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HONOURS PROJECT II

What are the challenges for General Studies teachers to implement STEM education to the students with Autism Spectrum Disorder in Primary School?

Submitted by

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1. Abstract

The difficulty of launching STEM education in mainstream primary has been a topic of interest in the research world in recent decade but there are not much research focusing the need of special education need student. The purpose of this study tries to find out the challenges from another point of view, to investigate the challenges that the in-service general studies teachers facing when they organize STEM education to the students with autism spectrum disorder (ASD). This research will be conducted by the use of qualitative research and semi-constructed interview with 4 serving general studies teachers from different mainstream primary schools in Hong Kong. Its goal is to raise suggestions regarding the difficulty they mentioned and how the related stakeholder can help to meet the education need of ASD students in STEM education.

2. Introduction

STEM education applies worldwide in the education reform and even extend to the General Studies (GS) Curriculum in Hong Kong. According the document from the Education Bureau (2015), the implement and promotion of STEM education began. In meanwhile, the Curriculum Development Council (2017) updated the General Studies Curriculum for primary school and gave similar objective "arouses students' interest in and develop their skills to related to science, technology and society". Then, the serving teachers especially for those who are teaching STEM related subjects including Computer, Mathematics and General Studies bear the responsibility and become the direct instructors for carrying out STEM education.

Besides, it is noticed that the total number of special education need (SEN) students in mainstream school increase from 33830 to 45360 between 2013 and 2018 which has increased 34%. At the same time, the percentage of the number of ASD students to the population of SEN students is 24%. (Legislative Council Secretariat, 2019) In the light of both trends, GS teachers are easy to meet ASD students with when they implement STEM education to the local primary school. Therefore, the objective of this study is to collect first-hand data from one of the main parties, General Studies teachers, and investigate the challenges they faced during the implement of STEM education to ASD students.

3. Research Background

3.1 Development of Inclusive Education in Hong Kong

In global aspect, the concept of inclusive education developed in the 1970s with the strategy that putting the learners with special education need in regular classroom. The reason behind of the concept is because of the raise of awareness on equality, social justice and human right for being educated. (Stella, Forlin & Lan, 2007) Following the education trend, the Hong Kong Government launched the first

motion through a White Paper called ‘‘Integrating the disabled into the community: A united effort’’ aiming at integrating SEN students into regular and mainstream schools. (Hong Kong Government, 1977)

After a few years, the Education Bureau stepped further by classifying 5 types of SEN student with normal intelligences but have mental handicap, physical, visual, hearing disability and autism student and encouraged them to study in regular classroom while the other SEN students remain stayed in special school. In the past few decades, it is obvious that the Education Bureau pushed the implementation of inclusive education forward and even develop guideline for mainstream school. Leung & Mak (2010) pointed out that with the help of ‘Whole school Approach’ and ‘New Funding Mode’, mainstream schools can receive funding from the government and instruction can be given to different stakeholders such as parents and school committee while the Whole school Approach means the cohesiveness between different stakeholders in the school community by allocating and utilizing resources. (Ainscow & Florek ,1989) For the SEN students, they will obtain different level of learning support according to the 3-tier model. (EDB,2009)

3.2 STEM education in Hong Kong

Internationally, STEM education is the curriculum covers Science, Technology, Engineering and Mathematics with the aim of acquire and apply knowledge to handle the issue they identified in daily life. (Bybee,2010) In order to enhance the competitiveness of the Hong Kong students, Education Bureau first raised the Report on Promotion of STEM Education - Unleashing Potential in the Policy Address of 2015. Education summarized 6 concrete suggestions to develop innovative potential of STEM education in both primary and secondary education. The six suggestions are i) update the curriculum of STEM education; ii) enhance the provision of quality learning experience; iii) increase the resource provided to school for supporting STEM development; iv) strengthen the professionalism of teacher and school; v) encourage the participation of the community for promoting STEM education and vi) keep reviewing on the process of STEM education development. (The Government of Hong Kong Special Administrative Region, 2016) The Policy has received support in 2016 as it is hoped to develop the interest of student in learning Science, Technology and Mathematics. (Education Bureau, 2016). When it came to 2017, it extended to the General studies curriculum for further support in STEM education.

Comparing to the Asian countries for example, Korea and Japan, the development of STEM in Hong Kong fell behind than them as Korea proposed the second Master Plan for Educating and Nurturing Human Capital in Science and Technology aspect while Japan launched their own Council for Science and Technology Policy aiming at promoting STEM education. (Marginson et al, 2013).

4. Literature review

4.1 Characteristics of Autism Spectrum Disorder

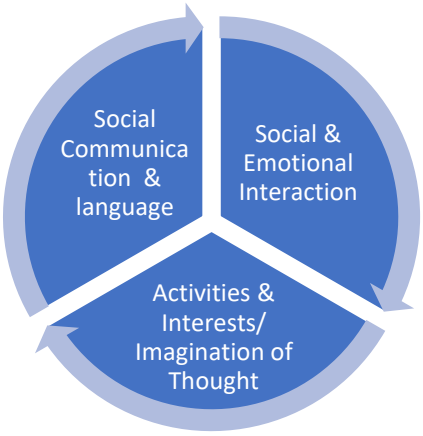

Figure 1. The Triad of Impairment in Autism

From the document of the Education Bureau, it is stated that autism is one of the types of special education need among the nine categories. The above diagram shows the typical impairment in three aspects. According to the research of Wing & Gould (1979), autistic students are weak in social interaction, social communication and imagination of though. The following are the concrete behaviours of ASD students.

Social Interaction: Comparing with the ordinary student at the same age, autistic students lack social skill on making friends. Thus, autistic students will tend to stay alone instead of taking the initiative to interact with other. They may be unresponsive toward others question or voices.

Social Communication & language: They are weak at using body language for example, eye contact, gesture and facial expression when they speak. They also have difficulty in understanding the verbal meaning of the sentence and literal interpretation such as ironic words or jokes. Sometimes, they may have unusual repetitive language.

Activities & Interests/ Imagination of Thought: Autistic students are only interested in a limited number of things, and often insist on doing things in their specific ways or procedures. They resist change and have a relatively large emotional response to sudden changes, such as changes in schedule or seating arrangement which are wired and strange in the eyes of ordinary people.

4.2 ASD students have their own talents

Although autism is one of the learning disabilities, but a number of researches proved autistic children perform well in particular tasks even STEM related tasks. Research from Shah and Frith (1983) discovered that autistic students obtained good result at the mission requiring detailed recognition and they have superior performance in finding hidden figures. Besides, a part of them can even talented at

visual search such kind of tasks which ask participant to focus on tiny stuff. (as cited in Dakin & Frith, 2005) The research of Baron-Cohen (2006, 2009) explain the cause of the above situation. The result of his research stated that ASD have higher aptitude toward systemizing than empathizing comparing to ordinary students. Therefore, ASD student can be a specialist on specific task.

4.3 Challenges of STEM education

Apart from improving communication skill, self-managing skill and problem-solving skill of student, STEM education is implemented to cope with the future society needs in terms of the competitiveness of economy. (Hoeg & Bencze, 2017) However, implementation of STEM education faces various challenges. There are many teachers do not have sufficient subject knowledge on engineering which is influential in STEM education. (Al Salami et al.,2017) Moreover, most of the teacher neglected the main purpose of STEM education, they tend to apply technology in the lesson instead of constructing the concept and understanding on science topic. (Pringle et al., 2015) In contrary with both western country and Asian country such as US and Singapore, who launch policy on implementing STEM education in 2009 and 2013 respectively, Hong Kong is late in promoting STEM education.

5. Research questions

This research is conducted to investigate the challenges that the serving GS teacher when they are implementing STEM education to ASD student and hopefully give out suggestion to ease the difficulty they encountered.

In this research, teachers will be asked what they think about STEM education and inclusive education should be. Following that, challenges the teachers encountered will be divided into three aspect, the school aspect, parental aspect and personal aspect. Teachers will be asked to express their opinion on what they found challenging according to these three aspects. Based on these two questions, setbacks they faced and the perception on both STEM education and inclusive education can be drawn.

