Development of undergraduate university students: A 4-year longitudinal case study in Hong Kong

Daniel TL Shek[1-6],*, PhD, FHKPS, BBS, SBS, JP, Wen Yu Chai[1], PhD, Huijing Lu[1], PhD, Lu Yu[1], PhD, Kevin Chan[1], PhD, Wynants Ho[1], MSc, Cecilia MS Ma[1], PhD, Florence KY Wu[1], EdD, Hildie Leung[1], PhD, Li Lin[1], PhD, and Moon Law[2], DSW

[1]Department of Applied Social Sciences, The Hong Kong Polytechnic University, Hong Kong, PR China
[2]Centre for Innovative Programs for Adolescents and Families, The Hong Kong Polytechnic University, Hong Kong, PR China
[3]Department of Social Work, East China Normal University, Shanghai, PR China
[4]Kiang Wu Nursing College of Macau, Macau, PR China
[5]Hong Kong Institute of Service Leadership and Management, Hong Kong, PR China
[6]Division of Adolescent Medicine, Department of Pediatrics, Kentucky Children's Hospital, University of Kentucky College of Medicine, Lexington, Kentucky, USA

* *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, Hunghom, Hong Kong, PR China. E-mail: daniel.shek@polyu.edu.hk

Abstract

Using a longitudinal case study approach, this study investigated students' development in their undergraduate years and perceptions of the "general university requirements" (GUR) in the new four-year undergraduate curriculum of The Hong Kong Polytechnic University (PolyU). Forty-two students enrolled in the new curriculum were invited to participate in yearly interviews, with 42, 31, 20, 23 students finally completed the yearly interviews from Year 1 to Year 4, respectively. Students' views in different academic years systematically indicated that the GUR program helped to promote students' development in a holistic manner, particularly with reference to the development of PolyU desired graduate attributes, knowledge broadening, and mental health promotion. The students' views towards different GUR subjects and the overall university education were also positive. Meanwhile, some challenges mentioned by students were noted for further improvement.

Keywords: General education, Hong Kong, longitudinal case study, student perceptions, undergraduate curriculum

Introduction

General education, once an important legacy of American higher education, is now being widely adopted in higher education institutions all over the world (1). A recent report showed that at least 58 countries have included in their higher education curricula some general education elements, of which Asian countries constituted a major part (1). There are both factors outside and inside the university for the growing adoption of general education ideas and programs. With regard to factors outside the university, the rapid economic and workplace changes and the fast obsolescence changed the nature of work and study. Many university graduates may need to change their jobs several times over their entire career life (2); more and

more working people return to university for a second major or retraining; and many university students might not do jobs relating to their original specialized field of studies in university (3). The fast-changing, increasingly interconnected, and globally competitive world also reshaped the manpower requirements of workforce.

Beyond professional knowledge, employers expect their employees to have strong transferable skills, critical thinking, effective communication, innovative problem-solving skills, as well as a sense of ethics and responsibility to not only adapt to the fast-changing environments but also help with enhancing the international competitiveness of the nation (2,4-6). A report of Association of American Colleges and Universities (AACU) (7) claimed that more than 70% of employers expected university education to put more emphasis on developing generic competences such as team-work skills, oral and written communication, critical thinking, analytic reasoning, innovative problem solving and global awareness. Therefore, a narrow undergraduate education is unable to equip students with these required competences for a changing world. David Kearns, the former CEO of the Xerox Corporation said:

"The only education that prepares us for change is a liberal education. In periods of change, narrow specialization condemns us to inflexibility-precisely what we do not need. We need the flexible intellectual tools to be problem solvers, to be able to continue learning over time." (8)

For the need within the university, the changing profiles of current university students and their increasing psychological and behavioral problems also raised concerns of university administrators, teachers, and scholars. Research consistently showed that there was an increasing high prevalence of mental health problems among university students (9, 10). Challenged by a double transition from adolescence to adulthood and from high school to university stage, university students were much vulnerable to mental health problems (11). Some common mental health problems included depression, anxiety, and stress (11, 12). Also, university students reported higher levels of emotional problems, suicidal ideation, and psychotic disorders compared with their normal

generation (11). Therefore, both the outside challenges and inside needs suggest that more strong educational initiatives or interventions should be provided to university students to help them adapt to critical transition and develop better to thrive to be competitive professionals and citizens in society. General education, with its outmost aim as developing holistic person, is an important mean to help university fulfill this task. This is as claimed by Louis (13) that "general education has been perceived as a medicine to cure many ills, including over specialization and vocationalism, to incite much virtue in areas as civic responsibility, and to prepare individuals for full self-realization." In addition, the value and meaning of a general/liberal education in contemporary age was claimed by AACU (7) as:

"Liberal education is an approach to learning that empowers individuals and prepares them to deal with complexity, diversity, and change. It provides students with broad knowledge of the wider world (e.g., science, culture, and society) as well as in-depth study in a specific area of interest. A liberal education helps students develop a sense of social responsibility, as well as strong and transferable intellectual and practical skills such as communication, analytical and problem-solving skills, and a demonstrated ability to apply knowledge and skills in real-world settings."

