

## Employability: Smart learning in extracurricular activities for developing college graduates' competencies

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Nowadays, employers expect college graduates (or simply “graduates”) to be for ready in taking up challenges when they enter into their careers. Most competencies that employers are looking for cannot be learned but can be developed by participating in extracurricular activities. However, planning on participation in extracurricular activities is difficult, given the lack of measurement standards together with their unstructured and non-systematic nature. To provide a smarter way for activity organisers, advisers and students to plan for extracurricular activities, our university has launched the central repository on student development activities system and codified the information about participation in extracurricular activities in a quantified and systematic way. This paper has collected data from three consecutive years from the system, the employers' feedback data and the academic performance data of placement students in the Department of Computer Science. Participation level, with logarithm transformation, had a positive and significant relationship with academic performance. Moreover, the competency developed by most students had a positive relationship with job performance in the placement year of 2019/2020. In this article, we discuss contributions, limitations and future directions.

### *Implication for practice or policy:*

- Organisers can plan extracurricular activities according to the market needs and student needs.
- Advisers and students can better plan the development of competencies according to the job market.
- Students can enhance their academic performance and job readiness by participating in extracurricular activities in a smarter way.

*Keywords:* smart learning environment, extracurricular activities, 21st-century competencies, personal development, job readiness

## Introduction

Recent surveys have shown that employers are looking for new college graduates (or simply “graduates”) equipped with competencies being required by the job rather than merely demonstrating their academic capability as printed on the university transcript. The National Association of Colleges and Employers (2020) conducted a survey in 2020 and found that most of the employers sought new graduates with soft skills such as the ability to work as a team and problem-solving skills rather than a strong grade point average. Other competencies that employers recognise as critical job-ready skills include work ethic, analytical and quantitative skills, communication skills and leadership skills. Similarly, the survey conducted by the Government of the Hong Kong Special Administrative Region in 2016 has shown that employers rank soft skills such as work attitude, analytical and problem-solving abilities, language proficiency, interpersonal skills, management skills and information technology literacy as highly necessary (Consumer Search Hong Kong Ltd, 2016).

From these surveys, it is understood that employers are more concerned about new graduates' capability in solving real-world challenges instead of their academic performances (Haste, 2001; Kalantzis & Cope, 2012). Competencies cannot be learned but can be developed through participation in extracurricular activities (Boyatzis, 2008). Participation in extracurricular activities has been identified as an essential element for students' personal development, development of career-related competencies and career success (Bartkus et al., 2012). New graduates who have been more engaged in extracurricular activities have better development in leadership and interpersonal skills (Rubin et al., 2002; Rynes et al., 2003; Shaffer, 2019), a better success rate in job hunting (Chia, 2005), higher potential in becoming alumni donors (Clotfelder, 2001) and a higher chance in becoming a senior manager (Bartkus et al., 2012).

However, the development of competencies has not been efficient because of various challenges. Organisers have not planned the extracurricular activities based on the actual needs of students and the job market. Most of them simply repeat the activities that have been held in previous academic years. Students usually participate in extracurricular activities randomly according to their interests and time availability (Hui et al., 2018). A majority of students focus on the present and activities that provide them with satisfaction and a lack of future orientation (Greenbank, 2014). It reflects that students do not know what competencies they need to be equipped to be job ready. Students' poor planning may be due to the lack of information for their planning purposes. Therefore, there is a gap between the nature and number of extracurricular activities that activity organisers arrange and how students participate (Hui et al., 2018).

To provide a smarter learning environment for students and activity organisers to plan and on reflect students' learning in extracurricular activities, in 2016 our university (City University of Hong Kong – CityU) developed a system called central repository on student development activities (CRESDA) (Kwok & Hui, 2017). CRESDA stores information about students' participation in extracurricular activities in a structured and systematic way. The initial analysis on CRESDA's data collected in the academic year 2016/17 has been discussed and published in the international symposium international conference on blended learning in August 2020 (Hui et al., 2020a) and the interactive learning environment (Hui et al., 2020b). Those papers have suggested conducting further research on whether the predictive power on academic performance based on the participation level in extracurricular activities can be consistent in other academic years and whether there is a relationship between the participation level in extracurricular activities and employers' appraisal reflecting on students' job readiness. The CRESDA provides a foundation for building a smarter environment to assist students, lecturers, and academic advisers in reviewing and adjusting students' study plans.

This study aimed at conducting a data analysis on information being collected from CRESDA in the academic years 2016/17, 2017/18, and 2018/19 in order to answer the following research questions:

- The organisational efficiency of extracurricular activities: Has the gap between activity organisers and students reduced, given that the learning progress information is transparent to them?
- Predictive power on academic performance: Does the relationship between the participation level in extracurricular activities and academic performance maintain consistency?
- Predictive power on job readiness: Is there a relationship between the participation level in extracurricular activities and employers' appraisal reflecting students job readiness?

## **Literature review**

### **21st-century competencies**

In the 21st century, employers expect new graduates to be job ready by having attained new competencies on top of their academic qualifications. These competencies refer to soft skills such as management skills, work ethics, interpersonal skills, global awareness, and communication skills, which are commonly called the 21st-century competencies (or "attributes"). These attributes are essential for new graduates to find their first job and succeed in their future career development (Stiwne & Jungert, 2010).

### **Smart learning environment and smart learning**

Smart learning environments can be regarded as “technology-supported learning environments that make adaptations and provide appropriate support (e.g., guidance, feedback, hints or tools) in the right places and at the right time based on individual learners' needs, which might be determined via analyzing their learning behaviors, performance and the online and real-world contexts in which they are situated” (Hwang, 2014, p. 5); they aim “to help students gain knowledge even when they are doing leisure activities” (Hwang, 2014, p. 5). Smart learning was defined as “an education system designed to strengthen the capabilities of 21<sup>st</sup>-century learners by offering an intelligent and customized learning solution” (Budhrani et al., 2018, p. 3). The objective of smart learning is to “improve the learning quality and student outcomes throughout the student's educational process; it [focuses] on contextual, personalized and transparent learning capable of encouraging the emergence of students' intelligence and facilitating their ability to solve problems in real environments” (Durán-Sánchez et al., 2018, p. 2).

