

## Achievement of desired university graduate attributes through a new 4-year undergraduate program

**Daniel TL Shek<sup>1-6,\*</sup>, PhD,**  
**Lu Yu<sup>1</sup>, PhD,**  
**Wen Yu Chai<sup>1</sup>, PhD,**  
**Florence KY Wu<sup>1</sup>, PhD,**  
**and Wynants WL Ho<sup>1</sup>, MSc**

<sup>1</sup>Department of Applied Social Sciences,  
The Hong Kong Polytechnic University,  
Hong Kong, PR China

<sup>2</sup>Centre for Innovative Programs for Adolescents  
and Families, The Hong Kong Polytechnic University,  
Hong Kong, PR China

<sup>3</sup>Department of Social Work, East China  
Normal University, Shanghai, PR China

<sup>4</sup>Kiang Wu Nursing College of Macau,  
Macau, PR China

<sup>5</sup>Hong Kong Institute of Service Leadership  
and Management, Hong Kong, PR China

<sup>6</sup>Division of Adolescent Medicine, Department  
of Pediatrics, Kentucky Children's Hospital,  
University of Kentucky College of Medicine,  
Lexington, Kentucky, USA

### Abstract

This study investigated how the new 4-year undergraduate program, particularly the “General University Requirements” (GUR) at The Hong Kong Polytechnic University (PolyU) contributed to the development of five desired graduate attributes amongst students of PolyU, including critical thinking, effective communication, innovative problem solving, lifelong learning and ethical leadership. The findings based on different evaluation methods, including longitudinal survey studies, Collegiate Learning Assessment Plus, secondary analyses of Student Feedback Questionnaire data, qualitative evaluation studies, longitudinal case study and repertory grid test evaluation are first summarized. Based on the findings, the question of whether the 4-year program contributed to the development of desired graduate attributes was explored. Integration of the available evaluation findings suggests that the GUR has helped the undergraduate students to develop the graduate attributes and the new 4-year undergraduate programme can promote the holistic development of the students.

**Keywords:** General education, higher education, Hong Kong, program evaluation, desired graduate attributes, Chinese

### Introduction

Key generic competences such as effective communication, higher-order thinking, and problem-solving skills are becoming critically important in knowledge-based economy. There is no doubt that these competences were also stressed in previous times. However, in the previous era based on a manufacturing economy, the focus was mainly on the capital assets rather than the human assets (1). Instead, in the current era dominated by a globalized knowledge economy and a service-based economy, the human assets play a key role in economic development (1). Therefore, The Association of American Colleges and Universities issued a report

---

\* **Correspondence:** Daniel TL Shek, PhD, FHKPS, BBS, SBS, JP, Associate Vice President (Undergraduate Programme) and Chair Professor of Applied Social Sciences, Department of Applied Social Sciences, The Hong Kong Polytechnic University, Hungghom, Hong Kong, PR China. E-mail: daniel.shek@polyu.edu.hk

named “*College learning for the new global century*” in 2007 (2). The report proposed that the American university and college education should develop in students a set of core learning outcomes including knowledge of human cultures as well as physical and natural world, intellectual and practical skills, social responsibility, and integrative learning. Particularly, under the category of intellectual and practical skills, several key skills were stressed, including critical and creative thinking, written and oral communication, teamwork and problem solving. In addition, in order for developing these skills, the report called for a strengthening of general education programs in different American higher education institutions to foster “cross-disciplinary inquiry, analysis, and application” (2).

The review of goals of college education in the new century and its related curricular reforms have also been rigorously carried out in different places in Asia. In Mainland China, from 1990s to the early 2000s, there had been a heated discussion on and rigorous implementation of quality education and general education in Chinese higher education institutions. Accompanying this was a deep reflection on what quality of manpower should be developed by Chinese higher education in the 21<sup>st</sup> century. Although various views emerged, their common threads were to develop high-quality graduates with strong flexibility, broad knowledge base, moral character and strong generic skills (3, 4). Based on this consensus, many Chinese top universities have revised their Soviet-style overspecialized undergraduate curriculum by adding American elements of general education program (3, 5). In Taiwan, the programs of general education had been introduced into higher education institutions since 1950s and had undergone a rigorous and institutionalized development since 1990s (6). Up to 2000s, almost all higher education institutions in Taiwan have implemented a formal general education program in their undergraduate curriculum (6). Similarly, in Japan, general education programs have been introduced into Japanese higher education system since 1950s and achieved a rigorous development in 1960s. Although there was a decline in formal general education programs since 1990s, the spirit of general education has been integrated into specialized education and achieved by various

innovative pedagogy and curricula in different universities (7). These different practices in different Asian areas illustrated that general education has become an important strategy for different areas to enhance their higher education quality and to develop more rounded manpower to rise up to the challenges of a more globalized society.