Moreover, questions related to the strategy their school applied to educating ASD students and what they think about the connection between STEM education will also be asked. When compare the previous questions about the definition of STEM and inclusive education with the current strategy they used in educating ASD student, we can see that whether the current measures and policy can meet the need of ASD student in STEM education. Then, suggestion can be raised to the specific difficulty with a view to help GS teachers to teach ASD students.

In order to carry out the research in an effective and systemic way, several research questions are proposed as the guideline of the whole research. The following are the research questions:

1. What GS teacher know about inclusive education and STEM education?
2. What kinds of strategy for their school used to help ASD students?
3. What are the challenges for them to implement STEM education to ASD students?
4. What is the relationship between STEM education and ASD students?
5. Who and what can be done to help GS teacher to implement STEM education to ASD students?

6. Research Methods

The target of this study will be the in-service general studies teacher working in local mainstream primary school who is experienced in STEM education and educating ASD student. There are 4 teachers will be invited to for the study.

In the light of the complexity of the research questions, with a view to allow deeper understanding on the challenges the in-service teacher they faced and the concept they think about the connection between STEM education and ASD students, qualitative research and in-depth interviews will be adopted. As Marshall (1996) mentioned, the choice between qualitative and quantitative research should be determined by the research questions instead of the researcher preference. The purpose of conducting qualitative research is to provide understanding to specific and complicated psychosocial issues and which means to answer 'why?' and "how?" of those issues. As the aim of this research is to collect the opinion of the in-service GS teachers toward ASD students and STEM education, qualitative research method will be the suitable way. In details, the format of the in-depth interview is semi-structured format composed with various open-ended questions and several interview questions will be formed based on the research questions. The reason of applying semi-constructed interview also because of the various background of the GS teacher. In order to stick with the real situation, semi-constructed interview is efficient in focusing on and building closer relationship with particular interviewees. In the meantime, open-ended questions increase the depth of their answer based on the real experience. Modification and adjustment will also be made on the questions according to the information provided by various interviewees. The following table shows the basic background of the four GS teachers.

Table 1: Brief background of the interviewees

Teachers' Name, Teaching Experience and Qualification	Qualification	Teaching Subjects	Strategy of their primary used to Educate ASD students
Mr. Wu (2 years)	Minors: Visual Arts and Chinese Language	Chinese, GS, Computer	Inclusive Classroom
Miss. Chan (2 years)	Minors: Chinese Language and Inclusive Education	GS, Computer, Religious	Pull-out programme for serious cases; Inclusive classroom for moderate cases
Miss. Poon (2 years)	Minors: Chinese Language and STEM Education	Chinese Language, GS, Science	Inclusive Classroom
Miss. Chan 2 (3 years)	Minors: Mathematics and Inclusive Education	GS, Computer, Mathematics	Inclusive Classroom

7. Research Findings

Concerning the purpose of inclusive education and STEM education, the concept of the GS teach er match with the term suggested by the government. The strategy of the primary school used to educate ASD students basically divided into two ways pull-in and pull out system. During the di scussion, it is also found that the challenges for implementing STEM education to them are as fo llows: managing undesirable behaviors, lesson arrangement, building inclusive classroom (perso nal aspect) ; lack of resource such as guideline to follow, human resource and training(school as pect) and even extend to the parental aspects for instance, lack of their support. At the same time, some of the teachers mentioned that STEM education serves as a media and platform for ASD s tudents to interact with their classmates. In order to tackle these difficulties, teachers highlight th e importance of governmental support.

7.1 Concept on the Inclusive education and STEM education

As mentioned above, the development of the inclusive education began in the 1970s while STE M education raised in the recent decade. During the interview, it is found that the concept of the current GS teacher goes along with the terms and the direction set by the government even they may have different qualification or educational background. GS teachers stated clearly the purpo se of the STEM education is to promote scientific learning and bring creative and innovative atm osphere for the learning activity of student. Teachers also highlighted some crucial elements suc

h as ‘Learning by doing’ and ‘self-directed learning’ which bring STEM education to a successf ul curriculum. Besides, four GS teachers pointed out the key strategy of the inclusive education i n Hong Kong, which is putting those students with special education need into the regular classr oom with the purpose of catering learning diversity, eliminate the discrimination among students and provide positive atmosphere for building self-esteem and frequent social interaction. Their q ualification background may explains why some of them are familiar with the concept of inclusi ve education and education as some of them minored in STEM education and inclusive educatio n respectively.

7.2 Strategy the Primary school used in Educating ASD students

The strategies for mainstream primary school used to educate ASD students classified into two t ype pull-in program (inclusive classroom) and pull-out program while using the whole school ap proach and 3-tier model together mentioned above. There is divergence in the purposes of pull-in program and pull-out program. Pull-in program is descried as process and measures of teaching students with special education need in the regular classroom with support and accommodations needed. It aims at changing education to all student but not only one particular type of student. (Burstein et al, 2004) On the contrary, pull-out program remove SEN students from general class room with the purpose of putting the students characteristics at the first priority rather than the q uality learning environment. (Wang, Reynolds, & Walberg,1982) Among the four primary schoo l where the interviewees come from, three of the school use pull-in program for teaching ASD st udent and the last one uses both pull-in and pull-out program depend on the level of the need of ASD student.

7.3 Challenges the GS teachers faced- Personal Aspect

7.3.1 Managing Undesirable Behaviours

As the teachers mentioned, managing the undesirable behaviours of the ASD students during the STEM activities will be one of the vital challenges. Once the ASD students have some extreme behaviour such as shouting or throwing stuff, the lesson cannot go on. Teachers felt helpless as they can only seek help from the social worker or SEN coordinator. One of the GS teachers shared as below:

> ‘Sometimes, it is quite difficult to organize STEM activities for the whole class including ASD students when there are ‘misbehaviours’ or even extreme behaviours of them. When **they have extreme behaviour, teacher cannot leave him or her alone.** We must handle it while the activity will be stuck and I cannot move on. I have met a ASD student tried to occupied the IPad or robots during the STEM activity and ignored what I say. For the worst cases, I may need to seek help from others. ’ (Mr WU)

> ‘There are of course many challenges for educating ASD students in STEM activity. For instance, you don’t know what you say or what you did will trigger their over-reaction. I have met a student, he blamed himself after failing in answering a question in a STEM activity. Then, he tried to hit himself and threw some stationery away. At that moment, I really don’t know what should I do and I can only ask the other student to find their class teacher and social worker. The class teacher told me that he is a very smart ASD student but quite sensitive to the marking and being wrong’(Miss Chan 2)

During the STEM activity, teacher need to supervise the whole class but not only the ASD students. In such circumstance, it makes teacher difficult to handle the aggressive behaviours of the ASD students while give oral instruction or guidance to other students. Teacher felt frustrated to the extreme behaviours as it is hard to engage ASD students into the STEM activity. If the teacher is not familiar with the interest, habits or strength of the ASD student, it will be a difficult task for teacher to calm down the ASD students. In short, teacher felt helpless and unfamiliar to manage the undesirable behaviours of ASD students while organise the STEM activity at the same time.

7.3.2 Lesson or Curriculum arrangement

According to the discussion with the GS teacher, the second challenge in organizing STEM activity to ASD student is the adjustment of the lesson or activity. In general, it is commonplace for ASD student to have particular interest. Two of the teachers said that STEM lesson should go along with the interest of ASD student in order to make it attractive in their eyes. They shared their feeling on design the STEM activity to ASD students as the followings:

> ‘There various challenges for educating ASD students. Teacher need to put effort on the design of the STEM lesson plan to fulfil their education need. The reason behind is that ASD student only pay attention on what they are interested. They don’t have motivation to participate if they feel bored. Besides, group discussion is very common before STEM activity. Students need to come out the design of the product or group work like water rocket or water filter. They need to make decision on the how is it look like and the material they used. But interaction with classmate is hard for ASD student. That’s why they may need more guidance. Teacher even need to have amendment on the lesson plan for example assign different duty such as drawing the design or shorten the discussion time in order to suit their need.’(Miss Chan)

The foremost aim of the inclusive classroom is to suit all the need of students including both ordinary students and ASD students. The purpose also covers the design of STEM activity. Teacher stated that it is impossible to follow what ASD want all the time as learning outcome of the ordinary student should also be considered. Teachers need to balance the need of all student so sometimes they cannot follow ASD students' interest.

