

# A Life-skills-based HIV/AIDS Prevention Education for Rural Students of Primary Schools in China: What Changed? What Have We Learned?<sup>1</sup>

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**Objective** To evaluate a four-hour life-skills-based HIV/AIDS prevention curriculum among 5th grade students in rural primary schools of Hainan province. **Methods** The study included two stages. Stage one (September 2006-May 2007) was a pre-post-quasi experimental design; a total of 2 413 students aged 9 to 14 years from fifth grade classes of nine primary schools completed a baseline survey (1 720 students were in the intervention group, 693 in the control group), and over 98% of them took part in a short survey. The experimental curriculum was provided to the intervention group. At stage two (September 2008), a cross-sectional questionnaire was administered to 6 923 students in 7th grade classes of eight middle schools in the same study sites. There were 1 437 students in the intervention group when the curriculum was conducted. **Results** Students tended to score higher in areas of HIV/AIDS related knowledge and attitudes, if they were younger than average, lived in the county seat, had access to the internet, and their parents had completed higher levels of education. Path analysis showed that, after controlling for characteristics such as family and community factors, the total effects of curriculum on knowledge in the short-term model increased remarkably compared with the baseline, and maintained major contributions to knowledge in the mid-term model. The positive effect of knowledge on attitudes was significantly improved in the short-term model as well. **Conclusion** A life-skills based curriculum can improve HIV/AIDS related knowledge and self-perceived level of life-skills among primary school students in rural areas in a short time, and these positive effects can still be observed at least 2 years post participation in the curriculum.

**Key words:** Adolescent; HIV/AIDS prevention; Life-skills education; Effect evaluation; Rural area; Intervention research

## INTRODUCTION

Young people are considered to be a group at risk for human immunodeficiency virus (HIV) infections and acquired immune deficiency syndrome (AIDS). Adolescence, as a transitional passage from childhood to adulthood, is an important period to foster healthy attitudes and behaviors. Adolescents are more likely to be exposed to, or to engage in behaviors related to contracting HIV, such as high-risk sexual behaviors and illicit drug use. While HIV/AIDS prevention efforts among high-risk groups (e.g. sex workers and intravenous drug users) are urgently needed in China, fostering healthy behaviors among adolescents may be even more important for prevention of HIV/AIDS high risk behaviors and sexually transmitted infections (STDs) in the general population.

Life-skills-based education (LBSE), as an HIV/AIDS prevention model, which uses participatory and interactive teaching techniques, combines HIV/AIDS prevention knowledge education with adolescents' psychosocial and interpersonal skills development. The aim of this education is to foster healthy lifestyles and lower HIV/AIDS related risk behaviors<sup>[1-4]</sup>.

Currently, schools are the primary locations in which young people acquire knowledge and skills in China, particularly in rural areas. School-based health education can be more efficiently operated and delivered than extra-curricular programs. Over the past 10 years, the United Nations International Children's Emergency Fund (UNICEF) has been working on promoting the LBSE for HIV/AIDS prevention among young people. Supported by the Chinese government, some pilot projects of

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HIV/AIDS LBSE were implemented. While most interventions were conducted among college and middle school students and a few in primary schools in urban areas, students in primary schools in rural areas of China were neglected<sup>[5]</sup>.

Hainan province is located in the south of China. Though Hainan province is not a HIV high epidemic area, the HIV prevalence among drug users in Hainan province has been steadily increasing in recent years<sup>[6]</sup>. Additionally the prevalence of STDs in Hainan is high compared with other regions in China<sup>[7-11]</sup>.

The "China AIDS comprehensive responds (CHINA CARES)" program, which focuses on delivering an integrated and comprehensive response covering areas such as health education, treatment and care, is a significant initiative of the central government. The current study's settings, counties A and B located in the north of Hainan province, which were both CHINA CARES sites since 2004, have HIV/AIDS risk factors such as a large sex industry<sup>[12-13]</sup> and high drug use and availability<sup>[7,14]</sup>.

Adolescents living in counties A and B may have long been exposed to risk factors such as prostitution, and illicit drugs. The STD surveillance system reported that some minors in Hainan contracted syphilis through commercial sexual behaviors<sup>[15]</sup>. A questionnaire of 881 out-of-school young adults aged 16 to 30 years old in 8 rural areas of Hainan province showed that 57.7% of the participants reported premarital sexual behavior, 31.8% of them reported multiple sexual partners, and 4.8% reported multiple sexual partners in the past 6 months<sup>[16]</sup>.

