

2022 WITSA Global Innovation and Tech Excellence Awards Nomination Form

The 2022 WITSA Global Innovation and Tech Excellence Awards (formerly known as *the Global ICT Excellence Awards*) will be presented to select individuals, academic institutions, corporations, NGOs or governments whose use and applications of digital technologies exhibit exceptional achievement within the following broad categories:

Private Sector/NGO	Public Sector
Digital Opportunity/Inclusion Award	Digital Opportunity/Inclusion Award
Smart Cities Award	Smart Cities Award
Sustainable Growth/Circular Economy Award	Sustainable Growth/Circular Economy Award
Innovative eHealth Solutions Award	Innovative eHealth Solutions Award
Public/Private Partnership Award	Public/Private Partnership Award
E-Education & Learning Award	E-Education & Learning Award
Emerging Digital Solutions Award	Startup Ecosystem Award

In addition, a *Chairman's Award* will be presented to a nominee selected from the entire pool of candidates from all award categories.

Candidates for these Awards are nominated by ICT experts from around the world who span over 80 countries/economies. The 2022 WITSA Global ICT Excellence Awards will take place in conjunction with the September 13-15, 2022 World Congress on IT in Penang, Malaysia (<https://wcit2022.com/>).

E-Education & Learning Award

Award #1: Individuals, academic institutions, corporations, or NGOs

Award #2: Government authorities

Award Criteria: The Digital Age is requiring new sets of skills, and adoption of new models of public education that emphasize coding, programming and computer science must be adopted. Contrary to popular belief, the digital gap is widening, putting pressure on countries to catch up. Public education must adopt new approaches to lifelong learning. This award will be given to the best electronic learning project. We seek any innovative new technological tool, or any project that uses existing electronic learning tools in an innovative way. Such projects should facilitate and support learning through the use of information and communications technology.

YOUR NOMINEES (limit three nominations per award category). *Please specify whether the nominee(s) are for the private or public sector category.*

Private Sector

Nominee: Science and Technology for Autism Remediation (STAR) Ltd

Entry Name: Robot for Autism Behavioral Intervention® (RABI®)

REASONS FOR NOMINATION (NOTE: It is important that you make a detailed description of the nominee and why you think the nomination is justified. The absence of a detailed summary of qualifications as they *relate* to the above-mentioned award description will make it difficult for the awards committee to make an appropriate assessment of the candidate):

The mission of STAR Ltd is to empower individuals with autism spectrum disorder (hereafter, autism) aged three to eighteen through the application of science and technology. Its vision is to enhance social inclusion of individuals with autism by equipping them with necessary skills in their workplace and social lives and to promote economic self-sufficiency in individuals with autism by actualizing their potential. It is the sole provider of an award-winning, innovative and effective robot-based intervention, namely Robot for Autism Behavioral Intervention® (RABI®).

Societal needs: Autism spectrum disorder (ASD) is a complex and pervasive neurodevelopmental condition (American Psychiatric Association, 2013). Children with ASD are characterized by impairments in communication and social interaction, including the inability to relate to other people, little use of eye contact, difficulties in verbal and non-verbal communication, delay in understanding gestures and facial expressions, and deficits in understanding others' intentions, feelings, and mental states. The prevalence of children with ASD is increasing in Hong Kong and around the world. ASD affects as many as 1 in 44 children in the United States (Centers for Disease Control and Prevention, CDC, 2020). In Hong Kong, approximately 800 school-aged children are newly diagnosed around every year, reaching approximately 15000 school-aged children diagnosed with ASD in 2021.