> 'Besides, consideration should be take it teacher want to engage ASD student into STEM activity. For example, I have met some of the student who are fascinated in animals and biology. His parents will bring him to bird observation or visit zoo in their spare time. Teacher can put some of these element into the lesson plan, such as design the animal in 3D model with Tinkercad software. It allows them to explore their interest. However, to be honest, teacher cannot always follow ASD students' mind as we need to cater the need of other students.' (Miss Poon)

To conclude, teacher feel difficult in prepare STEM activity for ASD students when they need to cater the interest of all students.

7.3.3 Establishment of an Inclusive Classroom

Another typical challenge for GS teacher to organise activity is to establish inclusive atmosphere among the whole class. Being classmate in the same classroom, students can notice the difference between ASD student and ordinary students. To the junior primary students, autism is a complex concept to understand when teacher explain to them. Simply in their eyes, ASD students are just the students who violated the rules. As a result, ordinary students are unwilling to form group with ASD student during STEM activity or class activity. Teachers found it is difficult to maintain inclusive climate in the whole class. One of the teachers pointed out:

> 'One of the biggest challenges is to building an understanding and empathetic environment to the whole class. It is easy for teacher to be tolerant and understanding to the need or behaviours of ASD students. But in the view of the other classmates, they are just *naughty* students. Shouting or ignore the instruction of teachers are what naughty behaved. It leads to ill-effect in organising STEM activity. It is obvious to see ordinary student do not want to be the group member with ASD students. Explain the situation of ASD students in simple words to other students will be a tough task. ' (Miss Poon)

Teachers stated that extending the inclusive mindset to the staff and parents would also be difficult. Other staff in the school and parents of other students may be unaware of the autism disorder or even have misperception on them. There are also a lot of concern if teacher need to explain the situation to them such as the privacy law or labelling effect. Teacher expressed that:

> 'Maintain an open-minded climate among the third party is another challenges. These third party includes all the staff in the primary school, students' parents and students from other class. Even for the staff of the school, it is not a must for them to have sufficient knowledge on ASD not to mention the parents of other students. On the sides, teacher need to explain the situation to parents of other students. On the other sides, teachers worry about disclosing privacy of the ASD student or causing label effect. Everybody knows, receiving complaint is one of the taboo for being teacher' (Miss Chan 2)

In sum, teacher found it is hard to build up inclusive climate among teacher, students and parents as there are so many constraints. Asking everyone to be tolerant to ASD student is not easy thing for teacher to do not only stay at the aspect of STEM education but even the normal curriculum.

7.3.4 Challenges the GS teachers faced- Personal Aspect- School Aspect and Parental Aspect

Apart from the personal challenges, GS teachers list out some other barriers in planning STEM activity for ASD student in the school and parental aspects. Concerning the facility and resource for organise STEM activity for ASD students, GS teachers noted that they lack human resource, professional and continuous training and guidance for holding STEM activity for ASD students. Experts on inclusive education cannot always support the STEM activities. One of the teachers spoke:

Limited Manpower

> 'In the school aspect, limited manpower will be one of challenges Undoubtedly, we are not the experts on the field of inclusive education. There are so many thing we need ask SEN-coordinator, social worker or supporting teacher for help. However, it is impossible for them to stay for whole section of the STEM activity due to limited time and manpower. In most of the cases, you need to rely on yourselves and hold the STEM activity on your own.' (Mr Wu)

Insufficient Training

In general, teacher felt they lack training on catering special education need and the training on STEM activity will not cover this field. Time is so short that STEM training workshop always focus on how to use the teaching tool. Teacher said:

> 'Actually, most of the teachers are busy with the teaching and administrative work. The teaching schedule is so packed that we can only form one-off workshop when we introduce some new STEM related teaching tool such as building blocks or robots. In addition, the tutor of the STEM material will only focus on the usage of teaching tool but not the skill on organise the activity not even mention the catering of the students with special education need. It is hard for teacher to learn new stuff and cater the ASD students' at the same time.' (Miss Poon)

> 'As we all know, every student is unique and special even the autistic students. Their personality, strength or interest are different. Therefore, we have no common guideline or instructions to follow for holding STEM activities. Basically, we as class teachers need to share the experience of our ASD students for example what saying or behaviour we be avoid or anything we need to pay attention. Otherwise, it is quite helpless if we work alone.' (Miss Chan)

7.3.5 Parental Engagement - Parental Aspect

From the experience from the GS teachers, it is realised that gain support from the ASD students is also a big challenge they encountered. Level of the acceptance and participation of each parents is different. Sometimes, parents refuse to cooperate with teachers. They share their experience as the following:

> 'We have talked about parents in the previous question. I have one more thing to add. In fact, getting support from the parents is quite difficult. In the personal view of the autistic students, parents' participation encourages to join the STEM activity. Parents are the person who is familiar ASD students most and it lower the change of having over-reaction. But the level of acceptance and engagement of each parents is different. Sometimes they may be too busy to be volunteer of the STEM activity. In the meantime, they may refuse to conduct an identification report for their own ASD children due to personal reason or labelling effect. They may also refuse to allow their ASD children to join any STEM activities after school except those in the formal lesson. It is difficult for teachers to organise STEM activity without the support from parents. ' (Miss Chan 2)

7.4 Connection between STEM education and ASD students

Although GS teachers expressed various setbacks they encountered in organising STEM activity for ASD students, they all agree to keep promoting STEM education to ASD student for certain reasons. Firstly, the utmost reason is STEM education help ASD student explore their interests. Unlike the traditional subjects and lesson, STEM education covers numerus topics which is fun and interesting to ASD students. Under such kind of learning climate, there is more chance for ASD student to develop their interests. One of the interviewees stated:

‘It seem that there is no connection between ASD student with STEM education. Actually, there is close relationship between them. Take a look to the core subjects like English and Chinese, you cannot get rid of the writing, dictation and comprehension which are quite boring to students including ASD students. Compare with that STEM activities covers wide range of topics such as biology and engineering which are interesting to them. It provides sufficient chance to explore their fascinated topics instead of stick to the traditional curriculum. ’ (Miss Poon)

Besides, STEM education serves as social platform for ASD students to interact with others. No matter the STEM competition outsides the school or the STEM workshop after school, STEM education creates collaborating and interacting environment to ASD student. It further enhances the social skill of them. Teachers mentioned:

‘I think STEM education is related to ASD students and I agree that ASD student should join more STEM activity. When they are joining STEM activity, they need to communicate and discuss with their classmates unavoidably. ASD students obtains more opportunity to express themselves and train their social skill which they are weak at eventually. ’ (Miss Chan)

‘There are many advantage for ASD student to join STEM activity. As mentioned, ASD students are weak at communicating with others. But STEM activity always involve project learning and collaborating learning. Student are required to cooperating with other to solve the specific task or problem such as the Mbot lesson. Students should input the formula to let the robot finish the task. ASD students can frequently interact with others. That is the reason why I encourage them to join more STEM activity.’ (Mr WU)

Apart from the reason, one of the teachers also advocated that STEM education facilitate the development of inclusive education as it helps to fulfil the need of autistic students. She said:

‘STEM education and ASD students are linked together because STEM education helps us to know what ASD student need. When ASD student join the STEM activity, as an educator, we can observe what can be done to help ASD student. For example, there are some application on tablets can be used to show social story to ASD student in order to improve their social skills. ’ (Miss Chan 2)

7.5 Responsible for Helping ASD students in STEM Education

Most of the interviewed teachers emphasize the importance of getting support from the Education Bureau. From purchasing teaching tools such as electronic devices to hiring specialist on autism and STEM education, they are related on the resource given by the Education Bureau. School and teachers themselves also bear a part of responsibility in helping ASD students to join STEM activity. Teachers as a frontline educator should equipped themselves with sufficient knowledge about autism while the primary school should work hard on providing clear instruction and guidelines to teachers.

8. Discussion and Suggestions

According to the result of interview, it found that GS teachers are familiar with the purpose and implementation of STEM education while some of them are knowledgeable with the concept of inclusive education as they have relevant qualification background. The foremost purpose of this research is to explore the challenges that GS teachers faced in implementing STEM education to ASD students. During the discussion, teachers stated challenges in three aspect including personal, school and parental aspect.