### **Definition of extracurricular activities**

Participation in extracurricular activities is important for students to develop competencies relevant to their future career success. However, there was no generally accepted definition of extracurricular activities until the year 2012, when Bartkus et al. defined it as “academic or non-academic activities that are conducted under the auspices of the school but occur outside of normal classroom time and are not part of the curriculum. Additionally, extracurricular activities do not involve a grade or academic credit, and participation is optional on the part of the student” (p. 698).

### **Developing 21st-century competencies via extracurricular activities**

It is a growing trend that students are expected to develop a set of competencies to succeed in their first job hunting and lifelong career development (Rotherham & Willingham, 2010). In producing new graduates for the job market, universities are therefore expected to develop the required competencies to enable students to be job ready (Soland et al., 2013).

Research has shown that competencies cannot be learned but can be developed via extracurricular activities (Boyatzis, 2008; Clark, 2015; Fredricks & Eccles, 2006). Extracurricular activities are not only for entertainment and enjoyment but they also provide a chance for students to have a well-rounded experience outside the classrooms (Chia, 2005; Himelfarb et al., 2014). They also assist in the development of students' competencies such as leadership, communication skills, entrepreneurial skills, confidence, self-esteem and appreciation for human diversity (Kuh, 1995; Rawat et al., 2014; Roberts, 2007) despite the type and nature of extracurricular activities (Fujita, 2006; Massoni, 2011; Siddiky, 2019).

For example, it has been found that the pattern of students' participation in extracurricular activities, such as the number of activities, frequency and duration of participation, has a positive relationship with the development of the 21st-century competencies (Fredricks & Eccles, 2006). Research conducted in 2015 showed that more than 64% of alumni expressed that participation in extracurricular activities directly links with employability (Clark, 2015).

However, competencies cannot be quantified, measured or assessed. It has a different meaning to different people in a different context (Soland et al., 2013), which means competencies are industry related (Ananiadou & Claro, 2009). Therefore, students from different disciplines should have different needs in which competencies should be developed. Challenges include students' lack of awareness about extracurricular activities, lack of extracurricular programs that satisfy their needs and lack of institutional supports to manage extracurricular activities (Kim & Lee, 2016).

In addition, extracurricular activities are unstructured and difficult to measure. The learning outcomes in curricular activities are associated with the graduate outcomes but this is not the case for learning outcomes in extracurricular activities. In addition, information about participation in extracurricular activities is not recorded for enhancing study planning. Therefore, a smarter learning environment should be provided to understand the set of competencies that students need to develop and at what stage students are developing them. This environment can also facilitate activity organisers and students' advisers to plan extracurricular activities that fit students' actual needs. That is why the CRESDA system was launched in 2016.

### **Ideas behind CRESDA**

Outcome-based learning, which CityU adopted, has been discussed since the early 1950s and defined as follows (Harden, 2002, p. 117):

- Intended learning outcomes should be defined clearly, published and achieved by the end of a course.
- Learning strategies and learning opportunities for achieving the intended learning outcome should be ensured in the curriculum design.
- There should be an assessment process purposely built based on the intended learning outcomes.
- Remediation and enrichment for learners should be provided as a result of the assessment, as appropriate.

CRESDA is the central repository for storing students' participation in extracurricular activities systematically and in a structured manner. The codification adopted the same set of learning outcomes as that of the academic curriculum. The expected graduate outcomes of CityU are listed in Table 1 (CityU, n.d.a).

Table 1  
*Expected graduate outcomes*

| Expected graduate outcome | Description             |
|---------------------------|-------------------------|
| GO1                       | Communicate effectively |
| GO2                       | Think critically        |
| GO3                       | Discover & innovate     |
| GO4                       | Learn continually       |
| GO5                       | Act professionally      |

According to CityU's expected graduate outcomes, 36 attributes for measuring the graduate outcomes have been defined by three experienced student counsellors of CityU. Each of the attributes is associated with the corresponding expected graduate outcomes (GO). For example, GO2 could contain analytical and problem-solving ability, reflective ability, judgement and numerical competency. Words such as "attitude", "skill" and "ability" in the attributes are used by CityU for judging the achievement of the corresponding graduate outcomes. These words are not definitive terms, and how to measure the level of achievement in each of these attributes was not within the scope of this paper.

The 36 attributes were categorised according to their properties into seven groups by three experienced student counsellors. For example, the internationalisation category consists of international perspective, multicultural perspective, understanding global issues, traditional culture heritage and integrating international students into the student community. Table 2 shows examples of the mappings between categories, attributes and graduate outcomes.

Table 2  
*Mapping between categories, attributes, and expected graduate outcomes (samples)*

| Category                | Attribute   | Expected graduate outcome |
|-------------------------|---|---------------------------|
| Spiritual               | Positive attitude   | GO3                       |
|                         | Art appreciation  | GO3                       |
| Intellectual            | Analytical and problem-solving ability                    | GO2                       |
|                         | Reflective ability  | GO2                       |
|                         | Judgement   | GO2                       |
| Physical                | Health maintenance  | GO4                       |
| Social                  | Engagement with society                                   | GO5                       |
|                         | Negotiation, conflict resolution and communication skills | GO1                       |
| Psychological/Emotional | Self-appreciation   | GO4                       |
|                         | Perseverance  | GO4                       |
| Professional/Career     | Organisation work   | GO3                       |
|                         | Language proficiency                                      | GO1                       |

To maintain high data quality, activity organisers are required to define what attributes are to be developed by students in each extracurricular activity. The ratio of time allocated for each attribute to be learned should also be defined when the extracurricular activity is created in the CRESDA system.

Since both the academic curriculum and extracurricular activities share the same set of expected graduate outcomes, learners' complete information can be consolidated by merging data from the existing student information system and the CRESDA system. Figure 1 shows the corresponding information model of CRESDA.