Propelled by the above-mentioned internal and external factors, there have been movements in different places of the world to enhance general education component or introduce new general education programs in undergraduate curriculum of higher education. Meanwhile, the emphasis of general education implementation has changed from focusing on its curricular content to innovative and engaging teaching and learning approaches that promote "modes of learning that are collaborative, experiential, service, and integrative" (14). Based on this shifted conception, different innovative and engaging curricular modes and pedagogy were developed, which included freshman-year seminars, learning communities, service learning, collaborative assign-ments, capstone courses, and writing-intensive courses, and other engaging courses (14, 15). The underlying rationale of these new initiatives, as claimed by Schneider (15), reflected a philosophy of general education that:

"It emphasizes an approach to learning rather than course categories, and gives primary attention to the habits of mind, breadth of perspective, and capabilities the student is developing. The ability of students to apply their knowledge to real problems is one indicator of their achievement level."

In line with the worldwide trends, there was a new general education initiative in higher education in Hong Kong in recent years. Since the 2012-2013 academic year, the eight public universities of Hong Kong extended their three-year early-specialization-oriented undergraduate degree programs to a four-year length. In the new four-year curricular structure, a significant general education component was introduced. This curricular transformation is a systematic response of Hong Kong higher education to the ongoing social and economic changes of Hong Kong society in an increasingly globalized age (16, 17). Among different new general education programs, a notable one was the "general university requirements" (GUR) developed and implemented in the new four-year undergraduate degree program at The Hong Kong Polytechnic University (PolyU). In addition to arming students with a broad knowledge base and learning experience, the GUR at PolyU is also intended to nurture PolyU students in five desired graduate attributes, including effective commun-ication, critical thinking, innovative problem solving, lifelong learning and ethical leadership. To achieve these goals, the GUR is comprised of six major learning components, including freshman seminar, leadership and intrapersonal development component, language and communication requirements, cluster area requirement, service learning and healthy lifestyle program. Across these different components, the GUR framework adopted new pedagogies such as hands-on workshop, service learning, group projects, writing assignments, in-class activities and other approaches to engage students in a more in-depth, collaborative and experiential-based learning. The objectives and characteristics of each GUR component are briefly introduced below:

- Freshman seminar (FS): a three-credit subject in each broad discipline designed to broaden students' understanding of their chosen discipline and nurture their entrepreneurship and university-preferred learning styles.

- Leadership and intrapersonal development (LIPD): includes two alternative leadership subjects: "Tomorrow's leaders" and "Tango! Managing self and leading others" to nurture students' knowledge and skills pertaining to successful and ethical leadership.
- Language and communication requirements (LCR): includes both English and Chinese subjects to develop students' oral and written language proficiencies in English and Chinese.
- Cluster area requirement (CAR): to choose four subjects respectively from four cluster areas to expand students' intellectual capacity and develop their reading and writing skills as well as an understanding of China.
- Service learning (SL): subjects with significant service components where students need to take one to apply academic knowledge in practice and develop civic responsibility.
- Healthy lifestyle (HLS): includes a series of learning including online tutorial and sports-doing classes to help students establish healthy lifestyle.

While the program of GUR was carefully designed and innovative teaching and learning methods were incorporated, how well this program works and how effective it promotes students' all-round development were less studied. In view of this, a five-year longitudinal evaluation project with multiple evaluative approaches has been conducted since the 2012-2013 academic year. The project was intended to understand the effectiveness of the GUR in promoting students' all-round development, particularly their development in the five desired graduate attributes of PolyU. The project was comprised of five major evaluative components: (a) longitudinal online survey; (b) Collegiate Learning Assessment Plus (CLA+); (c) secondary analyses of Student Feedback Questionnaire data; (d) student and teacher focus groups and written qualitative evaluation; and (e) longitudinal case study. For the first four components, they have generated rich and solid results. For example, the longitudinal online survey and CLA+ found that students had better performances in a set of developmental indicators in

their junior and senior years than in their freshman and sophomore years (18, 19) and PolyU students performed better than did control group students (20, 21). Student and teacher focus group results indicated that in different years, both students and teachers perceived that different GUR subjects helped with their holistic development in different aspects (22-24).

However, there is still a need to conduct longitudinal individual case studies. Different from focus groups based on different students in different years, longitudinal case study follows the same group of students over the four academic years. Thus, students' development over time could be more systematically identified. Also, longitudinal case study was based on individual interviews, which could help probe individual students' perceptions in deeper and richer approach. Moreover, data from longitudinal case study could help further triangulate with or interpret data from the objective outcome evaluation such as longitudinal online survey and CLA+ and other qualitative evaluation such as focus groups. Against the above background, this paper reports the methods and findings generated from the longitudinal case study component of the GUR evaluation project. It helped to answer the research question that how students perceived the GUR and how they develop under the GUR program over the four academic years.