The findings discovered that teachers think it is challenging to run STEM activity to ASD students in several aspects. In personal aspect, managing the over-reaction and designing a curriculum or lesson will be difficult. The reason behind probably because of a lack of understanding on autism and training on special education. Once teachers are not capable for educating ASD student, they tend to seek help from specialist and feel helpless. Building inclusive environment is also another problem in personal aspects as it is not easy to change the perception of students and parents toward ASD students. The conservative tradition on being a quiet and disciplined student in Chinese social society may be the vital cause to that.

Concerning the challenges on school and parental aspects, a lack of guideline and resource and parental engagement lead to the confusion of GS teacher. Since the EDB provide brief instruction on inclusive education with limited funding, teachers in mainstream school found it difficult to cater ASD students. At the same time, parents seldom engage into school activity as they are out of time to join even, they want. Without sufficient from school and parents, teachers then found it is difficult to organise STEM activity to ASD students. To ease such intense situation, suggestion are given in the following parts.

8.1 Suggestion 1: Apply Structured Teaching as Guideline in Stem Education

In order to ease the confusion on organising STEM activity to ASD students, Structed Teaching can be adopted as the instruction for teacher to follow. Treatment and Education of Autistic and Communication handicapped Children (TEACCH) is one of the famous programs for educating ASD students purpose defined by Eric Schopler. (Schopler, 1994) Four fundamental elements comprise the program, they are physical organisation, individual work system, visual strategy and task organisation. Many researches proved the effectiveness of TEACCH. Norgate (1998) conducted a study showing that the program can effectively reduce over-reaction of autistic student while another research found that TEACCH positively increased the academic of ASD students. (Ozonoff & Cathcart, 1998). The program gives concrete measures for teacher to organise the STEM activity. For instance, the individual work

system means provide a plan about the sequence of the learning task so ASD students can tackle the task step by step. In the meantime, physical organization shows clear division of the area of classroom or activity room for STEM education. With this strategy, ASD student will know the specific activity that should be carried out in specific places at a glance. Therefore, teacher can apply TEACCH to organise STEM activity for ASD students with a view to ease their confusion.

8.2 Suggestion 2: Promote Co-teaching for STEM Education

Co-teaching is a worldwide strategy in catering students with special education need. Bacharach, Heck & Dank (2004) defined co-teaching as two teachers including main teacher and cooperating teacher educate the specific group of students while sharing the lesson planning, assessment, and the physical place. It is proved that co-teaching has a strong effect on students' with ASD of engagement and on the nature of interactions. (Strogilos & Elias Avramidis, 2016) According to the interview with GS teachers, holding a STEM activity alone is a commonplace in mainstream schools. Teachers feel helpless when ASD students have undesirable behaviours. By launching co-teaching in STEM education, GS teacher can give instruction to the whole class meanwhile special education teacher gives assistance to ASD students. Depend on the STEM activity, different type of co-teaching methods can be carried out such as station teaching, alternative teaching, etc. Teacher can choose the appropriate one for ASD student. In consequence, education need of both ordinary students and ASD students can be fulfilled.

8.3 Suggestion 3: Develop Supporting Facility and Resource in STEM education for ASD

Developing STEM related technology or facility on helping SEN students provide incentive for mainstream school to introduce STEM education to ASD students as well as enhancing the capacity of teacher to educating ASD student. Government and EDB can offer funding as inducement for information technology industry to innovate new hardware or software for STEM education targeting on ASD students. Besides, the number of university place in catering ASD or SEN students should also be increased to alleviate the shortage of specialist on special education in mainstream school. Since most of the interviewees stated the responsibility of the government and EDB, they should take action to facilitate the implementation of STEM education to ASD students.

9. Limitation

Small sample size is the utmost limitation of this study causing the study may not be representative enough to cover the opinions of all other GS teacher due to the infection of COVID-19. The small sample may influence the level of further study. Another limitation of the study is that it only focuses on the perception GS teachers. Since the introduction of STEM education covers not only general studies but also mathematics, computer and science related subject, it may not reflect the whole picture

of the participation of ASD students in STEM education. Further, the qualification of some interviewees in our study is related to the knowledge about ASD students. It may not be typical or common in other GS teacher which will also affect the representation of the study. Therefore, more consideration should be taken if there are future research about the curriculum design of STEM education for ASD students.

10. Conclusion

General studies teachers as one of the essential parties for practising STEM education, they suffer a number of difficulties in educating ASD students covering three aspects, personal, school and parental such as managing undesirable behaviours and lesson arrangement. Based on this study, it is recommended supporting GS teacher in three ways. Implementation of Structed teaching and co-teaching can be a clear guideline and give direction for teacher to organise STEM activity. The government should also work hard on creating inclusive environment on STEM education by developing back-up facility and resource for special education and STEM education. Since no child should be left behind, all stakeholder should bear responsibility in helping ASD students in STEM education.

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Appendix

深入訪談問題大綱

（一）基本資料

名稱/性別：

教學經驗：

任教的科目：

主修科目：

（二）問題

老師對STEM Education的看法

1. 你知道甚麼是 STEM 課程嗎？有沒有甚麼目的和元素就你所知？
2. 現時您需要負責 STEM 方面的教學嗎？
3. 現時學校將 STEM 活動納入常識科？獨立成科？還是以課後活動形式教授？
4. 你自己在推行 STEM Education 中擔任什麼角色？（推行者/主導者/輔助者）

老師對融合教育的看法的看法

5. 你知道甚麼是融合教育嗎？
6. 你認為怎樣才算成功的融合教育？
7. 你們學校採用甚麼策略去教導自閉症學生？
8. 不同學校之間處理自閉症學生是否存在差異？
9. 有沒有接觸過 ASD（自閉症）學生？他們與其他學生有沒有甚麼不同的地方？
10. 你認為自閉症學生與 STEM education 之間有沒有甚麼關係？贊成自閉症學生多參與 STEM Education 有關的課堂嗎？

教導自閉症學生參加STEM Education時的困難

11. 你向自閉症學生推行STEM時有沒有遇到甚麼困難？
    你認為當中遇到最大的挑戰/困難是什麼？
    11.1）學校層面：政策、資源、培訓、人手

    11.2）個人層面：班房控制、課堂設計等
12. 你認為有那些人或團隊可以幫到你解決到這些困難？
13. 你認為ASD學生在常識課或者STEM課應該需要特別照顧嗎？為甚麼？
14. 你認為他們需要甚麼樣的照顧？誰應該幫忙？

深入訪談稿

（一）基本資料

名稱/性別：胡老師（男）

教學經驗：2年

任教的科目：中文、常識、電腦

主修/副修科目：主：常識，副：中文、視覺藝術

（二）問題

老師對STEM Education的看法

首先很感謝你願意參與我有關向自閉症學生推行STEM教育的困難研究，並且接受訪問。

1. 你知道甚麼是 STEM 課程嗎？有沒有甚麼目的和元素就你所知？

   答：知啊現時STEM教育都已經成為大勢所趨，相信每個老師都會知道。STEM 教育就是集四個科目於一身，包括科學、科技、工程及數學於一身，希望提升學生對.科技的興趣以及日常生活的解難能力。現時好多小學都會大力發展STEM。

2. 現時您需要負責 STEM 方面的教學嗎？

   答：我自己都需要負責 STEM 方面的教學。因為其實我自己是電腦科的助理課程主任（副panel)負責到很多學生的 STEM 課程及活動，甚至不單只是學生，STEM 教育都延伸到老師層面上，我都會教導老師怎樣使用一於電子教學器材及教具等，例如我早前都為老師示範怎樣使用 mbot 教學。