However, most schools in Hainan do not provide any education to prevent HIV/AIDS except for a few involved in special research projects. According to our pilot questionnaire, among 133 5th grade pupils of two rural primary schools in counties A and B, only nine percent of students knew the three routes of HIV transmission. Misconceptions about HIV-transmission were common. For example, students often directly applied their knowledge on prevention of respiratory and digestive tract infections to HIV transmission. Students were seldom able to relate HIV/AIDS to the environmental risks in the communities where they were living.

We collaborated with the Hainan Provincial Education Department and local education bureaus to launch a "Life-skills-based HIV/AIDS Prevention Education Research Project" in rural areas of Hainan province in 2005. The project set up a steering committee, consisting of researchers from our project team and 9 school masters or teachers of local schools from the study settings. Based on UNICEF LBSE for HIV/AIDS curriculum and other existing

materials, the committee designed an experimental curriculum for 5th grade students in primary school. The experimental curriculum included four lessons: adolescent development, HIV transmission and prevention, drug prevention, and risk behavior rejection. Each lessons lasted 45 min, and a lot of participatory activities were used, such as brain storm, role playing, group discussion, case study and games.

This paper primarily focuses on evaluation of the curriculum's post-intervention effectiveness on HIV/AIDS related knowledge and attitudes by considering not only the curriculum intervention but also students' background factors.

To our knowledge, this is the first intervention in rural primary schools of Hainan province by a LBSE HIV/AIDS prevention experimental curriculum. A follow-up survey was conducted 16 months after intervention. Path models were used to describe the complex relationships among the experimental curriculum, students' backgrounds, and their scores of HIV/AIDS related knowledge and life-skills attitudes.

## METHODS

### *Procedure and Subjects*

The study included two stages. In stage one (September 2006-May 2007), a quasi-experimental study was conducted to evaluate the short-term (one month after intervention) effectiveness of the experimental curriculum. Six intervention schools and three control schools were enrolled by judgmental sampling method; these schools were located in counties A or B in Hainan province. The selection criteria of the intervention schools included: agreed to participate in curriculum and surveys; at least one county seat school from each county; the other schools were rural schools located in areas with high prevalence of illegal drug use and/or patronage of prostitution. Control schools were selected from two county seats. All 5th grade students in selected primary schools were recruited as study participants. We named the participants in the six experimental schools as the "intervention group" and those in three control schools as the "short-term control group". Students in the intervention group were taught the experimental curriculum by trained teachers after participation in the baseline survey, and students in the control group participated in two surveys, but did not study the experimental curriculum.

At stage two (September 2008, 16 months after implementation of the experimental curriculum), a cross-sectional questionnaire (referred to as mid-term survey hereafter) was administered to 7th grade

students in eight middle schools, from which a large portion of the 5th grade students from the previous experimental primary schools were enrolled, and this was considered the “follow-up group.” Those individuals who were surveyed in 7th grade, but who reported they had not participated in the intervention in 5th grade in mid-term survey were called “mid-term control group.”

To assess students’ knowledge and self-perceived level of life skills and other relevant factors, three self-administered questionnaire-based surveys were conducted before and after implementation of the experimental curriculum, which were called as baseline, short-term (1-month after implementation) and mid-term (16-month after implementation) surveys.

The surveys were anonymous and conducted in classrooms. Trained surveyors gave instructions before the surveys began, and provided explanations to participants who had any problems in understanding the questionnaires. Before the baseline survey, students’ parents were notified in writing about the research study, no parent disagreed with the informed consent.

#### *Instrument*

HIV/AIDS related knowledge score and life skills attitudes scores were the main measures used to evaluate the curriculum’s effectiveness.

1. To evaluate students’ HIV/AIDS related knowledge level, there were 17 questions in the questionnaire (Attachment 1). Correct answers were scored one and incorrect answers were scored zero. Each question’s score was added to obtain the total knowledge score (TKS), which ranged from 0 to 17. The greater a student’s HIV/AIDS related knowledge, the higher their TKS.

2. The questionnaire included 9 questions to evaluate students’ self-perceived level of HIV/AIDS prevention related life-skills (Attachment 1). Affirmative attitude were scored two, neutral were scored one, and negative attitudes were scored zero. We added each question’s score into the total attitude score (TAS), ranging from 0 to 18. The more affirmative self-perceived level of HIV/AIDS prevention related life-skills, the higher the TAS.

Besides questions directly associated with HIV/AIDS knowledge or life skills, factors related to family community life and internet usage were also measured (Attachment 2).