Methods

In the 2012-2013 academic year, 71 first-year students enrolled in the four-year program of PolyU were recruited based on purposeful sampling. These students were invited to participate in a longitudinal case study in the GUR evaluation project. They would be followed up by a group of scholars about their development and perceptions of the GUR over their four-year study since the 2012-2013 academic year. In each academic year, each student would be invited to attend an individual interview conducted by their respective scholars. Since during the 2012-2013 academic year, only 42 students performed actively in the study and the other 29 students acted inactively, the 29 inactive students were removed from the study. The 42 active participants were further invited to

participate in the yearly interviews in the following three academic years (from 2013-2014 to 2015-2016). The number of students who finally attended the interviews in each academic year was 31 for 2013-2014, 20 for 2014-2015, and 23 for 2015-2016. All interviews were conducted around the end of the different academic years, with a length from 0.5 to 2 hours. All interviews were audio recorded. After each interview, the student was given a supermarket coupon as an incentive.

Interview guidelines

An interview guide with a set of semi-structured questions was developed by the authors in order to guide the individual interviews of the study in each academic year. The questions focused on (a) the students' perceptions of different GUR subjects, (b) the students' personal growth during each academic year and previous years, (c) the contribution of GUR to the students' personal development, and (d) the students' overall views of their four-year university study.

Data analyses

After the interviews of each academic year, all audio records of individual interviews were transcribed into full transcripts with the help of a group of trained student helpers. Then these transcripts were divided into three parts to be given to three trained research assistants for coding. These research assistants coded these transcripts based on method of thematic analyses and generated themes under supervision of a senior researcher who had solid experiences in qualitative study and data analyses. In the middle and at the end of the coding work, meetings were held and different research assistants' coding work was compared with each other and cross checked, based on which relevant revisions were made to keep consistency of the coding. After the fourth-year data collection and coding work, a senior researcher combined the codes of all four years together and generated a comprehensive coding scheme of the study.

Results

The data collected over four years revealed that students generally had positive perceptions of the GUR program, particularly with reference to its subject content, teaching and learning methods, and quality of teachers. Students generally perceived the contents of different GUR subjects as useful, attractive and important. They commended highly the engaging pedagogies adopted in different subjects and the high quality of subject teachers. These views of students were presented in detail as below.

Attractive and useful contents

One theme emerging from students' four-year narratives was students' positive views of the contents of different GUR subjects. Students generally perceived the GUR subject contents as rich, attractive, important and useful. For example, some students perceived the content and knowledge covered in the "tomorrow's leaders" subject as very important to their development. They said: "it ('tomorrow's leaders' subject) taught you something useful and let you know that to be a leader you need to have a lot of different abilities. This is very important." Students also appreciated that the freshman seminar subjects provided them opportunities to understand different professions in their broad disciplines and their interconnections. Furthermore, students commented that CAR subject contents were "very interesting" and "very rich" and fulfilled their desire to study their interested subjects beyond their own majors. In one interview, one student expressed that "the CAR subjects let us study based on our own interests" and "we have never expected that the University could offer these subjects to us such as the subject on 'logics and reasoning'." More narratives were provided below to illustrate students' views.

"I found this (CAR) subject very interesting. It conveyed to us something about human nature, some social phenomenon and some other issues that science fiction films would like to convey to the public."

"I have strong interests in Chinese culture and China. Therefore, I want to learn more through this (CAR) subject. Meanwhile, I am also interested in religion. This subject just taught the Buddhism and Chinese culture. It taught us different religions in Chinese culture and their influences to ancient, modern and contemporary Chinese societies."

Experiential and interactive learning and quality teaching

Over the four academic years, students also had general positive perceptions of the teaching and learning in different GUR subjects. This was manifested in different aspects. Commonly shared by students, one major characteristic of the GUR was its "experiential learning" components incorporated in many different subjects, which included hands-on workshop in Freshman Seminar subjects, fieldwork in CAR subjects, and service project in Service Learning subjects. These "experiential learning" components gave students a vastly different learning experiences that cannot be gained through traditional subjects, which greatly engaged students in learning and was highly welcomed by students. Besides, lots of students favorably commented on "tomorrow's leaders" (one leadership subject) for its delicately and carefully designed in-class activities and in-class games to facilitate students' learning and apprehension of leadership concepts. Some games were icebreaking games to help students get familiar with their group members. Some games were classical leadership-promotion games to help students practice leadership skills such as teamwork or cooperation. Students viewed these activities and games very positively, perceiving these activities as helpful not only to their understanding of leadership concepts but also to creating an active and relaxing class atmosphere to engage and facilitate their learning. Students' positive views of different innovative and engaging pedagogies were illustrated by narratives below.

"I liked the Solar-Car-Making project (in Freshman Seminar subject)! I had never done this kind of hands-on projects in my high school. In this project, we needed to complete all the design work by ourselves and the subject teacher only provided us raw materials. This is really good and fun because we really 'made' something out. The sense of achievements from this project was much greater than that from studying textbooks."

"There were many interactive elements in the 'Tomorrow's Leaders' subject, or many so called 'small games'. We might not know our groupmates at the very beginning of the course. But we got to know each other better and united our team members quickly through playing these games. Meanwhile, we could comprehend something behind each small in-class game."

"I remembered in one class (of 'Tomorrow's Leaders' subject) we did an activity to draw superman figures. We put a lot of efforts to draw and then presented to others how our drawing illustrated the advantages and disadvantages of teamwork. Our group was very united in doing this and felt very happy."