No cure exists for autism. Treatment success lies in behavioral support in early childhood. Early behavioral intervention is likely to be more effective and less costly than late intervention. Early behavioral intervention services can have a huge impact on the behavioral and cognitive functioning and future well-being of children with ASD. Behavioral intervention strategies have focused on social communication skill development (particularly at a young age when the child would naturally be gaining these skills) and reduction in restricted interests and repetitive and challenging behavior. However, behavioral intervention incurs high costs to families with children with ASD. In Hong Kong, the cost of one-to-one treatment by behavioral therapists is about HK\$800 an hour. The combination of an autism diagnostic assessment, approximately 60 hours of ABA training per month, progress assessment, and parent training can exceed annual costs of HK\$400,000. A survey by an NGO in Hong Kong shows that parents of ASD children face extreme financial pressure. In addition to meeting the monthly training expenses, there are also parents who give up full-time jobs, potentially reducing their family income by HK\$10,000. Furthermore, there is a limited supply of intervention in Hong Kong; a survey conducted by the Society for Community Organization in 2019 indicated more than 5,000 ASD preschool children waiting for treatment. The assessment time for diagnosis and the period of intervention take 2 years at least. This causes significantly delayed treatments for these children in need.

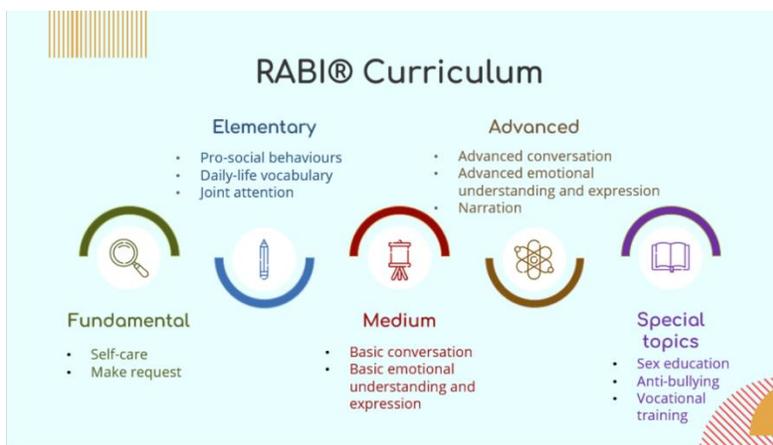
In addition to high costs and limited supply, children with autism have special learning needs. They show deficits in orienting themselves toward social stimuli, engaging with humans, and maintaining social relations (Social Motivation Theory). Therefore, these individuals may not be responsive to their human therapists. Besides, they tend to have excessive reactivity and rapidly form memories of experiences, due to a particular form of brain hypertrophy. The dynamic facial features and expressions of human beings may induce intensive sensory processing in individuals with autism, possibly resulting in sensory and emotional overstimulation and distraction (Intense World Theory). As a result, individuals with autism may actively avoid the sensory stimulation, and instead focus on elementary features that are more predictable, which

may interfere with their learning. Hence, human-based intervention alone may not be sufficient to enhance the social communication skills of the children with ASD.



RABI® as a solution: As a result, my STAR Ltd aspire to provide a an effective, affordable, and timely intervention for children with autism. Based on the empathizing-systemizing theory, robots are operated on predictable and lawful systems, thereby providing children with ASD with a highly structured learning environment and helping them to focus on the relevant stimuli. Additionally, children with ASD do not need to consider socio-emotional expectations when interacting with robots, thus reducing their social anxiety. Social robots can also be massively manufactured. Thus, they can provide timely and affordable interventions to the children with ASD. Taken together, the use of social robots may significantly reduce the autism severity of these children, family monthly expenses, and treatment waiting time.

What is RABI®? Since 2015, the founder and Director has established an award-winning robot-based intervention (namely RABI®) for children with autism. RABI® covers a plethora of social and behavioral skills for children with autism (So, 2020). The scope and sequence of RABI® is designed according to a simple-to-complex approach. It starts with module 1) self-care, followed by modules 2) making requests, 3) basic vocabularies, 4) basic emotional understanding, 5) basic conversational skills, 6) narration, 7) advanced emotional understanding, and 8) advanced conversational skills. There are also special modules on sexual education, anti-bullying topics, and vocational training. In order to cater for diverse learning needs, there are different levels of difficulty in contents and skills within each module.



How does RABI operate? There are group or individual classes with consideration of their abilities and preferences. In addition, STAR Ltd provides on-site services that our special childcare workers will go to different schools and NGO centres in the district to provide training to their students.