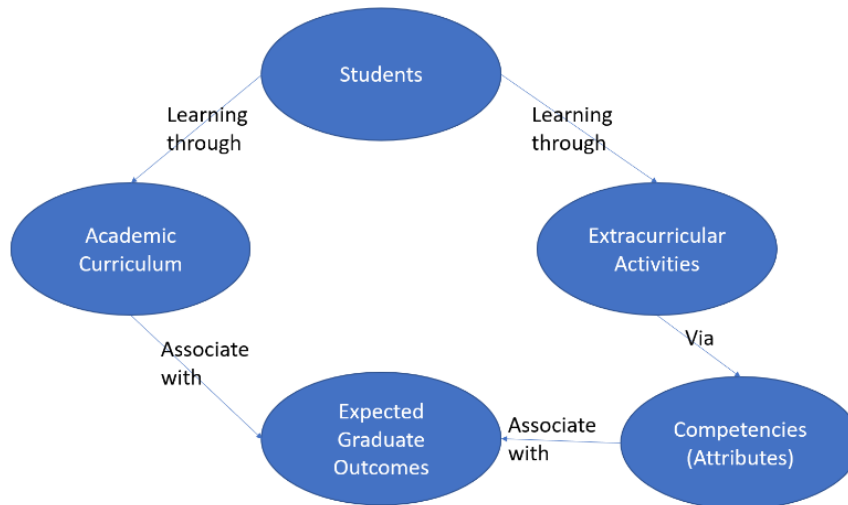


Figure 1. The information model of CRESDA

Since there is no formal assessment of students' skill development from the majority of the extracurricular activities, CRESDA measures participation in terms of the number of hours that students attend the learning activities of the corresponding attributes. It calculates by multiplying the total number of hours of extracurricular activity with each attribute's ratio of time (Hui et al., 2018). In most of the cases, one extracurricular activity is usually designed for cultivating multiple competencies for students. For example, an extracurricular activity with a total number of 10 hours may require 25% of the time cultivating problem-solving skills and 20% and 45% for communication skills and a global perspective, respectively. By storing details about students' participation in extracurricular activities in terms of the number of hours per each attribute to be cultivated, students and their advisers can reflect on learning more systematically and quantitatively. This information further facilitates adjusting learning plans by assessing learning outcomes and learning histories in academic and competencies development. The CRESDA system also provides dashboard functions to review students' study progress, attributes gained and the availability of extracurricular activities that fit their needs. In the future, more and more reporting features can be implemented by integrating CRESDA with other systems to facilitate personalised learning planning and advice on personal development.

## Methodology

This paper consists of three parts of data analysis by using the data collected from the academic years 2017/18 and 2018/19. The results are compared with those from the academic year 2016/17, which have been published previously (Hui et al., 2020a, 2020b).

The first part analyses the following areas by using summary statistics:

- participation rate and distribution to see if activity organisers have increased the usage of CRESDA for recording information about extracurricular activities
- analysis of the gap between what has been organised by activity organisers and the rate of actual participation by students to ascertain if the gap has been reduced given the transparency of CRESDA
- analysis of the difference between the set of competencies that are required by students from different disciplines.

Given that the set of competencies is job-related, the second and third parts of the analysis focus on students from the Department of Computer Science. All these students are required to work as full-time staff in an organisation for one academic year as part of their curriculum. This is called "placement" work. The total number of hours that the students spend in extracurricular activities before the start of the placement work is regarded as the participation level in extracurricular activities. The cumulated grade point average (CGPA) before the placement work is regarded as academic performance. The employer's feedback is collected via a survey at the end of the placement work and used to assess the students' job readiness.

The second part is to verify if the relationship between students’ participation level in extracurricular activities and their CGPA is positive and significant. The third part is to verify the relationship between students’ participation level in extracurricular activities and the corresponding employers’ feedback.

## Results

### Part one analysis: The participation rate, the gap and the diversity

Figure 2 shows the number of extracurricular activities in the CRESDA system in the academic years 2016/17, 2017/18 and 2018/19. It shows a gradually increasing trend over the 3 years.

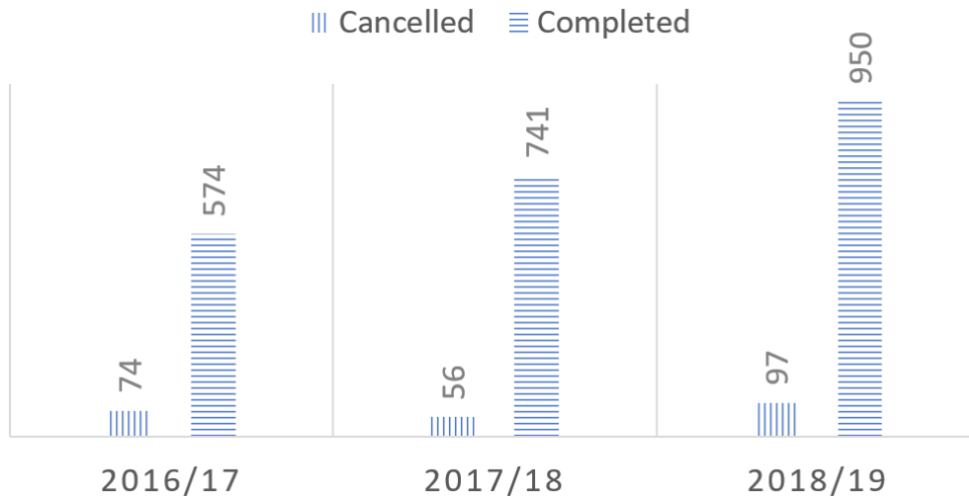


Figure 2. Number of extracurricular activities in the academic years 2016/17, 2017/18 and 2018/19

Figure 3 shows the participation rates in terms of the number of distinct students, the average number of activities of each student and the total number of participation hours of all students in each of the relevant academic years. It shows that all have increased gradually in three years.