Students in different years also commented positively on the good teaching skills of some teachers, particularly the CAR subject teachers and teachers in "tomorrow's leaders" subject. Students perceived some teachers could teach "beyond the content of PPT" and could use methods such as "story telling" or "case sharing" to illustrate the content of lectures. This can be illustrated by the following two narratives.

"She gave us a lot of examples. Also, in every class, she did not just teach new knowledge but helped us review the previous knowledge. For example, she would remind us of the linkage between topics in current lecture and the previous lecture, which made us know that different topics were not isolated."

"This topic ('spirituality' in 'tomorrow's leaders' subject) is difficult. Nevertheless, in our lectures, Amy (alias of the subject teacher) worked very hard to explain this concept to us. Then when we are doing our group projects, Amy and Alice (alias of the tutor) provided a lot of support to us, which helped us to understand this concept."

Students' development under the GUR

Multiple aspects of development and benefits were perceived by the students who have studied the GUR subjects across the four academic years. These developments and benefits included a broadened knowledge base and horizon, effective communication, effective and ethical leadership, critical thinking and innovative problem-solving skills, as well as other positive developments. Students also indicated their capability of applying

certain knowledge and skills into practice. These different aspects of development were presented in detail as below.

Broadened knowledge base and horizon

One important benefit of the GUR was that it helped to broaden students' knowledge base and horizons. Students over the four years consistently perceived this benefit. Meanwhile, along with progression of university study, students increasingly realized the importance of having a broad knowledge base and horizon to their future development. Students found that Freshman Seminar subjects shaped their understanding of knowledge in different specialized fields of studies covered by a broad discipline and helped them meet students from different disciplines. Students perceived in different years that CAR subjects broadened their horizons as they had met students from different disciplines and even from different academic years. Students benefited a lot from communicating with these different peers. Besides, across different years, students shared that service learning subjects also helped broaden their horizons. These subjects, particularly for those offering oversea service experiences, provided students with opportunities to experience and learn different cultures and people living in different conditions. Through these experiences, students' horizons were broadened and their understanding of society was enriched. Students' positive views of these benefits can be illustrated by narratives below.

"If there have been no these subjects, we might be developed to be narrowed professionals. But we have had these subjects. They could stimulate our multi-perspective thinking and let us try different things. For example, in Healthy Lifestyle program, besides badminton, I also took a hip-hop course. Although I like hip-hop very much, I had no opportunity to study it before. But the University provided me this opportunity and I would like to have a try. This really could broaden our horizons."

"These (CAR) subjects are very useful to facilitate our interpersonal communication and broaden our horizons. You see, we could study Psychology, Biology or Map Reading. These subjects could help broaden our knowledge base beyond the engineering field (the student's major)."

"To see society and culture of a different place will broaden our horizon largely. Before my service-learning trip, I only focused on what happened in Hong Kong and only knew that Cambodia was an underdeveloped country from the TV. But this understanding was very shallow. When I finished my Cambodia project and experienced life there, I was deeply shocked and felt that 'actually there are so many people in the world who are less fortunate than me!' The experience made me to do a lot of reflections."

Effective communication

Communication competency was another major aspect of development of students through studying GUR subjects. Two approaches contributed to students' effective communication. First, students' effective communication was promoted by English and Chinese language and communication subjects offered in different years. These subjects enhanced students' writing skills through specifically teaching these skills and practical writing practices in assignments. Some students reflected that they could apply these learned writing skills to the writing assignments in their major subjects. Besides, students reported that these language and communication subjects trained their different oral communication skills, such as discussion skills, class-presentation skills, and interview-presentation skills. This was through different innovative and engaging teaching methods such as group discussion tasks, in-class presentation and role-play activities. The benefits of language and communication subjects to students' effective communication were illustrated by two narratives below.

"These subjects (English and Chinese) included mock interview parts. Therefore, they trained our expression skills in job interview. Meanwhile, they taught us how to write letters, which is very useful."

"My Year-One study built a good foundation for me. I find very interesting because at the very start of my study the English subjects taught me how to find materials and how to write an essay. These helped with my major subjects because we had a lot of writing tasks in our major subjects."

Across different academic years, students' effective communication skills were also enhanced through engaging in different interactive learning activities in different GUR subjects such as attending different group-based learning activities and performing different writing assignments. For example, some students claimed that the hands-on group project work incorporated in most freshman seminar subjects trained their skills of discussion and negotiation through group members working together to make out one product. Students also commented that "tomorrow's leaders" subject trained their presentation skills through class teaching and in-class group presentation tasks. Moreover, students' effective communication was also promoted by Service Learning subjects that provided students opportunities to work in group to design and implement a service project. This kind of group work facilitated intensive and in-depth communication between group members and large amount of communication between students and service clients. During the group work process, lots of students perceived an improvement of their skills to communicate ideas in groups and with people outside of the campus. For example, students expressed below:

"Students needed to communicate with others (in the service project) no matter what majors they came from. When going to a place, no matter in a local or non-local service project, we need to communicate with others. When doing some activities, some students who were not good at communicating with others were pushed to communicate. To have opportunities to practice our communication skills is a good thing."