3. 現時學校將 STEM 活動納入常識科？獨立成科？還是以課後活動形式教授？

   答：我們學校本身就希望將STEM教育發展成跨學科的學習，主要圍繞常識、數學及電腦科。但就並漫有獨立成科，多會以在電腦科及課後形式還學生參與。

4. 你自己在推行 STEM Education 中擔任什麼角色？（推行者/主導者/輔助者）

   答：正如剛剛提到，作為電腦科助理課程主任，在推動 STEM 教育方面我都會給予意見，又會負責組織 STEM 的學生活動我想我也算是一位推行者吧。

老師對融合教育的看法的看法

5. 你知道甚麼是融合教育嗎？

   答：因為本身我自己大學校沒有修讀過有關的課程，不過我亦有聽過有關的概念，應該是希望將有特殊學習需要的學生放到普通班房中學習。

6. 你認為怎樣才算成功的融合教育？

   答：成功的融合教育的想就是正常及特殊學習需要學生可以一起融洽學習，兩組群體都可以得到自己的學習需要。

7. 你們學校採用甚麼策略去教導自閉症學生？

   答：我們學校都都會有特殊學習需要的學生，學校都會將有不同學習需要的學生放到不同的班房，當中都包括到自閉症的學生，所以不同老師都有機會接觸到特殊學習需要的學生。

8. 不同學校之間處理自閉症學生是否存在差異？

   答：我亦都有聽過其他學校有不同的做法，例如會設立抽離組別，當到特定課堂，例如主科科目，中英數的時候，就會到其他班房某老師負責，但就不知道包不包括自閉症的學生。

9. 有沒有接觸過 ASD（自閉症）學生？他們與其他學生有沒有甚麼不同的地方？

答：我自己作為班主任，本身班中都已經有自閉症的學生，其實可以明顯看見佢們比較喜歡自己一個，而且情緒都會有反複，與正常學生不同，例如小息時特別明顯其他學生會一群一群地談天說地，但自閉症學生不太會與人相處。

10. 你認為自閉症學生與 STEM education 之間有沒有甚麼關係？贊成自閉症學生多參與 STEM Education 有關的課堂嗎？

答：我想 STEM 教育其實對自閉症的學生學生有很大的好處，多剛剛提到其實自閉症學生不太喜歡與人接觸，但 STEM 教育合作學習和 project learning 是非常重要的元素。活動要求不單只是局限個人的學習，反而更要求學生之間的合作及解難，例如 mbot 的機械人課堂中學生都是一組完成機械人的指令，所以 STEM 教育變相令自閉症學生多與人接觸。我亦都很贊成他們多參與有關活動。

<u>教導自閉症學生參加STEM Education時的困難</u>

11. 你向自閉症學生推行STEM時有沒有遇到甚麼困難？

你認為當中遇到最大的挑戰/困難是什麼？

11.1）學校層面：政策、資源、培訓、人手

答：學校方面最大問題當然是人手的不足，很坦白說很多時間有關特殊學習需要學生特問題我們都要請教駐校社工或者特殊教育需要統籌主任，但人手有限，當然不能要求社工或主任在整個STEM活動中照顧自閉症學生，所以很多時獨自一人，一方面照顧自閉症學生，另一方面帶領活動非常困難。

11.2）個人層面：班房控制、課堂設計等

答：當然有很大的困難。首先最困難的當然是要兼顧到自閉症學生的情緒及反應。剛剛提到STEM活動大部分都牽涉到小組學習活動，所以其實當組織的活動當中一有自閉症學生有一些過激的反應，當下就會知道接下來的課堂很難會進行得流暢，因為要控制自閉症學生的行動和情緒。我曾經都接觸過小組活動中，自閉症學生會霸佔整個活動，例如ipad或者機械人等，所以控制他們的行為是十分困難的一件事。亦有試過自閉症不想參與課堂討論，只是坐在那裏整個課堂都不參與，也不會理會老師和同學。

12. 你認為有那些人或團隊可以幫到你解決到這些困難？

答：剛剛提到駐校社工或者特殊教育需要統籌主任當然可以幫助我們。但其實很大程度上作為老師自己都要靠自己努力。例如學校都建議老師修讀有關特殊教育需要的課程，例如有些老師都有修讀教育大學的課程，增加對特殊學習需要學生的認識及處理方法。同時裝備自己。

13. 你認為ASD學生在常識課或者STEM課應該需要特別照顧嗎？你認為他們需要甚樣的照顧？誰應該幫忙？

答：當然最好有特別照顧給予自閉症學生，我們作為老師帶領STEM活動亦會輕鬆得多，學校、教育局當然都能夠幫忙，只要多一點資源、多一點人手都能夠幫助自閉症的學生。

很感謝你今天接受我的訪問，分享你在教導自閉症學生的經歷。

深入訪談稿(2)

（一）基本資料

名稱/性別：陳老師（女）

教學經驗：2年

任教的科目：宗教、常識、電腦

主修/副修科目：主：常識，副：中文、特殊教育

（二）問題

老師對STEM Education的看法

首先很感謝你願意參與我有關向自閉症學生推行STEM教育的困難研究，並且接受訪問。

1. 你知道甚麼是 STEM 課程嗎？有沒有甚麼目的和元素就你所知？

   答：當然知道。作為主修常識科的老師都一定會接觸過STEM教育。因為現時STEM教育都成為了教育界的大方向，所以常識科老師想要尋求一教席都要在這方面下苦功。所謂STEM教育就是指集合數學、科學、科技及工程4方包的課程，目的是希望培養學生創意及創新的精神，發展他們科學方面的能力。

2. 現時您需要負責 STEM 方面的教學嗎？

   答：我現時都有負責 STEM 方面的教學，甚至乎會帶學生參加坊間舉辦的 STEM 比賽或者，例如機械人扒樓梯大賽，校內都會組織不同的 STEM 活動給予學生。

3. 現時學校將 STEM 活動納入常識科？獨立成科？還是以課後活動形式教授？

   答：我們學校就沒有將STEM教育獨立成科，主要都是在電腦、常識科加插STEM的原素，亦會有課後STEM的活動讓學生參加。我都曾聽過有其他學校將STEM獨立成科。

4. 你自己在推行 STEM Education 中擔任什麼角色？（推行者/主導者/輔助者）

   答：我想我在 STEM 教育我角色應該都只是輔助者，當然在組織 STEM 活動時我亦會給予意見，但由於經驗尚淺，未必能全盤統籌 STEM 活動。

老師對融合教育的看法的看法

5. 你知道甚麼是融合教育嗎？

   答：融合教育我知道啊。因為我在教育大學副修特殊教育所以有修讀過相關課程。融合教育就是指將有特殊學習需要的學生放到主流學校中上課學習，有別於特殊學校，希望他們融合普通學生的課堂當中。

6. 你認為怎樣才算成功的融合教育？

   答：我認為成功的融合教育是能夠消除到學生與學生之間的歧視同時照顧都不同學生的學習差異，即使能力有高有低都能一起學習。

7. 你們學校採用甚麼策略去教導自閉症學生？

   答：我們學校針對有特殊學習需要的學生做法比較特別。因為我們學校可以說是抽離形式以及共融班房的形式都有應用到。我們每一級都會將有很大程度學習需要的學生集合到一班，交由有經驗的老師負責教授，而班別人數相對教小。但同時亦會將較低程度特殊學習需要的學生放置到普通班房，讓他們和普通學生一起學習。而自閉症學生視乎程度，有機會獲派到不同課室。

8. 不同學校之間處理自閉症學生是否存在差異？

   答：不同學校當然會有不同的做法，就好像我們學校的做法相對少見，將抽離以及共融班

房個別使用就會較常見。

9. 有沒有接觸過 ASD（自閉症）學生？他們與其他學生有沒有甚麼不同的地方？

答：自教育局推廣融合教育後，老師都很大機會會接觸到不同的特殊學習需要學生，而我為例，都有接觸過自閉症的學生，與其他學生不同，可以留意到學生會有一些特別的興趣生及行。例如有一些自閉症學生對交通工具，如飛機、火車等特別有興趣，你會看見他們經常到圖書館借相關的書籍，而且相關知識都可以琅琅上口。

10. 你認為自閉症學生與 STEM education 之間有沒有甚麼關係？贊成自閉症學生多參與 STEM Education 有關的課堂嗎？

答：我認為 STEM 教育對自閉症學生都有很大程度上的關係我亦都很贊成自閉症學生多參與 STEM 活動，無論在校內參加 STEM 活動時與同學合作、交流討論，還是到校外參加相關比賽，表達自己及與人相處的機會都會增加，改善他們的社交能力。