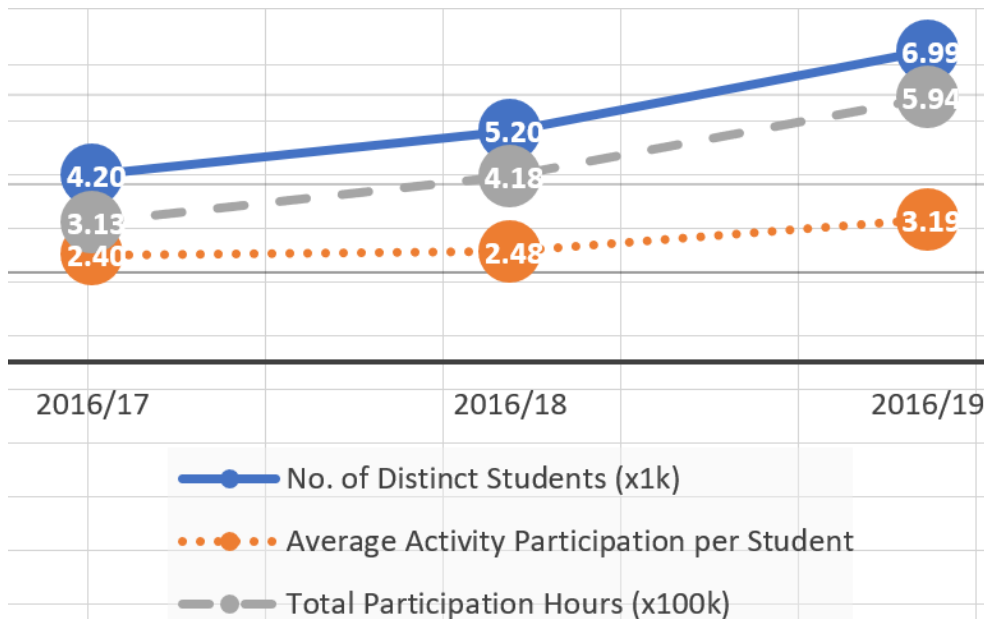


Figure 3. Participation rate by number of students, average number of activities of each student and the total number of participation hours for all students in each of the relevant academic years



Table 3 shows the top five attributes offered in the extracurricular activities by activity organisers and the top five attributes participated in by students. In the academic year 2018/19, four competencies were in the top five list in those being offered by activity organisers and those participated in by students. The first research question is answered because the gap between activity organisers and students reduced gradually (Table 3). As shown in the academic year 2018/19, global aspect, language and interpersonal skills were the main focus of students in CityU in general.

Table 3  
*Top 5 offered vs top 5 participated*

| Rank | 2016/17                                |                             | 2017/18                                |                                       | 2018/19                          |                            |
|------|--|-----------------------------|--|---------------------------------------|----------------------------------|----------------------------|
|      | Offered                                | Participated                | Offered                                | Participated                          | Offered                          | Participated               |
| (1)  | Interpersonal skills                   | Language proficiency        | Self-learning /Lifetime learning       | International perspective             | International perspective        | International perspective  |
| (2)  | Analytical and problem-solving ability | International perspective   | Interpersonal skills                   | Multicultural perspectives            | Multicultural perspectives       | Multicultural perspectives |
| (3)  | Language proficiency                   | Multicultural perspectives  | International perspective              | Language proficiency                  | Self-learning /Lifetime learning | Language proficiency       |
| (4)  | Self-learning /Lifetime learning       | Understanding global issues | Multicultural perspectives             | Interpersonal skills                  | Language proficiency             | Interpersonal skills       |
| (5)  | Multicultural perspectives             | Interpersonal skills        | Analytical and problem-solving ability | Application of professional knowledge | Interpersonal skills             | Transfer of knowledge      |

CityU has undergone some restructuring in its academic faculties in recent years. In order to analyse the diversity of attributes participated in by students from different colleges and schools, only the colleges and schools listed in Table 4 are included. Despite some minor changes, students' primary focus in corresponding college and school remained more or less the same.

Table 4  
*Top 5 attributes participated by students in colleges and schools*

| Rank  | 2016/17   | 2017/18   | 2018/19   |
|---|---|---|---|
| College of Business                         |   |   |   |
| (1)   | Interpersonal skills  | International perspective                                     | Multicultural perspectives                                    |
| (2)   | Integrating international students into the student community | Interpersonal skills  | International perspectives                                    |
| (3)   | Multicultural perspectives                                    | Multicultural perspectives                                    | Interpersonal skills  |
| (4)   | International perspective                                     | Integrating international students into the student community | Traditional cultural heritage                                 |
| (5)   | Teamwork  | Traditional cultural heritage                                 | Integrating international students into the student community |
| College of Liberal Arts and Social Sciences |   |   |   |
| (1)   | Teamwork  | International perspective                                     | International perspective                                     |
| (2)   | Interpersonal skills  | Multicultural perspectives                                    | Transfer of knowledge   |
| (3)   | Multicultural perspectives                                    | Language proficiency  | Organisation of work  |
| (4)   | Understanding global issues                                   | International skills  | Multicultural perspectives                                    |
| (5)   | Community care and services                                   | Teamwork  | Teamwork  |
| College of Science and Engineering          |   |   |   |
| (1)   | Language proficiency  | Language proficiency  | Language proficiency  |
| (2)   | Multicultural perspectives                                    | International perspective                                     | International perspective                                     |
| (3)   | International perspective                                     | Application of professional knowledge                         | Multicultural perspectives                                    |
| (4)   | Understanding global issues                                   | Multicultural perspectives                                    | Application of professional knowledge                         |
| (5)   | Interpersonal skills  | Understanding global issues                                   | Understanding global issues                                   |
| School of Creative Media                    |   |   |   |
| (1)   | Multicultural perspectives                                    | Multicultural perspectives                                    | Multicultural perspectives                                    |
| (2)   | Language proficiency  | Language proficiency  | Language proficiency  |
| (3)   | Information technology competency                             | Creativity and innovation                                     | Creativity and innovation                                     |
| (4)   | Creative and innovation                                       | Analytical and problem-solving ability                        | Information technology competency                             |
| (5)   | Community care and services                                   | Information technology competency                             | Analytical and problem-solving ability                        |
| School of Energy and Environment            |   |   |   |
| (1)   | International perspective                                     | International perspective                                     | International perspective                                     |
| (2)   | Career planning   | Interpersonal skills  | Multicultural perspectives                                    |
| (3)   | Teamwork  | Transfer of knowledge   | Interpersonal skills  |
| (4)   | Interpersonal skills  | Traditional cultural heritage                                 | Teamwork  |
| (5)   | Community care and services                                   | Language proficiency  | Traditional cultural heritage                                 |
| School of Law                               |   |   |   |
| (1)   | Understanding global issues                                   | Application of professional knowledge                         | Self-learning/Lifetime learning                               |
| (2)   | International perspective                                     | Career planning   | Analytical and problem-solving ability                        |
| (3)   | Teamwork  | Multicultural perspectives                                    | Teamwork  |
| (4)   | Interpersonal skills  | Interpersonal skills  | Transfer of knowledge   |
| (5)   | Organisation of work  | Integrating international students into the student community | Application of professional knowledge                         |