"In Year 1, I am not good at communication. I was very stubborn in communicating with others and would stick to what I think is right. I also communicated with others in this way in my Service Learning subject. Although I only wanted to speak out my own thoughts, the others thought I was objecting to their views. Therefore, I tried to improve my ways of communication from then on, and tried to be softer in communication with others."

Effective and ethical leadership

Students' leadership awareness has demonstrated an increase along with their four-year university study. For example, in the third and fourth years, more students perceived the leadership development as important to their personal and future development. For example, one student clearly claimed in the third-

year interview that one of his future goals was to "strengthen leadership and learn how to become an ethical leader," while he did not demonstrate this idea in the first and second year interviews. Students' leadership attributes have been nurtured by different GUR subjects in different years. Firstly, the "tomorrow's leaders" subject provided an important platform for students to learn and understand leadership knowledge and concepts. Students in interviews in different years all expressed that the subject was useful, which enhanced their understanding of the quality of a good leader, improved their self-understanding and understanding of "self-leadership," helped them to reflect on their leadership skills in practice. For example, one student said "I always remember what Iris (alias of the subject teacher) said that we not only need to lead others but also need to lead ourselves. So, 'tomorrow's leaders' subject really helped us in leadership development." In another example, a student talked about his understanding of the concept of "spirituality" and its impact on his personal life. The student said "based on my understanding, spirituality means we should have a firm belief" and "based on this, I began to feel that I should not waste time in the four-year university period and I should have faith to study hard on my own major." Furthermore, a student talked about how he applied the leadership knowledge learned from the "tomorrow's leaders" subject in his leadership practices:

"One lecture (of 'tomorrow's leaders' subject) taught us different leadership styles, such as the difference between the leader ordering his subordinates to do things and the leader joining in the teamwork and leading and instructing his team members to do something. I prefer the latter one. For example, when I was in charge of some activities, I normally joined to work together with the whole team and then told my team members how they should do about the task. Under these circumstances, I feel that I am applying leadership theories learned in practice."

Besides the "tomorrow's leaders" subject, across the four years, students also gained a lot of different chances to practice leadership skills through different group project work experiences in different GUR subjects, such as freshman seminar and service learning subjects. Particularly, through group projects in service learning subjects, students learned how to collaborate with other students from different departments and how to collaborate with different people outside of the University to perform better services to the community.

"Service learning helped my leadership development. When my group was to do a service, I had chances to take the leadership role to lead our group to accomplish the service project. I also learned how to get along with people and how to communicate with groupmates about the project."

Social and civic responsibility was important components in students' development of ethical leadership. Students generally perceived that service learning subjects nurtured their social responsibility and civic awareness. For example, through helping underprivileged people in different places in their service learning projects, some students developed a strong sense of social responsibility to help underprivileged people in future and also reflected on their life values. Service learning subjects also helped some students understand the social roles of their professions and helped them review their intentions in studying their professions. This influence was profound and even lasted to students' senior-year period. For example, two students shared the influence of service learning experiences to their social responsibilities in their senior-year interviews, respectively:

"I think the most important thing is the (service learning) subject changed my attitude toward my profession. It made me remember why I choose to study physiotherapy in university. The major reason is that when I was very young I have seen some doctors in Doctors Without Borders Organization. They are so good and so great. So I also hope that I could use my profession to help others."

"We went to a village to teach students in a school there. I felt that although those students lived in poor families and could only study half-day class, they cherished their learning opportunities very much. You could see their big differences from Hong Kong students, in terms of their learning attitudes and respect to their teachers. This made me reflect that I have wasted a lot of time through skipping classes or wondering in the campus when I have so good opportunity to go to study in university. This reflection changed my mind that I should try my best in my university study."

Critical thinking and problem-solving skills

GUR subjects offered in different years all helped to promote the development of students' critical thinking. Based on students' narratives in different years, teachers in different GUR subjects such as freshman seminar did not merely teach subject knowledge but tried to inspire students' critical thinking consciously. For example, in an interview of the 2014-2015 academic year (i.e., students' third-year study), a student still clearly remembered how his first-year freshman seminar subject teacher inspired his critical thinking: "I still remembered that my teacher said 'the chair you are now sitting on is not just a chair.' He taught us in this approach in almost every class, to try to promote our thinking." Other subjects also promoted students' development of critical thinking. For example, the study of CAR subjects in different knowledge areas helped students to understand intellectual approaches of different disciplines. Students find that "tomorrow's leaders" subject not only covered sufficient theories but also allowed students to think critically. Besides, service learning subjects also helped students to develop critical and multi-perspective thinking. Some students shared that in planning and conducting a service project, they learned to consider one issue from different perspectives. For example, a student having joined a service-learning subject on cultural conservation in an oversea district reflected:

"From the cultural aspect, our service project was only a cultural conservation project. However, it is also linked to the economic aspect since the local government had an urgent need to develop the local economy and too much emphasis on economic development might do harm to the local culture."

