

***Cognitive and Informative Level of Knowledge About Puberty Among Primary School Pupils in the Czech Republic and in China***

Miluše Rašková, Palacký University Olomouc, Czech Republic  
Dominika Provázková Stolinská, Palacký University Olomouc, Czech Republic

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**Abstract**

Knowledge is gained in the process of learning and represents the level of awareness. The cognitive and informative level of knowledge about puberty includes the amount and quality of relevant information. During puberty, reproduction abilities are achieved. Puberty represents an essential hormone process accompanied by physical changes and rapidly transforming psyche, during which individuals become aware of their own personalities. Puberty is a significant element of sex education in the European as well as global dimension. Children need to be prepared for puberty in time and in an appropriate manner; this should include all related associations and contexts. Timely readiness for puberty means that children have the required knowledge before its onset – during pre-puberty when they are in primary school. The objective of the present research study is to identify the level of knowledge about puberty among primary school pupils in the Czech Republic and in China. The research method to determine the knowledge about puberty among primary school pupils was the achievement test. The level of knowledge about puberty was tested by means of 9 items with open-ended answers. The content of the test items focused on the following: concept of puberty; definition of puberty; puberty age range; knowledge about physical changes in boys and girls; knowledge about other changes that puberty induces; significance of puberty in human life. The data were described by means of statistical procedures and descriptive statistics.

Keywords: Puberty, pupils, knowledge, testing, results

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## Introduction

We believe that the urgency and social significance of the present educational research study is high. Puberty (Vágnerová, 2000) is a significant element of sex education (Comprehensive sexuality education, IPPF; Standards for Sexuality Education in Europe, 2010), which represents an important aspect in comprehensive education of children. On a general level, sex education is frequently questioned by some parents and the general public as being useless and ineffective in school. Although comprehensive sex education including the issue of puberty should be centred around the family, there is no guarantee that children will receive (provided that sex education does not become taboo) subjectively and socially appropriate information, attitudes and behaviour in the broadest sense of sexual behaviour. Children encounter sexual issues also in other domains of life, for example through the media, especially television, radio, internet, advertisements, books and magazines. These sources of information provide children with a large amount of picture and text information, but also hero imitation motives. Obviously, parents and all persons involved in the process of education and upbringing play an important role.

Sex education has three levels (Rašková, 2008, etc.) The cognitive level represents gaining knowledge (i.e. cognitive line in the form of basic information, knowledge, skills and habits). The emotional and relationship level represents model imitation (i.e. social line in the form of relationships, experiences, models, social learning through imitation). The skills, behaviour and habits level represents relationships (i.e. emotional relationships in the form of high-quality emotional background and interpersonal relationships). These three tiers overlap, cannot exist in isolation and none of them can be omitted. Emotional relationships of a child serve as a basis for patterns of behaviour; these models then become a pillar for gaining sexual knowledge. The development of all of these tiers is affected by a number of aspects; the family, school, external environment – world around the child.

Sex education including the issue of puberty affects a large part of the human life and is intended for the present and future life. Children should be aware of the responsibility for their behaviour, should be able to recognize danger, and should be able to adopt ways of safe behaviour in various situations. In addition to the basic knowledge relating to puberty including for example information about various parts of the human body, reproductive organs, anatomical, physiological and psychosocial aspects of human sexuality, children must develop ethical attitudes to sexuality and be able to avoid risky sexual behaviour. Most information is of a general nature (e.g. puberty, physical appearance, human development, reproductive organs, assertive behaviour, etc.) and is an important part of the general knowledge. From an educational perspective, the knowledge in the area of sex education facilitates coherent personality development. Knowledge (Janík, 2005) is gained in the process of learning and represents the level of children's awareness. Children not only have the right to information about puberty, this information also becomes a source of prevention against various risks.

All children need to be prepared for puberty in time and in an appropriate manner; this should include all associations and contexts related to this stage. Children should learn the required knowledge about puberty before its onset – during pre-puberty when they are in primary school. The present study focuses on younger school-aged children, i.e. primary school pupils. This is the age group of children between 6 and 7 to 11 to 12 years of age.

The cognitive and informative level of learning about puberty represents the tier of gaining knowledge and includes the amount and quality of relevant information (i.e. knowledge) that a child should learn or has learned. The issue of the level of knowledge about puberty among primary school pupils is contextually related to the present educational research. The objective of the comprehensive research was to identify the cognitive and informative level of knowledge about puberty among primary school pupils, and information about mutual communication about puberty among primary school pupils, their teachers and families. The research study involved primary school pupils from the Czech Republic, China and Spain. At the moment, research cooperation is being established with Sweden.

The authors of the present study have previously published their results concerning communication about puberty among Czech and Chinese primary school pupils, their teachers and families (Rašková, Provázková Stolinská, 2015, 2017; Rašková, Provázková Stolinská, Vavrdová 2015). The results were based on a questionnaire survey and revealed the children’s perspective of communication about puberty with their peers, parents and teachers. In the area of verbal communication, friends and classmates together with the mother and teachers were more dominant sources of information about puberty than visual resources; if pupils communicated with each other about puberty, such communication took place sometimes or rarely; pupils considered puberty a normal and natural phenomenon; if pupils were able to assess their information about puberty, they considered it sufficient and were interested in learning more. The survey concerning communication about puberty was performed by means of a non-standardized questionnaire (Hendl, 2006; Chráška 2007). The questionnaire items were classified according to their content into questions about the source of information about puberty (i.e. from whom or from where pupils get information), and its frequency or method of communication (i.e. how often, what intensity, what obstacles, etc.) The questionnaire items included scaled, closed and semi-closed questions. The questionnaire items (numbered 10 – 21) followed the test items (numbered 1 – 9) which tested the level of knowledge about puberty.

This text informs about the results of an analysis of pupils’ knowledge about puberty in the Czech Republic and China. This text focuses purely on the selected topic, which is a part of a wider research context. The research was carried out as part of Student grant competition at Palacký University in Olomouc (IGA\_PdF\_2018\_011; Comparison of the cognitive and informative level of knowledge about puberty among primary school pupils in selected countries; principal investigator doc. PaedDr. Miluše Rašková, Ph.D.). The authors of the study tested the cognitive level, which is the pillar of general education of each person. The test involved 146 pupils in the Czech Republic; the sample was balanced in terms of gender. In China, the questionnaire survey included 135 students of the same age group and gender balance. The respondents represented the largest age group of 10 to 12 years.