Besides actual practices in the undergraduate programs, theories of general education also suggested that it was a very important strategy to develop students’ generic competences. Earlier in the 1820s, one famous report of Yale University (8, p. 7) defended liberal education which is the predecessor of the current concept of general education, claiming that the core purpose of a liberal education was “discipline and furniture of the mind; expanding its powers, and storing it with knowledge.” The Harvard report on general education entitled “*General education in a free society*” published in 1945 (9) also maintained that the essential aim of general education was to train students in four traits of mind, including “to think effectively, to communicate thought, to make relevant judgments, to discriminate among values.” In addition, the previous President of Chicago University, Robert Maynard Hutchins, a famous advocator of general education and the founder of the classic books model of general education program in Chicago University in 1930s and 1940s, also stressed that the goal of general education was to “draw out the elements of our common human nature” (10). These elements of common human nature were manifested in important intellectual virtues, such as the five intellectual virtues stressed in ancient times including the habits of induction, demonstration, philosophical wisdom, art, and prudence. These theoretical arguments and propositions further support the view that general education is an important curricular mean for students’ development in important generic competences.

Among general education initiatives in Asian societies, Hong Kong can be regarded as a “late starter.” Under the old British rule, there was not much room for the development of general education. Since the 2012-2013 academic year, mandated by the University Grants Committee, the higher education in Hong Kong has implemented a comprehensive reform on its undergraduate education program. Specifically, all the eight public universities in Hong Kong

extended the length of their undergraduate degree programs from three years to four years. In addition, they introduced a significant general education structure in their new four-year undergraduate curricula. The reform was targeted to nurture a more flexible and rounded manpower to cope with challenges of Hong Kong's transformation from a manufacture-based to a service-based economy and its increasing integration into a globalized knowledge economy (11, 12).

Among all these reforms, the one at The Hong Kong Polytechnic University (PolyU) was unique. In the 2012-2013 academic year, PolyU transformed its undergraduate curriculum from three to four years in length. In the new four-year curriculum, a new general education framework entitled "general university requirements" (GUR) was introduced. A major objective of the GUR was to nurture PolyU students in five desired graduate attributes, including effective communication, critical thinking, innovative problem solving, lifelong learning, and ethical leadership. These five attributes are regarded as key to PolyU students for their development to be locally and internationally competitive professionals and citizens.

The GUR is comprised of six major components, including freshman seminar (FS), leadership and intrapersonal development (LIPD), language and communication requirements (LCR), cluster area requirements (CAR), service learning (SL) and healthy lifestyle (HLS). Detailed introduction of these components can be seen in reference (13). An alignment of different components with the five

desired graduate attributes of PolyU is shown in Table 1.

To gauge the effectiveness of the 4-year program and to understand the changes in the students, a longitudinal study was carried out from the academic years of 2012-2013 to 2015-2016. Seven evaluation components based on different methods were included in the project, including (a) a four-year longitudinal online survey, (b) Collegiate Learning Assessment Plus (CLA+), (c) secondary data analyses of the Student Feedback Questionnaire (SFQ) data for GUR subjects, (d) student focus groups and written qualitative evaluation, (e) teacher focus groups and written qualitative evaluation, (f) longitudinal case study, and (g) repertory grid test. This evaluation project has several distinctive features and strengths. Firstly, it adopted a mixed-method approach including both quantitative and qualitative methods. This is valuable since the different methodologies could help to evaluate a program from different approaches and could help to answer different evaluation questions. Their results could also be integrated and triangulated to form a deeper understanding of an evaluation question (14). Secondly, even within either the quantitative or qualitative methodologies, different specific methods were adopted. For example, within quantitative methodology, both direct-approach evaluation (CLA+) and indirect-approach evaluation (longitudinal survey) were adopted to increase the validity of the research. Within the qualitative approach, focus groups with different stakeholders (students and teachers) were conducted to form a deeper understanding of the program from different stakeholders' perspectives.

**Table 1. Alignment of GUR components with five desired graduate attributes of PolyU**

	Professional competence	Critical thinker	Effective communicator	Innovative problem solver	Lifelong learner	Ethical leader
Freshman Seminar	⊙	⊙	⊙	⊙	⊙	
Language and Communication Requirements			●		⊙	
Leadership and Intrapersonal Development		⊙	⊙	⊙	●	●
Service Learning	⊙	●	⊙	●	⊙	●
Cluster Area Requirement		●	●		●	
Healthy Lifestyle Requirement					●	⊙

Note: ●:Target to make a significant contribution to the attribute; ⊙:Only some of the subjects/activities target to make a significant contribution to the attribute.

