香港教育大學
The Education University of Hong Kong

Annual Report on

Recurrent Funding for Knowledge Transfer

2017/18

Submitted to
University Grants Committee

KNOWLEDGE TRANSFER SUB-OFFICE
知識轉移辦公室

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1. Executive Summary

Universities and other tertiary education establishments have a vital role in encouraging original research and innovation that benefit the educational sector and the wider community. Through the reporting year 2017/18, The Education University of Hong Kong (EdUHK) has maintained and strengthened its emphasis on high-quality, high-impact research and innovative scholarship.

Creative and use-innovative intellectual property (IP) contributes to developing the University, community and industry. EdUHK supports its academic staff in generating, protecting, promoting and licensing original intellectual property. Since the upgrading of the KT Unit of the Research Development Office to a KT Sub-office in late 2016, it has been charged with promoting the transfer of the University's innovative knowledge from the research stage to community and industry where it may have a real impact on people's lives.

In June 2018, EdUHK set up a central fund to support patent applications and protect inventions by its staff, researchers and inventors. This will encourage them to reap the rewards of their own intellectual work through patent registration. On 18 July 2017 the Sub-office also held an IP Seminar to which it invited an external expert to brief staff on how we may better protect our innovation, research, originality, and creativity.

In June 2018, we established a new seed fund scheme, the EdUHK Education And Social Entrepreneurs "EASE" Fund, to create and promote a culture of innovation and entrepreneurship in the EdUHK community and encourage support staff, students and alumni to pursue their dreams and create sustainable start-up ventures.

We commit ourselves to applied research that generates inspiring and innovative knowledge. The four impact case histories submitted as part of this report show not only high quality research, but also effective engagement processes and significant contributions to society and policy. We are also happy to see the establishment of EdUHK's Research Centre for Transmission of Cantonese Opera in May 2018, devoted to innovating and enhancing the promotion and knowledge transfer of Cantonese Opera culture through research, use of new technologies, and bridging the gap between practitioners of the art and schools.

During the reporting period, the reach of EdUHK's technological and innovative knowledge has extended beyond Hong Kong. Our international endeavours have yielded encouraging results. Apart from co-ordinating the University's participation in exhibitions in Shenzhen, Tokyo and London, the KT Sub-office has joined, for the first time, the International Exhibition of Inventions of Geneva 2018, to exhibit three education technology (EdTech) projects that received three Silver Medals and a Special Merit Award.

For the future, the University will continue to encourage its academic units in ownership, creativity and innovation, and in planning and implementing KT initiatives based on their strengths and medium and long term development needs. The University will also continue to further develop its own entrepreneurship culture in education and social services.

The KT Sub-office will further develop the University's network and collaboration with industries to facilitate the transfer of our applied research into new education technologies, services and materials.

2. Highlights of the Year

The University is very grateful to the University Grants Committee (UGC)'s support in the form of earmarked funding for our KT. Our KT activities continue to surge and diversify owing to the funding from UGC and EdUHK. These financial resources have enabled EdUHK to continue supporting and promoting a wide range of KT activities at the University and academic unit levels within the reporting year. This report provides a summary of the University's KT developments in 2017/18.

2.1 Strategies in Supporting KT

EdUHK's enhanced capability allows it to initiate original, innovative and effective education projects that benefit the school sector and the wider community by generating and transferring knowledge and good practices. We seek feedback from academics continuously to improve our KT strategies and reinforce the practices that have proven effective.

EdUHK has formulated various strategies to drive KT by encouraging new research and development (R&D) initiatives, cross-department collaboration and partnership with external parties. The following strategies were adopted in the reporting year to encourage and facilitate KT activities across the University.

2.1.1 Knowledge Transfer Sub-office: The KT Sub-office within the Research Development Office (RDO) is the central supporting unit for fostering KT in EdUHK. This Sub-office is delegated to forge connections between the University and wider community to develop collaborations. Internally, the Sub-office provides advice and support to academics and research units on facilitating the development of intellectual properties and research with numerous applications. Externally, this Sub-office proactively reaches out to potential partners to initiate KT collaborations and commercialisation of R&D projects.

The executive support of the KT Sub-office will enable the KT Director and the Committee on Research and Development (CRD) to continue monitoring the overall implementation of the KT activities in the University in the new triennium.

2.1.2 Building Up A Strategic KT Network: The KT Sub-office has mapped out strategies and models for KT in EdUHK. It has also started to establish a collaborative research network with external parties (e.g. business, R&D, social services and education sectors) to expand the University's research capabilities and expand the research spectrum, focusing particularly on education technology, education innovation and social innovation. The Sub-office initiates new ideas and allocates funds to develop market-driven research projects.

2.1.3 President's Award for Outstanding Performance in Knowledge Transfer 2017/18: The President's Award for Outstanding Performance in KT was established in 2016 to recognise, encourage and reward academics who have demonstrated a successful transfer of university-owned knowledge to society or industry that leads to innovation and impact on education at the local, regional and/or international community level. This year, two staff members received individual awards during the presentation ceremony on 14 May 2018.

Outstanding Performance in KT
Individual Award

Professor Yeung Yau Yuen, Professor, Department of Science and Environmental Studies

Dr Yuen Wai Kwan Gail, Assistant Professor, Department of Education Policy and Leadership

2.1.4 **KT Funds Scheme:** The University continued to provide a KT Funds Scheme in 2017/18 in ongoing support for academic units to pursue applied R&D, implement innovations and develop KT initiatives and activities. 22 proposals to this scheme were received. 10 were supported. A list of funded projects is at Annex II. Due to its demonstrated effectiveness this scheme is to be continued. A working task group, composed of the CRD members and the KT Director, continues to coordinate grant applications.

2.1.5 **Central Funding for Patent Applications:** In June 2018, EdUHK set up a central fund to support patent applications to protect inventions from University staff. The aim is to encourage staff, researchers and inventors to capitalize their intellectual work through patent registration. All full-time academic and teaching staff on contracts of at least one year are eligible to apply. Applications can be submitted throughout the year and handled by KT Sub-office.

2.1.6 **Workshops / Seminars on Research Assessment Exercise (RAE):** Impact will account for 15% of the overall assessment in the upcoming Research Assessment Exercise (RAE)-2020, and will be based on case studies describing examples of impact resulting from research. To help us identify the most appropriate examples to include in our submission and to promote the new skill and expertise needed to enhance the social impact of colleague's research, members of the UK Research Excellence Framework (REF) 2014 panels have been invited to visit EdUHK. There were 12 workshops/ seminars held in 2016/17. During this reporting year, another seminar was held by Professor Ng On Cho from Pennsylvania State University from 20 – 22 June 2018.

These experts shared their rich and professional experience of being on the REF panel, introduced specific issues in research discipline, offered insights, helped colleagues examine their research outputs, and suggested strategies for improving research quality. Our staff found these workshops and seminars useful for their preparation for the upcoming RAE.

2.1.7 KT Sharing Sessions: Professional and staff member developments in KT have vastly improved through sharing sessions. The University continued to organise such sessions in 2017/18 for staff to share success stories and practical experiences. Also, all staff members were welcome to attend sharing sessions, and follow-up activities were conducted to promote the KT projects. Nine sharing sessions were organised by KT Sub-office in the reporting period, and were well received by participants.

On 5 July 2017, KT Sub-office also organised a Knowledge Transfer Networking Seminar on Special Education – Services and Technologies for EdUHK staff and teachers from kindergartens and schools. Our partner company and EdUHK researchers discussed how various services and technologies could contribute to children's well-being; and how academic research could be transferred into new education ventures and for community benefit. The Sub-office also held a session on Intellectual Property (IP) on 18 July 2017 and invited an external expert to share ways to protect innovation and research originality and creativity.

2.2 Strategies in Disseminating KT

2.2.1 KT Partnership and Marketing

2.2.1.1 Collaboration within and outside the University: Education innovation, education technology and social innovation are the strategic foci of KT in EdUHK. The KT Sub-office has matched internal expertise with external resources to develop application-oriented collaborative research projects that can create social impact.

In the upstream, EdUHK formed partnerships on collaborative research and educational technology development with outside companies. These projects included an AR VR and guidebook kit for plastic resources education, a play based training kit cum intelligent assessment platform for ADHD children, educational games for Chinese learning, and interactive portals and learning platforms for cultural heritage, etc. Downstream, licensing and other commercialization requests of EdUHK researches are under negotiation.

Also, the KT Sub-office collaborated with organizations in community programmes focused on innovation and education, including the Inter-University Social Enterprise Task Force of the British Council, the Incubation Programme of the HKJC CarbonCare Open Innovation Lab, the "Tuen Yuen" Summer Programme of the Po Leung Kuk, and the STEAM Learning Programme of the Hong Kong Innovation Foundation.

EdUHK has continued to actively participate in the technology area to market its R&D achievements and capability, such as the University's strategic partnership with the APAC Innovation Summit. The KT Sub-office has also marketed EdUHK's R&D in various technology conference and business activities.

2.2.1.2 **Promotion of KT in InnoCarnival 2017:** The University joined the InnoCarnival which was held from 21 – 29 October 2017 by the HKSAR Innovation and Technology Commission at Hong Kong Science Park. The KT Sub-office set up the EdUHK booth on the theme of "Tech-novate Education" to display some of EdUHK's innovations, and enable the public to experience new possibilities in creative education. The contents covered Cantonese Opera, music, recycling, Chinese language and STEM education. Through demonstrations and interactive games, visitors were able to see EdUHK's capability in innovative research and applications in facilitating culture and STEM education with technologies. Over 200,000 people visited the 9-day exhibition. The EdUHK booth and innovations were well covered in major mass media.