#### Description of the research sample

Frequency table: COUNTRY (Research Czech x China)				
Category	Count	Cumulative Count	Percent	Cumulative Percent
Czech	146	146	51,95730	51,9573
China	135	281	48,04270	100,0000
Missing	0	281	0,00000	100,0000

Figure 1: Respondents

Category	Frequency table: SEX (Research Czech x China)			
	Count	Cumulative Count	Percent	Cumulative Percent
boy	140	140	49,82206	49,8221
girl	137	277	48,75445	98,5765
Missing	4	281	1,42349	100,0000

Figure 2: Respondents by gender

Summary Frequency Table (Research Czech x China)			
Marked cells have counts > 10			
(Marginal summaries are not marked)			
COUNTRY	SEX boy	SEX girl	Row Totals
Czech	71	71	142
China	69	66	135
All Grps	140	137	277

Figure 3: Respondents by gender and country

Category	Frequency table: AGE (Research Czech x China)			
	Count	Cumulative Count	Percent	Cumulative Percent
9	5	5	1,77936	1,7794
10	72	77	25,62278	27,4021
11	126	203	44,83986	72,2420
12	64	267	22,77580	95,0178
13	8	275	2,84698	97,8648
14	2	277	0,71174	98,5765
Missing	4	281	1,42349	100,0000

Figure 4: Respondents' age

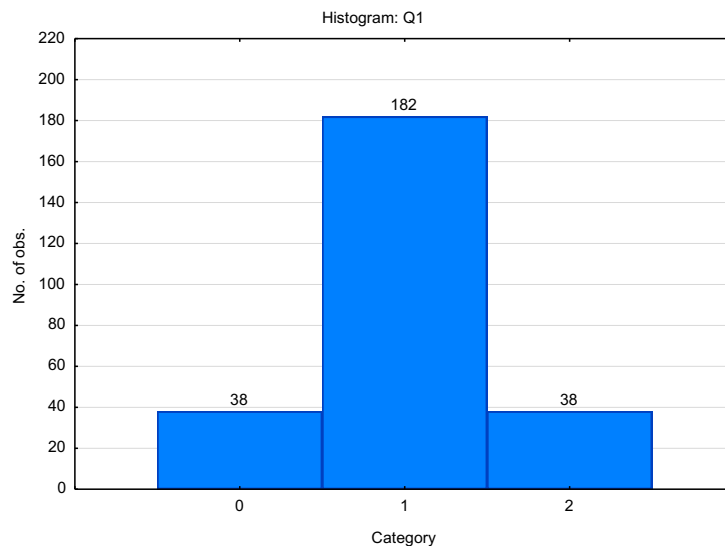
The research method to determine the knowledge about puberty among primary school pupils was an achievement knowledge test (Hendl, 2006; Chráska 2007). The level of knowledge about puberty was tested by means of 9 items with open-ended answers. The content of the test items focused on the definition of puberty (Test item 1); puberty age range in both genders (Test items 2 to 5); knowledge about physical changes in boys and girls (Test items 6 and 7); knowledge about other changes that puberty induces in both genders (Test item 8); significance of puberty in human life (Test item 9). The research sample was described by means of descriptive statistics; statistically significant differences in pupils' responses by countries were identified by means of the non-parametric U test (Mann-Whitney U Test).

## Conclusions

The responses of all participants indicated the level of knowledge about puberty. The following tables and graphs show the results and indicate the level of pupils' knowledge about puberty (i.e. knowledge required to identify puberty; age range in both genders; physical and other changes in both genders; its significance in life). The responses were coded by means of numbers as follows: 2 = correct answer, 1 = partially correct answer, 0 = incorrect answer. Test items with a missing answer were coded with the number 5.

Frequency table: Q1 (Research Czech x China)				
Category	Count	Cumulative Count	Percent	Cumulative Percent
0	38	38	13,52313	13,5231
1	182	220	64,76868	78,2918
2	38	258	13,52313	91,8149
Missing	23	281	8,18505	100,0000

Figure 5: Test item 1 (What is puberty)

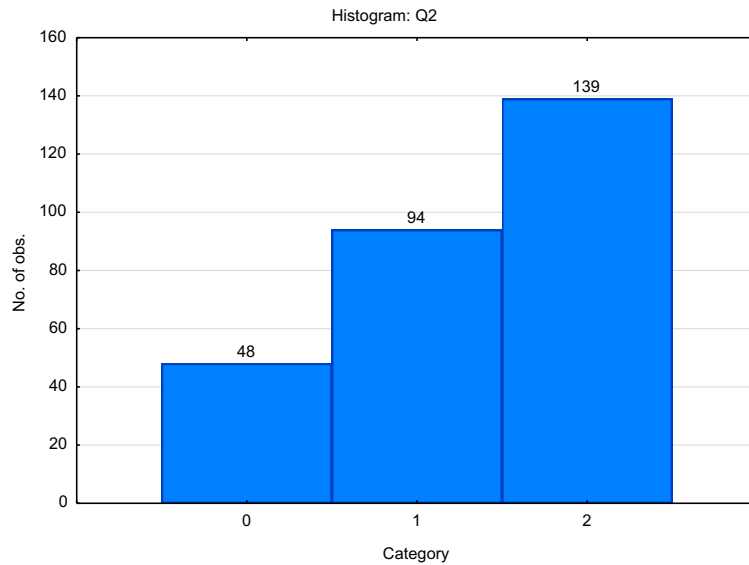


Graph 1: Responses to Test item 1 (What is puberty)

Puberty is a stage that follows pre-puberty, in which the reproductive capacity culminates. According to Czech professionals, the period of puberty is marked by the age of 13 to 15 years. Reproduction abilities are achieved later; in girls after the onset of regular ovulation cycle and regular menstruation, in boys after the development of secondary sex characteristics is completed. Puberty can thus be identified as a principal hormonal process of physical changes. A child changes to an adult person who is from a biological perspective ready for reproduction. This process can be identified as maturing. However, the process of maturing should not be assessed only from a biological perspective but also from the perspective of psychological changes that take place along biological changes. Biological and psychological changes are also accompanied by social changes, i.e. gaining a new social status. All changes that take place in the period of maturing are referred to as pubescent changes. Most of the responses were in the category of partially correct answer. This shows that the respondents do not understand puberty in a comprehensive way. They do not associate the achievement of reproduction ability, full sexual maturity and completion of physical growth with psychological and social changes.

