corresponding factor in the same unit of measurement and at the same level of measurement (or, in a same metric), across both cohorts; in other words, to examine whether the two cohorts interpret and respond to the scales in a similar manner

PCA was conducted using IBM SPSS Statistics 20.0 (IBM Corp., 2011). CFA and MG-CFA were performed based on Pearson correlation matrix using the maximum likelihood estimation method in LISREL 8.8 (Jöreskog & Sörbom, 2006). According to the literature (e.g., Browne & Cudeck, 1993; Hu & Bentler, 1999; Bentler & Bonett, 1980), a good fit is generally indicated by a comparative fit index (CFI) value above.90, a goodness-of-fit index (GFI) value above.95, a root mean square error of approximation (RMSEA) value below.05, and a standardised root mean square residual (SRMR) value below.08. The chi-square difference test was used to test the differences in fit between the model with additional constraints and the less restricted model (e.g. Model 2 vs. Model 1; Model 3 vs. Model 2). The invariance hypothesis is rejected if the chi-square difference test is smaller than the

critical value at .05 alpha level. A good fit indicates that it is permissible to continue with further invariance hypotheses, and a poor fit suggests that further testing is not appropriate.

Results

Psychometric Properties

Table 1 summarizes the key psychometric properties of the scales being studied. For all the analyses, the three-year and four-year first year cohorts were performed separately.

Table 1: Psychometric properties of the study scales

Scales	α	No. of Items	Eigenvalues	% of Variance
3-Year Cohort (n = 1445)				
1. Active learning	.87	3	2.37	78.98%
2. Feedback from teacher	.90	4	3.09	77.29%
3. Motivation	.78	2	1.64	81.97%
4. Clear goals and standards	.83	3	2.23	74.17%
5. Appropriate assessment	.86	3	2.34	77.88%
4-Year Cohort (n = 1657)				
1. Active learning	.87	3	2.40	79.98%
2. Feedback from teacher	.90	4	3.06	76.49%
3. Motivation	.78	2	1.64	81.82%
4. Clear goals and standards	.83	3	2.23	74.40%
5. Appropriate assessment	.84	3	2.29	76.20%

Cronbach's alphas of the scales for both cohorts of students ranged from .78 to .90, implying a high consistency of the student rating scores for each of the scales, considering a value of .70 as a commonly accepted minimum reliability estimate in psychological and educational measurement (Nunnally & Bernstein, 1994). In other words, the SLEQ to a great extent can be considered a reliable instrument.

Table 1 also illustrates the eigenvalue and percentage of the total variance the dominant factor accounted for in each scale. Using the criterion of eigenvalue greater than 1 (Kaiser, 1974), results from the principal component analysis on each of the scales produced a one-factor solution. These findings clearly suggest the presence of one factor for each of the scales for both cohorts of students. Amongst all the scales, the percentage of variance the dominant factor accounted for ranged from 74.17% to 81.97% under the three-year cohort and 74.40% to 81.82% under the 4-year cohort. In sum, the one-factor solution supports the unidimensional nature of the internal structure for each scale in the SLEQ.

Confirmatory Factor Analysis

In the confirmatory factor analysis, the fit indices for the correlated five-factor model (CFI = .991; GFI = .970; RMSEA = .0508; & SRMR = .0314) generally suggest a good or acceptable fit, though the RMSEA is marginally acceptable using the criteria discussed earlier. The path diagram showing the item-factor loadings and factor inter-correlations of the model is illustrated in Figure 1. The item-factor loadings were all significantly different from zero (p

< .05); with the values ranging from .73 to .87 (see Figure 1). The model-implied inter-correlations among the five factors were all significantly different from zero ($p < .05$); with the values ranging from .52 to .83 (see Figure 1).