How might the evaluation findings tell us whether the five desired graduate attributes have been attained? In this paper, the major findings based on the different evaluation strategies are presented and summarized. The findings are then integrated to answer the question of whether the desired graduate attributes have been successfully achieved.

## Different evaluation studies in the longitudinal evaluation

The longitudinal online survey assessed the longitudinal development of students in the five desired graduate attributes of PolyU in their study of the new four-year curriculum and the GUR. Four hundred and thirty-four participants completed the questionnaire of all four academic years. Two control

groups were added in the third academic year, comprising 300 students studying in previous three-year curriculum of PolyU and 300 students studying in a four-year curriculum in a comparable local university based on quota sampling. Four validated instruments were included in the survey, including measures of empathy, positive youth development, learning styles and student engagement (15, 16). An alignment of different instruments with the five desired graduate attributes of PolyU is presented in Table 2. Findings revealed students' positive changes in four academic years in study of the PolyU four-year curriculum, particularly in the five desired graduate attributes of PolyU. PolyU four-year curriculum participants also performed better when compared to PolyU three-year curriculum participants and participants in four-year curriculum in a comparable local university (17-20).

**Table 2. Alignments between longitudinal online survey scales and desired graduate attributes of PolyU**

Desired Graduate Attributes	Instruments	Index
Problem Solving	CPYDS	Problem Solving
Critical Thinking	CPYDS	Critical Thinking
Lifelong Learning	CPYDS	Life-long Learning
	NSSE	Higher Order Learning
		Reflective and Integrative Learning
		Learning Strategies
		Quantitative Reasoning
Ethical Leadership	C-IRI	Empathy
	CPYDS	Ethical Leadership
		Self-leadership
Effective Communication	CPYDS	Social Competence
	NSSE	Collaborative Learning
		Discuss with Diverse Other

Note: CPYDS = Chinese Positive Youth Development Scale; C-IRI = Chinese Interpersonal Reactivity Index; NSSE = National Survey of Student Engagement.

### *Collegiate learning assessment plus (CLA+)*

Four rounds of CLA+ were conducted with four groups of students enrolled in PolyU four-year curriculum, respectively, in four time points (i.e., before the start and near the end of the 2013-2014 and 2015-2016 academic years) (21). The CLA+ is a standardized online test developed by U.S. Council for Aid to Education measuring an institution's contribution to students' development of problem solving, critical thinking and written communication skills (21). Findings revealed that students in senior-

year group performed significantly better than students in freshman-year and sophomore-year groups in almost all the competences tested by CLA+. A paper is under drafting on the findings (22).

### *Secondary data analyses of the student feedback questionnaire (SFQ) data*

Students' subjective outcome evaluation of GUR was conducted through secondary analyses of student feedback questionnaire data obtained in the four

academic years. Results revealed that across the four academic years from 2012-2013 to 2015-2016, students had positive evaluation of the GUR subjects based on the general and specific indicators. Students' positive evaluation of some components such as LCR-English has even increased over the four academic years. Findings of some specific academic years have been published (23-28).

#### *Student focus groups and written qualitative evaluation*

Qualitative evaluation based on student focus groups and written evaluation form was also conducted (29-33). The focus groups were guided by a protocol asking about students' views about the rationale, teaching methods, implementation and benefits of the GUR. The qualitative evaluation form included students' descriptors to describe the GUR, and their memorable experiences and perceived benefits. Results based on thematic analyses suggested that students in different years had positive views of the GUR, with specific reference to its subject contents, teaching methods, implementation and perceived benefits.

#### *Teacher focus groups and written qualitative evaluation*

Teachers teaching different GUR subjects were invited to participate in focus groups in four academic years from 2012-2013 to 2015-2016, and in written qualitative evaluation in 2013-2014 and 2014-2015

(34-38). The teacher focus groups were guided by a protocol inquiring teachers' views of the rationale, subject content, pedagogy, and benefits of GUR subjects. The written qualitative evaluation form included teachers' descriptors of the GUR, and their perceived implementation, challenges, and benefits of the GUR. Results suggested teachers' generally positive perceptions of the GUR, with specific reference to its rationale, teaching and learning, and impacts on students, although few concerns were noted.

