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Comprehensive school-based sexuality education: outcome evaluation results from Hong Kong

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ABSTRACT

This study evaluated the effects of a comprehensive school-based sexuality education programme in enhancing sexual health knowledge and understanding among adolescents, parents and school personnel in six secondary schools in Hong Kong. Study outcomes were evaluated through pre- and post-tests. A total of 1588 students, 40 parents and 271 school personnel participated. Baseline student knowledge scores were highest among younger students, with significant improvements observed in both years for all grades except one. Baseline student attitude scores were $\geq 85\%$ for younger students, with no significant improvement, while older students showed significant improvements. Parents scored below 40% correct at baseline for knowledge items, while self-efficacy items were generally higher. Baseline teacher knowledge scores were higher than parents, but self-efficacy scores were comparable or lower. Baseline guidance counsellors' surveys indicated low confidence levels and awareness of community resources to support students. This study identified a clear need for sexuality education in Hong Kong and a special focus on students in schools traditionally serving a high proportion of non-Chinese speaking students. The programme has significant potential for expansion in Hong Kong schools as well as for dissemination in Mainland China.

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Sex education; sexual health; adolescent behaviour; health promoting schools

Introduction

Hong Kong lacks school-based comprehensive sexuality education (Leung and Lin 2019). While the Education Bureau first encouraged sexual education in 1971, provision was not integrated into the formal curriculum but often relegated to special assemblies held at the school's discretion and in accordance with its background, mission, ethos and resources (Cheng 2018; Fok 2005). This approach to sexuality education reflects Hong Kong's culture generally, where sexuality is not openly discussed despite its more westernised Chinese society (Leung and Lin 2019). Consistent with findings from Mainland China and Singapore, age at initiation of sexual intercourse is higher and sexual activity is less common among

Hong Kong adolescents relative to their counterparts in western countries (Wei et al. 2012; Madkour et al. 2010; Yip et al. 2016).

Recent public health concerns, including a high prevalence of Chlamydia trachomatis, rising rates of HIV, and unplanned pregnancies among adolescents have highlighted the inadequacies of sexual education in Hong Kong (Wong et al. 2017; CDC 2019; Census and Statistics Department and HKSAR 2017; HA HKSAR 2017; FPA 2017). Preliminary findings from the Family Planning Association of Hong Kong's 2021 Youth Sexuality Study (indicate Hong Kong high school and middle school students' sexual health knowledge scores remain consistently low in line with the prior survey in 2016 (FPA 2022). Moreover, less than half of sexually active youth report consistent contraceptive use (Yip et al. 2013). The local data underscore the urgent need to enhance sexual health education for Hong Kong adolescents.

In addition to adolescents in Hong Kong, 'supporting adults' such as parents, teachers and guidance counsellors lack sufficient sexual health knowledge, skills and resources to support students (Ling and Fang Chen 2017). A 2005 evaluation of sex education in secondary schools in Hong Kong concluded that a lack of human resources was the greatest problem facing schools in Hong Kong in their provision of sex education (Fok 2005).

In response to the pressing need for a holistic, replicable, and sustainable sexuality education model in Hong Kong, Mother's Choice, a local charity developed *Sexuality360@School*. The programme aimed to develop an ecosystem of support to empower adolescents and key adults with sexual health knowledge, attitudes, and skills to motivate healthy sexual decision-making, and in turn promote safer sex practices and delayed initiation of sex. This study evaluates the effectiveness of *Sexuality360@School* in enhancing sexual health knowledge and attitudes among Hong Kong adolescents, parents and school personnel.

Methods

Study design and sample

We conducted a prospective longitudinal study in six secondary schools in Hong Kong over two academic years (2019–2021). The schools were invited to participate in the study by Mother's Choice, the local Hong Kong charity implementing the sexuality education programme, *Sexuality360@School*. Based on 30 years of experience working with adolescents facing unintended pregnancies in Hong Kong, *Sexuality360@School* was developed with the specific aim to meet Hong Kong adolescents' unique needs. In contrast to the pervasive view in Hong Kong culture that talking about sex promotes sex among adolescents, the programme builds on international evidence suggesting increased dialogue between adolescents and trusted adults about sexuality is linked to delayed sexual activity (Widman et al. 2016) and seeks to deliver it through practice dialogues and videos developed locally to be culturally relevant to Hong Kong adolescents and their trusted adults.