2.2.1.3 **Promotion of Knowledge Transfer through China Hi-Tech Fair 2017:** From 16 – 21 November 2017 the University joined the China Hi-Tech Fair (CHTF) 2017, hosted in Shenzhen by Ministries and Commissions of the national government and Shenzhen Municipal People's Government. Aiming to increase the reputation of EdUHK innovation and foster industrial partnership in the PRC, the KT Sub-office showcased in the EdUHK booth numerous innovations in Special Education Needs (SEN), education technologies and environmental technologies. We made a presentation to Mr C.Y. Leung, GBM, JP, Vice-chairman of the National Committee of the Chinese People's Political Consultative Conference, EdUHK's SEN projects and expressed our aspiration to play a role in the Bay Area development. CHTF 2017 was a showcase for our achievements as well as a platform to develop new research and KT partnerships. Each year CHTF occupies an exhibition area of over 100,000 m^2, and attracts nearly 3,000 exhibitors from more than 50 countries and over 500,000 visitors.

2.2.1.4 **EdUHK Scoops Three Silver Awards in Geneva's Invention Expo:** In the first participation of EdUHK in the International Exhibition of Inventions of Geneva (11 – 15 April 2018), the KT Sub-office exhibited three education technology (EdTech) projects which won three silver medals and a special

merit award. The three projects covered the areas of STEM education, special educational needs and environmental education, of particular interest to the public. They will encourage breakthroughs in classroom teaching and home learning. Our winning of several awards, despite being a first-time participant in this renowned international exhibition, proved that our work on developing inspiring and innovative knowledge will contribute to both the education sector and the wider community.

In the exhibition, Ms Betty Ho (Director of the Hong Kong Economic and Trade Office in Berlin) met our representatives and celebrated Hong Kong's achievements. Besides, the researchers for the award-winning projects were invited to attend the Reception for Awardees on 4 June 2018, officiated by The Hon Mrs Lam Cheng Yuet Ngor Carrie, Chief Executive of the Hong Kong Special Administrative Region. The participation of EdUHK in this expo generated five media reports. Some companies/organizations, including one company listed on the Hong Kong Stock Exchange, contacted the KT Sub-office to explore collaborations on further developing the projects.

Award Winning Projects

(1) Mobile Logger for Self-Regulated STEM Education by Professor Yeung Yau Yuen, Department of Science and Environmental Studies **(Silver Medal)**

(2) Plastic Resources Education: 3Rs & 3Cs by Dr Chow Cheuk Fai Stephen and Professor So Wing Mui Winnie, Department of Science and Environmental Studies **(Silver Medal)**

(3) Play-Based AR Training Kit for ADHD Children by Dr Leung Chi Hung, Department of Special Education and Counselling **(Silver Medal and Special Merit Award)**

2.2.1.5 Promotion of Knowledge Transfer through Overseas Education Technology Trade Fairs: The KT Sub-office set up exhibition booths to highlight our educational technology researches at the Educational IT Solutions Expo (EDIX) Tokyo Japan (16 – 18 May 2018) and the EdTechXEurope cum London EdTech Week London UK (17 – 24 July 2018). Aiming to increase the reputation of EdUHK's innovations and foster partnership with industries in the international marketplace, the KT Sub-office showcased numerous technological innovations that bring innovative ways of learning. These two events attracted over 30,000 international visitors including investors, product developers, educators, educational organizations and institutions.

2.2.1.6 Research and Knowledge Transfer (R&KT) Videos: Three videos of EdUHK R&D projects were produced to promote the University's research capability and to open up opportunities for knowledge transfer. Apart from events and exhibitions, the videos were broadcast through the University's website and the YouTube channel. Details of the videos are as follows:

Videos (https://www.youtube.com/eduhknews)

3D Computerised Kinetic Chan Assessment and Learning System 3D (3D 肢體感應技術體感學習系統)

By Professor Leung Bo Wah, Department of Cultural and Creative Arts and Professor Mok Mo Ching Magdalena, Department of Psychology

The EdUHK Elder Academy (教大長者學苑)

by Professor Tam Siu Ling Maureen, Department of International Education and Lifelong Learning

Toukou Xiu Hanyu – Textbook for Global Chinese (《脫口秀漢語》大華語教材)

by Dr Wang Shan, Department of Chinese Language Studies

2.2.1.7 **Publicity and Media Exposure of KT Activities:** Good practices and advanced knowledge have been continuously disseminated among staff members and the community through different channels, such as the University's websites and reports, press releases, intranet and newsletters.

In the reporting year, several articles written by EdUHK staff members were submitted to the Beijing–Hong Kong Academic Exchange Centre for publication in their quarterly journal *Beijing–Hong Kong Academic Exchange* (京港學術交流) (http://www.bhkaec.org.hk/) to spread EdUHK news to a considerably wider audience. One article was selected in Issue 114 (July 2017) of the publication.

2.2.1.8 **EdUHK Research and Scholarship Portal:** The website (http://www.eduhk.hk/research_and_scholarship/) offers free and convenient services to local education practitioners as a one-stop online portal for research information and resources. Primary and secondary schools, child care centres, kindergartens and different educational organisations have been invited to subscribe to the portal. The website has attracted 3,497 unique visits and 5,422 page views from 1 July 2017 to 30 June 2018.

This portal has considerably benefited local and international students, teachers and scholars by making the research output of the University readily available on the Internet. The website directly transferred the knowledge, effort and academic research output of EdUHK staff members to potential

users over the Internet, thereby acting as a knowledge communication channel between the University and the public. We promoted this website by posting a direct link on the website of the Hong Kong Professional Teachers' Union (http://www.hkptu.org/links).

2.2.1.9 KT Website:

The KT website (http://www.eduhk.hk/rdo/KnowledgeTransfer/) continued to function as a channel for promoting KT activities. The website demonstrated the breadth of the University's KT activities, publicised our KT policies and guidelines and highlighted our excellence and shared good practices. This website was also a channel to establish networks with various internal and external stakeholders (e.g. researchers, experts, special interest groups, government, funding bodies and education and business sectors) and to open the way for interaction and exchange of new ideas on KT.

2.2.2 KT Dissemination Plan and Survey on the Nexus between Research and Teaching: As in previous years, all academic staff members were required to submit a KT Dissemination Plan so they could plan their dissemination activities for research findings at the proposal preparation stage. There was an encouraging increase in the dissemination of research in the reporting year. A survey was conducted to collect data on individual academic staff members who applied research in their teaching or used teaching activities in their research. The results (see Table 1) indicate that University staff members have incorporated their research into their teaching and vice versa, thereby facilitating the development of KT in the education sector.

Table 1: Survey Findings on the Nexus between Research and Teaching

	2016/17	2017/18
Academic staff members who use research in teaching/ course activities	93.7%	93.9%
Academic staff members who use teaching in research	60.4%	60.8%

2.2.3 Research Publications: Amongst the 727 refereed research outputs in 2017/18, 50.9% (370) were related to the various sectors of school education. These research outputs included early childhood, primary, secondary, technical and special education and were disseminated across different sectors that focus on teacher education and education disciplines. A total of 49.1% (357) of the outputs were related to complementary discipline areas, such as the social sciences, humanities and languages and other professional and vocational subjects. These refereed outputs and those produced in the past years provided a substantial new knowledge base for KT to provide insights into the practical improvement, professional innovation and education development in Hong Kong and beyond.

2.2.4 EdUHK Research Repository: Apart from being used for extensive KT activities, the EdUHK Research Repository (http://repository.lib.eduhk.hk), an initiative coordinated and promoted by our University Library, has been part of a strategy to transform education and the teaching profession through research. The repository allows knowledge, effort and results of academic research conducted by the University staff members to be transferred directly to potential users over the Internet. The repository also acted as a channel between the University and the public for sharing knowledge and ideas. As of 30 June 2018, the EdUHK Research Repository has collected 30,588 citation records dating back to 1994. Links to full texts were provided in 8,469 records, 3,252 of which can be accessed by the public. Materials deposited in the database included scholarly books, book chapters, journal articles and conference papers. A total of 102,309 visits were recorded from 1 July 2017 to 30 June 2018. The number of users was recorded at 79,282.

2.3 KT Outputs through Research Infrastructure

EdUHK supports and encourages its staff members in academic departments, faculties and research and resource centres to organise and conduct KT activities and/or projects based on their own capabilities and strengths in a creative manner. The ownership, creativity and integration of KT activities into the corresponding R&D agenda of academic units and research centres are crucial to the sustainable development of KT.

2.3.1 Key Academic Units for Implementing KT: Four university-level research centres and three Faculties, together with their constituent departments, research centres and resource centres, continued to be key academic units in 2017/18, providing the community with comprehensive KT activities. Their projects covered the education and non-education fields. In 2017/18, 7,299 schools, 76,060 teachers, 1,208,398 students and 1,164,877 other stakeholders benefited from these activities.

2.3.2 New State Key Laboratory in Marine Pollution: In June, EdUHK opened a new branch of the State Key Laboratory in Marine Pollution (SKLMP). The facility will support pioneering research and provide evidence-based advice on how to handle marine pollutants that have significant environmental and public health effects. The University's SKLMP branch will be at the forefront of an effort to examine the prevalence and health effects of endocrine-disrupting chemicals (EDCs) in the environment. CDCs are gaining increasing scientific and public attention, as they can interfere with the endocrine systems of humans and animals and cause harmful genetic mutations that can be passed down through generations.