Students from the College of Business focused on global aspects and interpersonal skills. This finding matches its vision and value, which is “the College of Business at City University of Hong Kong aims to be a globally-oriented business school, producing innovative and impactful business knowledge, and nurturing leaders for a sustainable future: a key business education hub — in China for the world” (CityU, n.d.b).

Students from the College of Liberal Arts and Social Sciences developed competencies in broader coverage. This finding matches its vision and value, which is defined as “actively cultivates multi-disciplinary and inter-disciplinary collaboration, promotes knowledge production, encourages community service and involvement, and engages with academic, professional, and policy-related debates, at local, national and international levels” (CityU, 2021).

Students from the College of Science and Engineering focused on language and global aspects, with language competencies being significantly higher than all others over the 3 years. This finding matches the findings of other research that students in engineering schools have more room for improvement in languages (Panyawong-Ngam et al., 2015).

Students from the School of Creative Media focused on global aspects and language proficiency, similar to most other colleges and schools. However, it is worth noting that they also focused on competencies related to creativity and innovation that are not in the top five of any other college or school.

Students from the School of Energy and Environment were more focused on work-related competencies, such as the application of professional knowledge, career planning and teamwork.

Students from the School of Law had a very different set of competencies compared to other disciplines. They were more focused on self-learning/lifetime learning, analytical and problem-solving ability and teamwork.

### **Part two analysis: Relationship with academic performance**

In this section, we have included students from the Department of Computer Science with those who had placement work in the corresponding years of 2017/18 (105 records), 2018/19 (129 records), and 2019/20 (151 records). According to the Weber-Fechner law, the total number of hours in the participation of extracurricular activities has been transformed using logarithm transformation (Fechner, 1860; Lanzara, 1994). The CGPA is obtained right before the start of the placement work. Microsoft Excel was used for the calculation of linear regression. The result for the year 2017/18 (Hui et al., 2020b) shows a significant relationship ( $p < 0.001$ ;  $R^2 = 22.80\%$ ) between the participation level in extracurricular activities (logarithm transformed) and the CGPA. Figure 4, Figure 5 and Figure 6 show the corresponding result of the year 2017/18, 2018/19 and 2019/20, respectively. The results of 2018/19 ( $p < 0.01$ ;  $R^2 = 21.75\%$ ) and 2019/20 ( $p < 0.01$ ;  $R^2 = 20.82\%$ ) are similar to that of 2017/18. With longitudinal data, it shows that the higher the level of participation in extracurricular activities, the higher the academic performance. This finding answers the second research question.

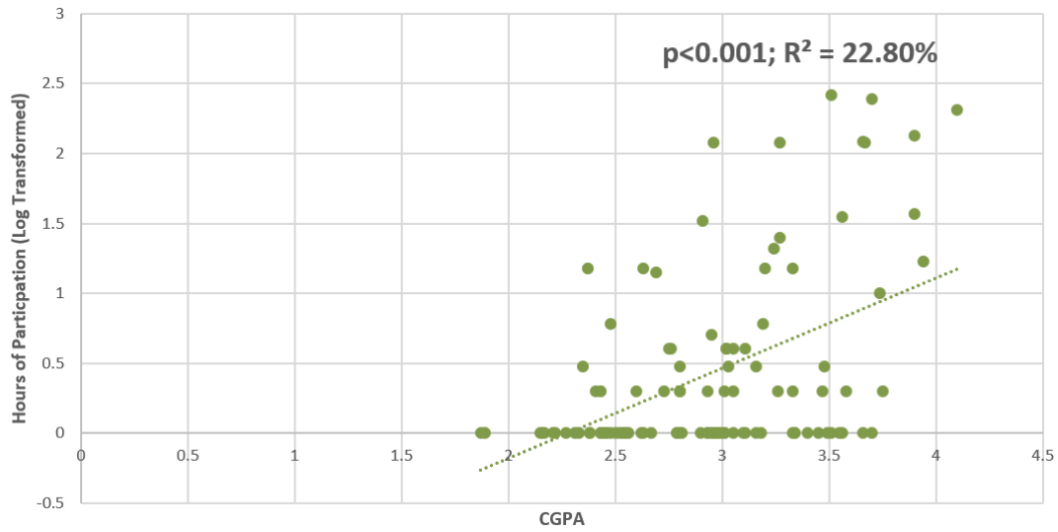


Figure 4. Participation level (logarithm transformed) vs CGPA – students with placement work in 2017/18