The six participating schools were located in geographically diverse areas in Hong Kong, with two schools serving a high proportion of non-Chinese speaking (NCS) students (previously referred to as 'designated schools' in Hong Kong) from diverse

cultural and linguistic backgrounds (Bhowmik, Kennedy, and Hue 2018). In Hong Kong, the term 'ethnic minorities' usually refers to persons of non-Chinese ethnicity, who represented eight percent of the population in 2016, up from five percent in 2006, and primarily include Filipino, Indonesian, Indian, Nepalese, Pakistani, Bangladeshi, Sri Lankan, Thai, Japanese, and Korean groups (Census and Statistics Department and HKSAR 2016, 2021). The English language sessions conducted in the schools traditionally serving a high proportion of non-Chinese speaking students provide a proxy sociodemographic indicator in the analysis, as they serve primarily ethnic minority (non-Chinese) students.

Intervention

The study protocol and intervention are described in detail elsewhere (Andres et al. 2021). Briefly, the student intervention for *Sexuality360@School* consists of a series of 1-hour workshops (12 in total) delivered to students in Forms 1–4 (ages 12–16). All students in the participating schools were required to attend three workshops per academic year during school hours. Each workshop is designed for a class of 25 students or fewer to maximise interaction between educators and students. Four short videos complement the workshop teaching materials and serve as tools for teachers facilitating sensitive discussions. The curriculum, addressing broad aspects of sexuality including human development, relationships, decision-making, communication, consent, contraception, unintended pregnancy, and disease prevention, is suitable for all adolescents, regardless of their sexual experience or orientation. Six percent ($n = 18$) of the student sessions and 20% ($n = 7$) of the non-student sessions were conducted via Zoom during the second study year (2020–21) between December 2020 and July 2021 when Hong Kong COVID-19 restrictions intermittently impeded in-person sessions.

The non-student interventions for *Sexuality360@School* included teachers and school administrators, guidance counsellors and social workers, and the parents of students from participating schools. The teacher/school administrator training events lasted three hours each focusing on adolescent sexual health development, communication skills and building confidence to support adolescents in making healthy sexual decisions. The guidance counsellor/social worker training events were one-and-a-half hours long and introduced critical case management skills and community resources to support adolescents in sexual health crisis. The parent training events were offered annually at each school and focused on teaching skills for use when discussing sexuality, relationships and growing up. In addition, parents received information letters explaining the topics covered in the student workshops through the schools.

Data collection

Student participants completed a questionnaire before the first workshop (pre-assessment) and at the end of the third workshop (post-assessment) for both study years. The student questionnaires assessed demographic variables such as gender, cohabiting family members, and parents' education level, as well as sexual health knowledge and attitude items. Similarly, non-student participants completed a questionnaire before (pre-assessment) and after (post-assessment) the training. The non-student participant questionnaires focused on knowledge and self-efficacy items. To enable matching of pre- and post-assessments, participants were instructed to create a self-generated identification code.

Outcomes

The primary outcomes measured by participant type were as follows: 1) students: sexual health knowledge items, awareness of attitudes motivating healthy sexual decisions, and understanding and self-efficacy for healthy sexual communication; 2) teachers and school administrators: sexual health knowledge and perceived confidence facilitating sexual decision discussions with students; 3) school social workers and guidance counsellors: understanding of Hong Kong sexual health community resources and perceived confidence managing adolescents' sexual health at-risk cases; and 4) parents: perceived self-efficacy to engage their children in sexual health discussions.

Questionnaire items were developed by modifying existing instruments, such as the Sexual Communications Self-Efficacy Scale (Quinn-Nilas et al. 2016) and *Get Real* evaluation questions (Cousineau et al. 2010) for use in the local context. Mother's Choice had piloted the surveys in prior years of their programme. The face and content validity of the survey items was also evaluated by a team of experts including two public health experts and one registered nurse specialised in sexual health (copies of the survey questionnaires are available from the corresponding author on request).