#### *Data Analyses*

Data were entered twice and validated using EpiData 3.02 software. The differences between the intervention and control groups were examined with

*t*-tests (homogeneity of variance) or nonparametric tests (heterogeneity of variance) for continuous variables. Categorical variables were examined with chi-square tests. A multivariate linear regression model can include only one dependent variable and can’t describe indirect dependency of variables. But health education studies usually need measure more dependent variables, and explore both direct and indirect dependencies among variables. Path analysis can include more dependent variables and describe direct and indirect dependencies among a set of variables by combining several related multivariate linear regression model into a “relationship net”, the “path diagram”. In our study, the effects of the intervention on HIV/AIDS related knowledge and attitudes were analyzed using path analysis models, controlling for other possible factors. LISREL 8.70 was used for all path analyses, and SPSS 13.0 was used for all other analyses.

## RESULTS

### *Descriptive Characteristics, Family and Community Factors of Participants*

At stage one, 1-720 and 1-700 students in the intervention group participated in the baseline and short-term effectiveness evaluation questionnaire-based surveys. In the short-term control group, the numbers of participants were 693 and 705. In stage two, 6 923 7th grade students from 8 middle schools were surveyed. Among them, 1 437 students had participated in our experimental curriculum which accounted for 83.5 percent of total “intervention group” students two years before. All the response rates of three surveys were above 98%.

The demographic characteristics were different between the intervention and control groups at baseline (Table 1). Compared with the control group, the intervention group included more rural students, their median age was higher, students’ parent had lower education levels, and fewer students reported having ever used the internet.

In the mid-term survey, most students’ characteristics in the follow-up and control groups were similar. But the intervention group had fewer rural students and more students reported having used the internet than in the control group.

### *The Changes in Scores on HIV/AIDS Knowledge and Attitudes*

The proportion of students who knew the three routes of HIV transmission increased from 18.5% in the baseline (16.5% of intervention group, 23.5% of control group) to 43% in the short-term survey

(45.2% of intervention group, 37.6% of control group).

Compared to the control group, the intervention group had statistically significantly lower total knowledge score (TKS), ranging 0~17,  $5.2 \pm 3.8$  vs.

$7.6 \pm 4.7$ ,  $P < 0.001$ , 95% confidence interval (CI) =  $-2.84 \sim -2.05$ ) at baseline, their TKS had significantly increased at short-term survey, while the control group's changed little ( $9.4 \pm 4.8$  vs.  $7.9 \pm 4.6$ ,  $P < 0.001$ , 95% CI =  $1.08 \sim 1.90$ ). In addition, the intervention

TABLE 1

Students' Characteristics, Family and Community Factors (Baseline and Mid-term Surveys)<sup>a</sup>

Characteristics	Baseline Survey				Mid-term Survey			
	Intervention Group (n=1720)	Short-term Control Group (n=693)	Test Statistics	P	Follow-up Group (n=1437)	Mid-term Control Group (n=5383)	Test Statistics	P
<b>Gender</b>								
Respondent Number (n)	1512	658	0.006 <sup>b</sup>	0.938 <sup>b</sup>	1385	5090	6.437 <sup>b</sup>	0.011 <sup>b</sup>
Male (%)	56.8	57.0			54.2	58.0		
Female (%)	43.2	43.0			45.8	42.0		
<b>Age (years)</b>								
Respondent Number (n)	1686	689	3.895 <sup>c</sup>	<0.001 <sup>c</sup>	1417	5321	0.868 <sup>c</sup>	0.385 <sup>c</sup>
Range	9-15	9-15			10-18	10-18		
Median	12	11			14	13		
<b>Have Ever Used Internet</b>								
Respondent Number (n)	1661	675	8.962 <sup>b</sup>	0.003 <sup>b</sup>	1424	5290	19.348 <sup>b</sup>	<0.001 <sup>b</sup>
Never (%)	74.1	68.0			45.2	51.7		
Yes (%)	25.9	32.0			54.8	48.3		
<b>Residence Registration</b>								
Respondent Number (n)	1687	682	58.616 <sup>b</sup>	<0.001 <sup>b</sup>	1410	5276	216.274 <sup>b</sup>	<0.001 <sup>b</sup>
Rural town (%)	44.5	30.7			37.5	58.7		
County seat (%)	44.6	60.9			55.1	35.4		
Others (%)	3.8	4.7			3.3	3.7		
Unknown (%)	7.1	3.8			4.1	2.3		
<b>Father's Education Level</b>								
Respondent Number (n)	1669	676	21.424 <sup>b</sup>	<0.001 <sup>b</sup>	1417	5256	5.332 <sup>b</sup>	0.149 <sup>b</sup>
Illiterate/Primary School (%)	23.5	19.4			19.8	22.4		
Middle school (%)	23.7	20.3			35.9	33.7		
Senior High School or above (%)	16.9	24.7			21.2	20.5		
Unknown (%)	35.9	35.7			23.2	23.4		
<b>Mother's Education Level</b>								
Respondent Number (n)	1693	679	21.182 <sup>b</sup>	<0.001 <sup>b</sup>	1422	5283	8.742 <sup>b</sup>	0.033 <sup>b</sup>
Illiterate/Primary School (%)	38.4	37.0			38.6	42.9		
Middle School (%)	15.5	12.1			22.0	20.0		
Senior High School or above (%)	9.3	15.5			10.5	9.6		
Unknown (%)	36.9	35.5			28.9	27.5		
<b>Live with Parents</b>								
Respondent Number (n)	1710	691	5.395 <sup>b</sup>	0.067 <sup>b</sup>	1424	5289	0.249 <sup>b</sup>	0.883 <sup>b</sup>
None (%)	14.1	13.5			14.0	14.4		
Single Parent (%)	10.5	7.5			9.4	9.6		
Both Parents (%)	75.4	79.0			76.6	76.0		