China's Ministry of Science and Technology selects, funds and oversees State Key Laboratories to address scientific issues of national importance. The SKLMP branch at EdUHK represents the University's considerable progress in promoting Science and Environmental Studies, one of several disciplines it has designated as complementary to education.

2.3.3 **Official Launch of RCTCO at EdUHK:** To opening ceremony of EdUHK's Research Centre for Transmission of Cantonese Opera (RCTCO) was held on 18 May 2018. Following the opening ceremony, a 10-day inaugural exhibition showcased the University's latest innovations: the 3D Computerised Kinetic Chain Assessment and Learning System (CKCALS), and Experiencing Cantonese Opera through VR.

Directed by Professor Leung Bo Wah, Head of the Department of Cultural and Creative Arts, the RCTCO aims to develop its local and international standing as a significant player in the field. It is devoted to innovating and enhancing the promotion and knowledge transfer of Cantonese Opera culture through research, use of new technologies, and providing a bridge between Cantonese Opera artists and schools.

Developed jointly by Professor Leung Bo Wah, Professor Mok Mo Ching Magdalena, Director of the Assessment Research Centre, and Professor Kuo Boh Chen from National Taichung University of Education, Taiwan, the CKCALS is a grading and review system supported by a Kinetic 3D movement sensor, in which the movements of renowned Cantonese Opera performer and EdUHK Honorary Fellow Mr Yuen Siu Fai are recorded. Classified into beginner, intermediate and advanced levels, six recorded movements, including "bow-and-arrow steps", "seven-star steps" and "mounting a horse", are displayed on the computer screen for learners to practise. Through recording, replaying and evaluating learners' movements, the system encourages them to improve and perfect their performance by comparing their own actions with those of an expert. In addition, a VR installation developed by Dr Lee Cheng of the RCTCO, featuring "The Dream of the West Chamber" (《西樓錯夢》), invites participants to experience the Cantonese Opera classic as its protagonist.

EdUHK launches Research Centre for Transmission of Cantonese Opera.

Visitors experience the 3D Computerised Kinetic Chain Assessment and Learning System.

2.3.4 In recent years, numerous KT projects have been organised by academic departments or education sector research centres. A few of these projects have already had long-term effects on professional innovation, practical improvement of school education and demonstrated their relevance to social improvement and policy change. They include the following examples.

Advancing Learning and Teaching: *Development of Executive Functioning (EF) Training Manual using play-based learning & Assessment tool to students with ADHD – AR Mobile Apps Version* was a project undertaken by Dr Leung Chi Hung, Department of Special Education and Counselling. This project was the first to use ongoing and real time assessments to identify ADHD students with either cool or hot EF. The information provided by the apps was useful for teachers and parents to understand their students or children more to plan learning activities for them. This project was also the first to generate local norms for assessing EF in Hong Kong which can be used as an objective measure to compare executive functions of non-ADHD and ADHD students, and between local and overseas ADHD students. The captioned project won Silver Medal and also Special Merit from Romanian Delegation in the International Exhibition of Inventions of Geneva in April 2018. (Annex I–A)

Raising Industry Standard and Policy Change: *Reshaping the policy landscape of early childhood education* is a project undertaken by Dr Yuen Wai Kwan Gail, Department of Education Policy and Leadership. Dr Gail Yuen's 10 years of research, knowledge transfer and engagement influenced policy to implement free kindergarten provision from 2017/18. Her research critically reviewed the earlier voucher system and market context of kindergarten education and proposed alternatives to provide more equitable access to quality provision. This research, along with Yuen's extensive knowledge transfer and public engagement activities – including roles in key advocacy and policy-making bodies from 2013 to 2017 – provided evidence and justification for policy change that has significant impact on children and their families that benefit from the change, as well as on kindergarten providers and educators. Dr Yuen received the President's Award for Outstanding Performance in Knowledge Transfer (Individual Award) in 2017/18. (Annex I–B)

2.3.5 The University continued last year's effort to encourage academic departments and research centres to organise outreach activities to promote STEM education to school students and the public, including:

- A talk **"中國 STEM 教育–政策、教師能力標準、教學案例"** organised by the Centre for Education in Environmental Sustainability and Department of Science and Environmental Studies on 25 May 2018;
- An activity **"從幼兒開始：創意 STEM 教學活動"** organised by the Department of Early Childhood Education with LEGO Education, SEMIA Limited and EVI Services Limited on 28 May 2018;
- A talk **"Developing STEM Teacher's TPACK Through the Magdaire Model"** organised by the Faculty of Education and Human Development on 1 June 2018; and
- **"STEAM Education: 3D Chinese Cultural Architectural Design Competition"** organised by the Department of Mathematics and Information Technology; for which the open ceremony was held on 13 January 2018. The first phase result was announced on 1 June 2018 and the Prize Presentation Ceremony will be held in September 2018;
- **"UK Experience in STEM Teacher Professional Development" Seminar** organised by the Centre for Education in Environmental Sustainability and the Department of Science and Environmental Studies on 21 June 2018.

- **21st Primary STEM Project Exhibition "Development in STEM Generation – Living in a Smart City"** co-organised by the Centre for Education in Environmental Sustainability (CEES) and the Department of Science and Environmental Studies (SES) at The Education University of Hong Kong (EdUHK) and other organisations, the 21st Primary STEM Project Exhibition (PSPE) was held on 18 May 2018 at Hong Kong Central Library. Themed "Development in STEM Generation – Living in a

Smart City", the exhibition featured STEM projects by over 1,000 primary students from Hong Kong, Zhongshan, Guangdong, Shenzhen and Macau that were related to smart city blueprints. Participating students discussed project outcomes, covering areas such as how they applied their STEM skills, the scientific principles and concepts behind their proposals, and the tests and experiments they used to explore the circumstances or phenomena in daily life.

2.4 KT Outputs through Training Professionals

The immense improvements in the research capabilities and outputs of EdUHK over the years have enabled the University to disseminate and transfer new knowledge to professionals. This has transformed training educators and practitioners into a new generation of professionals with novel research-based knowledge.

2.4.1 Continuing Professional Development (CPD): The academic departments and centres of the University continued to provide a wide range of self-funded development courses and training programmes, occasionally in collaboration with external parties. The objective is to transfer the research findings and knowledge of staff members to support the continuous development of the education profession in early childhood, primary, secondary, technical and special education. These CPD courses have allowed the University to establish close relationships and networks with schools. Such relationships have led to significant professional improvements and innovations in the school sector and contributed to the development of high-quality education practitioners in Hong Kong and the region.

In the context of the Hong Kong curriculum, STEM education is to be promoted through Science, Technology and Mathematics Education (Curriculum Development Council, 2015). In this reporting year, we organized CPD courses to introduce secondary and primary teacher participants to the principles and practices of STEM education, with the

ultimate goal of developing secondary and primary students' STEM literacy. This not only traced the origin and background of STEM education, but also introduced various modes adopted to implement STEM education around the world (including the recent development of STEAM). For example:

- **Provision of Training Service on Professional Development Programme to Support Teachers from Special Schools Implementing STEM Education in General Studies (2017/18)** organised by the Centre for Education in Environmental Sustainability
- **STEM Education in Physical Education** organised by Department of Health and Physical Education
- **Certificate in Professional Development Programme on Curriculum Design, Pedagogy and Assessment for STEM Education in Primary Schools** organised by Department of Mathematics and Information Technology and Department of Science and Environmental Studies
- **Certificate in Professional Development Programme on Coding Mobile Apps for Computational Thinking Development** organised by Department of Mathematics and Information Technology

A total of 53 principals and 2,581 teachers benefited from these 56 courses.

2.4.2 Conference for Scientific Playworlds: Promoting Conceptual Play in Early Childhood Settings: The Department of Early Childhood Education hosted this conference on 20 May 2018. Over 400 principals, teachers, parents, practitioners, and government officials took part. They included the Education Bureau and preschools of Tsung Tsin Mission of Hong Kong, Yan Chai Hospital, Hong Kong Sheng Kung Hui, Church of Christ in China (CCC), Yan Oi Tong, Tung Wah Group of Hospitals, Po Leung Kuk, N.T. Women & Juveniles Welfare Association Limited, the Salvation Army, the Chinese Rhenish Church Hong Kong Synod, and Hong Kong Christian Service, to name just a few. More than 25 local preschools and organizations presented work based on their own teaching experiences.

2.4.3 International Conference on Computational Thinking Education 2018 and Coding Fair & Press Conference on Opening Up of CoolThink@JC Educational Resources: The four-year CoolThink@JC programme was created and funded by The Hong Kong Jockey Club Charities Trust (The Trust), and co-created by The Education University of Hong Kong (EdUHK), Massachusetts Institute of Technology in the US (MIT) and City University of Hong Kong (CityU), with support from the Education Bureau. CoolThink@JC aims at inspiring students to apply digital creativity in their daily lives and preparing them for future challenges in any fields. Promoting computational thinking (CT) education can move students beyond mere technology consumption and into problem-solving, creation and innovation. This 4-year initiative will train 100 teachers to help 16,500 upper primary students at 32 schools. Insights and curricular materials from this initiative will be shared openly with educators across the territory.

To showcase the achievements and outcomes of implementing computational thinking education in Hong Kong, the International Conference on Computational Thinking

Education 2018 and Coding Fair (CTE2018), organised by CoolThink@JC, was held on 14 – 17 June 2018 at EdUHK. Over 1,000 world-renowned academics, frontline education practitioners, IT professionals, and teachers and students from local primary schools attended the event.

The four-day event also included a Coding Fair at EdUHK, at which a series of coding/STEM workshops, parent seminars and interactive exhibition booths were promoting computational thinking education. Over 800 primary school teachers and students took part. Over 2,000 parents and children aged 4 to 14 attended.