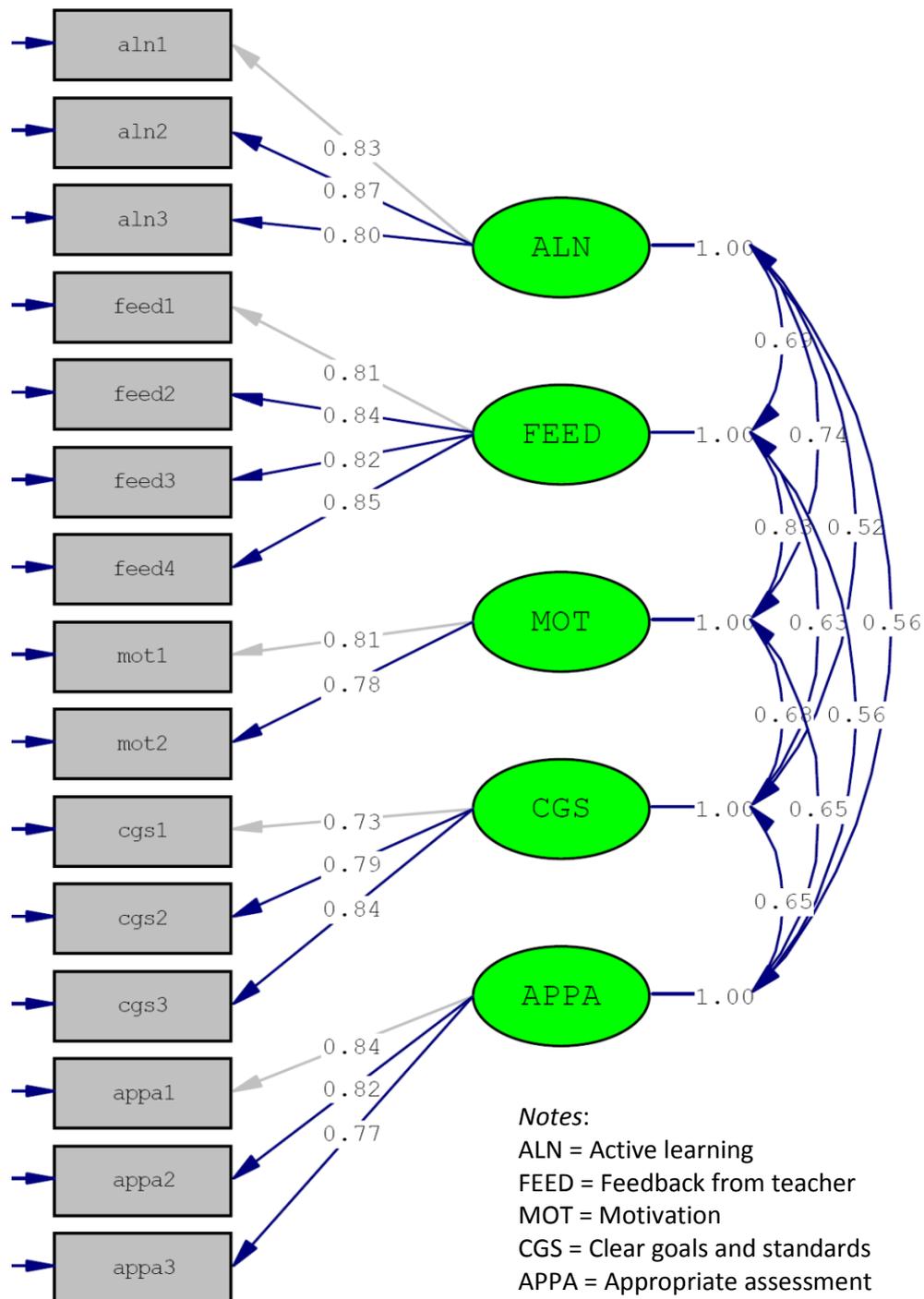


Figure 1: Path diagram of the correlated five-factor model

Multiple-Group Confirmatory Factor Analysis

Table 2 illustrates the fit indices for the sequence of multiple-group confirmatory factor analysis models that tested different types of measurement invariance.

Table 2: Fit indices of the multiple-group confirmatory factor analysis

Model	χ^2	df	RMSEA	SRMR	CFI	Model Comparison	$\Delta\chi^2$	Δdf
Model 1: Configural invariance	921.720*	160	.0554	.0336	.989	\	\	\
Model 2: Metric invariance	923.610*	170	.0535	.0344	.989	Model 2 vs. Model 1	1.890	10
Model 3: Scalar invariance	927.093*	180	.0521	.0345	.989	Model 3 vs. Model 2	3.483	10

Note. RMSEA = root mean square error of approximation; SRMR = standardised root mean square residual; CFI = comparative fit index.

* $p < .001$

The baseline model (Model 1) in which no equality constraints were imposed showed adequate fit (CFI = .989; RMSEA = .0554; & SRMR = .0344). When the equivalence of the factorial loadings was first imposed (Model 2), the chi-square difference test was not significant, $\Delta\chi^2(10) = 1.890$, $p > .05$, which supports metric invariance. Next, when the equivalence of the intercept values was added (Model 3), the chi-square difference test was not significant, $\Delta\chi^2(10) = 3.483$, $p > .05$, which supports scalar invariance. Therefore, measurement invariance was met, suggesting that the factorial structure of the SLEQ was operating equivalently in measuring the learning experiences across two cohorts. Practically speaking, both three-year cohort and four-year cohort interpreted and responded to the five scales in a similar manner.