Statistical analysis

Pre- and post- data for *Sexuality360@School* participants were matched using participants' self-generated pseudo codes. Matching self-generated pseudo codes is notoriously problematic, but necessary for sensitive research involving adolescents (Kristjansson et al. 2014). Our study had an overall match rate of 66%. Unmatched student respondents did not differ by parent education level except for Form 2 (2020–21). Unmatched respondents were more likely to be female in Forms 2 and 3 (2019–20) and male in Form 2 (2020–21), less likely to indicate they lived with their mother in Form 1 (2019–20) and Form 2 (2020–21) and father in Form 2 (2019–20). Statistical analysis of the results presented here include only the matched sample. Among the matched sample, one school completed only the first year of the two-year programme due to changes in school personnel and priorities. Student characteristics did not differ between the school that dropped out and the rest of the sample except for parents' highest education level, which was more likely to be secondary and less likely to be unknown in Form 1 (2019–20) and less likely to be university in Form 2 (2019–20).

Participant characteristics are summarised using group totals and proportions. The proportion of study participants correctly answering sexual health knowledge questions and affirming self-efficacy and attitude items was calculated using the pre-test as baseline. Paired t-tests were used to compare the mean change in study knowledge and self-efficacy items as well as the totals. Finally, multivariable regression models accounting for clustering at the class workshop level were used to evaluate the association between student outcomes and possible covariates, such as gender, parent education, living with two parents and school class type (i.e. English or Cantonese). All analysis was conducted in STATA 13 (College Station, TX: StataCorp LP, 2013).

Ethics

The Institutional Review Board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster reviewed and approved the study (reference: UW 19–090). Participating schools sent a consent form to all parents at the beginning of the school year describing the programme and allowing parents to opt out of the evaluation process for their child. Students whose parents opted out of the evaluation were not required to complete the study questionnaire. All adult training was voluntary, and participants provided consent before participating.

Results

Participant characteristics

This evaluation of *Sexuality360@School* included six schools, in which a total of 1588 students participated in 303 training events and 311 non-students (40 parents and 261 school employees) did so in 40 training events held between August 2019 and July 2021. Table 1 summarises student characteristics by study year and form (school grade level). Most students (73%) lived with both their mother and father, with 14% of participants indicating living with others besides their nuclear family members. Twenty percent of students were unsure about their parents' highest level of education, while 28% indicated at least one of their parents had attended university/college. Students from schools traditionally serving a large proportion of non-Chinese speaking students and who participated in the English sessions comprised 58 and 32% of the matched student sample, respectively.

Table 2 presents descriptive statistics for student knowledge and attitudes by study year and form. Baseline student knowledge scores were highest among Form 1 students who answered 66% correctly on average for both years versus 54% in Form 2, 33% in Form 3 and 45% in Form 4. Significant improvements were observed for knowledge scores in both years for all forms except Form 2. The Form 2 survey included only

Table 1. Student characteristics by Form and study year.

Form	2019–2020			2020–2021			
	1 n = 361 %	2 n = 316 %	3 n = 133 %	1 n = 147 %	2 n = 228 %	3 n = 265 %	4 n = 138 %
Female	46.5	37.0	60.2	55.8	51.3	45.3	49.3
Male	53.2	60.4	37.6	44.2	48.7	54.7	50.7
<i>Parents' Highest Education Level</i>							
College/University	23.0	28.2	25.6	32.0	31.6	28.3	27.5
Secondary	41.8	45.9	40.6	31.3	41.7	44.2	50.0
Primary	2.5	1.3	3.0	1.4	3.5	2.6	2.9
Unknown	24.7	19.0	16.5	27.9	15.8	18.5	15.9
<i>Lives with both father and mother</i>	77.8	78.8	68.4	76.2	72.8	73.2	52.2
<i>NCS school[#]</i>	28.5	41.8	100.0	78.2	58.3	61.1	100.0
English session	20.2	21.5	45.9	46.3	38.6	31.3	49.3

Note: Some column percentages do not add to 100 due to non-response and rounding.

[#]NCS school: School traditionally serving large proportion of non-Chinese speaking students (predominantly ethnic minority students) formerly referred to as 'designated school'.