2.4.4 Programme for Leadership Enhancement for Serving Principals: This KT programme was organised by the Department of Education Policy and Leadership from January to June 2018. Principals, as leaders of schools, are the key to quality education. Under school-based management, the successful development of the school hinges on the quality of school leadership. Principals should be able to develop a vision for change, which leads to improvements in students' learning outcomes. 16 principals from primary and secondary schools joined. The participants gained a profound understanding of how to possess global perspectives of leadership beyond the school context and how to draw on the experience gained from the Programme and become more effective school leaders. This programme enhanced the leadership of the profession as a whole.

2.5 KT Outputs through Student Engagement

2.5.1 Student Internships and Placements: Student internship programmes were organised by the Student Affairs Office and Faculties to encourage students to engage in and serve the community. The students thus gained experimental learning for their holistic personal development. The University also arranged placements with local schools for all full-time students of education-related programmes. Opportunities for student placements and internships offer two-way knowledge transfer between the students, education sector and industry. The number of student placements and internships in 2017/18 totalled 2,703.

Student Cheng Ka Keung (1st from the right) interned at the Radio Taiwan International in Taiwan.

Student Tse Ngai Ching (1st from the left) interned at UNICEF Hong Kong.

2.5.2 Entrepreneurship and Social Innovation Culture: EdUHK has started to develop its own entrepreneurship culture with implications for education and social services. Entrepreneurship-related activities have been organised to introduce the start-up concept in the University and provide related funding, training and support to students.

2.5.2.1 EdUHK Career Development Certificate Course 2017/18: To help EdUHK students understand the development of various industries and basic business concepts and ultimately design their own development plan to realize career goals, the Career Team of the Student Affairs Office (SAO) organized the EdUHK Career Development Certificate Course 2017/18 in October and November 2017. Students were given the opportunity to meet professionals from Education (non-teaching), Public Organizations, Disciplinary Forces, Heritage and Museums, HK's Overall Job Market, and Community and Social Services. Speakers shared insights on career development and technical know-how regarding entrepreneurship. This was a perfect chance for students to learn the necessary skills and business concepts needed to start up a business in today's environment, to develop their career plans, and to make job search preparation early.

2.5.2.2 EdUHK Education And Social Entrepreneurs "EASE" Fund: In June 2018, a new KT Fund Scheme called EdUHK Education And Social Entrepreneurs "EASE" Fund was established to create and promote a culture of innovation and entrepreneurship in the EdUHK community, to support staff, students and alumni in pursuing their dreams and starting up sustainable ventures; and to provide new opportunities to transfer EdUHK's research and knowledge to real applications. Each start-up will be awarded up to HKD120,000 for its first year's operation.

3. Performance Measurement and PIs

The outcomes of the KT activities conducted by the different units of the University are closely monitored using PIs. Faculties, university-level research centres and relevant academic support units had to submit annual reports on the implementation of their KT activities, including data on the list of PIs specific to their key KT activities.

As the University has been actively engaged in a wide range of KT activities and initiatives, the number of key stakeholders to have benefited from the University's KT activities has steadily increased. This progress can be seen in the PIs listed in Annexes III and IV.

4. Looking Forward

Looking ahead, the University will continue to encourage ownership, creativity and innovation of academic units in planning and implementing KT initiatives based on their respective strengths and medium- and long-term development needs.

The KT Sub-office will continue help strengthen the University's network and collaboration with industries to facilitate the transfer of our applied research into novel education technologies, services and materials.

The University will also consider ways to further develop its own entrepreneurship culture with implications in education and social services. Currently on trial is Entrepreneurial Studies Source in Library, a rich collection of full-text resources for entrepreneurship and small business research. Students can use the Entrepreneurial Studies Source for their entrepreneurial assignments or case studies ranging from solo projects to major entrepreneurial undertakings. Subscription will be considered depending on the availability of Library funding and evaluation by staff. We will also organise more entrepreneurship-related activities to further develop the start-up concept in the University and provide students with related funding, training and support.

Universities and other tertiary education establishments have a vital role as seedbeds for original research and innovation that benefit the educational sector and the wider community. It is a role to which EdUHK is entirely committed, today and in the future.

Annex I–A

Impact Case History

(i) Project Title

Development of Executive Functioning Training Manual Using Play-based Learning & Assessment Tool to Students with ADHD – AR Mobile Apps Version

(ii) Name of Principal Investigator

Dr Leung Chi Hung, Associate Professor, Department of Special Education and Counselling

After winning a silver award at the International Invention Exhibition of Geneva in April 2018, Dr Leung Chi Hung attended the Reception for Awardees of the Exhibition on 4 June 2018.

(iii) Summary

There are a total of 2,450 students with attention-deficit/hyperactivity disorder (ADHD) in Hong Kong primary schools (Education Bureau, 2013). Research has indicated that ADHD students are deficient in both attention and self-control compared with same-age students (Education Bureau, 2013), with weak executive functions being seen as the core problem (Heep Hong, 2015). "Executive functions" refer to the abilities to control, organize and execute a series of actions to achieve a predetermined goal; inhibition, working memory and set-shifting are three of the most important. These problems have been the target of interventions in Hong Kong, with some success. The Education Bureau (2013) reported that 50 primary schools participated in the "Executive Function Training" program as a Tier 1 intervention (general class level) in the 2009/10 academic year (Education Bureau, 2013). Heep Hong Society (2015) has also developed the "Executive Function Training App - The ADHD Hero" for children aged 6-12 with ADHD, to train their executive functioning ability as a Tier 3 intervention (individual level). These Tier 1 and Tier 3 interventions cover a wide range of executive functions, such as inhibition, working memory, and set-shifting. The soon-published manual will test an intervention that differs from these earlier interventions in two important respects: (a) the intervention is conducted in the context of play-based learning; (b) it is a Tier 2 intervention (small group level) in which children and their peers can have a positive impact on each other. The proposed training manual with AR mobile apps will provide 3D animated demonstrations of play-based learning activities and regular ongoing real time assessments from teachers, parents, and self-report perspectives in a plotted graph. Norms in different age groups will be generated from the data collected through the apps.

Play-based learning emphasizes (a) the importance of interactions and relationships between children and teachers to support learning; (b) the ways in which play and play-based learning are culturally and contextually mediated; and (c) the idea that play is neither value nor gender neutral, and that power relationships between children and teachers mean that it cannot necessarily be considered "free" (Cutter-Mackenzie and Edwards, 2013). The thirteen sets of play-based activities are comprised of direct prompting, structured learning environment, cooperative learning, discussion and feedback, and skills application in daily life. The proposed AR mobile apps will demonstrate the play-based activities in 3D animation in order to give clear guidelines to both teachers and parents on how to run the activities easily, to draw student's attention to the guidelines for the activities, and to make the activities more interactive between students and teachers and between children and parents.

The executive function is a conscious, self-regulating, high-level thinking process that assists in the active control of thought and action, including the regulation of attention, inhibit, working memory, etc. (Brock, Rimm-Kaufman, Nathanson and Grimm, 2009; Tsermentseli and Poland, 2016; Zelazo and Carlson, 2012).

Executive function (EF), which refers to the more deliberate, top-down neurocognitive processes involved in self-regulation, develops most rapidly during the preschool years, together with the growth of neural networks involving prefrontal cortex but continues to develop well into adulthood. Both EF and the neural systems supporting EF vary as a function of motivational significance, and this article discusses the distinction between the top-down processes that operate in motivationally and emotionally significant situations ("hot EF") and the top-down processes that operate is more affectively neutral contexts ("cool EF"). Emerging evidence indicates that both hot and cool EF are surprisingly malleable, with implications for intervention and prevention. Executive functions gradually develop and change across the lifespan of an individual and can be improved at any time over the course of a person's life.

Executive functions

There are two forms of executive functions: cool and hot (Brock et al., 2009; Zelazo and Carlson, 2012). Cool EF refers to the cognitive skills traditionally perceived to encompass EF, including inhibitory control, working memory and cognitive flexibility when used in affectively neutral situations (Zelazo & Müller, 2002). In contrast, hot EF has been posited to include affective cognitive abilities, such as the ability to delay gratification and affective decision making. The proposed AR mobile apps will suggest some suitable play-based learning activities to students with either cool or hot EF based on the results of ongoing assessments.

(iv) Underpinning research

1. To develop a EF training manual using play-based learning with AR mobile apps version based on the developed hardcopy version, the proposed AR & apps version can provide ongoing and real time assessments with parents, teachers, and self-report dimension. Teachers, parents, and students themselves can know what areas of EF he or she can improve.
2. To generate big data from the proposed AR mobile apps as when they use the apps, they are required to do the assessments before, within, and after the activities. Data will then be automatically sent to the server. The apps will compare the data with teachers, parents, and self-report perspective in a plotted graph. The norms of BRIEFS in different ages will then be generated from the Big Data saved in the server.
3. To translate the proposed AR mobile apps into English in order to encourage people from different ethnicities to use the manual with assessment tools and to generate the norms from different ethnicities.

(v) References to the Research

Relevancy of the Project to Research:

Data collected from fieldwork practices can be used for developing a local norm of BRIEF (Behavior Rating Inventory for Executive Function) in different ages. At the moment, we only have US norms for BRIEF. A newly developed local norms and validation of BRIEF for Hong Kong population are expected to produce one or two papers leading to journal publication.