The confirmation of the invariance of the intercepts (Model 3) allows comparison of the latent means across the two cohorts (Meredith, 1993). Holding the constraints of measurement invariance, the four-year cohort rated significantly lower than the three-year cohort in *feedback from teachers* ($diff_{3yr-4yr} = -0.072$, $p < .05$) and *clear goals and standard* ($diff_{3yr-4yr} = -0.052$, $p < .05$), indicating that on average, the four-year cohort rated 0.072 unit below the three-year cohort on *feedback from teachers* and 0.052 unit below the three-year cohort on *clear goals and standard*.

On a side note, the invariance of the factor variances and covariances was also tested, given that measurement invariance has been established. In the evaluation of factor variances and covariances equivalence, the chi-square difference test was not significant, $\Delta\chi^2(15) = 18.46$, $p > .05$, which supports invariance of factor variances and covariances (or structural invariance), implying that the five latent factors correlated with each other in a similar pattern across the two cohorts.

Discussion

The present study may well be amongst the first to apply rigorous psychometric methodology to compare the learning experience of the double cohort during the transition period of the reform in the academic structure for higher education in Hong Kong. In the following, the findings are discussed with implications to *re-thinking higher education research, professional development and evaluation in globalized world* (sub-theme of HERDSA 2014).

In the evaluation of the psychometric properties of the Student Learning Experience Questionnaire (SLEQ), Cronbach's alpha values of all reporting scales were no less than .70,

and they imply high consistency of the students' ratings within each scale. The findings from the principal components analysis for each scale showed a one-factor structure, which supported the unidimensional nature of the internal structure for each scale. The findings from the confirmatory factor analysis confirmed the hypothesized five-factor structure on students' perception of learning environment. With all of the above, the SLEQ demonstrates sound psychometric properties as a reliable and valid instrument in measuring students' learning experience in the higher education in Hong Kong.

In the testing of measurement invariance across the three-year and four-year cohorts, the findings from the multiple-group confirmatory factor analysis suggest that the factorial structure of the SLEQ was functioning equivalently in measuring the perceived learning environment across two cohorts, implying that the SLEQ is being interpreted in a conceptually similar manner by the two cohorts. One speculation is concerning the similarity between the three-year curriculum and four-year curriculum which in turn foster the students to share similar concepts of their learning in the undergraduate curriculum. As mentioned earlier, some of the local universities have phrased-in components of the new curriculum to the three-year curriculum to enable students to benefit as early as possible from the new curriculum.

However, differences do exist on the latent means of *feedback from teacher* and *clear goals and standards*. Specifically, the four-year cohort rated less positively than the three-year cohort on their learning experiences in both aspects. The possible explanations of these differences may come from students' prior education background and the nature of the curriculum. As mentioned earlier, the students of the four-year cohort had undergone a new senior secondary curriculum, one less secondary school year and one less public examination, and this difference in their secondary school background, compared with the three-year cohort, may render them difficult to realize the goals and standards expected for higher education, and raise their needs to receive feedback from teachers on their learning and performance. On top of that, the nature of the new four-year curriculum may be making the difference too. With more non-discipline-specific courses to be taken in the first year of study in the four-year curriculum, it may be more difficult for the students of the four-year cohort (compared with the 3-year cohort) to have a clear idea about what is expected in their discipline and they in turn demand for more feedback from their teachers on their learning in their discipline.

Regardless of the exact cause for the differences, the findings clearly pointed to the need to provide additional support to the students of the four-year cohort to enhance their learning experiences, especially on feedback from teachers (e.g. giving more effective and timely feedback on students' progress, allocating more time into commenting on students' work, and making more effort to understand difficulties that the students might be having with their work, etc.) and clear goals and standards (e.g. making it more clear to the students, right from the start and during the whole process, what is expected from them in the degree curriculum and the standard of works expected). Focus group interview with the students may be necessary to better understand their needs and the possible reasons underlying their different perceptions on the two aspects. Professional development programmes may be designed for the teachers in higher education on these topics for fostering positive changes in providing feedback to students and setting clear goals and standards in the curriculum.

For future direction to the higher education research in Hong Kong, the measurement and comparison of the learning experience of the double cohort could be evaluated over the years, as the two cohorts of students proceed to their later years of studies. The first year was only an

introductory year for the double cohort to their corresponding curricula. The learning experience of the students of the four-year cohort may change dramatically in their second and higher years with the increase in disciplinary studies compared with a majority of general education studies in their first year of study. It would be worthwhile to conduct follow-up studies at the end of students' second year and final year to look into the potential change in learning experiences at different stages of learning. In fact, the perceptions of the four-year cohort in their second year of study may be more comparable to the perceptions of the three-year cohort in their first year of study, taking into account of the relative time these two cohorts of students have undertaken over their normative years of study.