Table 2. Student programme results by Form and study year: knowledge and attitudes.

		2019–2020			2020–2021		
		Pre	Post	<i>p</i> -value	Pre	Post	<i>p</i> -value
<i>Form 1</i>							
2019–2020 (<i>n</i> = 361)	Total Knowledge (5 items)	3.3	3.6	.00**	3.3	3.8	.00**
NCS [#] school (<i>n</i> = 103)	Total Attitudes (1 item)	.9	.9	.37	.9	.9	.07
2020–2021 (<i>n</i> = 147)	Total Correct (6 items)	4.1	4.5	.00**	4.1	4.7	.00**
NCS school (<i>n</i> = 78)							
<i>Form 2</i>							
2019–2020 (<i>n</i> = 316)	Total Knowledge (1 item)	.55	.37	.00**	.53	.46	.08
NCS school (<i>n</i> = 132)	Total Attitudes (6 items)	5.5	5.5	.96	5.2	5.4	.10
2020–2021 (<i>n</i> = 228)	Total Correct (7 items)	6.0	5.8	.02*	5.8	5.9	.39
NCS school (<i>n</i> = 133)							
<i>Form 3</i>							
2019–2020 (<i>n</i> = 133)	Total Knowledge (3 items)	1.0	1.9	.00**	1.1	2.0	.00**
NCS school (<i>n</i> = 133)	Total Attitudes (8 items)	5.6	6.2	.00**	5.7	6.0	.00**
2020–2021 (<i>n</i> = 265)	Total Correct (11 items)	6.6	8.1	.00**	6.7	8.0	.00**
NCS school (<i>n</i> = 162)							
<i>Form 4</i>							
2020–2021 (<i>n</i> = 138)	Total Knowledge (2 items)	–	–	–	.9	1.3	.00**
NCS school (<i>n</i> = 138)	Total Attitudes (14 items)	–	–	–	10.9	11.5	.02*
	Total Correct (16 items)	–	–	–	11.9	12.8	.00**
	Sexually active	–	–	–	–	15.2	–

Note: T-tests were used to evaluate differences in means between pre and post groups for all non-missing responses;

[#]NCS school: School traditionally serving large proportion of non-Chinese speaking students (predominantly ethnic minority students) formerly referred to as ‘designated school’; **p* < 0.05, ***p* < 0.01.

one knowledge item which declined significantly for 2019–2020. Average baseline student attitude scores were $\geq 85\%$ for Forms 1 and 2, with no significant improvement following the intervention, while significant improvements were observed for Forms 3 and 4. Fifteen percent of Form 4 students chose ‘yes’ for the item: ‘Have you ever been sexually active’ (17% of boys and 13% of girls).

Table 3 presents results from the multivariable regression analysis exploring the relationship between gender, parents education, living with two parents, and school class type (i.e. English language or Cantonese language) on student knowledge and attitudes outcomes. The pre-test predicted the post-test scores for all Forms and study years. Participation in the programme sessions conducted in English (rather than Cantonese) was negatively associated with student outcome summary scores for attitudes (Form 1 (2020–21)) and knowledge (Form 1 (2019–20); Form 3 (both years); Form 4 (2020–21)). Male gender was also negatively associated with student outcome summary scores for attitude (Form 2 (2019–20); Form 3 (2020–21); Form 4 (2020–21)) and knowledge ((Form 1 (2020–21); and Form 3 (both years)). Living with both mother and father was negatively associated with student knowledge summary scores in Form 1 (both years), while having university-educated parents was associated with positive student outcomes in Form 4 (2020–21).

Table 4 presents descriptive statistics for the non-student knowledge and self-efficacy items. No conclusions can be drawn from the 2019–20 matched parent sample due to limited sample size. Among the adult participants, guidance counsellors were most likely to have discussed sexuality issues with students in the last 12 months (49% 2019–20; 41% 2020–21) followed by parents (44% 2020–21) and teachers (31% 2019–20; 28% 2020–21).

Table 3. Multivariable regression analysis of factors associated with post-intervention outcomes (knowledge, attitudes and overall) by Form and study year.