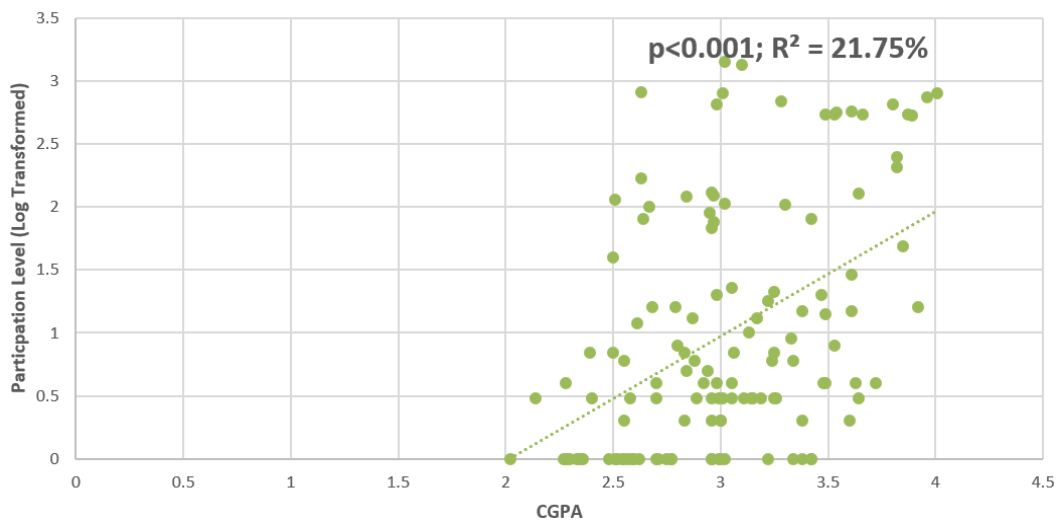


Figure 5. Participation level (logarithm transformed) vs CGPA – students with placement work in 2018/19

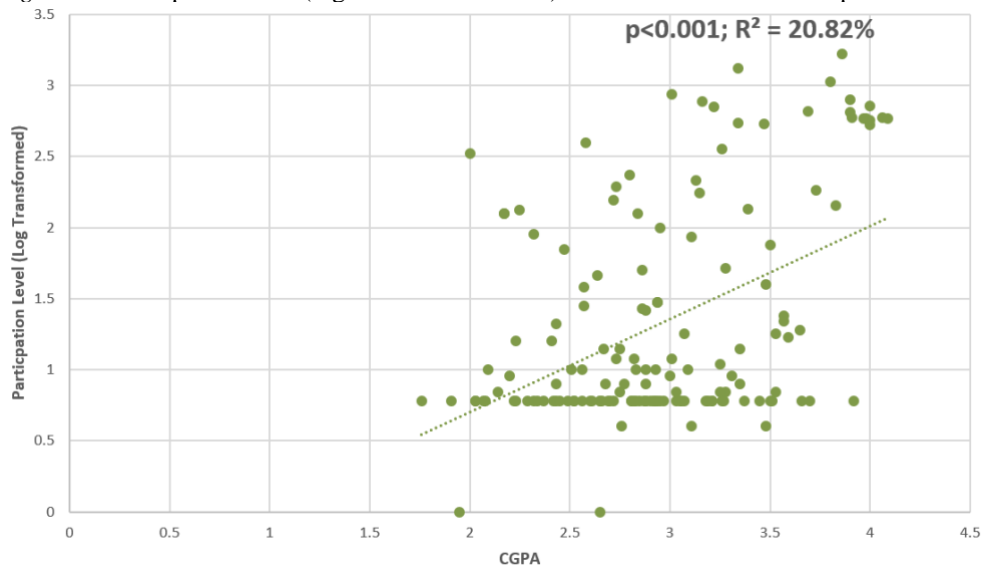


Figure 6. Participation level (logarithm transformed) vs CGPA – students with placement work in 2019/20

### Part three analysis: Relationship with job performance

This section uses employer feedback on the students from the Department of Computer Science with those who had placement work in the academic year 2019/20. Only those with employer feedback are included in the analysis. There were 143 valid records for the academic year 2018/19.

Given that we were exploring the level of job readiness of the student, the most relevant question in the employer feedback survey is E2, which is “Performance compared to newly recruited graduates”.

For computer science students, as a department in the College of Science and Engineering, language proficiency is the number one competency that most of them developed over the 3 years, as shown in Table 4. We defined the following student groups:

- Group 1: students who have participated in extracurricular activities for developing their language proficiency
- Group 2: students who have not participated in any extracurricular activities for developing their language proficiency.

Therefore, we formulated the following hypotheses:

- Hypotheses ( $H_0$ ): There are no differences in performance indicator E2 between the two student groups.
- Hypotheses ( $H_1$ ): There are differences in performance indicator E2 between the two student groups.

SPSS (version 26) was used to run the ANOVA test on whether there were significant differences in performance indicator E2 between the two student groups. Given that there are fewer than three groups, the post-test is not required.

The descriptive information is shown in Table 5.

Table 5  
*Descriptive information of the data (academic year 2019/20)*

| Group | Number | Mean | Standard deviation |
|-------|--------|------|--------------------|
| 1     | 137    | 3.93 | 0.810              |
| 2     | 6      | 3.17 | 0.983              |

From the result of ANOVA test in Table 6, we can verify that the difference in performance indicator E2 between the two groups of students is significant ( $p < 0.05$ ), and thus the  $H_0$  is rejected while  $H_1$  is accepted. From Table 5, the mean value of Group 1 (3.93) is higher than that of Group 2 (3.17). Therefore, it can be interpreted that the group of students with a higher average participation level in extracurricular activities achieved significantly higher appraised results by their employers. This finding answers the third research question of this study.

Table 6  
*ANOVA result in performance indicator E2 between the two groups of students*

|                | Sum of squares | Df  | Mean square | F     | Sig.  |
|----------------|----------------|-----|-------------|-------|-------|
| Between groups | 3.323          | 1   | 3.323       | 4.979 | 0.027 |
| Within groups  | 94.103         | 141 | 0.667       |       |       |
| Total          | 97.427         | 142 |             |       |       |

## Discussions

According to the results outlined in the previous section:

- the participation rate has improved

- the gap between organisers and students has reduced
- the diversity of sets of competencies focused on by students from different disciplines remained
- the relationship between participation level in extracurricular activities and academic performance was consistent over the 3 years' data
- the most important competence for computer science students was positively related to their job readiness.