Besides, students' narratives indicating that some GUR subjects also promoted the development of students' problem-solving skills. Particularly, students' consistently agreed that the hands-on projects in freshman seminar subjects and service experiences in service learning subjects were conducive to their problem-solving skills. The common aspect of these subjects was that they provided complex real-problem contexts for students to solve problems effectively and innovatively, which

is as one student said: "Service learning subject helped me a lot. There were many unexpected situations that we need to modify our plan. This actually is problem solving." In another case, another student also said:

"We finally went to Cambodia to develop a map for local people based on testing local soil and water. I think we practiced innovative problem solving through this project. This is because that we needed to use some test instruments in doing the project, while we could not find these instruments in local place and also could not bring these instruments from our University to Cambodia. Under this circumstance we have to find some solutions to this problem, to think of some innovative ideas."

Other aspects of student development

Besides the above developments, students' narratives in different years also revealed that the GUR program helped with development of mental and physical health, self-efficacy, and friendship and social network of different students. Some students consistently claimed that "tomorrow's leaders" helped to improve their mental health and self-efficacy. For example, one student shared that "my mental health has improved. Through "tomorrow's leaders" subject I realized actually we should hold positive attitudes towards everything and should not be too negative." "Tomorrow's leaders" subject also helped students to build their inner powers and increased their self-efficacy in general and in pursuing their academic study. For example, several students said that the subject taught them "how to cope with and bounce back to adversities" and how to "change" themselves for a better personal development, which made them "more positive to study their majors" because "I have realized that I should strive hard to study in the four years." Furthermore, different GUR subjects, with their general-education-based course nature, involved different students in the class and learning, which greatly increased students' social interaction with peers from other departments and knowledge backgrounds. This helped many students to broaden their social networks and were perceived as useful for students' future development. For example, one student said:

"My groupmates in 'tomorrow's leaders' subject helped me a lot not just in this subject. For example, some male groupmates' mathematics is very good. They helped me a lot on calculus. In turn, for some who take the CAR subjects that I have already studied in the last semester, I could give advices to them."

Application to life and helpful to future development

Across the four years, a number of students perceived that the knowledge, skills, or learning experiences they have gained from different GUR subjects could be applied in their daily life or could be helpful to their future development. For example, students perceived that their group work experiences in GUR subjects in early university years prepared for their group work in major studies in later university years. Also, students from non-business disciplines perceived that the business planning knowledge they learned in freshman seminar subjects were helpful to their future career development since their professions had interconnection with business fields. For example, one student from engineering discipline expressed that the business plan gave him "a good foundation" because "our engineering profession would have some relation-ships with business sectors, we can use this knowledge (business plan) if we would like to run business in engineering field in future." Students also commonly perceived that the academic writing skills such as referencing skills learned from English language and communication subjects were very useful to their writing tasks in major subjects. Furthermore, there were students who benefited from "tomorrow's leaders" subject, perceiving the subject helped their leadership in reality and self-reflection. In an interview, a student expressed that leadership knowledge was very important to him because he took several leadership roles in student societies and church work. He expected to learn leadership knowledge and skills from "tomorrow's leaders" subject and then "Finally, it turned out that through the subject I really learned a lot, comprehend a lot, and reflected a lot. This facilitated my development."

Students' general impressions of their university study

The students were also asked about their general impressions of their university studies in the interviews of longitudinal evaluation study. Overall speaking, the students' views were highly positive. The majority of the students perceived their university studies as "fulfilling," "enriching", and "rewarding." Some of the students also used "busy but happy," "changing," "exploring" and "enjoying" to describe their four-year university lives. Some of the students perceived that the four-year university study, with different subjects including GUR and major subjects, helped them to pursue their personal and professional goals. Many of the students commented that the University provided them with many different learning opportunities, such as service learning and overseas exchanges and different activities to enrich their lives and build their multiple abilities, which helped shape their future competitiveness in society. Some of the students also perceived that during their four-year university studies, they had opportunities to meet and communicate with different students from different backgrounds. The students' positive views can be illustrated by the following Chinese narratives translated in English:

"I think the university is a place that helps you to realize or get close to your dreams. As I have said earlier, since I want to help people, I chose physiotherapy as my major. Then the service learning project in Cambodia made me realize more about the meaning of my Major. So the four-year university life made me closer to my dream and developed my different abilities such as communication, leadership and problem solving. These were very useful to my future profession."

"I feel hard but rewarding. This rewarding is not only on the grade but also on how to get along with people and dealing with things. These interpersonal experiences are so treasurable, which cannot be gained elsewhere. But the University provided these opportunities to us, for us to train ourselves. Therefore we could arm ourselves better to compete with others in future."

"Very enriching! Almost in every year, I could be able to use the opportunities provided by the University to do exchange in different places and to join different activities. I have been to Japan, Taiwan and Cambodia. Every time I

could learn different things. This helped to prepare for our future career because we will not feel so challenging in doing different things in our workplace in future if we have already tried so many different things. So my four-year university life was very enriching and I have explored different things in this life."

"Before enrolling in the University, I was not clear about my future goals. But after the four-year study, I find that I have not only more understanding about my profession but also a clearer conception about my future directions. Also, I have learned and improved a lot in interpersonal skills in the University."

"My university study was enjoyable and worthwhile. I was not just sitting in the classroom to read the textbooks every day. The GUR subjects, such as the Service Learning subject, provided me a lot of different experiences to apply our knowledge into helping the community. This made me feel that I have the ability to contribute to the society and to help people living in different conditions. I feel that my horizons have been broadened and my knowledge learned is applicable. These life experiences are so good and valuable to me."