Covariates	2019–2020 F1 (n = 361)			2020–2021 F1 (n = 147)			Total B (95% CI)	p
	K B (95% CI)	A B (95% CI)	p	K B (95% CI)	A B (95% CI)	p		
Pre-test	.35 (.25, .45)	.24 (.08, .40)	.01*	.23 (.08, .38)	.38 (.18, .57)	.00**	.22 (-.10, .34)	.00**
Male	-.16 (-.36, .03)	.00 (-.06, .07)	.92	-.47 (-.10)	-.10 (-.24, .02)	.11	-.58 (-.98, -.18)	.01*
University-educated parent	-.01 (-.26, .23)	.03 (-.05, .10)	.50	.08 (-.79, -.04)	.06 (-.10, .21)	.44	.14 (-.19, .48)	.37
English class	-.20 (-.63, .23)	-.21 (-.39, -.02)	.03*	-.42 (-.79, -.04)	-.03 (-.15, .08)	.53	-.48 (-.88, -.09)	.02*
Live with Mom and Dad	-.35 (-.63, -.07)	.05 (-.05, .20)	.30	.37 (.05, .69)	-.02 (-.11, .06)	.55	.36 (-.03, .68)	.04*
R-squared	.15	.20		.21	.22		.22	
2019–2020 F2 (n = 316)								
Covariates	K B (95% CI)	A B (95% CI)	p	Total B (95% CI)	K B (95% CI)	p	A B (95% CI)	p
Pre-test	.34 (.22, .45)	.53 (.37, .69)	.00**	.47 (.32, .62)	.38 (.21, .55)	.00**	.52 (.26, .77)	.00**
Male	-.05 (-.18, .08)	-.51 (-.80, -.23)	.45	-.59 (-.91, -.26)	-.03 (-.16, .09)	.60	-.26 (-.59, .08)	.12
University-educated parent	.10 (-.06, .26)	.03 (-.19, .25)	.77	.13 (-.12, .37)	-.11 (-.25, .04)	.14	.21 (-.02, .44)	.08
English class	-.02 (-.15, .11)	-.35 (-.71, .01)	.75	-.40 (-.84, .04)	-.04 (-.26, .18)	.71	-.48 (-1.04, .08)	.09
Live with Mom and Dad	.06 (-.06, .19)	-.06 (-.29, .16)	.55	.02 (-.23, .27)	.02 (-.10, .14)	.74	.05 (-.37, .46)	.82
R-squared	.14	.35		.31	.16		.36	.38
2020–2021 F3 (n = 265)								
Covariates	K B (95% CI)	A B (95% CI)	p	Total B (95% CI)	K B (95% CI)	p	A B (95% CI)	p
Pre-test	.34 (.22, .45)	.53 (.37, .69)	.00**	.47 (.32, .62)	.38 (.21, .55)	.00**	.52 (.26, .77)	.00**
Male	-.05 (-.18, .08)	-.51 (-.80, -.23)	.45	-.59 (-.91, -.26)	-.03 (-.16, .09)	.60	-.26 (-.59, .08)	.12
University-educated parent	.10 (-.06, .26)	.03 (-.19, .25)	.77	.13 (-.12, .37)	-.11 (-.25, .04)	.14	.21 (-.02, .44)	.08
English class	-.02 (-.15, .11)	-.35 (-.71, .01)	.75	-.40 (-.84, .04)	-.04 (-.26, .18)	.71	-.48 (-1.04, .08)	.09
Live with Mom and Dad	.06 (-.06, .19)	-.06 (-.29, .16)	.55	.02 (-.23, .27)	.02 (-.10, .14)	.74	.05 (-.37, .46)	.82
R-squared	.14	.35		.31	.16		.36	.38

(Continued)

Table 3. (Continued).