### **Finding 1: Increase in the participation rate**

The number of completed extracurricular activities organised by activity organisers increased from 574 in the year 2016/17 to 950 in the year 2018/19. The increase of about 65% in terms of the number of extracurricular activities is significant. Similarly, the number of students increased by 66% from 4,199 in 2016/17 to 6,994 in 2018/19; the average activity participated in by each student increased by 90% from 2.40 in 2016/17 to 3.19 in 2018/19; and the total participation hours by all students increased by 33% from 313,405 in 2016/17 to 594,495 in 2018/19. These increases are mainly the result of the annual promotional work conducted by the CRESDA project team by reviewing the data since 2016/17. It is hoped that the increase of data can enhance the accuracy of data analysis.

### **Finding 2: Reduction in the gap between activity organisers and students**

Globalisation and advancement in technology increase cultural interaction and integration. Being a highly internationalised university, CityU collaborates with institutions from 43 countries and regions for over 1,200 outbound exchange students each year (CityU, n.d.c).

However, the extracurricular activities offered focused mainly on other competencies such as analytical and problem-solving, language proficiency, and self-learning/lifetime learning in 2016/17. Simultaneously, students focused too much on language proficiency and downplayed the importance of global aspects and interpersonal skills, as observed from Table 3. Annually, the CRESDA project team has presented data analysis findings to senior management and urged support for adjusting the offering of extracurricular activities. At the same time, dashboard functions have helped students and advisers visualise the competencies that the students have learned and what extracurricular activities are available to them. With this kind of data transparency in CRESDA for senior management, activity organisers, students, and advisers for facilitating smarter planning, the gap reduced significantly in the year of 2018/19, in which the top two competencies being offered and participated in were the same, and four out of the top five competencies were the same, as shown in Table 3.

### **Finding 3: Diversity between disciplines**

As shown in Table 5, the diversity on the set of competencies developed by students from different disciplines remained, although there were minor adjustments in some of the colleges and schools. Also, competencies related to global aspect and interpersonal skills were common interests of students from most colleges and schools. This finding explains why these competencies were in top five university wide.

### **Finding 4: Participation rate vs academic performance**

Figures 4, 5 and 6 show that the participation level, with logarithm transformation of the total hours of participation in extracurricular activities, was positively and significantly related to the CGPA afterwards. This finding is consistent for the 3 consecutive years. Although the  $R^2$  value was not high (from 20.82% to 22.80%), it was deduced from a single variable, and its value was roughly at a similar magnitude, which means the predictive power was stable.

### **Finding 5: Participation rate vs job readiness**

Comparing the performance of a placement student who is in the third year of their undergraduate program with a new graduate may not be fair but is one of the best ways in assessing how ready students are for entering the future job market. In this study, we used the performance indicator (E2) assessed by the employer on whether the placement student performed better than other new graduates in the same organisation. Given that the participation level in extracurricular activities increased significantly in

2018/19, we conducted the analysis using the data of students who had placement work in 2019/20. The finding shows that students who participated in developing their language proficiency, which is the number one focus of College of Science and Engineering students, had a higher mean value of E2 than those who have never developed their language proficiency in extracurricular activities.

## A proposal towards smarter learning

### Enabling quantitative measurement

Defining a perfect model to assess if a student has participated enough or not is not straightforward (Bartkus et al., 2012). As shown in Figures 4, 5 and 6, the number of participation hours in extracurricular activities is positively related to academic performance. Therefore, we defined it as the average number of hours participated in by all students of the relevant discipline (Hui et al., 2020b). This ideal number of hours was adjusted based on the data from the previous year.

### Facilitating extracurricular activities planning for organisers

We suggest that the project team should brief senior management and organisers on the findings annually. The organisers can then adjust the activities to be organised in the next academic year based on the market situation and students' interests.

### Facilitating study planning in extracurricular activities participation

To provide a smarter learning environment in assisting students, lecturers, and academic advisers in planning extracurricular activities participation, a radar chart, as shown in Figure 7, can be implemented to compare each student's learning progress in each of the seven categories of attributes and the student's development goal. At the very beginning, the goal-setting can be based on the norm in each discipline. Each category's development goal in Figure 7 is equivalent to the average number of hours participated in by all students of the corresponding discipline in the corresponding category. Finally, students and their academic advisers can view each attribute's learning progress under each category, as shown in Figure 8. With all these being implemented, planning in learning outside the classroom can be conducted in a smarter way.