Challenges

Although the students over the four academic years generally had positive views of the GUR and perceived the GUR program as effective in promoting students' all-round development, they indicated challenges in studying GUR subjects. Three major challenges were noted by the students. First, although the students perceived that many GUR subjects incorporated innovative and engaging pedagogy, they noted that there were still few courses adopting a big-class and mere-lecturing teaching method, which made their learning process boring and ineffective. For example, one student expressed in an interview "when I came in the class, the classroom was very dark and there were so many students there. Only one teacher stood far away speaking." Another student also shared in another interview that "the content (of lectures of a CAR subjects) was very introductory. There was a far distance between the lecturer and us, and the lecturer was just speaking for himself, regardless of whether we listened to him or not." Second, a number of the students indicated that they could not register their interested CAR subjects because a large part

of their timetables was occupied by their major subjects and most of their interested CAR subjects had timetable conflicts with their pre-assigned major subjects. Third, some of the students in their early university years showed unfamiliarity with and an unclear understanding of the course objectives and the rationales of the GUR, which hindered their active participation and learning in these subjects. They expected that they would be given clearer information about the rationales and the objectives of the GUR and its different subjects at the very start of their learning.

Discussion

This study investigated students' perceptions of the general university requirements (GUR) at The Hong Kong Polytechnic University (PolyU) and their developments under this new general education framework over the four academic years. This study was one component of a five-year longitudinal evaluation project to evaluate the effectiveness of the GUR at PolyU. Results showed that students improved in different aspects of developments under the GUR and held positive views of different aspects of GUR program. These results were consistent with the other quantitative and qualitative findings gained from other evaluation components of the project (18-24), which suggests a general effectiveness of the GUR in promoting students' holistic development and the development in the five desired graduate attributes of PolyU.

The findings of the present study have broad implications to the general education implementation and effectiveness in different higher education institutions. Particularly, broad literature on general education suggests that although general education was perceived as important by many educators, scholars, philosophers, and university administrators in centuries for developing all-round persons and broad-based professionals for a changing society, its implementation in higher education encounters increasing challenges in an age marked by over-proliferation and over-division of knowledge, science and university disciplines (25-27). Against this, the reform and implementation of the GUR at PolyU provided experiences and references for

other higher education institutions about implementation of general education in undergraduate education.

Several important observations can be gained from the findings of the present study. Firstly, results of the present study indicated that the GUR at PolyU incorporated large amount of elements of innovative and engaging teaching, and interactive and experiential learning. These new course modes and pedagogies were shown as the key determinants to students' engaged learning in the GUR and their development of important competencies through GUR subjects. Instead, the fewer courses adopting mere-lecture teaching method were criticized by students as less engaging and less effective in GUR. This observation is consistent with the general literature, which suggested that some engaging pedagogy or high impact practices in general education or liberal arts education such as service learning, capstone courses, first-year seminar, and collaborative learning and others had highly positive impacts on students' learning and development of desired learning outcomes (28-30). In conjunction with the existing literature, the present study further supports the idea that the teaching and learning modes rather than the knowledge were key factor to successful general education program. Thus, university administrators and curricular reformers should focus more on how to develop innovative and engaging teaching and learning modes than on debating what and how many knowledge should be included in a general education program (31, 32). The recent reform trends on general education in different higher education institutions have further strengthened this argument (33-35).

Secondly, the present study indicated that students' clear knowledge about the objectives of the GUR and the subject registration mechanisms were also important factors impacting their learning motivations and effects in the general education. Students' unclear knowledge about the course rationale would hinder their active participation in learning. University administrators and general education subject teachers should pay more attention to how to clearly deliver the messages of their course objectives to their students before their learning. Students' failing to register their interested subjects would also greatly diminish their learning motivation

and interests. However, there was not much literature concerning how to design selection mechanisms of elective subjects in general education to maximize students' course selection effects. More research is needed in this area for promoting a better functioning of different general education programs.

Thirdly, students' overall experiences about their four-year university education were very positive. One major contribution to this was the multiple learning experiences provided by the GUR program, such as the oversea service learning experiences. This was also in line with some literature suggesting that although students perceived their specialized studies highly, they valued a good and valuable general education as well and expected university provide broader and diversified learning experiences (36-38). In conjunction with these existing findings, the findings of this study not only help to support the success of the GUR at PolyU, but also further indicate the importance and value of general education in modern universities.

Although the current study is pioneer in nature, the limitations of the present study should be noted. Although the four-year longitudinal case study gained rich results about how students develop and perceive the GUR during their four-year university studies, its data were subjective and still need to be combined with results from objective outcome evaluatios such as objective survey and competency tests to determine the effectiveness of the GUR. Also, the present study only followed the first cohort of students enrolled in PolyU new curriculum. The views of students enrolled in later academic years should also be investigated. Despite the limitations, the present study explored the students' development under the general education program in a longitudinal case study approach, which was pioneering in its methodology in field of evaluating effectiveness of general education.

Acknowledgments

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] Godwin KA. The worldwide emergence of liberal education. Int High Educ 2015;2-4.