Many institutions, locally and globally, made use of student evaluation surveys for accreditation and institutional planning and use the survey data to benchmark with other institutions in higher education. The present study highlighted the importance of the validation process in designing and conducting evaluation for this purpose. The validation process involves accumulating evidence to provide a sound scientific and psychometric basis for supporting the intended use of an instrument. Undoubtedly, the evidence should not be limited to the internal consistency and measurement invariance discussed in the present study, but more evidence could be collected, such as, evidence based on relations to external variables (e.g., direct evidence of student learning, study process factors), to support the relevance of the instrument to its intended use. Furthermore, the present study made use of the survey data, after validation of the psychometric properties of the instrument, to study the potential impact of the education reform in Hong Kong on students' learning experience in an aim to inform curriculum design and to enhance teaching and learning environment through a better understanding of the learning experience perceived by the double cohort.

On a final note, cautions may be taken regarding the generalizability of the results. The results in the context of the undergraduate first year learning experience under education reform in Hong Kong may not be generalized to other globalized contexts which may have different internal structure, inter-scale correlations and internal consistency.

Acknowledgements

We would like to thank fellow colleagues for their diligent work in survey administration and data management. We are indebted to Professor Amy B. M. Tsui and Professor Michael Prosser for their valuable comments on the earlier version of this paper. Without this help and support, this study could not have been successfully conducted and presented.

References

- Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88(3), 588-606.
- Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollem & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Newbury Park, CA: Sage Publications.
- Byrne, M., & Flood, B. (2003). Assessing the teaching quality of accounting programmes: An evaluation of the Course Experience Questionnaire. *Assessment & Evaluation in Higher Education*, 28(2), 135-145.
- Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling*, 9(2), 233-255.
- Curriculum Development Council (2009). *Senior secondary curriculum guide – The future is now: from vision to realisation (Secondary 4-6)*. Retrieved from http://cd1.edb.hkedcity.net/cd/cns/sscg_web/html/english/index.html.
- Education and Manpower Bureau. (2005). *The new academic structure for senior secondary education and higher education – Action plan for investing in the future of Hong Kong*. Retrieved from http://334.edb.hkedcity.net/doc/eng/report_e.pdf.

- Ginn, P., Prosser, M., & Barrie, S. (2007). Students' perceptions of teaching quality in higher education: the perspective of currently enrolled students. *Studies in Higher Education*, 32(5), 603-615.
- Hu, L., & Bentler, P. M. (1999). Cut off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1), 1-55.
- IBM Corp. (2011). *IBM SPSS Statistics for Windows*, Version 20.0. Armonk, NY: IBM Corp.
- Jöreskog, K. G., & Sörbom, D. (2006). *LISREL 8.8: User's reference guide*. Skokie, IL: Scientific Software International Inc.
- Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, 39(1), 31-36.
- Marton, F., & Säljö, R. (1976). On qualitative differences in learning: I-Outcome and process. *The British Journal of Educational Psychology*, 46(1), 4-11.
- Meredith, W. (1993). Measurement invariance, factor analysis and factorial invariance. *Psychometrika*, 58(4), 525-543.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). New York, NY: McGraw-Hill.
- Prosser, M., & Trigwell, K. (1999). *Understanding learning and teaching: the experience in higher education*. Buckingham, PA: Society for Research into Higher Education & Open University Press.
- Ramsden, P. (1991). A performance indicator of teaching quality in higher education: The Course Experience Questionnaire. *Studies in Higher Education*, 16(2), 129-150.
- University Grants Committee (2013). "3+3+4" – *Nurturing our Talents*. Retrieved from <http://www.ugc.edu.hk/eng/doc/ugc/publication/report/AnnualRpt1213/full.pdf>.
- Webster, B. J., Chan, W. S. C., Prosser, M. T., & Watkins, D. A. (2009). Undergraduates' learning experience and learning process: quantitative evidence from the East. *Higher Education*, 58, 375-386.
- Wilson, K. L., Lizzio, A., & Ramsden, P. (1997). The development, validation and application of the Course Experience Questionnaire. *Studies in Higher Education*, 22(1), 33-53.

Copyright © 2014 Yue Zhao and Jenny Huen. The authors assign to HERDSA and educational non-profit institutions a non-exclusive license to use this document for personal use and in courses of instruction provided that the article is used in full and this copyright statement is reproduced. The authors also grant a non-exclusive license to HERDSA to publish this document in full on the World Wide Web (prime site and mirrors) and within the portable electronic format HERDSA 2014 conference proceedings. Any other usage is prohibited without the express permission of the authors.