Frequency table: Q2 (Research Czech x China)				
Category	Count	Cumulative Count	Percent	Cumulative Percent
0	48	48	17,08185	17,0819
1	94	142	33,45196	50,5338
2	139	281	49,46619	100,0000
Missing	0	281	0,00000	100,0000

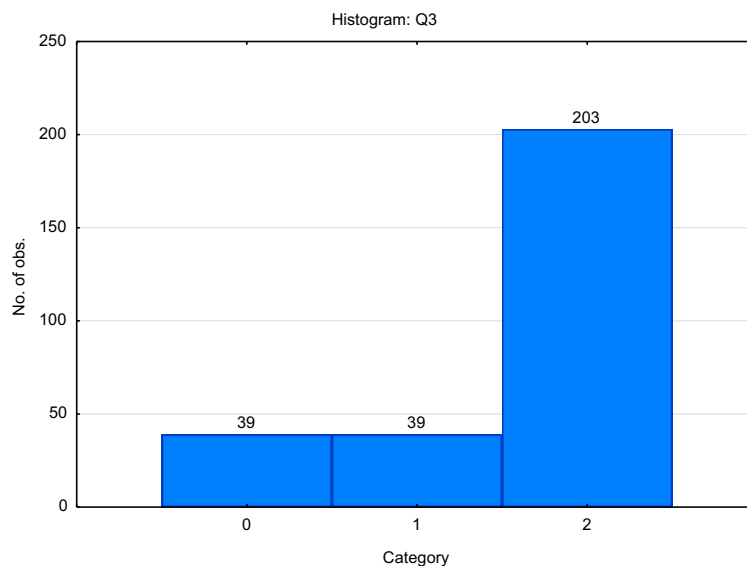
Figure 6A: Test item 2 (Onset of puberty among boys – age)



Graph 2A: Responses to Test item 2 (Onset of puberty among boys – age)

Category	Frequency table: Q3 (Research Czech x China)			
	Count	Cumulative Count	Percent	Cumulative Percent
0	39	39	13,87900	13,8790
1	39	78	13,87900	27,7580
2	203	281	72,24199	100,0000
Missing	0	281	0,00000	100,0000

Figure 6B: Test item 3 (Onset of puberty among girls – age)



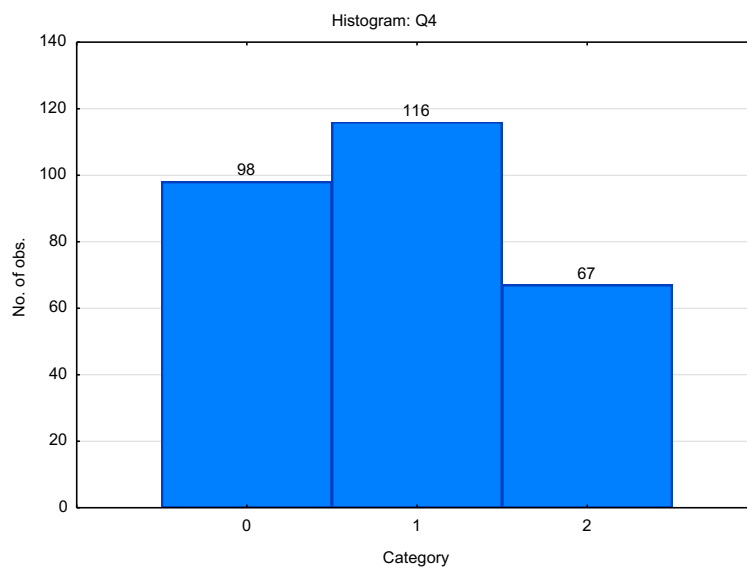
Graph 2B: Responses to Test item 3 (Onset of puberty among girls – age)

The issue of puberty is associated with a period referred to as pubescence and maturing in a broader sense. As mentioned above, according to Czech professionals, the period of puberty is marked by the age of 13 to 15 years. This period comes after pre-puberty, which is defined as a transition from childhood to adulthood and precedes puberty. Although a number of professionals have different opinions about the period of pre-puberty and puberty, the age range of pre-puberty is usually eight to eleven years of age, while the age range of puberty is

eleven to fifteen years of age. According to professionals, the main features of pre-puberty (also referred to as pre-pubescence) include the first signs of sexual maturing, occurrence of secondary sex characteristics, and a considerable increase in height. The period of pre-puberty, which is a period of preparation for puberty, is marked by vast differences between children in terms of physical and mental development. In terms of gender differences, pre-puberty in girls takes place between 11 and 13 years of age, while in boys, physical development is delayed by 1 or 2 years. Most of the responses were in the category of correct answer, which suggests that the respondents are knowledgeable about the onset of puberty in boys and girls.

Category	Frequency table: Q4 (Research Czech x China)			
	Count	Cumulative Count	Percent	Cumulative Percent
0	98	98	34,87544	34,8754
1	116	214	41,28114	76,1566
2	67	281	23,84342	100,0000
Missing	0	281	0,00000	100,0000

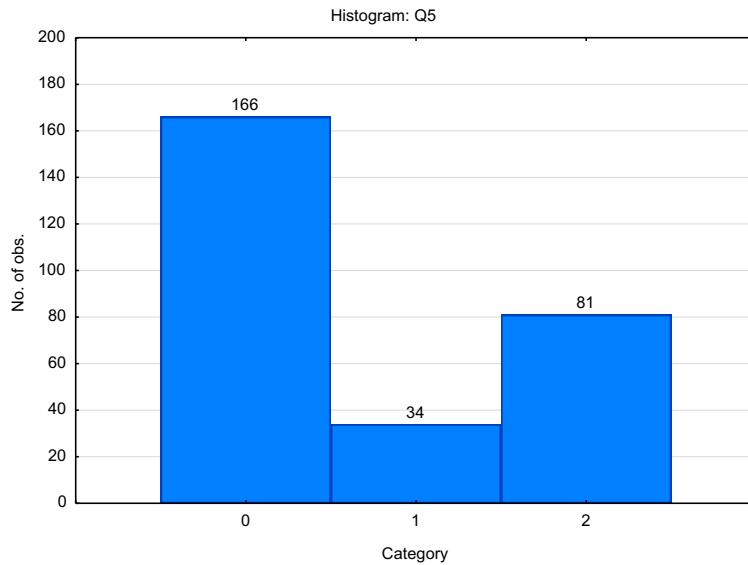
Figure 7A: Test item 4 (End of puberty among boys – age)



Graph 3A: Responses to Test item 4 (End of puberty among boys – age)