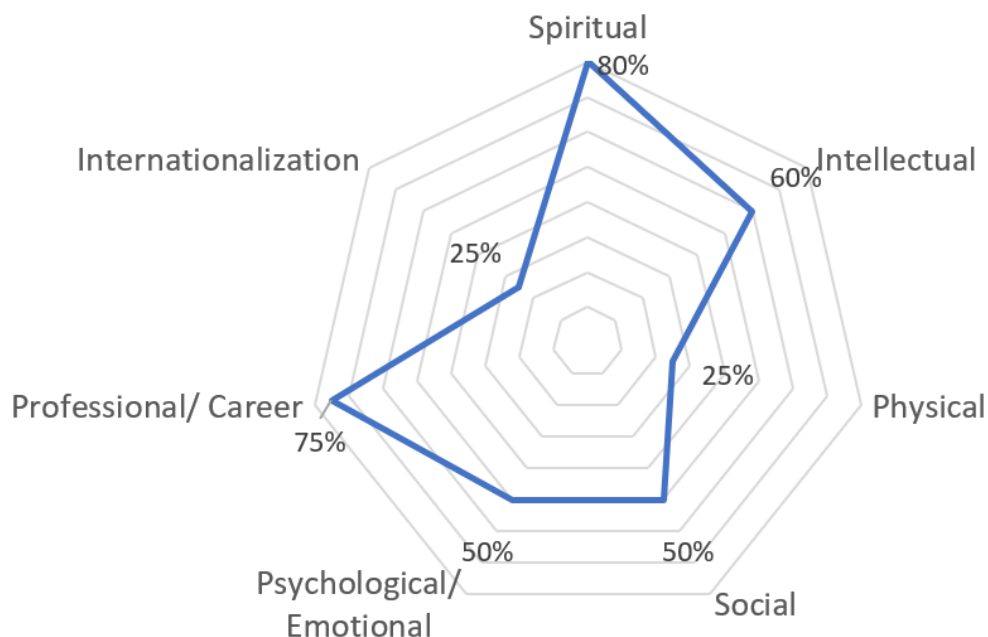


Figure 7. Learning progress vs development goal

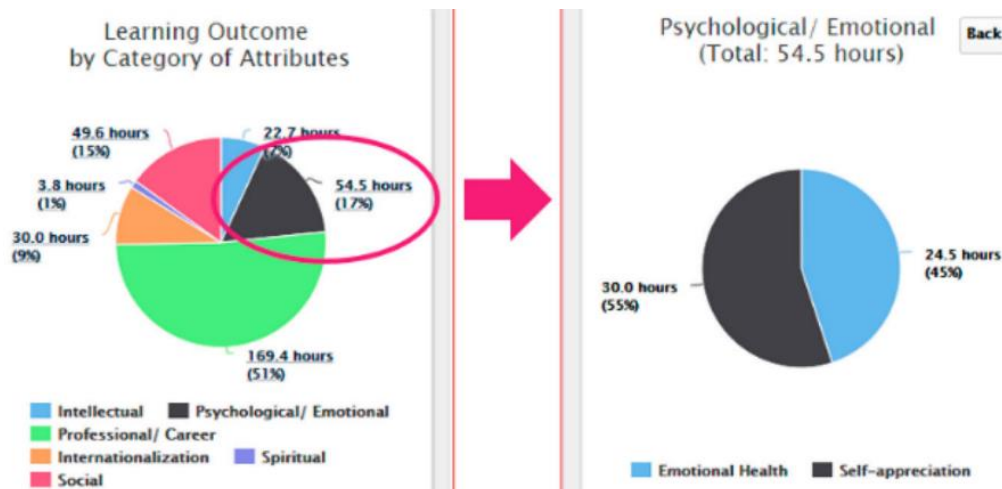


Figure 8. Learning progress in category and attribute levels

## Contributions, limitations and future directions

### Practical contributions

The findings of this study are relevant to activity organisers, students, advisers, institution administrators and employers. First, activity organisers can offer extracurricular activities more smartly at the right time for the right group of students and with the right combination of competencies by referring to the dashboard provided in the CRESDA system. Second, students can reflect on their learning by referring to the best combination of their discipline based on historical data, the current state of their competency development and the extracurricular activities being offered or to be offered. This assists students in planning their learning more smartly and effectively. Third, advisers can reference similar information before giving students recommendations to make the student advisory services smarter and more effective. Fourth, institutions can utilise resources to cultivate students with different needs at a different pace. Finally, employers have a higher chance of recruiting new graduates with the right combination of competencies as well as readiness to handle the job's real-work challenges.

### Theoretical contributions

This study contributes to the 21st-century competencies by providing a central repository for recording students' learning in non-academic curricular activities quantitatively and systematically. It also provides a way of measuring and transforming participation level in extracurricular activities. To the best of our knowledge, this study differs from previous research, which mainly measured the number and duration of activities in a linear way and without differentiation by students' disciplines. Another critical contribution is the linkage between academic curricular activities and extracurricular activities via the expected graduate outcomes. This provides the opportunity for better data analytics and provides centralised and combined information for assisting advisers and students in planning and reflecting on students' learning. It also contributes to the learning analytics discipline by extending the data landscape to predict student success and extend the prediction from academic performance to job readiness.

### Limitations

Although this study has demonstrated the usefulness of students' engagement in extracurricular activities in predicting their academic performance and job readiness, it has multiple limitations. First, many extracurricular activities are not stored in the CRESDA system although the number of records has increased significantly. Second, the data analysis covers only students from one department. The replicability of the prediction in academic performance was not verified. Third, only one competence with one-year data was used in assessing the relationship with job readiness; replicability of the prediction in job readiness was not verified. Finally, the job readiness analysis was based on feedback on the placement students from the employer instead of career success after graduation.



## Future directions

We propose a practical plan for further enhancing the CRESDA system based on the findings and the limitations. The proposal includes improvement areas for enhancing the quality and predictive power of the CRESDA's data and enhancement to assist students, lecturers and academic advisers in planning in a smarter manner.

To further enhance the quality and predictive power of CRESDA's data, policies should be created to ensure all activity organisers to input extracurricular activity data into the CRESDA system to ensure data analysis accuracy. Then, factor analysis should be performed to identify the set of competencies that influence students' job readiness in their related disciplines. Furthermore, data from graduate exit surveys, such as the number of offers within 6 months, initial salary, organisational scale and time for obtaining the first offer, should be used to assess graduates' employability.

## Conclusions

We live in a world of rapid changes due to globalisation and technological advancement. Various stakeholders, particularly employers, are looking for new graduates who have academic qualifications and are job ready. At the same time, the definition of student success has been changing from academic performance to job readiness (Cachia et al., 2018). The source data for predicting student success has been extended from engagement in academic learning activities to extracurricular activities (Hui et al, 2018). Institutions which produce new graduates for entering the job market are responsible for developing students' competencies according to the market's needs.

To enhance the offering of extracurricular activities and have a systematic way of keeping the records of students' participation in extracurricular activities, CityU launched the CRESDA system, which acts as a central repository for keeping extracurricular activities associated with expected graduate outcomes via a list of competencies. By reviewing the CRESDA data collected from the year 2016/17 to 2018/19, the employers' feedback for placement students in computer science from 2017/18 to 2019/20 and the corresponding CGPA before the start of placement work, we identified the relationships between the participation level in extracurricular activities and academic performance and job readiness.

The results of this study show that the gap between the nature and number of extracurricular activities that activity organisers arrange and students' participation has reduced significantly. It also shows that the participation level in extracurricular activities has a significant and positive relationship with students' academic performance, while the right competence set being developed has a positive relationship with students' job readiness.

Finally, we proposed a set of suggestions to assist students, lecturers and academic advisers in adjusting students' learning plans in extracurricular activities.

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