<u>教導自閉症學生參加STEM Education時的困難</u>

11. 你向自閉症學生推行STEM時有沒有遇到甚麼困難？

你認為當中遇到最大的挑戰/困難是什麼？

11.1）學校層面：政策、資源、培訓、人手

答：而在學校層面上，每個學生都是獨一無二，即管是自閉症學生，每個自閉症學生都喜好、性格都不同。而正正因為這樣，我都沒有概定的指引去跟從。因此我們組織STEM活動的時候都沒有特定的指引或工具讓我們去跟從，很多時要靠我們老師分享有關學生的經驗，例如詢問班主任處理學生要留意的地方、自閉症學生的興趣等，因為沒有指引所以都會有無助的時候。

11.2）個人層面：班房控制、課堂設計等

答：向自閉症學生推STEM教育當然會遇到很多困難，例如在課堂設計方面都要兼顧到自閉症學生的需要，一但所舉行的活動是自閉症學生不感興趣的，他們就沒有動力去參與。剛剛提到自閉症學生會對某樣東西特別感興趣，但同時他們表達及社交能力會教弱。常識課及STEM課程中，難免會有小組討論的時候，經常出現的活動例如水火箭、濾水器等的製作過程都要經過學生討論，從形狀到物料，才會開始製作，但有時自閉症學生不善討論，老師都要加以輔助，甚至縮短討論時間，而畫圖方式取代，所以在課堂設計中都要有所變動及取捨。

12. 你認為有那些人或團隊可以幫到你解決到這些困難？

答：當然相關的持分者，政府、學校甚至家長老師都能夠多做一點幫助我們照顧學生。只要政府多放一點資源到學校，已經能夠很大程度幫助老師。除了資源外，老師家長的合作都能夠幫忙。例如學校可以邀請自閉症學生家長一同參與正規課堂外，STEM的活動例如出外比賽，又或是多和老師分享教授自閉症學生的經驗都能幫到老師推行STEM活動。

很感謝你今天接受我的訪問，分享你在教導自閉症學生的經歷。

深入訪談稿(3)

（一）基本資料

名稱/性別：潘老師（女）

教學經驗：2年

任教的科目：中文、常識、科學

主修/副修科目：主：常識，副：中文、創造力與STEM教育

（二）問題

老師對STEM Education的看法

首先很感謝你願意參與我有關向自閉症學生推行STEM教育的困難研究，並且接受訪問。

1. 你知道甚麼是 STEM 課程嗎？有沒有甚麼目的和元素就你所知？

答：我曾經在教育大學副修創造力與STEM教育課程，加上主修常識，所以對STEM教育都有一定程度上的認識。教育局在幾年前開始大力推動STEM課程希望長遠培養一班具科學精神、具創意的人才，而STEM課程都強調學生「從做中學」（Learning By Doing)，動手動腳去學習。

2. 現時您需要負責 STEM 方面的教學嗎？

答：我現時都要負責 STEM 的活動，我們學校所推行的是在 STEM 加入藝術元素，組成 STEAM 教學。在常識以及科學課堂中都會加入 STEM 的教學元素培養學生對科學的興趣。當中包括不同的電子教材例如 google classroom 及 ipad 配合課堂活動。

3. 現時學校將 STEM 活動納入常識科？獨立成科？還是以課後活動形式教授？

答：我們學校作為剛起步的新校，在STEM課程都和其他學校有所不同，我們雖然沒有將STEM獨立成科，但另外成立了科學課，除常識課堂外教授學生科學知識以推行STEM教育。當然課後亦會有有關STEM我課後活動讓學生參加。

4. 你自己在推行 STEM Education 中擔任什麼角色？（推行者/主導者/輔助者）

答：我認為自己在 STEM 教育中是一位推行者。由於大學副修 STEM 教育，我在這方面都有接觸不同課程例如 ROBO 電子機械及編程等，但 STEM 教育其實不停轉變，所以我亦都要搜集不同教具及課程讓學生學習 STEM 教育。

老師對融合教育的看法的看法

5. 你知道甚麼是融合教育嗎？

答：我雖然未曾修讀過有關融合教育的課程，但我亦都有聽過有關融合教育的資訊。簡單而言就是將有特殊學習需要的學生放到主流班房當中，與普通學生一起學習。

6. 你認為怎樣才算成功的融合教育？

答：成功的融合教育我認為應該是普通學生與特殊學習需要的學生能夠在同一個班房中互相尊重同時互相學習，同時公平地得到機會學，讓課堂可以順利完成。

7. 你們學校採用甚麼策略去教導自閉症學生？

答：我們學校採取的應該是最普遍的策略，將有特殊學習需要的學生包括自閉症學生放到主流班房學習。但程度嚴重的學生會有個別支援老師及社工作跟進。有時侯會看見有老師會陪伴個別學生一起上課。

8. 不同學校之間處理自閉症學生是否存在差異？

答：我認為不同學校應該都會有不同的做法，但都大同小異。將自閉症學生放到普通班與

普通學生一起上課，希望他們一起學習。個別學生亦會視乎程度得到支援。但我亦曾聽過有學校會將某部分學生在某些課堂作抽離小班教學。

9. 有沒有接觸過 ASD（自閉症）學生？他們與其他學生有沒有甚麼不同的地方？

答：我在常識正規課堂以及負責 STEM 課程的活動時，都有曾遇過自閉症的學生。他們無論在行為言語些都看出和其他學生有所不同，相比起同班的學生，有時表達能力會較差未能清楚表達自己的意思，亦不善與人交往。

10. 你認為自閉症學生與 STEM education 之間有沒有甚麼關係？贊成自閉症學生多參與 STEM Education 有關的課堂嗎？

答：STEM 教育看似與特殊學習需要又或者自閉症學生沒有關係，但其實內裏有一定的連繫。有別於傳統的主要科目課堂，例如中文、英文課堂，很多時牽涉書寫、讀默等元素，較為沉悶。相比之下，STEM 課程當中的課題題材廣泛，包羅萬有，有天文地理以至生物方面的課題，當中非常適合自閉症學生去藉此發堀自己的興趣。

<u>教導自閉症學生參加STEM Education時的困難</u>

11. 你向自閉症學生推行STEM時有沒有遇到甚麼困難？

你認為當中遇到最大的挑戰/困難是什麼？

11.1）學校層面：政策、資源、培訓、人手

答：而學校方面，大部分現職老師都會了解到，日常教學及行政工作已經令老師非常忙碌。所以往往引入新的教學用具例如積木、機械人等很多時候只能在課後舉行一次性的工作坊及教學示範，而當中亦不會有為特殊學習需要包括自閉症學生而設的課程設計，所以在STEM教育的師資訓練中都沒有為學生的調適時，就要靠老師自身的經驗。

11.2）個人層面：班房控制、課堂設計等

答：在向自閉症學生推行STEM教育活動時當然會有一些困難。當中最困難就是建立一個共融環境。因為我們老師都會體諒自閉症學生的需要以及有時會有情緒要發洩，但就學生的角度而言就非常簡單。在他們眼中自閉症學生就等於「壞」學生，有是不聽老師指示、大叫等行為學生都認為是壞學生的表現。而STEM課堂很大部分都要求學生分組完成學習任務，當一到分組環節都可以看到其他同學不願意和自閉症學生一組，同時向學生解釋個別學生需要幫助亦非常困難。所以當其他對自閉症學生有負面看法時，老師在推行STEM活動都有一定的困難。

再者，假若課堂中有自閉症的學生，舉行STEM活動的時候都要多花一點心思，因為自閉症學生只對特定課題有興趣。而想要他們投入課堂就要投其所好。例如有些學生對生物非常有興趣，閒時家人會帶他去觀鳥及去動物園，老師就可以在3D打印及Tinkercad 3D設計中讓他們發揮發揮自己的興趣，所以老師可以將自閉症學生的元素加入到STEM活動中，吸引他們。但坦白說，有些課題也未必能夠作改動，因為要顧及到其他同學的興趣，不能每次都遷就自閉症的同學。

12. 你認為有那些人或團隊可以幫到你解決到這些困難？

答：有很多持分者以及方法都能夠幫助老師在推行STEM時照顧自閉症學生的需要。說到底也就是資源方面，只要有充足的人手資源而老師的工作量又減少的話，就能在這方面多下苦功進修自己，幫助自閉症學生。

很感謝你今天接受我的訪問，分享你在教導自閉症學生的經歷。

深入訪談稿(4)