Pre-test	.43 (.18, .68)	.01*	.59 (.39, .79)	.00**	.66 (.41, .90)	.00**	.35 (.22, .48)	.00**	.56 (.37, .75)	.00**	.54 (.42, .66)	.00**
Male	-.06 (-.44, .31)	.68	.07 (-.64, .78)	.81	-.05 (-.84, .75)	.89	-.03 (-.22, .15)	.71	-.31 (-.57, -.05)	.03*	-.37 (-.84, .10)	.06
University-educated parent	.24 (-.14, .63)	.18	.16 (-.51, .84)	.58	.34 (-.55, 1.23)	.39	.11 (-.11, .33)	.29	.11 (-.22, .43)	.48	.21 (-.31, .73)	.34
English class	-.90 (-1.34, -.49)	.00**	-.59 (-1.20, .03)	.06	-.137 (-2.10, -.64)	.00**	-.70 (-1.03, -.37)	.00**	-.64 (-1.26, -.02)	.05	-.1.3 (-1.81, -.79)	.00**
Live with Mom and Dad	.12 (-.61, .84)	.71	-.14 (-.93, .65)	.69	-.00 (-1.12, 1.11)	1.00	-.03 (-.29, .24)	.83	.30 (-.14, .74)	.16	.23 (-.30, .75)	.46
<i>R-squared</i>	.35	.43	.43	.53	.31	.34						
2020–2021 F4 (n = 138)												
Covariates	K B (95% CI)	<i>p</i>	A B (95% CI)	<i>p</i>	Total B (95% CI)	<i>p</i>						
Pre-test	.32 (.11, .54)	.01*	.71 (.54, .89)	.00**	.74 (.54, .93)	.00**						
Male	-.07 (-.37, .22)	.56	-.71 (-1.22, -.19)	.02*	-.93 (-1.63, -.23)	.03*						
University-educated parent	.19 (-.35, .73)	.42	.91 (.57, 1.25)	.00**	1.13 (.57, 1.69)	.02*						
English class	-.61 (-.99, -.23)	.01*	-.58 (-1.35, .20)	.12	-1.06 (-2.04, -.09)	.04*						
Live with Mom and Dad	-.20 (-.62, .23)	.30	-.06 (-1.07, .94)	.89	-.14 (-1.50, 1.22)	.81						
<i>R-squared</i>	.25	.47	.47	.49								

Notes: K indicates knowledge total, A indicates attitudes total. **p* < 0.05, ***p* < 0.01.

Table 4. Non-student programme results by study year: knowledge and self-efficacy.

		2019–2020			2020–2021		
		Pre (%)	Post (%)	<i>p</i> -value	Pre (%)	Post (%)	<i>p</i> -value
<i>Parents</i>	Discussed sexuality issues with child in last 12 months	71	57	.36	45	55	.08
2019–2020 (<i>n</i> = 7)							
<i>NCS school</i> (<i>n</i> = 0)	Q1K Naked	40	100	.07	39	57	.16
2020–2021 (<i>n</i> = 33)	Q2K Attraction	60	80	.62	36	60	.01*
<i>NCS school</i> (<i>n</i> = 22)	Q3K Gay	20	80	.07	24	40	.10
	Q4K Masturbate	20	80	.07	17	40	.01*
	Q5SE Comfort	60	80	.37	77	60	.06
	Q6SE Confidence	80	60	.37	77	87	.26
	Q7SE Skill	20	60	.18	40	67	.02*
<i>Teachers/ School Administrators</i>	Discussed sexuality issues with student in last 12 months	31	32	.65	28	28	–
2019–2020 (<i>n</i> = 59)							
<i>NCS school</i> (<i>n</i> = 12)	Q1K Naked/Gay	53	95	.00**	23	28	.07
	Q2K Attraction/Masturbation	50	79	.00**	57	60	.32
2020–2021 (<i>n</i> = 140)	Q3K Relevance/Toilet	97	95	.66	46	96	.00**
<i>NCS school</i> (<i>n</i> = 77)	Q4K STI /Withdrawal	100	100	1.0	92	95	.20
	Q5SE Comfort	50	69	.00**	44	57	.00**
	Q6SE Confidence	48	69	.00**	40	57	.00**
	Q7SE Skill	24	59	.00**	23	54	.00**
<i>Guidance Counsellors/ Social Workers</i>	Discussed sexuality issues with student in last 12 months	49	46	.57	41	41	–
2019–2020 (<i>n</i> = 35)							
<i>NCS school</i> (<i>n</i> = 11)	Q15E_Confident discussing – pregnancy / STI	32	86	.00**	24	78	.00**
2020–2021 (<i>n</i> = 37)	Q25E Confident discussing – abuse	–	–	–	22	70	.00**
<i>NCS school</i> (<i>n</i> = 14)	Q35E Resources – pregnancy/STI	18	53	.00**	16	71	.00**
	Q45E Resources – abuse	–	–	–	19	57	.00**