(vi) Details of Local/Regional and International Impact or Benefit

A. Relevancy of the Project to EdUHK's Intellectual Properties (IPs)

A developed Executive Function Manual – AR mobile apps will apply for copyrights with EdUHK trademarks. Manual will be adopted for student's fieldwork practice in both normal schools and special schools.

Data and norms generated by the data will be kept in EdUHK for further development and franchise use.

B. Enrichment of Students' Experience
Both in-service teachers in BAT program and pre-service undergraduate students enrolled in SEC as minor, electives, second major, and major in special education or inclusive education can use the manual in their fieldwork practice. This will surely enhance their abilities to handle students with SEN in both normal and special schools.

C. Innovation and Creativity
There is no existing manual in AR and apps version with online assessments and providing real time assessments from teachers, parents, and student perspectives. Design of play-based activities will be fully based on the assessment results. Secondly, norms for local population will also be generated for assessments. Thirdly, the manual will be translated in English, this will generate more data from different cultures. A norms will be built for different cultural backgrounds.

D. Usability and Accessibility
A set of play-based learning activities will be used for both in-service and pre-service teachers in their teaching practices. The assessment tool of early diagnosis of cool or hot EF is useful for teachers to design IEP or curriculum for student with ADHD and class with ADHD students. The manual will be translated in English, some localized play-based activities will then be developed for different cultural context. Norms will be updated every year for the assessments. It's also expected the manual will develop more play-based learning activities in different context, like school, family, and community context.

E. Social Impact/ Beneficiaries
This project is the first one to use ongoing and real time assessments to identify ADHD students with either cool or hot EF. The information provided by the apps is useful for teachers and parents to understand their student and child more in order to plan learning activities to them. This project is also the first one to generate local norms of assessing EF in Hong Kong which can be used as an objective measure to compare the executive functions between normal and ADHD students, and between local and oversea ADHD students.

If this project is proved to be effective, funding can be sought from corporate companies, especially some IT firms, to expand this project to more schools. There is a potential IT and software firm agreeing on bidding some grants together, like the IT fund, to further develop the apps in different contexts. Big data generated from the apps will be encouraged for further research development with other universities.

(vii) References to the Corroboration of Impact or Benefit

- The captioned project has won Silver Medal and also Special Merit from Romanian Delegation in the International Exhibition of Inventions of Geneva in April 2018.
  Press release: https://www.eduhk.hk/main/features/FeatureBanner_20180401_124110

  The researchers for the award-winning projects were invited to attend the Reception for Awardees on 4 June 2018, which was officiated by The Hon Mrs Carrie Lam Cheng Yuet Ngor, Chief Executive of the Hong Kong Special Administrative Region.
  Press release: https://www.eduhk.hk/main/features/FeatureBanner_20180604_155826

- Play-Based AR Training Kit for ADHD Children – Principal Investigator: Dr Leung Chi Hung, Department of Special Education and Counselling

  This novel play-based EdTech is for executive function (EF) training of ADHD children in the classroom. It is a technologised system, which consists of localised training manuals, teaching materials and an assessment model for conducting small group play-based learning in the classroom. The system can provide ongoing assessment and self-learning algorithms and generate new assessment norms for executing functions for ADHD children and even children with multi-SEN.

Annex I–B

Impact Case History

(i) Project Title
Reshaping the Policy Landscape of Early Childhood Education

(ii) Name of Principal Investigator
Dr Yuen Wai Kwan Gail, Assistant Professor, Department of Education Policy and Leadership

(iii) Summary
Dr Gail Yuen's 10 years of research, knowledge transfer and engagement have influenced policy to implement free kindergarten provision from 2017/18. Her research has critically reviewed the previous voucher system and market context of kindergarten education and proposed alternatives to ensure more equitable access to quality provision. This research, along with her extensive knowledge transfer and public engagement activities – including roles in key advocacy and policy-making bodies from 2013 to 2017 – has provided evidence and justification for policy change that now has significant impact on children and their families benefiting from the change, as well as on kindergarten providers and educators.

(iv) Underpinning research

Dr Gail Yuen is assistant professor in the Department of Education Policy and Leadership at EdUHK. Her research, knowledge transfer and public engagement has been deeply concerned with identifying and addressing social injustices evident in a marketised education system, and the effects of vouchers on parental choice and the quality of provision.

Underpinning her research were four sequential studies, conducted 2007/2008 to 2011/2012, which identified key limitations in Hong Kong government's policy, introduced in 2007/08, of using a voucher system to help parents to fund their children's kindergarten education.

Working with colleagues in the University's Department of Early Childhood Education, Yuen piloted and launched the first large-scale study in Hong Kong on the effects of vouchers. Quantitative and qualitative research involved surveys, focus groups and interviews with over 1,700 parents of different socio-economic backgrounds on their kindergarten choice practices and views on the voucher system. These studies found that children from disadvantaged backgrounds encountered barriers in the kindergarten market, due to different choice practices of their parents and limitations in the choice available to them compared with more affluent families [see Section 3, R1, R2, R3]. A further study in 2010, for the Council of Non-profit Making Organizations for Pre-primary Education, identified reasons that more than 10,000 parents used full-day kindergartens, which receive limited government support, and the challenges they faced. These kindergartens were found to mostly serve children from poorer families with working mothers [R4]. Together, these studies generated clear evidence of inherent inequities and injustices arising from the marketised structure of Hong Kong's kindergarten education, and offered policy recommendations for free quality provision [R1, R4].

Additional quantitative research, conducted in 2010 with colleagues of the Strategic Planning Office, focused on the kindergarten teaching profession. A survey involving more than 1,400 teachers identified intense workload pressure due to policy requirements for professional upgrading and strengthened quality assurance, and low morale caused by the removal of recommended salary scales aimed to give kindergartens greater flexibility in their operations. This study built on the

previous research to reveal that the new policy and market forces that mitigated against quality provision [R3, R5].

These two strands of research fill a gap in knowledge on how markets in education work in practice. They provided the conceptual foundation for Yuen's extensive knowledge transfer and public engagement activities, working in collaboration with the kindergarten sector and various stakeholder groups [R6]. Concentrated effort was made in the years 2013 to 2017 when the future of kindergarten education was being deliberated by policymakers and the wider community [See Section vi].

Yuen's research has been disseminated in five book chapters, five journal papers and two research reports published between 2009/10 and 2017/18 [See Section 3]. These contributed new empirical evidence and knowledge about education vouchers, education markets, and activism in teacher professionalism, relevant to Hong Kong and internationally in the context of increasing policy interest in voucher systems and market-based school systems. This work was further shared internationally through Yuen's seven conference presentations, in Hong Kong, South Korea, Australia, Canada and the United Kingdom. The research succeeded in advancing the discourse beyond vouchers to a greater understanding of the intended and unintended consequences, and problems, associated with the market approach to funding education and the promotion school choice for parents.

(v) References to the Research

[R1] Yuen, G., & Lam, M. S. (2017). Mothers' experiences of a voucher scheme within the context of Hong Kong's early education: Issues of affordability and justice. *Children and Youth Services Review, 82,* 185-194. (IF = 1.23; 5-year IF = 1.65; SJR = 0.66)

[R2] Yuen, G. (2015). Markets, choice of kindergarten, mothers' care responsibilities and the voucher scheme in Hong Kong. *Children and Youth Services Review, 48,* 167–176. (IF = 1.11; SJR = 0.85) (citations: 3)

[R3] Yuen, G., & Grieshaber, S. (2009). Parents' choice of early childhood education services in Hong Kong: A pilot study about vouchers. *Contemporary Issues in Early Childhood, 10*(3), 263-279. (citations: 21)

[R4] Yuen, G., & Yu, W. B. (2010). *Parents' choice in the use of full-day early childhood services (in Chinese)*. Hong Kong: Education Policy Forum, Department of Education Policy and Leadership, Hong Kong Institute of Education.

[R5] Yuen, G., Lai, K. C., & Law, K. Y. (2010). *The work of early childhood education teachers under the voucher scheme (in Chinese)*. Hong Kong: Strategic Planning Office, Hong Kong Institute of Education.

[R6] Yuen, G. (2018). Masks, masquerades and ironic performances: Getting our(selves) heard. In K. J. Kennedy & J. C. K. Lee (Eds.), *Routledge International Handbook on Schools and Schooling in Asia* (441-449). New York; London: Routledge.

(vi) Details of the Impact or Benefit

Contribution to reframing understanding of limitations in existing kindergarten provision and constructing and negotiating the alternative discourse

Yuen's research provided professional knowledge and insight to reframe the debate on Early Childhood Education (ECE) policy; drive the campaign for free quality kindergarten education; and influence policy change.

Its influence is evidenced by Yuen's appointments in 2013 as convenor of the Alliance on the Fight for 15-year Free Education (the Alliance) and to the Subcommittee on Objectives, Teacher Professionalism and Research under the Committee on Free Kindergarten Education (CFKE) established by the Education Bureau (EDB) to review the sector.

In these roles Yuen drew on the Comprehensive Proposal for 15-year free education (including three years of kindergarten) she masterminded in 2013, referencing her research [Section 5, C1]. This established a coherent policy framework for public provision of free quality kindergarten education, and its interface with other phases of education. It was widely disseminated to kindergartens, policymakers, legislators, the media and public. The Proposal informed the discussion paper she drafted for the CFKE subcommittee. Chow Wai-chun, a member of the subcommittee and Chairperson, Hong Kong Early Childhood Educators Association, affirmed Yuen's contribution: "Another important sub-committee member, Principal Tai Hei-lap, invited Dr Gail Yuen to write a discussion paper on behalf of the subcommittee, updating the reform progress of early childhood education and to draft an overarching policy framework, with goals, values and principles, as a reference for other subcommittees. This framework, after being discussed and modified, was included in the committee report." [C2]. Further impact was achieved when the Proposal was adapted in 2014 as the Alliance's reform blueprint [C3].