group had a slightly lower total attitude score (TAS, ranged 0~18,  $10.7 \pm 2.8$  vs.  $11.5 \pm 2.8$ ,  $P < 0.001$ , 95% CI = -0.99~-0.50) at baseline, and the discrepancy between two groups still existed but was smaller ( $11.9 \pm 2.7$  vs.  $12.0 \pm 2.8$ ,  $P > 0.05$ , 95% CI = -0.30~0.18) in the short-term survey.

At the mid-term survey, students who were previously in the intervention group had significant higher TKS than those who had not attended the curriculum ( $8.6 \pm 4.8$  vs.  $7.5 \pm 4.1$ ,  $P < 0.001$ , 95% CI = 0.80~1.34), though their levels of TKS decreased in comparison to their own levels in the short-term survey. There was a slight difference in TAS between the students who attended the curriculum before and did not ( $12.6 \pm 3.0$  vs.  $12.8 \pm 2.9$ ,  $P < 0.01$ , 95% CI = -0.39~-0.55), though the follow-up group's TAS score increased in from baseline to the short-term survey.

### *Participants' Characteristics, Family and Community Factors Associated with HIV/AIDS Knowledge and Attitudes*

Though initial analysis confirmed that our curriculum had some effect on promoting the intervention group students' HIV/AIDS related knowledge and attitudes, some other factors such as students' characteristics, family and community background may also impact their levels of HIV/AIDS related knowledge and attitude.

Based on the results of baseline survey, characteristics of students and their families were found to be associated with the level of HIV/AIDS knowledge and self-perceived level of life-skills (Table 2).

There were no significant gender differences in students' TKS and TAS, but differences were found in TKS and TAS among students in different age

TABLE 2

Students' Characteristics, Family and Community Factors Associated with TKS, TAS and Internet Using (Baseline Survey)

Factors	Respondent Number	Using internet (%)	$\chi^2$	$p^a$	Respondent Number	TKS		TAS	
						Mean Rank	$p$	Mean Rank	$p$
<b>Gender</b>									
Male	1190	36.6	83.203	<0.001	1234	1077.31	0.483 <sup>b</sup>	1062.89	0.052 <sup>b</sup>
Female	917	18.4			936	1096.29		1115.30	
<b>Age Group</b>									
Youngest	364	38.2	38.902	<0.001	379	1445.77	0.000 <sup>c</sup>	1458.18	<0.001 <sup>c</sup>
Normal	1516	28.0			1560	1172.00		1183.17	
Oldest	422	19.0			436	1021.16		970.43	
<b>Using Internet</b>									
Never	--	--	--	--	1690	1127.69	0.000 <sup>b</sup>	1128.23	<0.001 <sup>b</sup>
Yes	--	--			646	1275.27		1273.85	
<b>Residence Registration</b>									
Rural	923	19.3	59.856	<0.001	960	999.50	0.000 <sup>b</sup>	971.74	<0.001 <sup>b</sup>
Township	1144	34.6			1170	1119.65		1142.43	
<b>Living with Parents</b>									
None	326	28.2	0.327	0.849	334	1128.88	0.075 <sup>c</sup>	1159.00	0.024 <sup>c</sup>
Single Parent	224	29.0			231	1170.57		1103.26	
Both Parents	1775	27.4			1836	1217.95		1220.94	
<b>Parents' Education Level</b>									
Both Illiterate/Primary School	340	16.2	93.688	<0.001	357	538.45	0.000 <sup>c</sup>	548.12	<0.001 <sup>c</sup>
One Illiterate/Primary School, One Middle School	312	22.1			318	621.24		630.93	
Both Middle School or One Illiterate/Primary School, One Senior High School or above	285	24.6			294	646.74		665.07	
One Middle School, One Senior High School or above	142	41.6			144	727.03		703.20	
Both Senior High School or above	149	53.7			153	767.32		711.80	

groups. The youngest age group students had the highest mean ranks of TKS and TAS, while the oldest group students had the lowest scores.