Notes: T-tests were used to evaluate differences in means between pre and post groups for all available responses; *K* indicates knowledge item; *SE* indicates self-efficacy item; #*NCS school*: School traditionally serving a large proportion of non-Chinese speaking students (predominantly ethnic minority students) formerly referred to as 'designated school'; **p* < 0.05, ***p* < 0.01.

Parents (2020–21) scored below 40% at baseline for knowledge items, while self-efficacy items were generally higher except for skills to start a dialogue about sexuality with child (40%). Baseline teacher knowledge scores were generally higher than those of parents, but self-efficacy scores were similar or lower. Parents and teachers scored lowest on the knowledge item related to homosexuality. Guidance counsellors were only surveyed on self-efficacy items, with baseline scores ≤ 32%, indicating low confidence levels and awareness of community resources to support students. Statistically significant improvements were observed for knowledge items among parents and teachers and self-efficacy items for all non-student groups (2019–20 parent sample not included). Based on the differences found in the student sample, logistic regression was used to explore the effect of school type (i.e. schools traditionally serving a large proportion of non-Chinese speaking (*NCS*) students versus schools serving primarily local Chinese students) on knowledge and self-efficacy items for non-student groups (data available upon request). School type was not a significant predictor of any of the outcomes for non-student participants.

Discussion

To the best of our knowledge, *Sexuality360@School* is the first comprehensive sexuality education programme developed specifically for the Hong Kong context, taking an ecological approach to foster an ecosystem of sex-positive support within schools. The study provides new understanding of baseline levels for student, school personnel and parent knowledge and self-efficacy related to sexual education in Hong Kong. The study also provides evidence of the feasibility of offering comprehensive sexuality education in secondary schools and fitting a meaningful programme within Hong Kong's busy curriculum.

Our results indicate relatively low levels of student baseline sexual health knowledge, particularly among older students (Form 3 and Form 4 participants scored $\leq 50\%$ for all knowledge items at baseline). By comparison, preliminary findings from the Hong Kong Youth Sexuality Study 2021 found Form 3–6 students answered eight of 12 key questions correctly regarding sexual and reproductive health, with younger students answering five to six of 12 correctly. Student attitudes motivating healthy sexual decisions and communication seem well-established at baseline, particularly among younger students, with less room for improvement. Consistent with prior literature both in Hong Kong and elsewhere, boys scored less favourably both on knowledge and attitudes outcomes and were more likely to have had sexual experience (Shrestha et al. 2013; Shek 2013; Lam et al. 2001). In contrast to existing literature, living with both a mother and a father did not serve as a protective factor for student knowledge and attitudes outcomes in our sample, however, this finding was only observed in Form 1 (2019–2020) (Shek 2013).

This study provides important new findings related to differences in sexual health knowledge and attitudes between local Chinese students and students from other cultural backgrounds in Hong Kong. Prior studies have differentiated between local and Mainland Chinese students' sexual health knowledge, attitudes, behaviour, and intention to engage in sexual behaviour, showing lower levels of knowledge, less favourable attitudes and higher levels of sexual behaviour and intention among Mainland Chinese students than local students (Shek 2013; Wong and Lawrence Lam 2013). However, this is the first study of sexual health to include students from local schools serving a large proportion of non-Chinese speaking students. Participation in English language sessions at schools serving primarily non-Chinese speaking students was negatively associated with student outcomes for all Forms in both study years. Further investigation into non-Chinese speaking students' experience with sexual health in Hong Kong is warranted to build on this initial evidence and tailor sexual health programmes to effectively support this growing segment of the student population, who have been shown to experience unique educational challenges in Hong Kong (Bhowmik, Kennedy, and Hue 2018).