Category	Frequency table: Q5 (Research Czech x China)			
	Count	Cumulative Count	Percent	Cumulative Percent
0	166	166	59,07473	59,0747
1	34	200	12,09964	71,1744
2	81	281	28,82562	100,0000
Missing	0	281	0,00000	100,0000

Figure 7B: Test item 5 (End of puberty among girls – age)

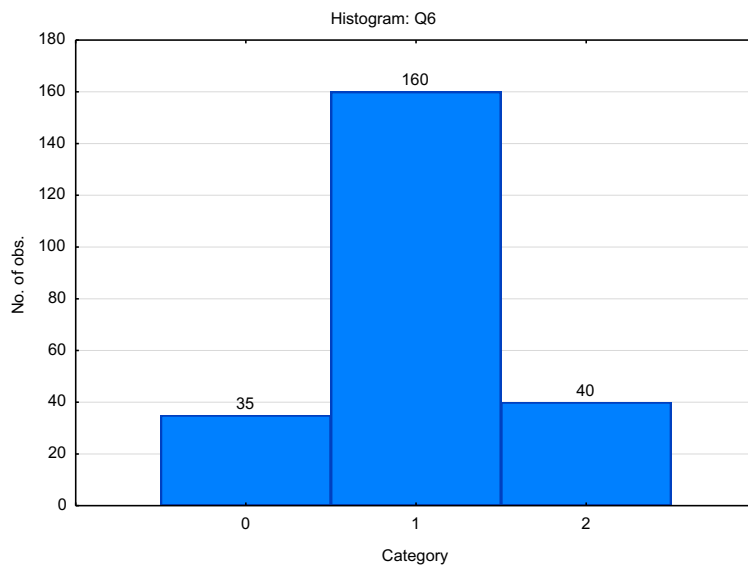


Graph 3B: Responses to Test item 5 (End of puberty among girls – age)

Unlike the area concerning the onset of puberty in both genders, where the responses confirmed pupils' knowledge in this area (see text above), their awareness about the end of puberty in both genders is worse. This area was dominated by partially correct answers and incorrect answers.

Frequency table: Q6 (Research Czech x China)				
Category	Count	Cumulative Count	Percent	Cumulative Percent
0	35	35	12,4552	12,4555
1	160	195	56,93950	69,3950
2	40	235	14,23488	83,6299
Missing	46	281	16,37011	100,0000

Figure 8A: Test item 6 (Physical changes in puberty in boys)

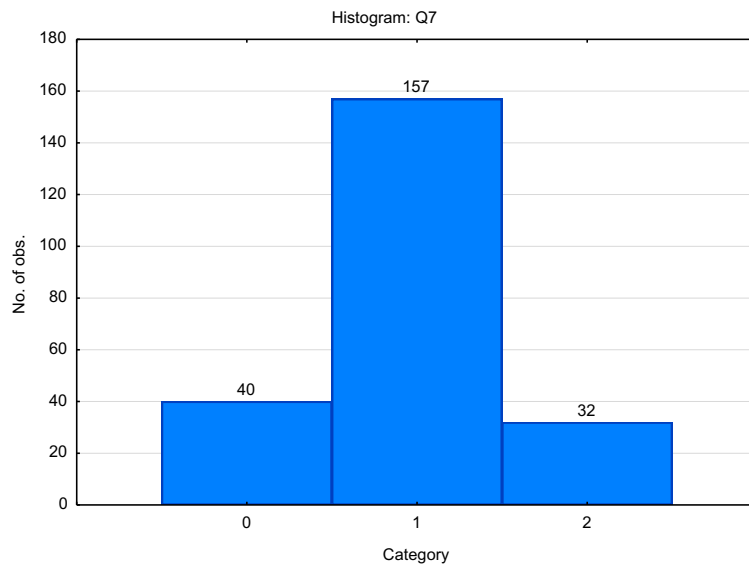


Graph 4A: Responses to Test item 6 (Physical changes in puberty in boys)



Category	Frequency table: Q7 (Research Czech x China)			
	Count	Cumulative Count	Percent	Cumulative Percent
0	40	40	14,23488	14,2349
1	157	197	55,87189	70,1068
2	32	229	11,38790	81,4947
Missing	52	281	18,50534	100,0000

Figure 8B: Test item 7 (Physical changes in puberty in girls)

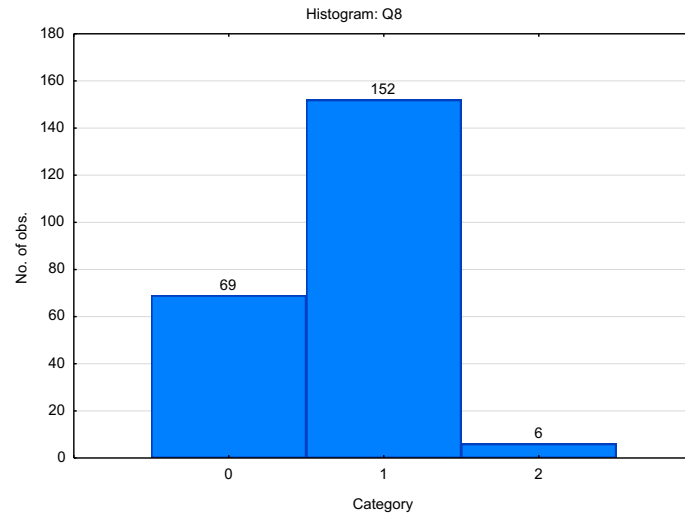


Graph 4B: Responses to Test item 7 (Physical changes in puberty in girls)

During puberty, the signals concerning the required hormonal changes are sent from the brain to the reproductive organs, which stimulate the growth, development of functions and other changes in the brain and other organs. In line with the hormonal process of physical changes in both genders, during which the reproductive organs mature and start to produce sex hormones (sperms or ova), changes in the physical structure take place. During the period of puberty, growth is decelerated or even stopped in both genders, changes in the physical structure take place, secondary sex characteristics appear including pubic hair in the armpit, skin changes and the development of acne. Changes in boys further include thickening of the body and muscle growth, pubic hair on the scrotum, hair on the face and voice change. Changes in girls include hair in the pubic area, gaining female shape of the body and growth of breasts. Most of the responses were in the category of partially correct answer, which suggests basic awareness in the area of physical changes during the period of puberty in both genders. The responses included only various incomplete combinations of changes.