Students who came from townships had higher mean ranks on both TKS and TAS than students from rural areas. TKS and TAS also varied according to parents' educational backgrounds. Students tended to score the highest mean ranks on both TKS and TAS if their parents had an educational background of senior high school or above.

Students who had access to the internet got higher mean ranks of scores on both TKS and TAS than those who did not use the internet. Moreover, Internet use as a personal behavior was influenced by other personal, family and environmental factors (Table 2). In our results, students who were male, in the youngest age group, living in a township, living with both parents, or/and their parents had education

of senior high school or above were more inclined to use the internet.

To further refine our curriculum's effect, according to the project objective and results of univariate analysis, nine variables were used in the path models, including "gender", "age group", "residence registration", "parents' education status", "living with parents", "attending curriculum", "using internet", "TKS" and "TAS". "Using internet" and "TKS" are mediators in these models, because they can effect on TAS and affected by other five independent variables. A variance-covariance matrix was used in the pass analyses. Results of all the three path models demonstrated very good goodness-of-fit, with adequate sample size, *P*-value, "comparative-fit index; CFI", "non-normed fit index; NNFI", "goodness-of-fit index; GFI" and "root mean square error of approximation; RMSEA" (Table 3)<sup>[17]</sup>.

TABLE 3

Assessment the Fit of the Path Models

Surveys	Sample Size of Models	Sample Accounts for Participant (%)	Goodness-of-fit Index					
			WLS Chi-square Test		GFI	NNFI	CFI	RMSEA
			$\chi^2$	<i>P</i>				
Baseline	993	41.2	10.53	0.94	1.00	1.02	1.00	0.000
Short-term	1257	52.3	25.23	0.09	1.00	0.98	0.99	0.020
Mid-term	3751	55.0	10.49	0.88	1.00	1.00	1.00	0.000

The relationships among those variables and their independent effects on student's TKS and TAS were explored through comparing the path models of baseline (Fig. 1), short-term (Fig. 2) and mid-term surveys (Fig. 3).

Compared with the baseline model, the total effects of attending the curriculum on TKS in the short-term model increased remarkably (standard beta coefficient from -0.16 to 0.19). Moreover, attending the curriculum replaced the parents' educational level as the most major contributor to TKS in the short-term model. The positive effect of TKS on TAS was significant (standard beta coefficient from 0.19 to 0.38) in the short-term model as well.

Controlling for other factors, attending the curriculum did not show a positive direct effect on TAS in those models, but indirectly influenced attitudes through improving knowledge in the short-term model.

Several variables, such as parents' education level and place of residence, have been shown to have positive effects on TKS and TAS in the baseline model, but the effects became weaker or disappeared in the short-term model.

Comparing the mid-term model with the short-term

model, the positive effects of attending the curriculum on TKS decreased from 0.19 to 0.11, attending the curriculum still remained the major contributor to TKS. The follow-up group showed lower TAS than the mid-term control group.

## DISCUSSION

This project was conducted in two of the "CHINA CARES" sites, which means participating students had more potential access to information about HIV/AIDS prevention, but only less than 1/5 students knew the three routes of HIV transmission in the baseline survey. These results suggest that public communication was not sufficient to educate rural adolescents on HIV/AIDS prevention knowledge.

In China, parents are considered responsible for their children's education. In our results, students tended to have higher score of both knowledge and attitudes if they came from better home environments, such as living in a township and their parents had completed senior high school, which may suggest a relationship between family background and students' scores. But more than 2/5 of our participants came from rural areas, and over 70% of their