Our results confirm and provide new insight related to Fok's earlier conclusion that lack of human resources is the greatest problem facing schools in Hong Kong in their provision of sex education based on her findings that few teachers were trained in or willing to take up sex education and many were uncomfortable or embarrassed to teach sex education (Fok 2005). Teacher sexual health knowledge was quite low from baseline, with significant improvement on several items following the training, though there was still room for improvement on knowledge items. This is consistent with findings from studies in other Asian contexts in which teachers lacked confidence and appropriate training and were

reluctant to discuss sexual health issues due to cultural, societal or personal concerns (Shrestha et al. 2013; Seung-Duk et al. 2001; Pokharel, Kulczycki, and Shakya 2006). Likewise, baseline school social worker scores show the professionals tasked with helping students navigate sexual health issues lacked both the confidence to discuss sexuality issues and the knowledge of resources to assist students with their concerns. This deficiency in knowledge and comfort among professional adults supporting student sexual health has also been documented among paediatric nurses in Hong Kong (Yip et al. 2015). While students' results varied significantly by class type (i.e. English versus Cantonese training), school personnel outcomes did not differ by type of school (i.e. schools traditionally serving a high proportion of non-Chinese speaking students versus local Chinese).

Despite the limited (2019–20) matched sample of parents, results from this study provide new insight into the complex dynamics existing between parents and their children when it comes to sexuality education. Parent-child communication regarding sexuality is universally acknowledged as challenging (Mullis et al. 2021), with personal, communal and cultural factors in Hong Kong compounding the difficulty. Similar to school employees in this study, parents' sexual health knowledge levels at baseline were quite low. Limited sexual health knowledge among parents is consistent with studies conducted elsewhere in Asia in which parents likely have not themselves experienced sexuality education and thus lack the knowledge, awareness, comfort, and skills to engage their children in dialogue about sexuality (Sham et al. 2020; Ballal et al. 2022). However, following training, parents showed significant improvement (2020–21) for two sexual health knowledge items and the self-efficacy skills item. Even with room for growth in both knowledge and self-efficacy following the trainings, the results confirm heightened awareness, understanding and motivation among parents to support their children in sexuality education. The encouraging results related to parents' improved self-efficacy in this study suggest the potential for enhanced communication lines between adolescents and supporting adults going forward.

Sexuality360@School has the potential for expansion through adoption in Hong Kong schools. Moreover, it could also be utilised in other Chinese-speaking contexts such as in Mainland China, where a large study of college students found only 50% of participants had received school-based sexuality education (Chunyan et al. 2017). The same study found higher levels of sexual health knowledge and improved sexual health practices among participants who previously received school-based sexuality education (Chunyan et al. 2017). Hence, by offering a more comprehensive, evidence-based approach to sexuality education tailored to a Chinese context, *Sexuality360@School* has the potential for widespread reach benefitting many more adolescents.

Limitations

This study is subject to limitations. First, by including only the matched sample in the evaluation we may have inadvertently excluded low-performers, resulting in a unduly optimistic set of study results, although we felt this was a necessary risk to capture the treatment effect. Second, the inclusion of a comparison group would have strengthened this study, but this was not seen as feasible by programme staff at the time of implementation. Third, although the survey items were based on validated instruments that had been piloted and

evaluated for face validity in the Hong Kong context, participants may not have interpreted the questions consistently. Additionally, measuring behaviour change would have improved our evaluation, although this was outside the scope of the study. Finally, we considered the threat of maturation in the student sample but sought to minimise it by conducting the pre and post-tests within a limited timeframe around three training events. Finally, we were not able to measure the durability of change found between the pre- and post-tests.

Conclusion

Our results indicate low levels of sexual health knowledge among both student and adult participants at baseline, confirming the clear need for sexuality education in Hong Kong and underscoring the importance of ensuring supporting adults receive instruction and support in addition to students. Study findings also highlight the need for special attention to be given to sexuality education in schools serving a high proportion of non-Chinese speaking students. Our findings provide initial evidence of significantly enhanced sexual health knowledge among all types of participants, improved attitudes among older students (Forms 3 & 4) and enhanced self-efficacy among all supporting adult participants.

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