[2] Humphreys D. Making the case for liberal education: Responding to challenges. Washington, DC: Association of American Colleges & Universities. URL: http://www.und.edu/instruct/akelsch/GE%20Taskforce/LEAP_MakingtheCase_Final.pdf.

[3] Hurdle LS. Re-appraising general education for higher education in the 1980s. J Negro Educ 1981;50:191-5.

[4] Billing D. Generic cognitive abilities in higher education: An international analysis of skills sought by stakeholders. Compare 2003;33:335-50.

[5] Conrad C, Dunek L. Cultivating inquiry-driven learners: A college education for the twentieth-first century. Baltimore, MD: Johns Hopkins University Press, 2012.

[6] Wells CA. Realizing general education: Reconsidering conceptions and renewing practice. ASHE Higher Education Report 2016;42:1-85.

[7] Association of American Colleges and Universities (AACU). Making the case for liberal education – and its economic value: Talking points. Washington, DC: Association of American Colleges and Universities. URL: https://www.aacu.org/leap/presidentstrust/talking points

[8] Association of American Colleges and Universities (AACU). Liberal education outcomes: A preliminary report on student achievement in college. Washington, DC: Association of American Colleges and Universities. URL: https://www.aacu.org/sites/default/files/files/LEAP/LEAP_Report_2005.pdf.

[9] Hunt J, Eisenberg D. Mental health problems and help-seeking behavior among college students. J Adolesc Health 2010;46:3-10.

[10] Zivin K, Eisenberg D, Gollust SE, Golberstein E. Persistence of mental health problems and needs in a college student population. J Affect Disord 2009;117:180-5.

[11] Aldiabat KM, Matani NA, Navenec CL. Mental health among undergraduate university students: A background paper for administrators, educators and healthcare providers. Univ J Public Health 2014;2:209-14.

[12] Storrie K, Ahern K, Tuckett A. A systematic review: Students with mental health problems – A growing problem. Int J Nurs Pract 2010;16:1-6.

[13] Louis KRRG. General education: Rethinking the assumptions. Change 1981;13:31-36.

[14] Schneider CG, Shoenberg R. Contemporary understanding of liberal education: The academy in transition. Washington, DC: Association of American Colleges and Universities, 1998.

[15] Schneider CG. Liberal education takes a new turn. The Nea 2008 Almanac of Higher Education 2008:29-40 URL: http://www.nea.org/assets/img/PubAlmanac/ALM_08_03.pdf.

[16] Jaffee D. The general education initiative in Hong Kong: Organized contradictions and emerging tensions. High Educ 2012;64:193-206.

[17] Jaffee D. Building general education with Hong Kong characteristics. Int Educ 2013;42:41-59.

[18] 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.

[19] 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 2016 Oct 10. doi:10.1007/s11482-016-9493-4.

[20] 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.

[21] 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.

[22] 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.

[23] Shek DTL, Yu L, Chi X. Focus group evaluation of teachers' views on a new general education program in Hong Kong. Int J Adolesc Med Health 2017;29:67-74.

[24] 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 Edu 2015;40:1017-31.

[25] Harvard University. General education in a free society: Report of the Harvard Committee. Cambridge, MA: Harvard University Press, 1945.

[26] Hutchins RM. The higher learning in America. New Haven, CT: Yale University Press, 1936.

[27] Newton RR. Tensions and models in general education planning. J Gen Educ 2000;49:165-81.

[28] Kilgo CA. The estimated effects of service learning and undergraduate research on students' intercultural

effectiveness. Dissertation. University of South Carolina, 2012.

[29]   Kilgo CA, Sheets JKE, Pascarella ET. The link between high-impact practices and student learning: Some longitudinal evidence. High Educ 2015;69:509-25.

[30]   Smith KA, Sheppard SD, Johnson DW, Johnson RT. Pedagogies of engagement: Classroom-based practices. J Eng Educ 2005;94:87-101.

[31]   Gaff JG. General education today: A critical analysis of controversies, practices, and reforms. San Francisco, CA: Jossey-Bass, 1983.

[32]   Gaff JG. General education: The changing agenda. The academy in transition. Washington, DC: Association of American Colleges and Universities, 1999.

[33]   Huber MT, Hutchings P, Gale R. Integrative learning for liberal education. Peer Review, Association of American Colleges and Universities, 2005. URL: http://mars.umhb.edu/~wgt/cloc/GenEd_Reports/Integrative_Learning_for_Liberal_Education.pdf.

[34]   Ishler JLC. Laying the foundation for general education: The role of first-year and short seminars. J Gen Educ 2003;52:71-83.

[35]   Johnson DK, Ratcliff JL, Gaff JG. A decade of change in general education. New Dir Higher Educ 2004;2004:9-28.

[36]   Boyer EL. College: The undergraduate experience in America. Washington, DC: Carnegie Foundation for the Advancement of Teaching, 1987.

[37]   Astin AW, Korn WS, Berz ER. The American freshman: National norms for fall 1989. Los Angeles, CA: Higher Education Research Institute, 1989.

[38]   Johnston JS, Reardon RC, Kramer GL, Lenz JG, Maduros AS, Sampson JP. The demand side of general education: Attending to student attitudes and understandings. J Gen Educ 1991;40:180-200.