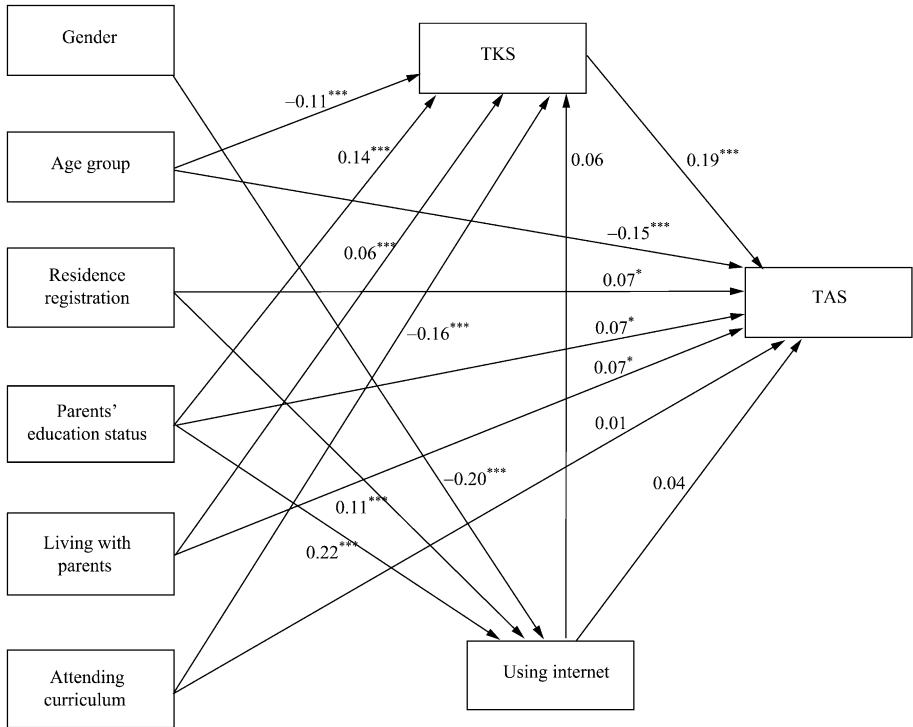


FIG. 1. Path model of standardized solution (Baseline survey). \*  $P < 0.05$ ; \*\*  $P < 0.01$ ; \*\*\*  $P < 0.001$ . Standardized residuals: TAS 0.89, TKS 0.92, Using internet 0.88.

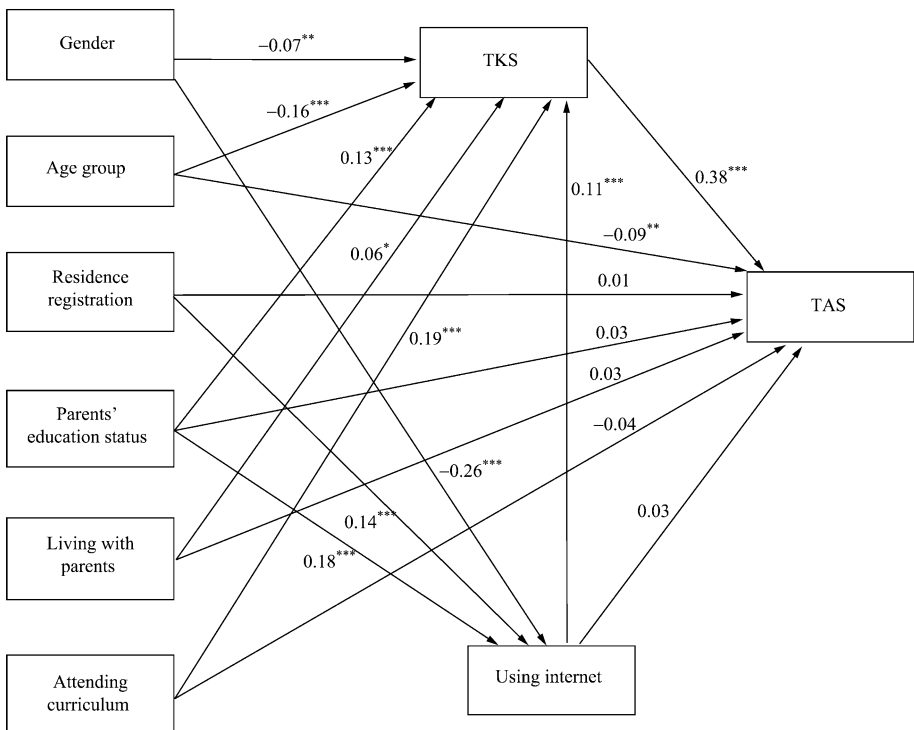


FIG. 2. Path model of standardized solution (Short-term survey). \*  $P < 0.05$ ; \*\*  $P < 0.01$ ; \*\*\*  $P < 0.001$ . Standardized residuals: TAS 0.82, TKS 0.88, Using internet 0.87.