#### *Other evaluation methods incorporated (longitudinal individual case study and repertory grid tests)*

The longitudinal case study and repertory grid test were also incorporated in the study. The former traced 42 students' longitudinal development during their study of the four-year curriculum (including the GUR) from freshman to senior year. The latter assessed 100 stratified random sample of senior-year students in terms of their change in indicators of self-identity after the study of four-year curriculum. The longitudinal case study data indicated students' positive personal growth and development of PolyU desired graduate attributes after studying the GUR (39, 40). The results of repertory grid test also suggested students' positive changes based on different indicators of self-identity. The related data analyses and paper writing are under way. Table 3 summarizes the papers in References section that have been published under each evaluation component.

**Table 3. Summary of papers published on the longitudinal evaluation project of the general university requirements (GUR) at PolyU**

GUR evaluation component	Paper published (in reference section)
Four-year longitudinal online survey	16, 17, 18, 19, 20
Collegiate Learning Assessment Plus (CLA+)	21, 22
Secondary analyses of Student Feedback Questionnaire (SFQ) data	23, 24, 25, 26, 27, 28
Student focus group and qualitative evaluation	13, 29, 30, 31, 32
Teacher focus group and qualitative evaluation	34, 35, 36, 37
Longitudinal case study	39, 40
Overall evaluation	15, 33, 38

## Integration of findings with reference to the desired graduate attributes

This part presents the findings related to the development of students under the new four-year curriculum and the GUR at PolyU, with particular reference to the five desired graduate attributes (i.e.,

critical thinking, innovative problem solving, effective communication, ethical leadership and lifelong learning). For each attribute, results from different evaluation approaches were presented and integrated. Table 4 shows how different evaluation mechanisms provide evidence for the achievement of the five desired graduate attributes.

**Table 4. Alignment of findings of different evaluation components with students' development in the five desired graduate attributes of PolyU**

Evaluation Component	Critical Thinking	Innovative Problem Solving	Effective Communication	Ethical Leadership	Lifelong Learning
Four-year longitudinal survey	√	√	√	√	√
Collegiate Learning Assessment Plus (CLA+)	√	√	√		
Secondary analyses of Student Feedback Questionnaire (SFQ) data					
Student focus group and qualitative evaluation	√	√	√	√	√
Teacher focus group and qualitative evaluation	√	√	√	√	√
Longitudinal case study	√	√	√	√	√
Repertory grid test	√	√		√	

### *Critical thinking*

In the longitudinal online survey, students' ability in critical thinking was assessed by the critical thinking subscale of CPYDS. Results showed students' significantly higher ratings of Critical Thinking subscale in the academic year of 2015-2016 than in 2012-2013 and 2013-2014 (17). Compared with control group 1, i.e., the students studying PolyU three-year curriculum, the experimental group (i.e., the students of PolyU four-year curriculum) scored significantly higher in critical thinking subscale (18), although no significant difference was found between experimental group and control group 2 (i.e., the students in the four-year curriculum in a comparable local university) (19). Students' critical thinking ability was also assessed by three subscales of CLA+, including scientific and quantitative reasoning, critical reading and evaluation, and critique an argument. Results revealed that senior-year group of students performed significantly better than sophomore-year group of students in all the three subscales indicating critical thinking (22). Results also showed that the senior-year group of students scored significantly

higher in all three subscales than the freshman group of students (22).

The qualitative data based on different methods including student and teacher focus groups, written qualitative evaluation, and longitudinal case study also consistently indicated students' improvements in critical thinking skills through studying different subjects in GUR in different years (13, 31, 32, 34, 35). Qualitative data also indicated the important role of the interactive teaching and learning methods played in students' critical thinking development. Particularly, group projects and discussion contributed greatly to students' development of critical thinking through confronting them with different viewpoints of their peers (32, 35).

### *Innovative problem solving*

Different evaluation data suggested students' improvements of problem solving ability after studying the four-year curriculum and the GUR at PolyU. Students' problem solving in the longitudinal survey was assessed by the problem solving subscale of CPYDS. Results demonstrated that students had

higher ratings of problem solving subscale in their junior and senior years when compared with their freshmen and sophomore years (17). Although the students of PolyU four-year curriculum performed similar to the students in the four-year curriculum of a comparable local university on problem solving subscale (19), they performed significantly better than the students in PolyU three-year curriculum (18). Students' ability of problem solving was also measured by the analysis and problem solving subscale of CLA+, with the senior-year student group scoring significantly higher than both the sophomore and the freshman groups on analysis and problem solving subscale (22).