Category	Frequency table: Q8 (Research Czech x China)			
	Count	Cumulative Count	Percent	Cumulative Percent
0	69	69	24,55516	24,5552
1	152	221	54,09253	78,6477
2	6	227	2,13523	80,7829
Missing	54	281	19,21708	100,0000

Figure 9: Test item 8 (Other changes in puberty in boys and girls)

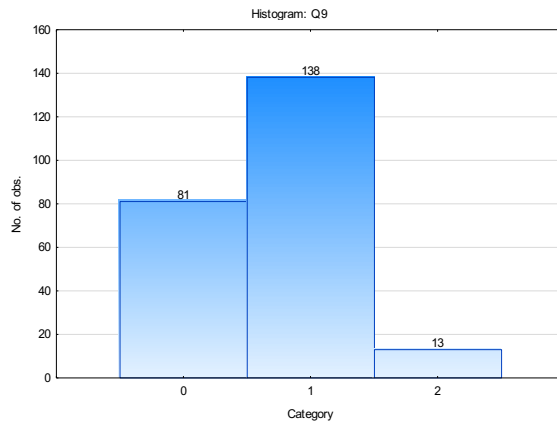


Graph 5: Responses to Test item 8 (Other changes in puberty in boys and girls)

The period of puberty is marked not only by physical changes but also significant psychological changes including becoming aware of one's personality. Puberty is a period of searching for and building one's identity. The manifestations of psychological changes in puberty include refusal of a subordinate role, which changes the social role of an individual and causes attacks against authorities including parents and teachers. The attitude to the school and the teacher changes as well, the teacher is no longer considered a formal authority, only when there is something to be impressed by. Generally, adolescent children want to participate in decision making about matters that relate to them, they start to assess their parents and other adults in a critical way. A significant aspect in the life of an adolescent is spending leisure time. They want to spend time with their peers. Their emotional relationships start to evolve including love and affection. For some individuals puberty may become an impulse for artistic expression, reading complex literary works, doing attractive sports, interest in mysteriousness, romance, nature, and other activities. Pubescents tend to show greater emotional instability. Their self-evaluation changes, they tend to be touchy and vulnerable. According to psychologists, emotional instability is primarily a consequence of hormonal changes. Secondly, instability may be supported by psychological changes and changes in interpersonal relationships. In puberty, the way of thinking changes. In puberty, individuals start to think hypothetically (at the level of formal logical operations). This change affects their overall attitude to the world but also to themselves. The answers also suggest the respondents' awareness of other changes in puberty apart from biological changes. Most of the responses were in the category of partially correct answer. The respondents indicated only various incomplete combinations of other changes. The most frequent responses included the need to spend leisure time with peers, aspects associated with emotional instability, love and affection, and the need to participate in decision making on matters that relate to them.

Category	Frequency table: Q9 (Research Czech x China)			
	Count	Cumulative Count	Percent	Cumulative Percent
0	81	81	28,82562	28,8256
1	138	219	49,11032	77,9359
2	13	232	4,62633	82,5623
Missing	49	281	17,43772	100,0000

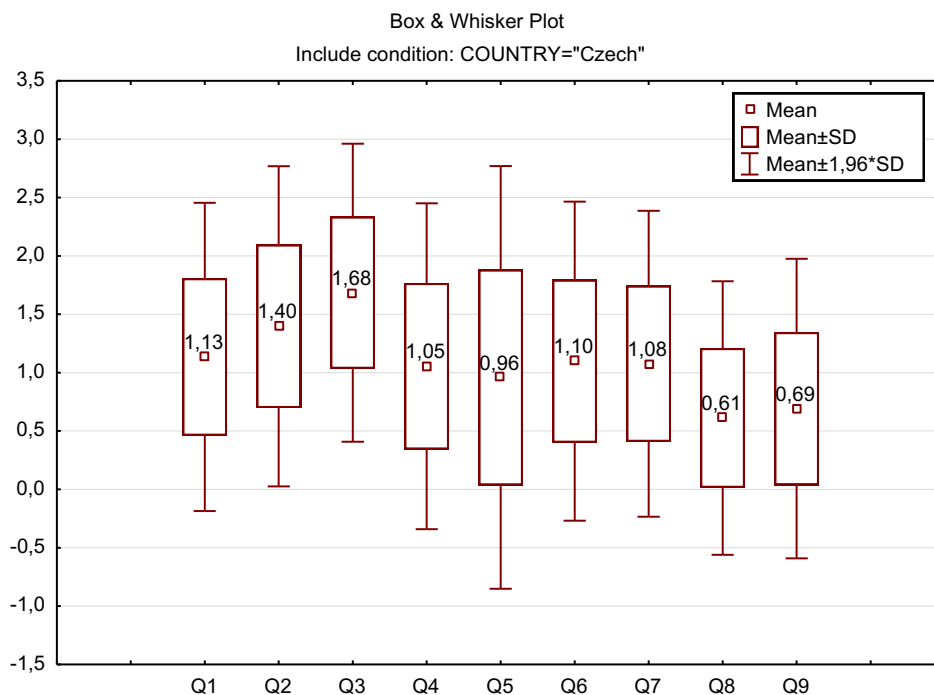
Figure 10: Test item 9 (Significance of puberty in life)



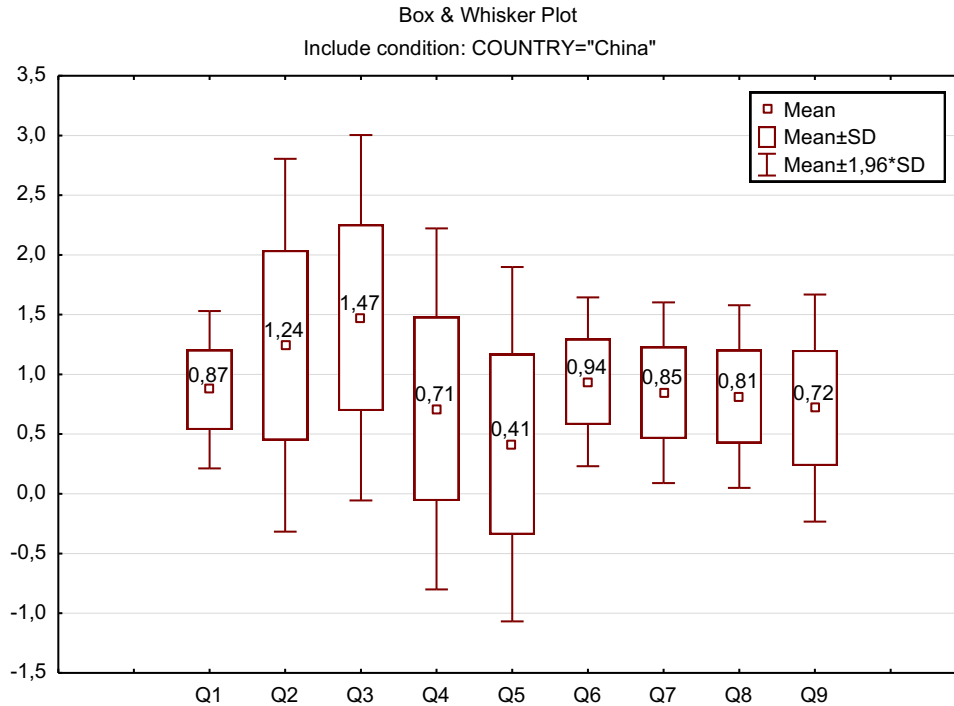
Graph 6: Responses to Test item 9 (Significance of puberty in life)