As Alliance convenor, Yuen led public engagement on equity and justice issues highlighted in her research, by orchestrating public actions and hearings, press conferences, teacher events, and meetings with CFKE members, legislators, EDB officials and policy think tanks. This raised public awareness, reflected in 180 newspaper article mentions (nine international), and nine television and nine radio mentions [e.g., C4]. This built on earlier engagement, in 2013/14, supported by the University to shape policy discussion, through two seminars attended by around 450 principals, teachers, parents, and organisational representatives, and other public activities. Wong Siu Fung, a core member of the Alliance and kindergarten principal, reflected how Dr Yuen's research and reports "raised the awareness of the sector on the deep and widespread impact of policy on educational development, and prompted the sector's willingness to confront problems in education" [C5].

She also broadened policy debate by engaging with the Hong Kong Council of Social Service to position 15-year free education as policy to promote children's rights and well-being, support families with limited resources, and attend to poverty and children with special educational needs. Three collaborative events (opinion polls, sector-wide consultation and policy forum) were held in 2015-16, with 1,500 parents, teachers, principals, organizational representatives, policymakers, and legislators participating.

<u>Policy change and social impact</u>

This research, knowledge transfer and engagement won the arguments, to a large extent, for policy change when government agreed in 2016 to replace vouchers with direct subsidies for kindergartens, and increase its financial commitment to the sector by 63%, to HK$6.7 billion. New policy implemented from 2017/18 directly impacts an estimated 150,000 children aged three to six each year, and 748 non-profit-making kindergartens (about 97% of the total) in Hong Kong. Free places are available in 90% of non-profit-making half-day kindergartens [C6].

Ip Kin Yuen, Legislative Council member, reflected on Yuen's influence*: "Research findings of Dr Yuen provided the community at large with solid information that enabled not only the education sector but also the policymakers to get rid of the voucher system and embrace the idea of 15-year free education … As Deputy Chair of the Legislative Council's Panel on Education, the impact of her works was very obvious as I myself and many early childhood education leaders frequently made reference to them."* [C7].

<u>Features of the new policy that reflect Yuen's research and advocacy include</u>:

a. Providing direct subsidies to kindergartens (based on half-day operation) instead of vouchers to parents, for their more sustainable development;
b. Providing additional subsidies to whole-day and long whole-day operations;
c. Providing additional subsidies and support to students with diverse needs:
    - families with financial needs;

- kindergartens with 8 or more non-Chinese students;
- students with special needs;

d. Attending to teacher-student ratio to address the diverse needs of children and improve the work environment of teachers;
e. Establishing a clear manpower structure for staffing and career development;
f. Raising the entry salary of new teachers and starting points of head teachers and principals;
g. Intention to raise teacher qualification to degree level, increase full-day places, and improve kindergarten premises and facilities.

Yuen's influence is reflected in feedback from Professor Nirmala Rao, principal investigator of a comparative project on early childhood education, as a "valuable and essential addition to the analysis of the services provided to young children and their families" [C8].

Through Yuen, Hong Kong's experience of kindergarten reform now influences knowledge and policy beyond Hong Kong. For example, Professor Hou Limin, Vice-Chair of the Committee on Curriculum and Professional Teaching, China Pre-primary Education Research Association, sought her advice when the government called for reform in China following scandals of child abuse in Chinese kindergartens revealed in 2017 [C9]. Yuen was approached by two academics from Taiwan, Dr Sun Liang Chen, Department of Early Childhood Education, National Hsinchu University of Education, and Dr Young Kin Bao, Vice-President, National Taipei University of Nursing and Health Sciences, who had been commissioned by the Taiwan Education Bureau to examine the effectiveness of the "Free Tuition Education Scheme for Five-Year-Olds". Sun shared that the Hong Kong experience, and Yuen's Proposal for reform, were valuable for Taiwan to learn from [C10].

(vii) References to the Corroboration of Impact or Benefit

[C1] Working Group of 15-year Free Education. (2012). *Full subsidy for early childhood education: Comprehensive proposal for implementing 15-year free education (in Chinese)* http://www.legco.gov.hk/yr12-13/chinese/panels/ed/papers/ed0319cb4-486-22-c.pdf
[C2] Letter from Chow Wai Chun, a member of the CFKE subcommittee and Chairperson, Hong Kong Early Childhood Educators Association.
[C3] Alliance on the Fight for 15-year Free Education. (2014). Recommendations submitted to the Committee on Free Kindergarten Education (in Chinese) http://www.legco.gov.hk/yr14-15/chinese/panels/ed/ed_fke/papers/ed_fke20150117cb4-360-4-c.pdf
[C4] Yau, E. (2013, June 04). Early childhood education: by the same token. *SCMP.* Retrieved from http://www.scmp.com/lifestyle/family-education/article/1252627/same-token
[C5] Letter from Wong Siu Fung, a core member of the Alliance on the Fight for 15-year Free Education and Principal, Fanling Assembly of God Kindergarten.
[C6] Education Bureau. (2016). Report to the Legislative Council Panel on Education, http://www.legco.gov.hk/yr15-16/english/panels/ed/papers/ed20160201cb4-542-1-e.pdf
[C7] Email communication with Ip Kin Yuen, Member, Legislative Council.
[C8[Letter from Professor Nirmala Rao, Faculty of Education, University of Hong Kong.
[C9] Online communication with Professor Hou Limin, Vice-Chair of the Committee on Curriculum and Professional Teaching, China Pre-primary Education Research Association.
[C10] Email communication with Dr Sun Liang Chen, Assistant Professor, Department of Early Childhood Education, National Hsinchu University of Education, Taiwan.

Awards

- Faculty Publication and Knowledge Transfer Awards 2016/17, Faculty of Education and Human Development, The Education University of Hong Kong.
- President's Award for *Outstanding Performance in Knowledge Transfer (Individual Award)*, The Education University of Hong Kong (2018) (http://p-awards.eduhk.hk/DrGailYUENWai-kwan.php).

Annex I–C

Impact Case History

(i) Project Title

Application and Promotion of an Innovative Mobile Logger for Effective Teaching and Learning of Science and Environmental Studies

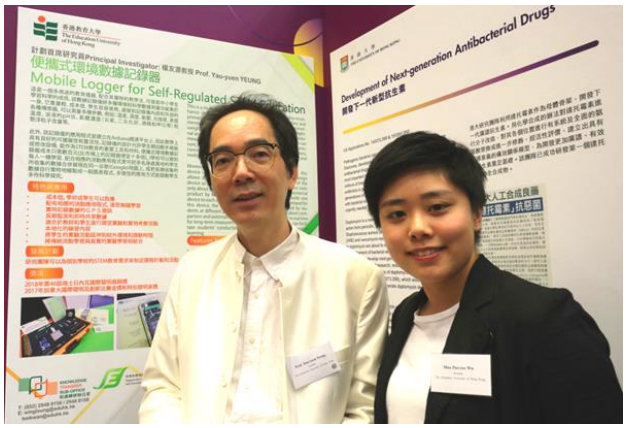
(ii) Name of Principal Investigator

Professor Yeung Yau Yuen, Professor, Department of Science and Environmental Studies

(iii) Summary

An innovative, multi-functional and low-cost datalogging system (called mobile logger with a companion specific app called SESlogger for any Android devices) was invented by the Project Leader. Crucial strategies for student-centered learning and collaborative learning were specifically embedded in the design and development of this digital device for enabling learners to conduct many kinds of scientific experiments or field trip activities within or outside schools. It is affordable by most schools for widespread usage to implement authentic and hands-on STEM education. For the purpose of application and promotion of this device, the main objectives of this project are:

(a) To apply the mobile logger in some selected science or environment-related courses and activities at EdUHK to evaluate learning effectiveness;
(b) To apply the mobile logger in science lessons or field trip activities at two local schools to evaluate learning effectiveness;
(c) To promote the mobile logger to the public for collecting feedback and opportunities for further development.



After winning a silver award at the International Invention Exhibition of Geneva in April 2018, Professor Yeung Yau Yuen and his research team member attended the Reception for Awardees of the Exhibition on 4 June 2018.

(iv) Underpinning research

As practiced in many places, the use of data-logging systems for hands-on experimental activities is crucial in school science learning. Existing commercial data-logging systems are not only expensive but their proprietary software also restricts the teachers' and students' full or creative utilization of the systems. To solve those problems, the design-based research method was applied to develop a new data-logging system with effective pedagogy to implement/encourage student-centred and collaborative learning of science and environmental studies embedded into its design and development. The new system can:

(a) Enable students' creative design and conduction of scientific experiments and field trip activities with collection of authentic data by the students themselves.
(b) Extend students' experimental activities beyond school environment and school hours, especially for overnight or longer time experiments (e.g. photosynthesis, fermentation, rustling processes).
(c) Integrate with and enrich traditional mobile learning with authentic experiments (i.e. beyond virtual/simulation experiments.).
(d) Promote collaborative learning through real-time sharing of observed data as collected in different places by different students.
(e) Facilitate STEM education as students can learn and modify the instrument and code small app to control/use the data-logger.

The present mobile logger is an original design and invention as based on past research on e-learning and technology-enhanced learning in science/physics/STEM education which has already led to a number of conference and refereed journal publications (see Part (v) below).