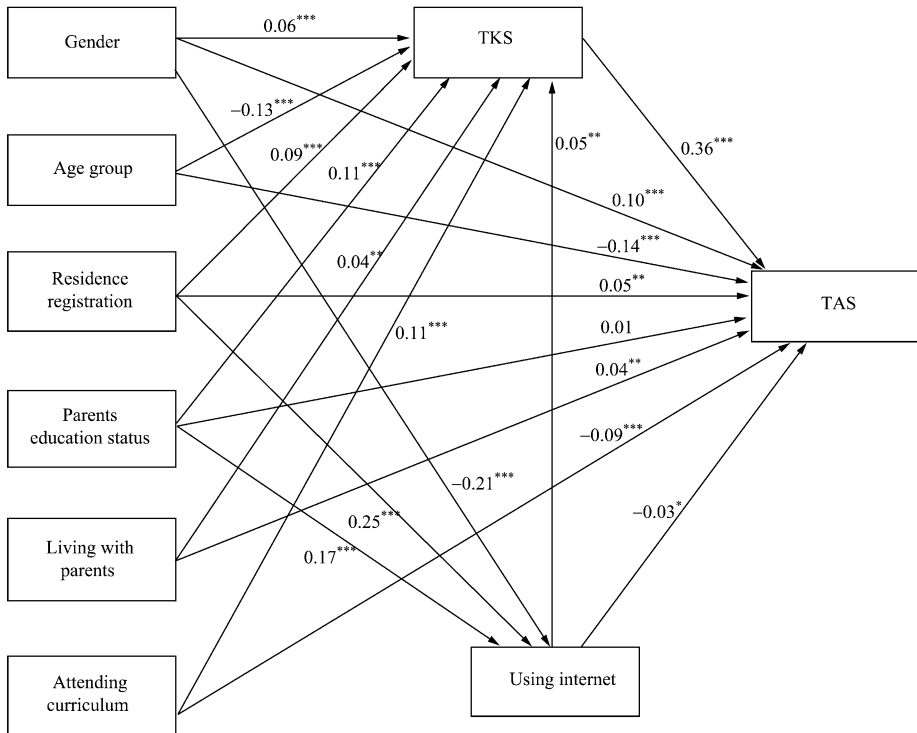


FIG. 3. Path model of standardized solution (Mid-term survey). \* $P < 0.05$ ; \*\* $P < 0.01$ ; \*\*\* $P < 0.001$ . Standardized residuals: TAS 0.79, TKS 0.91, Using internet 0.85.

parents had less than senior high school education. Parents in rural areas may not teach HIV/AIDS prevention and life skills education to adolescents because they lack in resources in terms of time, skills, and knowledge. In stage one survey, control group was superior to intervention group in students' characteristics, family and community background, TKS and TAS at baseline, that may be because intervention schools were selected from the county seat and rural areas, and controls were only selected from the county seat. On this account, we not only compared changes of TKS and TAS between two groups, but also use path analysis to further refine our curriculum's effect. The results lend evidence to the notion that schools may be the most effective, efficient, and feasible venue to educate rural adolescents on the possible consequences of risky behavior.

LBSE focused on how to strengthen the essential elements of behavior development and change. In addition, it is important to develop life-skills-based HIV/AIDS prevention education according to the different requirements of students of different ages<sup>[18]</sup>. Some researchers suggest that students should start such programs during primary school, because of the increasing trend in early sexual maturity in Chinese teenagers in the past 15 years<sup>[19]</sup>. The same should be true of life-skills-based

HIV/AIDS prevention education, not only because LBSE includes adolescent knowledge, but also more importantly because healthy attitude development takes a much longer time. Based on systematic reviews, although the study design and demographic characteristics of participants differed some researchers think that intensive behavioral interventions can reduce HIV risk, especially because they increased skill acquisition<sup>[20]</sup>; others argue that improvement in health knowledge does not necessarily lead to behavioral change, while knowledge may help improve health-seeking behavior among young people<sup>[21]</sup>. The current study found some evidence that although attitudes are more difficult to improve than knowledge, a LBSE curriculum can indirectly influence attitudes by improving knowledge. These results indicate that helping pupils develop healthy attitudes and behaviors may be more meaningful than educating them on risky attitudes and behavior changes as adults.

In these study sites, a large portion of rural adolescents are unable to continue their schooling after middle school<sup>[22]</sup>, and a number of them will become "out-of-school youth" and/or "migrant workers" the most vulnerable groups for being infected with HIV. Providing rural adolescents with LBSE HIV/AIDS prevention at an early stage in



their formal education is important in order to discourage them from engaging in high-risk behaviors in the future.