As was mentioned in connection with the results concerning the definition of puberty by our respondents (see above), the period of adolescence is a broadly defined stage of life. On the one hand, this stage of life is marked by the so-called first signs of sexual maturing including physical growth, on the other hand by achieving the reproduction ability, full sexual maturity and completion of physical growth. However, the process of maturing must not be assessed only from the biological perspective but also from the perspective of psychological changes that take place along biological changes. Biological and psychological changes are also accompanied by social changes, i.e. gaining a new social status. The respondents understand the significance of puberty, which is confirmed by most of the responses in the category of partially correct answer. However, the respondents do not think about the significance of puberty in a comprehensive perspective but rather in various combinations of the biological, psychological and social areas.

For clarity purposes, the following graphs show pupils' aggregate responses to the test items by countries.



Graph 7: Aggregate pupils' responses to test questions – Czech Republic



Graph 8: Aggregate pupils' responses to test questions – China

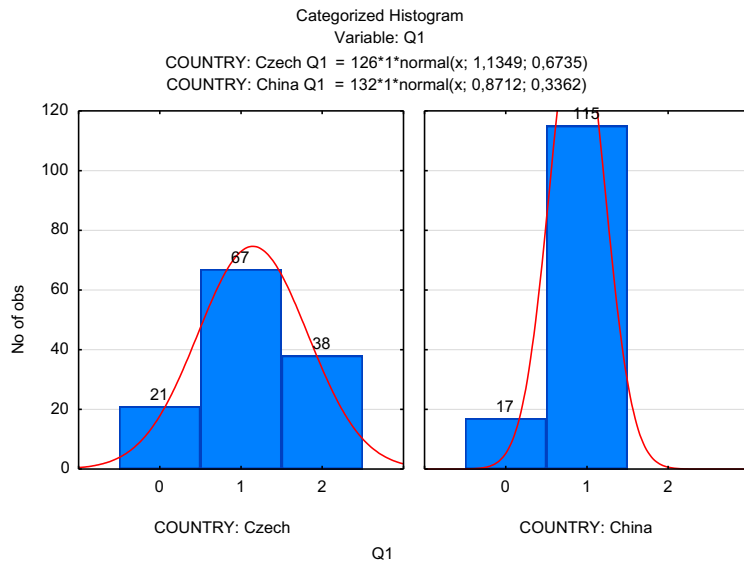
The test of differences in the pupils' responses (Mann-Whitney U Test) between individual countries revealed statistically significant differences.

Mann-Whitney U Test (w/ continuity correction) (Research Czech x China) By variable COUNTRY Marked tests are significant at $p < ,05000$									
variable	Rank Sum Czech	Rank Sum China	U	Z	p-value	Z adjusted	p-value	Valid N Czech	Valid N China
Q1	18187,00	15224,00	6446,000	<b>3,120</b>	<b>0,002</b>	<b>3,893</b>	<b>0,000</b>	126	132
Q2	21519,00	18102,00	8922,000	1,370	0,171	1,498	0,134	146	135
Q3	21944,00	17677,00	8497,000	<b>1,995</b>	<b>0,046</b>	<b>2,538</b>	<b>0,011</b>	146	135
Q4	23069,50	16551,50	7371,500	<b>3,648</b>	<b>0,000</b>	<b>3,903</b>	<b>0,000</b>	146	135
Q5	23683,50	15937,50	6757,500	<b>4,551</b>	<b>0,000</b>	<b>5,192</b>	<b>0,000</b>	146	135
Q6	15351,00	12379,00	5938,000	1,833	0,067	<b>2,229</b>	<b>0,026</b>	122	113
Q7	14804,50	11530,50	5314,500	<b>2,463</b>	<b>0,014</b>	<b>3,010</b>	<b>0,003</b>	118	111
Q8	10377,50	15500,50	5021,500	<b>-2,769</b>	<b>0,006</b>	<b>-3,379</b>	<b>0,001</b>	103	124
Q9	11774,00	15254,00	6314,000	-0,672	0,502	-0,777	0,437	104	128

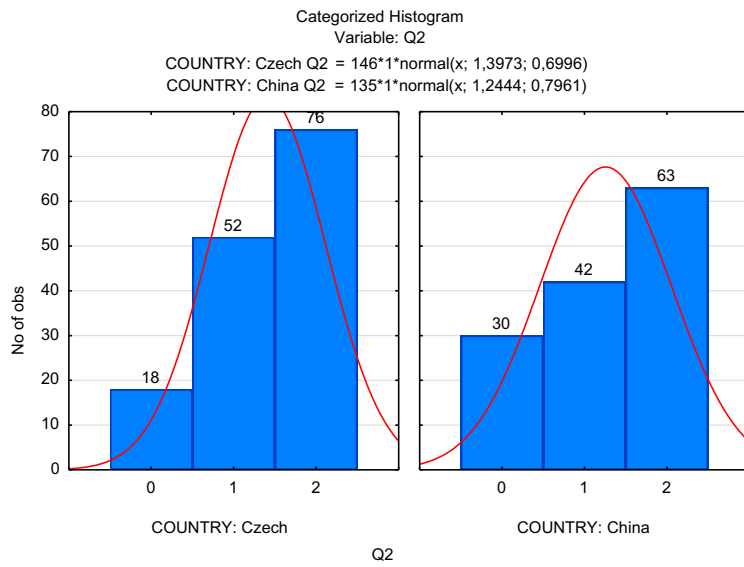
Figure 11: Testing of the differences in pupils' responses by countries

As shown in the table above, statistically significant differences in the score of the responses between pupils from China and the Czech Republic were observed in Test items 1, 3, 4, 5, 6, 7 and 8. In all of these items (except Q8) Czech pupils achieved a statistically significantly higher score than pupils from China.