Focus group results suggested the positive impacts of the GUR to students' development of problem solving ability (34, 35, 39). Particularly, the Service Learning subjects were perceived as much helpful to students' innovative problem solving, which provided students opportunities to solve problems in natural social circumstance through a 40-hour community service practice. Both teachers and students perceived that many unexpected events occurring in service practices promoted students' ability to solve problems innovatively (35). Some other teaching approaches in GUR such as hands-on workshop in freshman seminar subjects and field work in cluster area requirement subjects also trained students in problem solving ability (39).

### *Effective communication*

The GUR and the four-year curriculum successfully promoted students' effective communication competencies. Students' effective communication was firstly measured in the longitudinal survey by three subscales, including the social competence subscale of CPYDS, and the collaborative learning and discuss with diverse other subscales of NSSE. Comparing students' performances in the four academic years, students' ratings of collaborative learning and discuss with diverse other subscales in the academic years of 2014-2015 and 2015-2016 were significantly higher than those in 2012-2013 and 2013-2014, although their ratings of social competence subscale remained stable (17). The PolyU four-year curriculum students also performed better than the PolyU three-year

curriculum students in collaborative learning and discuss with diverse other subscales, while no significant difference was found between their performance of social competence subscale (18). The PolyU four-year curriculum students performed comparable to the students studying four-year curriculum in a comparable local university on all three subscales (19). Students' competence in effective communication, particularly written communication, was also measured by two subscales of CLA+ (writing effectiveness and writing mechanics). Comparison of students' ratings between different groups showed that the senior-year group performed better than the sophomore group in writing mechanisms and the two groups had no significant difference in their ratings of writing effectiveness (22). The senior-year group also performed better than the freshmen group in writing effectiveness, while the two groups performed similar in writing mechanisms (22).

Besides, focus group and written qualitative evaluation results in different academic years suggested that the students' development in written communication skills were effectively strengthened by students' study in language and communication requirements, particularly English-LCR subjects (30, 32, 34-36, 39). Through English-LCR subjects, students were effectively taught how to integrate and critique different sources and viewpoints in writing academic essays, and how to structure academic articles and cite references (35, 36). Some cluster area requirement subjects with English reading and writing requirements also effectively trained students' ability in effective written communication (36). Some students perceived the cluster area requirement subjects with reading and writing requirements as highly useful because these subjects offered them opportunities to get individualized instructions from English tutors about their academic writing assignments (30, 32). Besides, students' oral communication and public expression skills were promoted through studying in different group projects and group presentation tasks, which built up students' confidence in oral communication and increased their ability to communicate with people from different backgrounds and disciplines through group projects (30, 32, 35, 39).

### *Ethical leadership*

Students' ethical leadership was measured in the longitudinal survey by three subscales: empathy subscale of C-IRI, and ethical leadership and self-leadership subscales of CPYDS. Results showed that students' rating of empathy in their sophomore year decreased when compared with their rating in freshmen year; their ratings of ethical leadership was decreased in sophomore year but rebounded in senior year; and their rating of self-leadership in senior year was higher than in sophomore year (17). The PolyU four-year curriculum students, i.e., experimental group, scored significantly higher in empathy and ethical leadership than the PolyU three-year curriculum students (i.e., control group 1), although the two groups performed comparable in self-leadership (18). The experimental group and control group 2 (i.e., the students studying four-year curriculum in a comparable local university) performed similar in empathy, ethical leadership and self-leadership (19). Qualitative evaluation results indicated students' improved understanding of leadership concepts and development of leadership skills through studying GUR subjects, particularly the leadership and intrapersonal development subjects. First, the leadership and intrapersonal development subjects, particularly the tomorrow's leaders subject, promoted students' understanding of leadership attributes, particularly concept of self-leadership (35, 36, 39). Some students could be able to apply the leadership attributes learned in leadership subjects in their daily life in interpersonal relationship building (13, 39). Besides the leadership subjects, the service learning subjects cultivated some students' empathy and social responsibility, which are important components of ethical leadership (34-36). Furthermore, different group project works in different GUR subjects created good platforms for students to practice their leadership skills (32).

### *Lifelong learning*

Different evaluation studies also suggested students' improvements in lifelong learning ability. Students' ability of lifelong learning was assessed by the lifelong learning subscale of CPYDS, and four

subscales of NSSE, including higher-order learning, reflective and integrative learning, learning strategies, and quantitative reasoning in the longitudinal survey. Results showed that students' ratings of higher-order learning, reflective and integrative learning and quantitative reasoning in the academic years of 2013-2014 and 2014-2015 were significantly higher than their ratings in 2012-2013 and 2013-2014 (17). Students' ratings of learning strategies in 2014-2015 and 2015-2016 were significantly higher than that in 2013-2014 (17). The experimental group scored higher than the control group 1 on higher-order learning, reflective and integrative learning and learning strategies, while the two groups had no difference in their ratings of lifelong learning and quantitative reasoning (18). The experimental group also performed better than control group 2 on learning strategies, while the two groups performed similar on lifelong learning, higher-order learning, reflective and integrative learning and quantitative reasoning (19). These results generally suggested students' improvements in lifelong learning ability over their four-year study, particularly in higher-order learning, reflective and integrative learning, learning strategies and quantitative reasoning.