The RABI® program has designed dramas and role plays training that tailored for individuals with ASD aged 3 to 18 who have diverse learning needs and verbal abilities. We deploy NEC Social Robot, “HUMANE” to provide language communication, self-care and behavioural training to individuals with autism. HUMANE, as the key to the RABI® program, can communicate interactively with facial expression. Equipped with sensors, it can record and analyses the child’s speech and body language and give instant feedback to improve their social skills, such as concentration, eye contact and mental interpretation for individuals with autism. Additionally, HUMANE is a user-friendly robot which controllers can use a computer to carry out all pre-set training programs.



HUMANE is installed with RABI® curriculum, that cover a wide range of social and behavioural skills including self-care, daily-use vocabularies, basic and advanced emotional understanding and expression, basic and advanced conversation, narration, sexual education, and anti-bullying. In one of the robot drama lessons, a robot acting a child with ASD loses temper and yells at its sibling due to the sudden change of the schedule. Then the parent robots explain the change and teach the child robot how to express the anger or anxiety appropriately; those who have moderate verbal abilities will be taught conversation skills through role play with a robot, to practice communication and social skills, such as eye contact.

As mentioned above, we choose the curriculum for each student in accordance with their abilities and needs. For example, for a five-year-old ASD child with low cognitive functioning who always imitates others’ speech (i.e., echolalia) and whose non-echoed speech is repetitive and meaningless (e.g., “Malala...malala”), our team would teach basic vocabulary. For another age-matched child with high cognitive functioning, who produces meaningful and non-echoed speech, but seldom looks at their conversation partner, we would teach him/her basic conversation skills starting with eye contact. In a different case again, another age-matched

child who can establish eye contact with others but does not know how to maintain a conversation topic should be taught more advanced conversational skills.

At times, we offer tailor-made robot dramas that demonstrate unique scenarios particular ASD children have come across during the week. It is important for these children to learn relevant social skills from these real scenarios. Therefore, we program the robots to perform corresponding dramas. Thanks to the text-to-speech interface empowered by machine learning method, which was developed by an engineer, Professor Lee Tan at the Chinese University of Hong Kong, we can easily design new dramas to meet daily needs of ASD children.

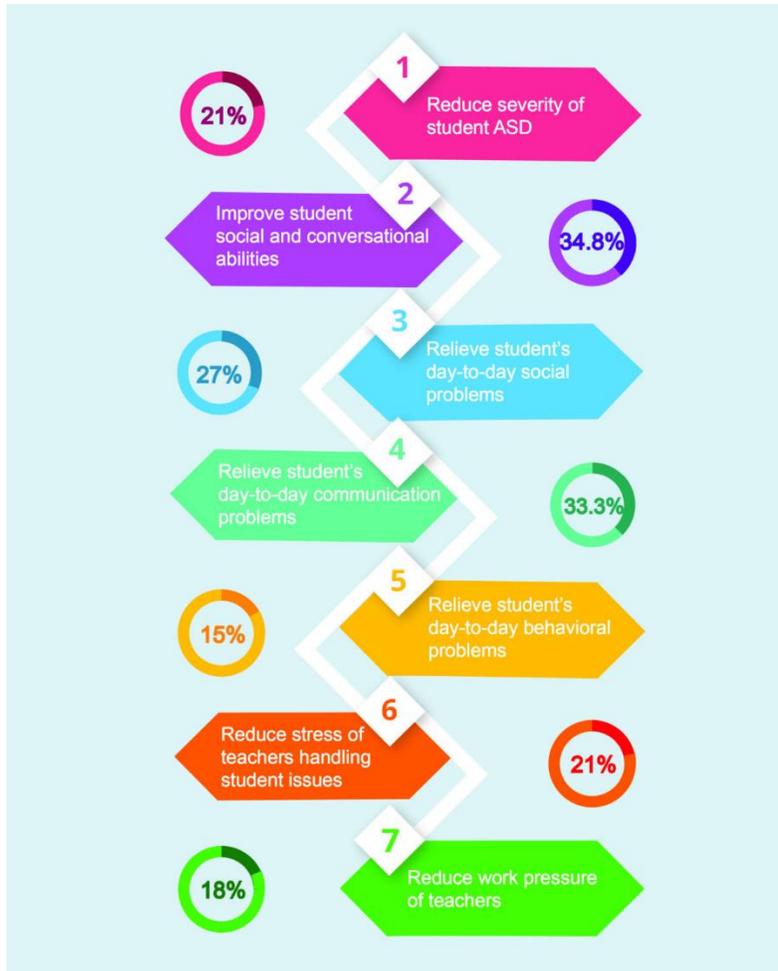
Empirical evidence of RABI®: The findings generated from the pretest-posttest designs support the effectiveness of RABI® on gestural communication, joint attention, play behaviors, verbal imitation, narrative skills, and conversation, thereby providing an alternative to conventional intervention in which human teachers or therapists play the sole or significant role (So et al., 2016, 2018a, 2018b, 2019a, 2019b, 2020, 2021a, 2021b). The latest findings have also shown that RABI® is more effective than human-based intervention in improving joint attention (So et al. revision under review). These results suggest that RABI® can enhance the social and behavioral functioning, which in turn facilitates societal inclusion, promotes economic self-sufficiency in individuals with autism.