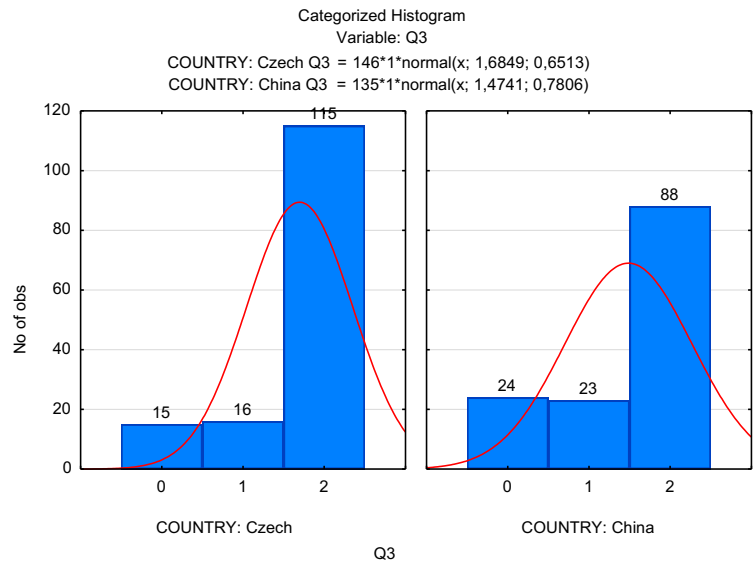
To provide a comprehensive view of the proportion of numbered responses among Czech and Chinese pupils, the graphs below show a comparison of all test items.



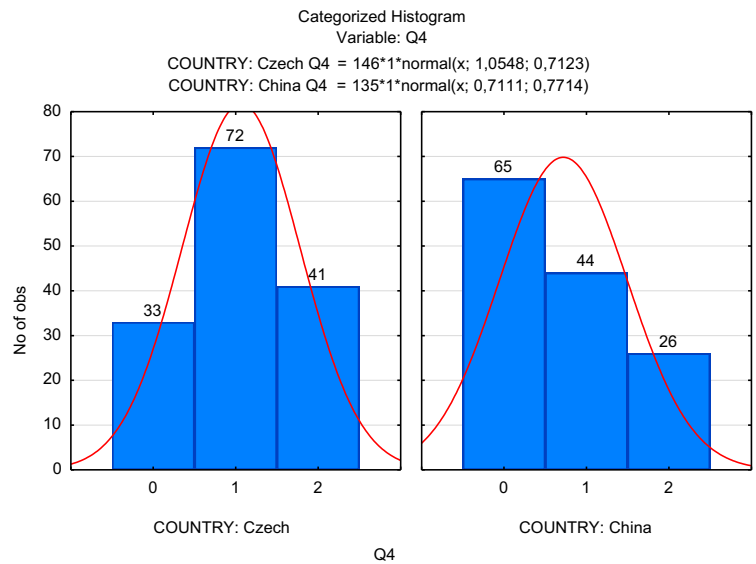
Graph 9: Proportion of numbered responses (Test item 1)



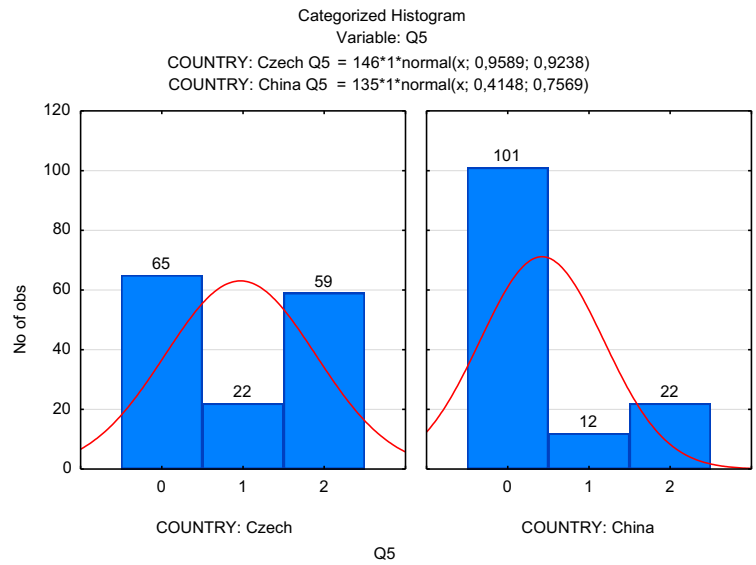
Graph 10: Proportion of numbered responses (Test item 2)



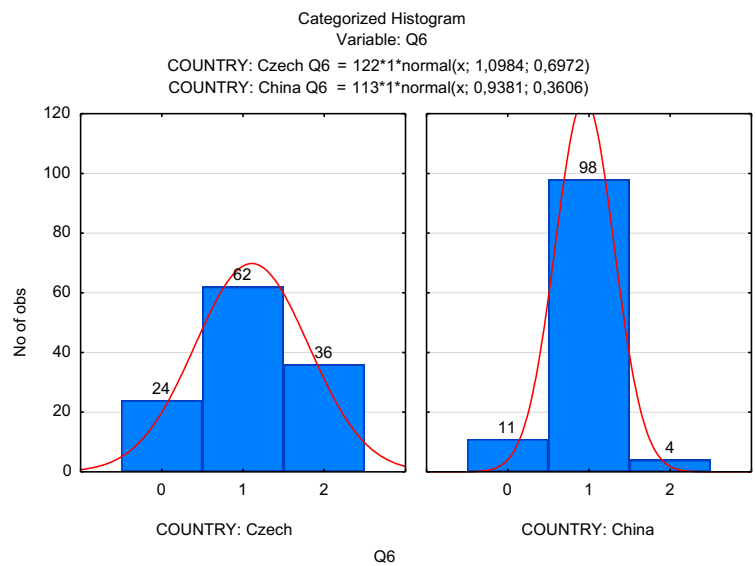
Graph 11: Proportion of numbered responses (Test item 3)