Qualitative evaluation findings were also positive, suggesting that the GUR was conducive to students' development in lifelong learning capacity. Perceived by students, some cluster area requirement subjects promoted their interests in learning some topics beyond their fields of specialized studies (30). These students had intention to further study these topics if there were opportunities. The sports-training courses in HLS component also nurtured some students' interests in further learning and doing these sports, and developed in these students a notion of pursuing healthy lifestyle. In addition, some assessment methods such as written assignments adopted in many GUR subjects promoted students' ability of lifelong learning through facilitating students to search literature and accomplish their writing tasks independently (32).

## **Discussion and conclusion**

This paper reported findings of a five-year longitudinal evaluation project on how the new four-



year undergraduate curriculum and the “general university requirements” (GUR) contribute to students’ development on the five desired graduate attributes of The Hong Kong Polytechnic University (PolyU). Results from different evaluation mechanisms, including longitudinal online survey, collegiate learning assessment plus (CLA+), student feedback questionnaires, focus groups with students and teachers, written qualitative evaluation, and longitudinal case study, consistently suggested that the four-year curriculum and the GUR were effective in promoting students’ development in the five desired graduate attributes.

These findings have two general implications. Firstly, although the curriculum reform and the introduction of general education in higher education of Hong Kong are significant, fewer studies have been conducted to evaluate the effectiveness of these reform initiatives. Since general education was mainly a heritage of Western, especially American higher education, whether its curricular models adapt to Hong Kong context with a Chinese cultural heritage and a heritage of British model of higher education should be investigated. Actually, some scholars raised their worries about the adaptation of general education to the context of Hong Kong (11, 41). They doubted the effects the new curriculum with a significant component of general education in Hong Kong higher education. The findings of the present evaluation study challenged these doubts by showing the effectiveness of the GUR curriculum and the new four-year curriculum of PolyU in developing students in desired graduate attributes of PolyU.

Secondly, findings of the present study indicated that teaching and learning design plays an important role in aligning general education with desired graduate attributes. Literature also suggested that active learning strategies such as group-based learning with authentic tasks, game-based learning, and written assignments are highly helpful in helping students to develop desired graduate attributes such as critical thinking and effective communication (42-44). Scholars promoting general education movements in American higher education also advocated that general education reform should pay more attention to teaching and learning methods than focus solely on curricular content of general education (45). The findings of the present study are in line with the

existing literature by showing that the active pedagogy adopted in GUR subjects was highly effective in promoting students’ development of the desired graduate attributes.

The present study has several limitations. First, the longitudinal survey only included the control groups in one academic year (i.e., 2014-2015), which could not compare group effects over time. Second, since participants in control group 2 also studied a general education program in a comparable local university which might have similar effects as the GUR, the effects of PolyU new four-year curriculum comparing to the old three-year curriculum could not be fully tested by comparing the experimental group and control group 2. Third, the four groups of participants participating in four rounds of CLA+ were not the same participants, which also limited the interpretation of the results. Despite of these limitations, this present comprehensive evaluation research is pioneering in Hong Kong in evaluating the effectiveness of the new four-year curriculum and general education program of PolyU in promoting students’ development in the five desired graduate attributes.

## Acknowledgements

This work and the ‘The longitudinal evaluation of the general university requirements under the new 4-year curriculum project’ are financially supported by the Learning and Teaching Committee at The Hong Kong Polytechnic University under Learning and Teaching Development Funding 2012-15. The authors declare that there is no conflict of interest with any financial organization regarding the material reported in this manuscript.

## Ethical compliance

The authors have stated all possible conflicts of interest within this work. The authors have stated all sources of funding for this work. If this work involved human participants, informed consent was received from each individual. If this work involved human participants, it was conducted in accordance with the 1964 Declaration of Helsinki. If this work

involved experiments with humans or animals, it was conducted in accordance with the related institutions' research ethics guidelines.