### Limitations

Several study limitations should be noted. In order to protect the individual privacy of students, the questionnaires were anonymous, thereby prohibiting longitudinal evaluation of the curriculum. The change of students' knowledge and attitudes before and after intervention was instead evaluated using path models.

Even though we conducted pilot survey and all the response rates of questionnaires in three surveys were above 98%, some pupils were too young to have information about their family such as parents' education background, which made almost half of the participant data unable to be entered in the path models. Considering parents' educational background was an important factor to student's knowledge and attitudes, this data was finally included it in the models. In order to explore whether the missing data influenced the results of this study, distribution of variables which had significant association with total knowledge and attitude scores between those with data and those with missing data (results are not reported in this paper) were analyzed and two variables were found to differ. More students whose parents had lower education backgrounds were missing in baseline, but the imbalance disappeared in short-term and mid-term models. Students whose parents had lower educational backgrounds were more likely to score lower in knowledge and attitudes. If the missing group was entered into the baseline model, this would increase the distance of knowledge and attitude scores between baseline and short-term surveys and the missing data of students whose parents had lower educational backgrounds would have reduced the measured positive effectiveness of the curriculum. Students who did not live with parents tended to have missing data in short-term and

mid-term models. Students who were living with both parents tended to have the highest attitude scores and those who were living with a single parent tended to have the lowest and this missing data also reduced the positive measured effectiveness of the curriculum too. Overall, the missing data most likely influenced our results towards the null. The sample sizes of three models were large enough to ensure the parameters were stable.

Attitudes might be influenced by multiple factors and are more difficult to measure than knowledge. Some of those effect factors can be measured and quantified, but not all, which may explain why the standardized residuals in path models were larger.

Another limitation is that, though we followed 83.5% of the intervention group students to assess the mid-term effectiveness of the curriculum, we need studies to assess long-term impact of the curriculum when they are most likely to be engaging in high risk activities.

### Conclusion

This research demonstrates that a four-hour life-skills-based HIV/AIDS prevention curriculum can improve students' HIV/AIDS knowledge and self-perceived level of life-skills in a short time even after controlling for other influencing factors. These positive effects can be maintained approximately 2 years post curriculum participation.

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### ATTACHMENT FILES:

#### Attachment 1. Items of HIV/AIDS Related Knowledge Score and Life Skills Attitude in the Questionnaire

##### Items

##### *HIV/AIDS related knowledge*

1. HIV can transmit through sexual contact.
2. HIV can transmit through blood transfusion.
3. HIV can transmit through mother-to-child transmission.
4. HIV can transmit through eating together with HIV/AIDS patients.
5. HIV can transmit through sharing toilet seat with HIV/AIDS patients.
6. We will be infected if we study in the same classroom with HIV/AIDS patients.
7. HIV can transmit through cough or sneezes.
8. HIV can transmit through handclasp or hug.
9. HIV can transmit through mosquito bites.
10. HIV can transmit through sharing needles with HIV/AIDS patients.

11. HIV can transmit through sharing toothbrush with HIV/AIDS patients.
12. HIV can transmit through using unsterile needles.
13. HIV can transmit through using unsterile apparatus to Pull out the teeth.
14. HIV can transmit through playing discarded needles.
15. It is possible to know whether a person is infected with HIV by their appearance.
16. We don't have vaccine which can against HIV/AIDS.
17. Adults are more highly vulnerable to AIDS than young people.

*Self-perceived level of HIV/AIDS prevention related life-skills*

1. I accept that the physical changes in my body are natural.
2. I am not ashamed of the changes that my body is going through.
3. I am able to discuss and ask questions about the physical changes by body with someone I trust.
4. It is not good to refuse a friend, even if they want us to do something that we don't want to do or that is inappropriate.
5. We should protect private parts of our bodies.
6. A person's outer appearance can tell us the quality of that person.
7. People who will hurt young people are usually strangers.
8. Smoking increases our problems rather than solve them.
9. Alcohol can make our emotions better.

Attachment 2. Students' HIV/AIDS Knowledge and Attitude Related Variables in the Questionnaires

Variables	Assignments and Meanings	Range
Residence Registration	Rural=1, Township=2	1,2
Age Group	Divided the students' reported age into three groups, Younger group (=1), Median group (=2) and Older group (=3).	1,2,3
Living with Parents	None=0, Single parent=1, Both parents=2	0,1,2
Father/Mother's Education Level	Illiterate/Primary school=1, Middle school=2, Senior High school or above=3	1,2,3
Parents' Education Level	Plus Father and Mother's education level	2,3,4,5,6
Using Internet	Never=0, Yes=1	0,1
Attending Curriculum	Never=0, Yes=1	0,1

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