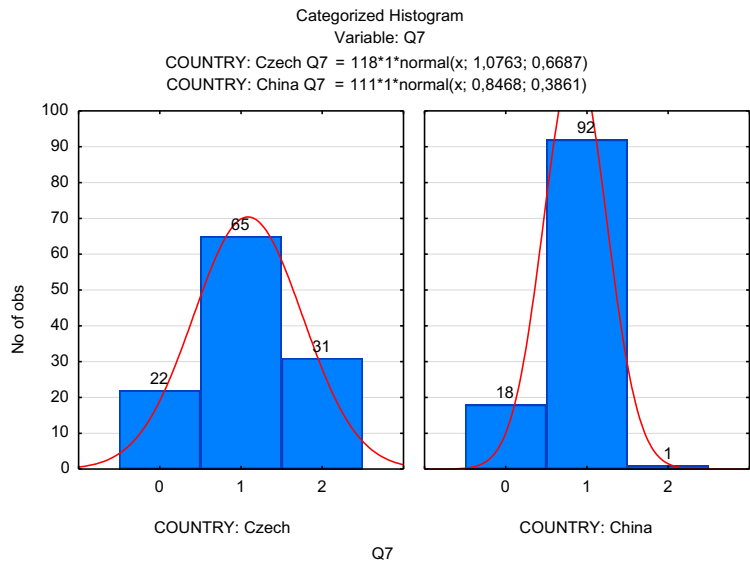
Graph 12: Proportion of numbered responses (Test item 4)



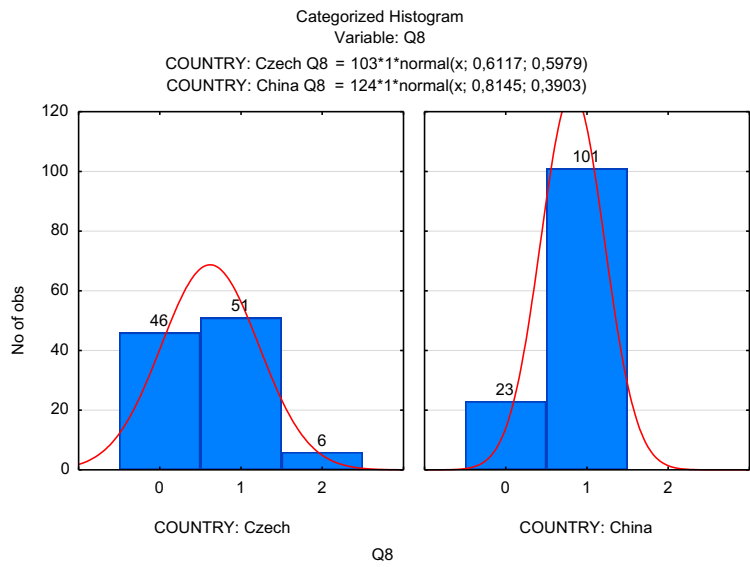
Graph 13: Proportion of numbered responses (Test item 5)



Graph 14: Proportion of numbered responses (Test item 6)

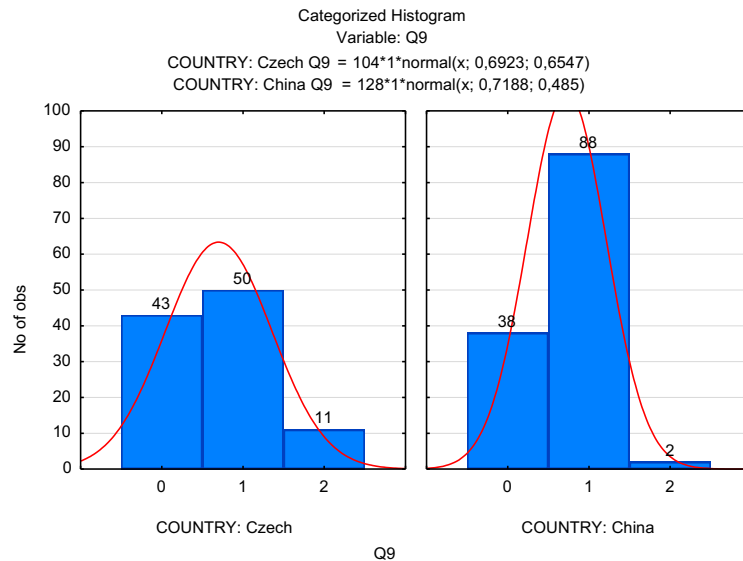


Graph 15: Proportion of numbered responses (Test item 7)



Graph 16: Proportion of numbered responses (Test item 8)





Graph 17: Proportion of numbered responses (Test item 9)

Based on the data obtained from the respondents, it can be concluded that pupils are informed about puberty before its onset. Their knowledge of puberty suggests only partial awareness, which is manifested as incomplete understanding of relevant associations and contexts. From the perspective of pupils, the biological aspect and its importance for future reproductive life of each person is not placed in context with other changes. Most frequently, pupils associate puberty with psychosocial changes. It is desirable to strengthen pupils' knowledge in terms of a comprehensive approach to all changes in the biological, psychological and social areas, taking into account the specificity of both genders.

Parents, friends or classmates cannot play the primary role in the formation of knowledge, attitudes and behaviour, because they do not guarantee the relevance of information that they provide. The generation of contemporary Czech and Chinese parents has not undergone any conceptual and systemic sex education in their families or in school, which would lay down the basis of the issue of puberty and communication about puberty. For this reason, the current generation of adults lacks adequate life experience and often lacks the necessary knowledge. We have mentioned that the issue of puberty and communication about puberty should be centred around the family, but it is impossible to guarantee that in the family the child will be exposed to subjectively and socially appropriate information, attitudes and behaviour in a sufficiently wide context.

Teachers in schools can significantly contribute to the acquisition of knowledge about puberty. Both Czech and Chinese educational systems have the issue of puberty embedded in their curricula. In the Czech system of education, puberty is defined in the general curricular document in terms of concept and content. Teachers should be professionally and didactically prepared for education about puberty. Recently, Chinese education has been subject to a considerable change as a result of the introduction of a new subject – sex education. Sex education, including the issue of puberty, has become a compulsory subject in some Chinese schools, primarily in Beijing and Shanghai; compulsory courses on this topic have even been introduced in some Chinese universities. Sex education including the issue of puberty must be delivered in schools in a qualified way, taking into account various educational and psychological particularities of pupils and respecting humane approaches and ethical principles. Communication about puberty in a school environment is a professional

responsibility of the teacher (Štěřbová, Rašková, 2014). The role of the school is, through the teacher, to provide the knowledge about puberty, but also to lay the foundations of attitudes and guidelines for decision making.

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**Contact email:** miluse.raskova@upol.cz; dominika.stolinska@gmail.com