Local and Potential Global Social impact created by RABI®: Over 2000 children in Hong Kong and Macau had received RABI® since 2015. Children aged 3 to 12 who receive RABI® from 3 to 9 months have a 25% reduction in autism severity, a 20% increase in social and behavioral functioning, and an 18% improvement in cognitive performance. Parents also agreed that "children's social behavior has improved significantly". Parental stress is also reduced by 60%, and financial burden is reduced by 57.2%



Teachers believe that "students are able to apply the skills they acquire and integrate them into their daily lives". Teachers commented that their students, aged 6 to 12, have autism severity reduced by 21%, social communication skills improved by 35%, and problem behaviors by 15%. Teachers' workload is significantly reduced by 18% and their stress reduced by 22%.



IP of RABI®: RABI® has registered 6 trademarks in Classes 16, 41, and 44 in China (54504317 - 513516-600001-CN07; 54504316 - 513516-600001-CN08; 54504315 - 513516-600001-CN09; 54504314 - 513516-600001-CN10; 54504313 - 513516-600001-CN11; 54504312 - 513516-600001-CN12; 54504311 - 513516-600001-CN13). RABI® has also registered three trademarks in Classes 16, 41, and 44 in Hong Kong (305575375; 305575410; 305575492).

Honors and Awards: RABI® also obtained the Information Communication and Technology Merit Award in 2018 and Gold Award in 2021 for its contribution to school inclusion and special needs education through the application of technology. The founder of STAR Ltd has been appointed by the International Society for Autism Research (INSAR), a leading global autism research body, as its sole Global Senior Leader for Hong Kong. Recently, RABI® has recently won five awards from different local and international organizations: Silver Award from the International Exhibition of Inventions of Geneva 2022 and 2021 Best Practice Awards in Social Welfare (Outstanding Social Service Award; Service Delivery Award (Innovative Ideas); Service Delivery Award (User Participation); Service Delivery Award (Evidence-based Practice))

Overall, RABI® is recognized locally and internationally regarding its research and development, technology and innovation, and social impact.

Scalability of RABI®: STAR Ltd aims to develop effective, affordable, and timely early intervention, through the application of technology. The use of technology may significantly reduce the autism severity of these children, family monthly expenses, and treatment waiting time. Our main targets are schools / NGOs in the district, as well as the families. STAR Ltd serves approximately 500 ASD children and 15 schools / NGOs annually. Originally located at the Chinese University of Hong Kong, this year, STAR Ltd will expand its business by opening the second branch in a local district, hence increasing the number of beneficiaries by 50% annually.

Children from the families, which are currently recipients of Comprehensive Social Security Assistance or Student Grant by the HKSAR Government, can sign up to our training under the funded scheme. Alternatively, children who are not receiving any subsidies from the Government will receive our training under the non-funded scheme.