(v) Selected Research References to Support This KT Project

1. Tho, S. W., & Yeung, Y. Y. (2014). Innovative use of smartphones for sound resonance tube experiment. *Teaching Science, 60*(1), 39-42.
2. Tho, S. W., & Yeung, Y. Y. (2014). Remote laboratory system for technology-enhanced science learning: The design and pilot implementation in undergraduate courses. In Liu, C.C., Ogata, H., Kong, S. C., & Kashihara A. (Eds.), *Proceedings of the 22nd International Conference on Computers in Education*, ICCE 2014 (pp. 260-262). Japan: Asia-Pacific Society for Computers in Education.
3. Yeung, Y. Y., Cheang, C. C. F., & Fok, L. (2015). Development and evaluation of an innovative arduino-based datalogging system for enhancing field-based learning. In Carmo, M. (Ed.), *International Conference on Education and New Developments 2015: Proceedings* (pp. 170-174). Portugal: World Institute for Advanced Research and Science (WIARS).
4. Tho, S. W., & Yeung, Y. Y. (2015). Innovative IP camera applications for scientific investigation. *School Science Review, 96*(356), 58-62.
5. Tho, S. W., Chan, K. W., & Yeung, Y. Y. (2015). Technology-enhanced Physics Programme for Community-Based Science Learning: Innovative Design and Programme Evaluation in a Theme Park. *Journal of Science Education and Technology*, *24*(5), 580-594. DOI: 10.1007/s10956-015-9549-5
6. Chung, M. L. I., Yeung, C. H., & Yeung, Y. Y. (2016). Mobile learning in Hong Kong teacher education: Pilot implementation and evaluation. In Carmo, M. (Ed.), *Education Applications & Development II, Chapter 11,* pp.112-122. inScience Press: Lisboa, Portugal.
7. Tho, S. W., & Yeung, Y. Y. (2016). Technology-enhanced science learning through remote laboratory: System design and pilot implementation in tertiary education. *Australasian Journal of Educational Technology, 32*(3), 96-111.
8. Tho, S. W., & Yeung, Y. Y. (2018). An implementation of remote laboratory for secondary science education. *Journal of Computer Assisted Learning. 2018;1–12* https://doi.org/10.1111/jcal.12273
9. Yeung, Y. Y. (2017). Innovative Development of Low-cost Online Experiments for Science/Physics Education. Oral presentation in *The 9th Joint Meeting of Chinese Physicists Worldwide: International Conference on Physics & Education (OCPA9)*, 17 – 20 July 2017, Beijing, China.
10. Yeung, Y. Y., Wu, P. Y., Tsang, Y. F. C., Cheang, C. C. F., & Lee, H. M. S. (2017). Development and implementation of case study teaching in Hong Kong STEM education: Preliminary findings from an education university. Oral presentation in the *WERA Focal Meeting & HKERA International Conference 2017*, 30 November – 2 December 2017, Hong Kong.

(vi) Details of the Impact or Benefit

The impact or benefit of this project could be reflected from the following scopes of events:

(a) Promotion to the public in some local and international educational technology or KT exhibitions:
   (i) InnoCarnival 2017 in the Hong Kong Science and Technology Park during 21 – 29 October 2017 (coordinated and supported by KT Sub-office of EdUHK),
   (ii) EduTECH Asia 2017 Conference and Exhibition in Singapore during 8 – 10 November 2017 (a booth for exhibition of the mobile loggers plus half an hour of speech in the Tech Showcase theatre during the exhibition period),
   (iii) China Hi-Tech Fair 2017 in Shenzhen during 16 – 21 November 2017 (coordinated and supported by KT Sub-office of EdUHK) and
   (iv) International Exhibition of Inventions of Geneva 2018.

(b) Classroom implementation was made in a primary school and 4 secondary schools in form of either (i) STEM workshop for the students' assembling of the mobile loggers by themselves or (ii) some new and challenging scientific investigation activities specifically designed for the incorporation of the mobile loggers in some science lessons. Those activities were intensively participated by over 10 classes of students (with a total of around 150 primary students and over 150 secondary students).

(c) Classroom and field trip implementation in EdUHK (with 1 course in Sem I and 4 different courses in Sem II of 2017/18 in programme like PGDE(S), BEd(P), BA(EfS), General Education or BSocSc(GES)) with some new and challenging scientific investigation activities and/or field trip activities specifically designed for the incorporation of the mobile loggers in some science methods or environmental studies lessons (as taught by the project team members during September 2017 – May 2018). There were around 300 participants.

(d) Teacher professional development – a number of workshops were conducted on the use and/or assembling of the mobile loggers in a primary school, a secondary school and a PDP course at EdUHK for primary General Studies and secondary Science and Liberal Studies (LS) teachers. Besides, two on-site field trips were conducted for the LS teachers as organized by the EDB. There were a total of over 100 teacher participants from over 50 different schools. Those teachers will teach around 3-4 classes of students in their own schools and so there will be over 10,000 students indirectly benefited in the long term.

(vii) References to the Corroboration of Impact or Benefit

The invention of the mobile logger itself has rendered the Project Leader to obtain the following four awards:

(a) Gold Medal Award and (b) Special Inventor Award, conferred in the *2017 International Invention Innovation Competition in Canada* for the invention and innovation of a new device for effective learning and teaching of science and environmental studies (2017)

(c) Silver Medal, conferred in the *International Exhibition of Inventions of Geneva 2018* for the design of a STEM education kit (2018)
Press release: https://www.eduhk.hk/main/features/FeatureBanner_20180401_124110

The researchers for the award-winning projects were invited to attend the Reception for Awardees on 4 June 2018, which was officiated by The Hon Mrs Carrie Lam Cheng Yuet Ngor, Chief Executive of the Hong Kong Special Administrative Region.
Press release: https://www.eduhk.hk/main/features/FeatureBanner_20180604_155826

(d) President's Award for *Outstanding Performance in Knowledge Transfer (Individual Award)*, The Education University of Hong Kong (2018)
http://p-awards.eduhk.hk/ProfessorYEUNGYau-yuen.php

This project also supported and facilitated

(e) the students' investigation of air quality for the research *project "School-STEM Professionals Collaboration: Impact on teachers' conceptions and students' attitudes towards STEM"* which was led by Professor Winnie So and funded by the General Research Fund for 2017/18 from Research Grants Council; and

(f) the STEM activity for the large-scale competitive university-school partnership project "*Promoting STEM education at the upper primary and secondary levels by using self-directed learning as a strategy*" which was led by Dr Lee Y.C. and commissioned by the Education Bureau, 2017–2019

Further information of the invention and its resources and exemplars for implementation in schools can be found at http://has.eduhk.hk/seslogger/.

Annex I–D

After winning a silver award at the International Invention Exhibition of Geneva in April 2018, Professor So Wing Mui and Dr Chow Cheuk Fai attended the Reception for Awardees of the Exhibition on 4 June 2018.

Impact Case History

(i) Project Title

Plastic Resources Education: 3Rs & 3Cs

(ii) Name of Principal Investigator

Professor So Wing Mui Winnie, Dr Chow Cheuk Fai Stephen, Department of Science and Environmental Studies

(iii) Summary

"Plastic Resources Education: 3Rs & 3Cs" was launched in 2016. The project aims to raise the awareness of the plastic waste problem in Hong Kong through education; to promote 3Rs (Reduce, Reuse and Recycle) and 3Cs (Cleaning, Classification and Compression) with plastic in primary schools, EdUHK and the community; and to establish a role model for plastic waste reduction and recycling for other schools, campuses and wider society. The programme is a platform for changing the next generation's knowledge, attitudes, and behaviours with regard to plastic resources recycling.

(iv) Underpinning research

To evaluate and review the effectiveness of the programme in plastic resources education, research data has been collected and evaluation has been conducted.

Research 1:

"Integration Plastic Resources Education into Primary Education: A case study in Hong Kong"

Examined teachers' use of strategies and approaches in integrating Plastic Resources Education (PRE) into school life to overcome the challenges encountered during implementation and promote environmental friendly practices.

Research 2:

"Study of the relationship between changes of primary students and their families in aspects of knowledge, attitude and behavior through the teaching activities (under the "Plastic Resources Education - 3Rs & 3Cs" Programme)"

Primary students will gain knowledge of plastic resources management through a 2-year teaching program and practice in their daily life. This research aims to evaluate the relationship of the behavioral, attitude and knowledge change of students and those change of their parents through questionnaire surveys. Pre- & post test have been conducted.

(v) Selected Research References to Support This KT Project

- Cheung, T. Y., Fok. L., Cheang, C. C., Yeung, C. H., So, W. M. W. *, & Chow, C. F. * (Accepted) University halls plastics recycling: a blended intervention study. *International Journal of Sustainability in Higher Education.*
- Cheung, T. Y., Chow, C. F., & So, W. M. W.* (2017). A train-the-trainer design for green ambassadors in an environmental education programme on plastic waste recycling. *International Research in Geographical and Environmental Education. 27*, 24-42.

- Chow. C. F., & So, W. M. W. "8-Compartment Plastic Recycling Bin": A 8-compartment plastic recycling bin designed to facilitate collection of different plastic recyclables (PET, HDPE, PVC, LDPE, PP, PS, Others, and Blend polymers). (Patent no.: 1500153.0) (granted, publication date: 21 January 2015)
- Chow. C. F., So, W. M. W. , & Cheung, T. Y. (2016). Research and development of a new waste collection bin to facilitate education in plastic recycling. *Applied Environmental Education & Communication, 15*(1), 45-57.
- So, W. M. W.*, Cheng, N. Y. I., Chow, C. F., Zhan, Y. (2016). Learning about the Types of Plastic Wastes: Effectiveness of Inquiry Learning Strategies. Education 3-13: *International Journal of Primary, Elementary and Early Years Education, 44*, 311-324.
- Yeung, S. K. D., Cheng, N. Y. I., So, W. M. W., Chow, C. F.* (2017). Comparing pedagogies for plastic waste management at university level. *International Journal of Sustainability in Higher Education. 18*(7), 1039-1059.