（一）基本資料

名稱/性別：陳老師（女）

教學經驗：3年

任教的科目：數學、常識、電腦

主修/副修科目：主：常識，副：數學、特殊教育

（二）問題

老師對STEM Education的看法

首先很感謝你願意參與我有關向自閉症學生推行STEM教育的困難研究，並且接受訪問。

1. 你知道甚麼是 STEM 課程嗎？有沒有甚麼目的和元素就你所知？

答：常識科老師都經常接觸到STEM課程，我當然都了解到當中的一些元素。最主要是結合4個科目元素，包括科學、科技、工程和數學的元素。由老師準備一些如專題研習、問題為本的學習活動，讓學生能夠結合所學既科學知識解決問題，從而提升他們創意、團體合作及解難等能力。

2. 現時您需要負責 STEM 方面的教學嗎？

答：現時很多常識課老師都會負責 STEM 課程的教學，我也是其中的一員。一方面會在校長設計一些 STEM 方面的比賽，常識科每級都會引入專題研習。另一方面，有時都會會坊間機構合作，外聘一些 STEM 導師為學生準備課後活動，例如再造紙、太陽能車的工作坊等。

3. 現時學校將 STEM 活動納入常識科？獨立成科？還是以課後活動形式教授？

答：就正如剛才提到，校內課程都會引入STEM的元素同時，亦會以課外活動的形式為學生準備STEM活動。但我們學校就沒有將STEM太立成科。多數將STEM引入電腦科及常識科為主。

4. 你自己在推行 STEM Education 中擔任什麼角色？（推行者/主導者/輔助者

答：我想我應該算是推行者的一員。作為其中一名前線常識科老師，都要兼備教授 STEM 的知識又要在學生上實踐，向學生推行 STEM 的理念，所以應該算是推行者吧。

老師對融合教育的看法的看法

5. 你知道甚麼是融合教育嗎？

答：我在教育大學時亦有副修融合教育，所以都了解到融合教育的概念。融合教育就是要將特殊學習需要學生放到普通學生班房中學習，讓他們一起相處。由原本「隔離」的模式變為「共融」模式。

6. 你認為怎樣才算成功的融合教育？

答：我認為成功的融合教育在於同時滿足到多方面學生的學習需要。在普通學生班房學習對特殊學習需要學生本身就是挑戰，這時侯就要有足夠資源幫助特殊學習需要的學生。例如製訂獨立的學習目標計畫、器材輔助等，讓他在正常班房中學習。

7. 你們學校採用甚麼策略去教導自閉症學生？

答：我們學校採用的都是很多學校採用的共融班房模式，將自閉症派往不同主流班房學習，個別需要更大程度幫助的，都會有支援老師師及社工幫助。

8. 不同學校之間處理自閉症學生是否存在差異？

答：我想應該每間小學都差不多做法，因為都是跟從教育局的指引，將學生放到普通班房

中，配合三層支援模式去幫助自閉症學生，再個別視乎情況加以幫助。

9. 有沒有接觸過 ASD（自閉症）學生？他們與其他學生有沒有甚麼不同的地方？

答：我在這幾年的教學中，都有遇過自閉症的學生。自閉症學生較易分辨出來，因為他們會有一些特別的行為或者嚐好，有時會經常專注自己的世界中，不理睬其他人。我亦曾經遇過非常聰明的自閉症學生，但只是會有情緒激動，以及不太懂與同學相處。

10. 你認為自閉症學生與 STEM education 之間有沒有甚麼關係？贊成自閉症學生多參與 STEM Education 有關的課堂嗎？

答：STEM 教育和自閉症學生都息息相關。因為 STEM 教育正正幫助學校發展融合教育以滿足特殊學習需要學生包括自閉症學生的需要。因為其實當自閉症學生多參與 STEM 的活動，我們作為教育工作者都可以更了解有那些工具及教材更能幫助他們。例如坊間都有些應用程式以運用社交故事教導自閉症學生社交技巧，這些都可以加入 STEM 課程中幫助到自閉左學生。

<u>教導自閉症學生參加STEM Education時的困難</u>

11. 你向自閉症學生推行STEM時有沒有遇到甚麼困難？

你認為當中遇到最大的挑戰/困難是什麼？

11.1）學校層面：政策、資源、培訓、人手

答：在家展方面，其實向自閉症學生舉辦STEM活動時，想要得家長的支持都十分困難。在自閉症學生眼中，家長的出現會鼓勵到自閉症學生投入活動同時有最熟悉的人在旁都會減少他們受到刺激的機會。但無個家長投入程度都不同，有時他們太忙也未必應擔任活動義工。甚至有家長因為害怕標籤效應，未必會識別自己子女為自閉症學生，又或者除了課堂的活動外，都不讓自閉症學生參與課後活動。這些都令到往後老師想實行措施幫肋自閉症學生都十分困難。

11.2）個人層面：班房控制、課堂設計等

答：其實當然有很多困難，例如管理他們的情緒就十分困難，因為你不會知道你說過的那一句話還是那些行為會刺激到他們。曾經試過有一次，在課堂STEM的活動當中，有舉行一些計分比賽，有一個男生答錯問題後，就開始有責罵和打自己，亦有甩掉檯些的面具，當刻其實很無助。因為我不知道應該怎樣處理，我唯有請其中一位學生去找班主任以及社工幫忙。事後班主任才告訴我其實他會對一些分數以及自己答錯問題都會比較敏感。所以當接觸到不熟悉的自閉症學生，很難處理他們情緒問題。另外，兼顧其他第三者對自閉症學生的看法都十分困難。這些第三者包括了其他教職員、全校同學、甚至乎學生的家長。即使是同校的老師，也不是每位老師對自閉症都了充分的了解或諒解。這問題延伸到家長及學生層面。很難向每位家長或者學生解釋自閉症學生的問題，即使能夠解釋，又要顧慮到自閉症學生的家長，擔心洩露學生私隱或者標籤自閉症學生。眾所周知，一但收琴家長投訴，會非常麻煩。所以不單只STEM教育，甚至做到真正共融班房都十分困難。

12. 你認為有那些人或團隊可以幫到你解決到這些困難？

答：說到底都要靠教育局多放資源與學校幫助自閉症學生。剛才提到的教學活動、手機應用程式等都需要人才及資源配套去輔助，所以很靠教育局多加支持。當然作為前線老師都要提升自己對自閉症兒童的認識，主動幫助學生。

很感謝你今天接受我的訪問，分享你在教導自閉症學生的經歷。

(revised May 2016)

INSTRUCTIONS FOR USE

1. Consent to Participate for Data Collection Site/ School

The Project Investigator must prepare a set of Consent forms / Information sheets for school/ data collection sites so that the school / organization is aware of the research study and agrees in writing to allow the Project Investigator to run the study in the school/ organization.

2. Guidelines on Obtaining Consent for Minor Participants

Please note the following guidelines on obtaining consent for minor participants (extracted from the HREC Operational Guidelines, paragraph 29):

The following guidelines for obtaining consent should be adopted if the research participants are minors:

- ★ *For children aged below 9, only the signature of their parents/guardians is required; completion of the task, after verbal explanation of its nature by the researcher, provides implied consent by the child;*
- ★ *For children aged 9 to 15, signature of both the children and their parents/guardians is required; and*
- ★ *For adolescents aged 16 to 17, signature of the adolescents is required and consent from their parents/guardians is optional for studies involving minimal risk.*

3. Language of the Information Sheet

(a) Information Sheets should be written in simple language which is comprehensible to a non-specialist. A good rule of thumb is that the Information Sheet should be readable by a Grade 6 student.

(b) Please be concise and indicate clearly in what procedures a participant will be involved.

(c) Please do not include too many technical details that are not necessary to participants.

(d) Typically one page should be sufficient for providing appropriate and adequate information on the project for purposes of informed consent.

(e) If the consent form and information sheet are to be presented to participants/ parents in Chinese, please also provide a Chinese version to HREC for review, and ensure that there is consistency between the English or Chinese version.

Sample Consent Form and Information Sheet for PARTICIPANTS

THE EDUCATION UNIVERSITY OF HONG KONG

The Department of Science and Environmental Studies

CONSENT TO PARTICIPATE IN RESEARCH

What are the challenges for General Studies teacher to implement STEM education to the students with Autism Spectrum Disorder in primary school?