Non-funded scheme:

[Group RABI® class]	HKD250 / class (50 minutes, 2 kids) HKD200 / class (50 minutes, 3 kids or above)
[Individual RABI® class]	HKD600 / class (30 minutes) HKD1000 / class (50 minutes)

Funded scheme:

[Group RABI® class]	HKD150 / class (50 minutes, 2 kids) HKD100 / class (50 minutes, 3 kids or above)
[Individual RABI® class]	HKD150 / class (30 minutes) HKD200 / class (50 minutes)

According to our pricing schemes, the non-funded families, which pay more, to some extent assist the funded families to receive RABI®.

To date, RABI® has Chinese (Cantonese and Mandarin) and English versions available, hence being ready to serve autistic individuals in Chinese- and English-speaking countries such as United States, United Kingdom, China, Taiwan, and Singapore. RABI has established social ventures in Australia, where its services will be made available at five special schools in these regions, such as Waratah Special Developmental School, Kalianna School. In total, 1500 pupils with ASD from these schools and organizations abroad will benefit from RABI.

Besides providing center- and school-based services, we also offer other services, which include school subscription of RABI®, training of speech therapists or clinicians in implementing RABI® in their workplace, and ASD assessment. We particularly adopt the train-the-trainers model. RABI® team visits the schools/organizations and trains the professional/ teaching staff (train-the-trainers model). To date, 40 seminars were delivered for over 1000 therapists and caregivers. 90% of the participants mentioned that the workshops and seminars increase their understanding of the application of social robots for their children or students and their interests in using the robots. More than 35 workshops have also been delivered training close to 500 professional staff in deploying robots in their workplace. This provides them with detailed evidence-based manuals and guidelines, thereby enhancing their professional development and competency in administrating robot-based intervention in schools. After completion of the training, professional staff would receive certificates and become registered users of RABI®. By practicing the train-the-trainers model, RABI® can be continuously provided in a particular school in the long run. The Salvation Army Shek Wu School, Neighbourhood Advice-Action Council, and Hong Kong Sheng Kung Hui Council are having their staff run RABI® themselves.

SUPPORTING INFORMATION: Please send any supporting information to the address above, including information from candidate (i.e. excerpt from program description, web site print-out, press release, etc.)

STAR Ltd website <https://star-autism.com/en/rabi/>

Enclosed print-out (star website_RABI; star website_RABI team; star website_parent testimonials; star website_FAQ)

RABI@ introduction video
<https://drive.google.com/file/d/10A0hu27rSDAHHqqYDx2QOhk0jzZIApri/view?usp=sharing>

RABI@ short documentary
<https://drive.google.com/file/d/1xSYfEjbbYuaqvs8a1rKvqt8q4Txf7fwu/view?usp=sharing>

Media Coverage

1. Friendly gestures from robots inspire autistic children in Hong Kong
Chinese University programme has reduced the challenging behaviour of students, particularly relating to anger and mood swings (South China Morning Post, 2016)
<https://www.scmp.com/news/hong-kong/article/1983179/friendly-gestures-robots-inspire-autistic-children-hong-kong>
2. Robots break communication barriers with autistic Hong Kong children: Professor's programme teaches interaction skills using machines designed to appeal to kids (South China Morning Post, 2017)
<https://www.scmp.com/news/hong-kong/education-community/article/2097135/robots-break-down-teaching-barriers-autistic-hong>
3. Robot helps ASD children develop social competence (Learning and Teaching Expo Newsletter – 2018)
4. Robot revolution to help train autistic children (Standard, 2018)
5. Life with robots (NHK World Japan, 2019)
https://gocuhk-my.sharepoint.com/:v/g/personal/wingchee_cuhk_edu_hk/Ea3GhtnyhxtEpYhiwiuUVB0Bx1FlxERemJZ02_z7aR73ZQ?e=GbMol5
6. A research based curriculum treating autism using social robots: Using social robots to teach people with ASD to identify the subtleties of communication and respond appropriately is effective in treating the disorder. (Education Today, 2020)
7. Acclaimed Global Leadership in Autism (THE World University Ranking, 2021)
8. Hong Kong robots help autistic children boost social skills (Reuters, 2021)

NOMINEE CONTACT INFORMATION (for award follow up and coordination)

Name/title: So Wing Chee, Catherine / Founder and Director

Email: **wingchee@cuhk.edu.hk**

Phone/Mobile: +852 66220516