(vi) Details of the Impact or Benefit

Sustainable approach of 3Rs and 3Cs education:

1. Conducted train-the-trainer program about 3Rs and 3Cs to EdUHK student teachers, school teachers and the volunteers from HSBC as green ambassadors. They transfer their knowledge about plastic to schools, pupils and assisted in different 3Rs and 3Cs promotion activities, such as exhibition, workshops and field visits.

School education:

2. Developed educational publication/ videos/ teaching kits on 3Rs & 3Cs of plastic and uploaded to the online platform, to share the useful materials and knowledge with schools.

3. Conducted training in 40 primary schools (with 14,000 students) through experiential learning and different implementation schemes e.g. site visit, coastal cleanup, mosaic art workshops, Bring Your Own Plastic, Plastic Take 2, Love Plastic Friday, design of 8-in-1 recycling bin competition etc. Through the programme and these activities, introduced the concept of over-use of plastic, pupils and teachers acquired the knowledge of plastic as resources, and developed awareness towards 3Rs and 3Cs among pupils and teachers.

4. Arranged consultation and training sessions for participating school teachers to share their experience, difficulties, teaching approaches and possible solutions. Teachers became more knowledgeable and confident in conducting plastic resources education in their schools.

Community education:

5. Collaborated with public and private sectors i.e. elderly centers, kindergarten, child care centers and green groups in organizing fun days, upcycling workshop etc., to promote the message of 3Rs and 3Cs and smart usage or consumption of plastic.

(vii) References to the Corroboration of Impact or Benefit

- Silver Award, conferred in the *International Exhibition of Inventions of Geneva 2018* for the design of an EdTech education kit (2018)
  Press release: https://www.eduhk.hk/main/features/FeatureBanner_20180401_124110

  The researchers for the award-winning projects were invited to attend the Reception for Awardees on 4 June 2018, which was officiated by The Hon Mrs Carrie Lam Cheng Yuet Ngor, Chief Executive of the Hong Kong Special Administrative Region.
  Press release: https://www.eduhk.hk/main/features/FeatureBanner_20180604_155826

Media: Newspaper

1. SingPao Daily News (15 October 2017)

教大3R嘉年華 推動減塑

【本報港聞部報道】香港教育大學（教大）可持續發展教育中心（中心），於昨日在大埔校園舉行「少塑」點 —3R．3C嘉年華，吸引近200名師生及家長參與，以活動提升正確處理塑膠資源觀念。

在小學回收塑膠

中心過去一直致力於推動塑膠資源的教育和管理；於2016年9月，中心開展為期兩年的「塑膠資源教育— 3Rs & 3Cs」計劃，在全港40間小學進行塑膠資源教育和塑膠回收，計劃得到滙豐支持，計劃推行至今共收集到超過470公斤塑膠廢料，全部已送往本地回收中心及回收公司作回收之用。

■嘉賓主持開幕儀式。

是次嘉年華活動屬「塑膠資源教育— 3Rs & 3Cs」計劃的重點活動之一。中心總監蘇詠梅致歡迎辭時表示：「塑膠資源教育得到眾多學校積極參與，我們感到相當鼓舞。嘉年華命名為『少塑』點，正是希望向大眾帶出減少使用塑膠的信息，喚起大家正確對待塑膠的觀念。」

家長亦可以參與

教大科學與環境學系副教授周卓輝在同一合亦表示：「塑膠資源教育對象，並非局限於小學生。我們在小學推動時，亦希望透過學生與家庭成員互動和接觸，影響無數學生所屬的家庭，以至整個社會。期望透過今次活動，成為家長直接參與學習的機會。」

來自近20間不同學校的學生及環保團體，在嘉年華中擺放超過30個展覽及遊戲攤位，向參與者推廣環保訊息及展示學生作品。會上亦頒發於早前進行的「塑膠分類回收箱設計比賽」及「宣傳短片製作比賽」等多個獎項。

Annex II

KT Fund Projects 2017/18

Project Title	Principal Investigator
Belt and Road Initiative and Hong Kong	Professor Chiu Wing Kai Stephen
One Country Two Systems in Hong Kong	Dr Fong Chi Hang Brian
Development of Executive Functioning Training Manual Using Play-based Learning & Assessment Tool to Students with ADHD – AR Mobile Apps Version	Dr Leung Chi Hung
Production and Promotion of an Evidence-based Exercise Manual for Children with Autism Spectrum Disorder in Primary School and Kindergarten	Dr Yu Chung Wah Clare
Enhancing Teacher Efficacy and Positive Parenting for the Support of High Functioning Students with Autism Spectrum Disorder: An Evidence-based Professional Development and Practical Approach	Professor Lo Sing Kai
Promoting Positive Parent-child Relationship through Mindfulness Training	Dr Zhang Yuefeng
Knowledge Transfer through Short Film Production: Research on Silence and Mindfulness	Dr Koji Matsunobu
A Website for Art Criticism Learning and Teaching: Building Up of Resources, Forming of Community of Practice and Enhancement of Impact	Dr Tam Cheung On
Application and Promotion of an Innovative Mobile Logger for Effective Teaching and Learning of Science and Environmental Studies	Professor Yeung Yau Yuen
Lesson Planning for Drama in Language Education: A New Approach	Dr Decoursey Matthew William

Annex III

Number of Beneficiaries [Note 1]

Key Beneficiary Item	Nature of KT Activities involved [Note 2]	2016/17	2017/18 [Note 3]
Number of schools benefited	Categories (4), (5) & (6)	26,348	7,299
Number of principals benefited	Categories (1), (3), (4),(5) & (6)	26,359	4,522
Number of teachers benefited	Categories (1), (3), (4),(5) & (6)	75,722	76,060
Number of students benefited	Categories (4) & (5)	1,472,243	1,208,398
Number of conference participants benefited	Category (2)	6,813	9,055
Number of organizations/ advisory bodies benefited	Category (6)	1,085	1,125

Notes:

1. The number of beneficiaries is calculated according to the number of activities involved. Some beneficiaries and schools may have been involved in more than one activity.

2. Categories of KT Activities include:
   (1) Continuing Professional Development (CPD) Courses
   (2) Local/International Professional Conferences
   (3) Professional Seminars/Workshops
   (4) Commissioned/Contract Projects
   (5) Partnership Projects for Change, Improvement and Innovation
   (6) Consultancies

3. A large regional project was carried out in 2016/17 and it had a wide regional reach with large number of beneficiaries. The project was ended in October 2016. Besides, around 50 projects reported in the year 2017/18 did not provide number of beneficiaries because (1) some of these projects have just started at the time of reporting and (2) some of them were conducted via an on-line system and their reports did not give statistics on number of beneficiaries.

Annex IV

Summary of Performance Indicators

Performance Indicators for Knowledge Transfer Activities			2016/17 (1/7 - 30/6)	2017/18 (1/7 - 30/6)
1	**Continuing Professional Development (CPD) Courses**	Number of CPD courses	49	56
		Income from CPD courses	$10,279,277	$12,523,754
		Number of key partners	23	35
		Number of student contact hours	3,737	4,403
2	**Local/International Professional Conferences**	Number of local/international conferences	52	54
		Income from conferences	$933,469	$2,089,214
		Number of key partners	241	126
		Number of presentations	1,436	1,547
3	**Professional Seminars/Workshops**	Number of professional workshops/ seminars	426	428
		Income from seminars/workshops	$546,977	$1,236,700
		Number of key partners	413	1,011
4	**Commissioned/Contract Projects**	Number of commissioned/ contract projects	97	103
		Income from projects	$48,132,401	$60,262,647
		Number of key partners	238	254
5	**Partnership Projects**	Number of partnership projects	112	120
		Income from partnership projects	$7,687,091	$11,168,258
		Number of key partners	1,967	1,563
6	**Consultancies**	Number of consultancies	27	29
		Income from consultancies	$2,111,890	$7,189,653
7	**Professionals Engaged in Academic/ Professional Programmes**	Number of programmes involved	65	66
		Number of teachers engaged	11	49
		Number of principals engaged	24	23
		Number of other professionals engaged	89	141
8	**Commercialized R&D Products and Intellectual Properties(IPs)**	Number of commercialized R&D products/ IPs	15	20
		Income from the R&D products/ IPs	$160	$233,424
9	**Social, Community and Cultural Engagement**	Number of public lectures/ symposiums/ exhibitions And speeches to a community audience	417	460
		Number of performances and exhibitions of creative works by staff or students	47	50
10	**Staff Engaged as Professional Consultants or Members of External Advisory Bodies**	Number of staff engaged	122	149
11	**Student Engagement**	Number of student internships/ placements	2,842	2,703
12	**Publicity or Media Exposure**	Number of publicity or media exposure related to KT, including print, on-line and electronic media	729	783
13	**Nexus between Research and Teaching**	Number of academic staff using research in teaching/course activities	296	275
		Percentage of academic staff using research in teaching/course activities	93.7%	93.9%
		Number of academic staff using teaching as research	191	178
		Percentage of academic staff using teaching as research	60.4%	60.8%
14	**Publications with Local and Regional Impacts** [Note 1]	Number of publications directly relevant to improvement, innovation and development of professional/educational practices/ policy development	836	847

Notes:

1. All the incomes generated are in HK$.