I hereby consent to participate in the captioned research supervised by Chan Ping Man and conducted by who are staff / students of the Department of Science and Environmental Studies in The Education University of Hong Kong.

I understand that information obtained from this research may be used in future research and may be published. However, my right to privacy will be retained, i.e., my personal details will not be revealed.

The procedure as set out in the **attached** information sheet has been fully explained. I understand the benefits and risks involved. My participation in the project is voluntary.

I acknowledge that I have the right to question any part of the procedure and can withdraw at any time without negative consequences.

Name of participant

Signature of participant

Date **17/02/2020**

INFORMATION SHEET

What are the challenges for General Studies teacher to implement STEM education to the students with Autism Spectrum Disorder in primary school?

You are invited to participate in a project supervised by Chan Ping Man and conducted by who are staff / students of the Department of Science and Environmental Studies in The Education University of Hong Kong.

The Introduction of the Research

A) What does the research involve?

Through this investigation, it is hoped that I can listen the serving GS teachers' experience on organizing STEM activity with Autistic students by face-to-face communication. Under the light of that, we can find out whether GS teachers need extra help in that aspect according to the challenges of the serving GS teachers in holding STEM activity for ASD students and further enhance the learning experience of ASD students on STEM activity.

The methodology of the research

With a view to collect first hand data from serving GS teachers, in-depth interviews will be conducted. In the beginning, serving GS teachers who have STEM education background on the ASD students in the school for my field experience or in my alma mater will be invited to join the study. Once it is finished for the first few GS teachers, snowball sampling will be applied. Those interviews will be recorded with tablets and recorder. Interviews will be organized in December and January. Once the participants joined the interviews, they will receive a copy of the research paper showing the contribution to the study.

The potential risks of the research (State explicitly if none)

Your participation in the project is voluntary. You have every right to withdraw from the study at any time without negative consequences. All information related to you will remain confidential and will be identifiable by codes known only to the researcher.

Describe how results will be potentially disseminated

Permission will be obtained from my supervisor and me in advance from participants to videotape the interviews. Besides, the recording will be destroyed at 01/09/2020 in order to protect the privacy of the participates. Data will only be disclosed for academic reason.

If you would like to obtain more information about this study, please contact at telephone number or their supervisor Chan Ping Man at telephone number

If you have any concerns about the conduct of this research study, please do not hesitate to contact

the Human Research Ethics Committee by email at hrec@eduhk.hk or by mail to Research and Development Office, The Education University of Hong Kong.

Thank you for your interest in participating in this study.

Principal Investigator

(revised May 2016)

INSTRUCTIONS FOR USE

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The Department of Science and Environmental Studies

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I_____hereby consent to participate in the captioned research supervised by Chan Ping Man and conducted by who are staff / students of the Department of Science and Environmental Studies in The Education University of Hong Kong.

I understand that information obtained from this research may be used in future research and may be published. However, my right to privacy will be retained, i.e., my personal details will not be revealed.

The procedure as set out in the **attached** information sheet has been fully explained. I understand the benefits and risks involved. My participation in the project is voluntary.

I acknowledge that I have the right to question any part of the procedure and can withdraw at any time without negative consequences.

Name of participant

Signature of

participant

Date **02/03/2020**

INFORMATION SHEET

What are the challenges for General Studies teacher to implement STEM education to the students with Autism Spectrum Disorder in primary school?

You are invited to participate in a project supervised by Chan Ping Man and conducted by who are staff / students of the Department of Science and Environmental Studies in The Education University of Hong Kong.

The Introduction of the Research

A) What does the research involve?

Through this investigation, it is hoped that I can listen the serving GS teachers' experience on organizing STEM activity with Autistic students by face-to-face communication. Under the light of that, we can find out whether GS teachers need extra help in that aspect according to the challenges of the serving GS teachers in holding STEM activity for ASD students and further enhance the learning experience of ASD students on STEM activity.

The methodology of the research

With a view to collect first hand data from serving GS teachers, in-depth interviews will be conducted. In the beginning, serving GS teachers who have STEM education background on the ASD students in the school for my field experience or in my alma mater will be invited to join the study. Once it is finished for the first few GS teachers, snowball sampling will be applied. Those interviews will be recorded with tablets and recorder. Interviews will be organized in December and January. Once the participants joined the interviews, they will receive a copy of the research paper showing the contribution to the study.

The potential risks of the research (State explicitly if none)

Your participation in the project is voluntary. You have every right to withdraw from the study at any time without negative consequences. All information related to you will remain confidential and will be identifiable by codes known only to the researcher.

Describe how results will be potentially disseminated

Permission will be obtained from my supervisor and me in advance from participants to videotape the interviews. Besides, the recording will be destroyed at 01/09/2020 in order to protect the privacy of the participates. Data will only be disclosed for academic reason.

If you would like to obtain more information about this study, please contact at telephone number or their supervisor Chan Ping Man at telephone number

If you have any concerns about the conduct of this research study, please do not hesitate to contact

the Human Research Ethics Committee by email at hrec@eduhk.hk or by mail to Research and Development Office, The Education University of Hong Kong.

Thank you for your interest in participating in this study.

Principal Investigator

(revised May 2016)

INSTRUCTIONS FOR USE

1. Consent to Participate for Data Collection Site/ School

The Project Investigator must prepare a set of Consent forms / Information sheets for school/ data collection sites so that the school / organization is aware of the research study and agrees in writing to allow the Project Investigator to run the study in the school/ organization.

2. Guidelines on Obtaining Consent for Minor Participants

Please note the following guidelines on obtaining consent for minor participants (extracted from the HREC Operational Guidelines, paragraph 29):

The following guidelines for obtaining consent should be adopted if the research participants are minors:

- *For children aged below 9, only the signature of their parents/guardians is required; completion of the task, after verbal explanation of its nature by the researcher, provides implied consent by the child;*
- *For children aged 9 to 15, signature of both the children and their parents/guardians is required; and*
- *For adolescents aged 16 to 17, signature of the adolescents is required and consent from their parents/guardians is optional for studies involving minimal risk.*

3. Language of the Information Sheet

(a) Information Sheets should be written in simple language which is comprehensible to a non-specialist. A good rule of thumb is that the Information Sheet should be readable by a Grade 6 student.

(b) Please be concise and indicate clearly in what procedures a participant will be involved.

(c) Please do not include too many technical details that are not necessary to participants.

(d) Typically one page should be sufficient for providing appropriate and adequate information on the project for purposes of informed consent.

(e) If the consent form and information sheet are to be presented to participants/ parents in Chinese, please also provide a Chinese version to HREC for review, and ensure that there is consistency between the English or Chinese version.

Sample Consent Form and Information Sheet for PARTICIPANTS

THE EDUCATION UNIVERSITY OF HONG KONG

The Department of Science and Environmental Studies

CONSENT TO PARTICIPATE IN RESEARCH

What are the challenges for General Studies teacher to implement STEM education to the students with Autism Spectrum Disorder in primary school?

I hereby consent to participate in the captioned research supervised by Chan Ping Man and conducted by who are staff / students of the Department of Science and Environmental Studies in The Education University of Hong Kong.

I understand that information obtained from this research may be used in future research and may be published. However, my right to privacy will be retained, i.e., my personal details will not be revealed.

The procedure as set out in the **attached** information sheet has been fully explained. I understand the benefits and risks involved. My participation in the project is voluntary.

I acknowledge that I have the right to question any part of the procedure and can withdraw at any time without negative consequences.

Name of participant

Signature of

participant

Date 25/02/2020

INFORMATION SHEET

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The procedure as set out in the **attached** information sheet has been fully explained. I understand the benefits and risks involved. My participation in the project is voluntary.

I acknowledge that I have the right to question any part of the procedure and can withdraw at any time without negative consequences.

Name of participant

Signature of participant

Date 05/03/2020

INFORMATION SHEET

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If you would like to obtain more information about this study, please contact Cheung Chun Hang at telephone number or their supervisor Chan Ping Man at telephone number

If you have any concerns about the conduct of this research study, please do not hesitate to contact

the Human Research Ethics Committee by email at hrec@eduhk.hk or by mail to Research and Development Office, The Education University of Hong Kong.

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