## References

- [1] Shek DTL, Chung PPY, Leung H. Manufacturing economy vs. service economy: Implications for service leadership. *Int J Disabil Hum Dev* 2015;14:205-15.
- [2] Association of American Colleges and Universities (AAC&U). *College learning for the new global century: A report from The National Leadership Council for Liberal Education and America's Promise*. AAC&U, 2007. URL: [https://www.aacu.org/sites/default/files/files/LEAP/GlobalCentury\\_final.pdf](https://www.aacu.org/sites/default/files/files/LEAP/GlobalCentury_final.pdf)
- [3] Chai WY. *General education in Chinese higher education: A case study of Fudan University*. Hong Kong: The University of Hong Kong, 2013.
- [4] Dello-Iacovo B. Curriculum reform and "Quality Education" in China: An overview. *Int J Educ Dev* 2009;29:241-9.
- [5] Feng HM, Guo M. General education curriculum reforming advance the universities of China mainland. *US-China Educ Rev* 2007;4:23-5.
- [6] Huang C. Liberal arts education in postwar Taiwan: A case study on general education reform at National Taiwan University. In: Jung I, Nishimura M, Sasao T, eds. *Liberal arts education and colleges in east Asia: Possibilities and challenges in the global age*. Dordrecht: Springer, 2016:87-97.
- [7] Otsuka Y. Some thoughts on liberal arts education in Japanese universities in the era of globalization [Quanqihua shidai dui riben daxue boyu jiaoyu de ruogan sikao]. *China Comparat Educ Rev [Bijiao Jiaoyu Yanjiu]* 2009;1:1-6. [Chinese].
- [8] Herbst J. The Yale report of 1828. *Int J Classical Tradition* 2004;11:213-31.
- [9] Harvard University. *General education in a free society: Report of the Harvard Committee*. Cambridge, MA: Harvard University Press, 1945.
- [10] Hutchins RM. *The higher learning in America*. New Haven, CT: Yale University Press, 1936.
- [11] Jaffee D. The general education initiative in Hong Kong: Organized contradictions and emerging tensions. *High Educ* 2012;64:193-206.
- [12] Jaffee D. Building general education with Hong Kong characteristics. *Int Educ* 2013;42:41-59.
- [13] Shek DTL, Yu L, Wu FKY, Chai WY. General university requirements at The Hong Kong Polytechnic University: Evaluation findings based on student focus groups. *Assess Eval High Educ* 2014;40:1017-31.
- [14] Teddlie C, Tashakkori A. *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences*. Thousand Oaks, CA: Sage, 2009.
- [15] Shek DTL, Yu L, Ng CSM. Evaluation of a general education program in Hong Kong: Results based on multiple evaluation strategies. *Int J Child Health Hum Dev* 2016;9:263-73.
- [16] Shek DTL, Yu L, Zhu X. Student development under a new general education program in Hong Kong: A 3-year longitudinal assessment. *Int Public Health J* 2018;10:57-69.
- [17] Shek DTL, Yu L, Wu FKY, Zhu X, Chan KHY. A 4-year longitudinal study of well-being of Chinese university students in Hong Kong. *ARQOL* 2017;12:867-84.
- [18] Shek DTL, Yu L. The impact of 3-year and 4-year undergraduate programs on university students: The case of Hong Kong. *Int J Adolesc Med Health* 2017;29:49-55.
- [19] Shek DTL, Yu L. General university requirements and holistic development in university students in Hong Kong. *Int J Adolesc Med Health* 2017;29:41-8.
- [20] Shek DTL, Yu L, Wu FKY, Chan K, Ho WWL, Ngai J. Well-being of university students in Hong Kong: A four-year longitudinal study. Paper presented in ISQOLS 14<sup>th</sup> Annual Conference, Seoul, South Korea.
- [21] Shek DTL, Yu L, Chan KHW, Ho WWL. Assessing learning gains of university students in Hong Kong adopting the Collegiate Learning Assessment Plus (CLA+). *Int J Disabil Hum Dev* 2016;15:331-7.
- [22] Yu L, Shek DTL, Ngai J, Chai WY. Measuring learning outcomes of general education using the Collegiate Learning Assessment Plus (CLA+): A case in Hong Kong. Manuscript under preparation.
- [23] Shek DTL, Yu L, Ngai J. Evaluation of a general education program in Hong Kong: Secondary data analyses based on student feedback questionnaires. *Int J Disabil Hum Dev* 2015;14:401-6.
- [24] Shek DTL, Yu L. Student feedback on a subject on leadership and intrapersonal development for university students in Hong Kong. *Int J Disabil Hum Dev* 2016;15:339-46.
- [25] Shek DTL, Yu L. An evaluation study on a university general education subject in Hong Kong. *Int J Adolesc Med Health* 2017;29:103-9.
- [26] Shek DTL, Yu L, Zhu X. Evaluation of a leadership and intrapersonal development subject for university students in Hong Kong: Findings based on two years. *Int J Disabil Hum Dev* 2016;15:101-9.
- [27] Shek DTL, Yu L, Pu XP. Evaluation of a general education program in Hong Kong based on student feedback questionnaires. In: Shek DTL, Siu AMH, Leung H, Merrick J, eds. *New York: Nova Science Publishers*, 2016:199-208.
- [28] Shek DTL, Yu L, Xie QZ. Student feedback on a pioneer subject on leadership and intrapersonal development in Hong Kong. *Int J Adolesc Med Health* 2017;29:83-9.

- [29] Shek DTL, Wu FKY, Chai WY. Students' views on general education: Insights gained from the narratives of Chinese students in Hong Kong. *Int J Disabil Hum Dev* 2017;16:443-50.
- [30] Shek DTL, Yu L, Chai WY. Evaluation of the general university requirements: What did students say? *Int J Adolesc Med Health* 2017;29:75-82.
- [31] Shek DTL, Yu L, Wu FKY, Ng CSM, Chai WY. Qualitative evaluation of general university requirements in a new 4-year university curriculum: Findings based on experiences of students. *Int J Adolesc Med Health* 2017; 29:91-102.
- [32] Shek DTL, Yu L, Zhu X. Qualitative evaluation of a new general education program in Hong Kong: Findings based on students. *Int J Child Adolesc Health* 2017;10: 347-56.
- [33] Shek DTL, Yu L, Wu FKY, Ng CSM. General education program in a new 4-year university curriculum in Hong Kong: Findings based on multiple evaluation strategies. *Int J Disabil Hum Dev* 2015;14: 377-84.
- [34] Shek DTL, Yu L, Chai WY. Qualitative evaluation of a new general education program at a university in Hong Kong: Teachers' experiences. *Int J Child Adolesc Health* 2017;10:73-89.
- [35] Shek DTL, Yu L, Chi XL. Focus group evaluation of teachers' views on a new general education program in Hong Kong. *Int J Adolesc Med Health* 2017;29:67-74.
- [36] Shek DTL, Yu L, Wu FKY, Chai WY. Teachers' views of a new general education program in Hong Kong: A qualitative study. *Int J Adolesc Med Health* 2017;29:57-65.
- [37] Shek DTL, Yu L, Wu FKY, Zhu X, Chai WY. Teachers' views on a new general education program in Hong Kong: Qualitative data collected over two years. *Int J Child Adolesc Health* 2017;10:233-43.
- [38] Shek DTL, Yu L, Wu FKY, Zhu X. Implementation of the general university requirements in a university in Hong Kong: Experience based on the third year. *Int J Child Adolesc Health* 2017;10:245-53.
- [39] Shek DTL, Wu FKY, Chai C, Lu HC, Leung JTY, Ho W, Lin L, Ma CMS, Yu L, Leung H, Chan K, Law M. Views of Chinese students on general education based on individual interviews. *Int J Child Adolesc Health* 2017;10:325-35.
- [40] Wu FKY, Shek DTL, Yu L, Chai WY, Zhu X. Well-being of university students in Hong Kong: A longitudinal case study. Paper presented in ISQOLS 14<sup>th</sup> Annual Conference, Seoul, South Korea, 2016.
- [41] Hoshmand AR. Barriers to change: General education in Hong Kong. In: Corrigan P, ed. *General education and university curriculum reform: An international conference in Hong Kong*. Hong Kong: City University of Hong Kong, 2012:37-43.
- [42] Cozine K. Thinking interestingly: The use of game play to enhance learning and facilitate critical thinking within a homeland security curriculum. *Brit J Educ Stud* 2015; 63:367-85.
- [43] Johnson K, Conneely C, Murchan D, Tangney B. Enhancing key skills-based curricula in secondary education: Lessons from a technology-mediated, group-based learning initiative. *Technol Pedagogy Educ* 2015; 24:423-42.
- [44] Kim K, Sharma P, Land SM, Furlong KP. Effects of active learning on enhancing student critical thinking in an undergraduate general science course. *Innovative Higher Educ* 2013;38:223-35.
- [45] Gaff J. *General education today: A critical analysis of controversies, practices, and reforms*. San Francisco, CA: Jossey-Bass, 1983.

*Submitted:* March 14, 2017. *Revised:* April 04, 2017.  
*Accepted:* April 09, 2017.

Copyright of International Journal of Child & Adolescent Health is the property of Nova Science Publishers, Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.