

## **Multi-level analysis of factors explaining differences in civic knowledge**

Wolfram Schulz  
Australian Council for Educational Research  
Melbourne/Australia  
[schulz@acer.edu.au](mailto:schulz@acer.edu.au)

Julian Fraillon  
Australian Council for Educational Research  
Melbourne/Australia  
[fraillon@acer.edu.au](mailto:fraillon@acer.edu.au)

John Ainley  
Australian Council for Educational Research  
Melbourne/Australia  
[ainley@acer.edu.au](mailto:ainley@acer.edu.au)

Eva van de gaer  
Catholic University Leuven  
Leuven/Belgium  
[Eva.Vandegaer@ped.kuleuven.be](mailto:Eva.Vandegaer@ped.kuleuven.be)

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## Introduction

The IEA International Civic and Citizenship Education Study studied the ways in which young people in lower secondary schools are prepared to undertake their roles as citizens in a wide range of countries including Europe, Latin America, and the Asian-Pacific region. ICCS was the third IEA study designed to measure contexts and outcomes of civic and citizenship education and was linked to the 1999 IEA Civic Education Study (CIVED) (Amadeo, Torney-Purta, Lehmann, Husfeldt & Nikolova, 2002; Schulz & Sibberns, 2004; Torney-Purta, Lehmann, Oswald & Schulz, 2001). A central aspect of the study was the assessment of student knowledge about a wide range of civic-related issues (Schulz, Ainley, Fraillon, Kerr & Losito, 2010).

This paper makes use of the data of the IEA Civic and Citizenship Education Study (ICCS) to analyse which factors explain variation in student knowledge about civic and citizenship-related issues in 38 countries at the lower secondary level. The analyses are based on multi-level analyses of sample survey data and make use of contextual data from students, schools and systems.

## Theoretical Framework

Civic knowledge refers to the application of the civic and citizenship cognitive processes to the civic and citizenship content described in the ICCS Assessment Framework (Schulz, Fraillon, Ainley, Losito & Kerr, 2008). It is a key outcome of civic and citizenship education programs and is fundamental to effective civic participation. Civic knowledge as described in this paper is therefore taken to be a broad term that is inclusive of knowing, understanding and reasoning.

ICCS is the third IEA international study that includes the measurement of Civic Knowledge. In 1971 the IEA Civic Education Study included a 47 item test for 14 year olds in nine countries (Torney, Oppenheim & Farnen, 1975). In 1999 the IEA CIVED study included a 38 item test for 14 year old students in 28 countries (Torney-Purta et. al., 2001) and a 42 item test for 17-18 year olds in 16 countries (Amadeo et. al., 2002).

Numerous national and international studies have analysed the factors that influence students' civic knowledge. The first IEA Civic Education Study in 1971 found (male) gender, socio-economic background and encouragement of independent expression of opinion to be positive predictors of civic knowledge (Torney, Oppenheim & Farnen, 1975).

General literacy plays a crucial role in acquiring knowledge related to civic and citizenship. Chall and Henry (1991) note that considerably more than a minimum level of literacy is required for understanding documents such as constitutions or for locating information in sources such as newspapers. Their claim receives support from the findings of the National Assessment of Educational Progress (NAEP) in the United States, a program that regularly tests samples of students at Grades 4, 8, and 12 (ages approximately 9, 13, and 17 years) in various subject areas and topics, including civics and citizenship. Use of English at home also has a significant influence on test performance (Niemi & Junn, 1998), a finding that is consistent with the proposition that proficiency in reading is important for understanding political communication.

Lutkus and Weiss (2007) showed, for the United States, positive associations between civic knowledge and higher parental education and family income. Their work confirmed earlier findings by Niemi and Junn (1998) of differences in civic knowledge between students from high-socioeconomic backgrounds and students from low-socioeconomic backgrounds. Hart, Atkins, Marken, and Youniss (2004) found that neighbourhoods with high percentages of adolescents recorded low levels of civic knowledge but high participation in volunteer activities (see also Torney-Purta, Wilkenfeld & Barber, 2008). Analyses of CIVED data showed effects of school context on civic knowledge, such as average school home literacy or average perceptions of open classroom climate (Schulz, 2002). These analyses also showed interaction effects between neighbourhood contexts and school environment on levels of civic knowledge, where school aggregate levels of confidence in student participation had significant effects on civic knowledge only in poor neighbourhoods (Wilkenfeld, 2009).

In their analysis of 1988 NAEP data, Niemi and Junn (1998) introduced an “exposure-selection model.” They postulated that, in order to acquire civic knowledge, students need to be exposed to relevant information in this field *and* must be motivated to learn this information. The indicators of exposure that Niemi and Junn identified consisted mainly of home-environment and school-related factors, such as curriculum, course work, and recency of study. The two authors saw individual factors—among them planning for college, participation in mock-elections, and liking studying government-related matters—as indicators of selection of information. The two researchers also found, after controlling for other variables in a multiple regression model, that taking classes in which civic topics were studied and participating in role-playing elections or mock trials had positive effects on students’ civic knowledge.

Using data from the IEA Civic Education Study in 1999 (CIVED), and with the aim of predicting determinants of civic knowledge, Torney-Purta, Lehmann, Oswald, and Schulz (2001) estimated multivariate models for each participating country by regressing scores on several indicators of home background, school, and individual (student) characteristics. Gender (female) had a moderate negative effect in 11 countries, and frequency of watching news on television had a significant positive effect in about half of the countries. Spending evenings outside the home was negatively associated with civic knowledge in all but four countries. Levels of expected further education and home literacy, perceptions of openness in classroom discussions, and student interest in public affairs programs on television also emerged as predictors of civic knowledge scores. Amadeo, Torney-Purta, Lehmann, Husfeldt, and Nikolova’s (2002) regression analysis of civic knowledge with data from the CIVED survey of upper secondary students largely confirmed these results. Their analysis also showed that interest in politics served as a positive predictor in a number of countries.

Further secondary analyses of CIVED data revealed different patterns of effects depending on the characteristics of each national context. Schulz (2002) used multilevel analyses to predict civic knowledge and to identify regional patterns of associations. These analyses largely confirmed findings from earlier studies but also revealed variations in school-level and student-level effects among countries. When Torney-Purta, Richardson, and Barber (2005) reviewed the link between teacher factors and civic knowledge, they found evidence that teachers’ experience and confidence had an influence, but only in some of the countries included in the

analysis. The study by Torney-Purta and colleagues also highlighted differences between countries with respect to teacher preparation and civic education.

An underlying assumption of the analysis model for civic knowledge that we present in this paper is that acquisition of civic knowledge is influenced by contextual factors relating to different levels (for example, community, school/classroom, home environment) and operating as either antecedents or processes (Schulz, Fraillon, Ainley, Losito, & Kerr, 2008). Whereas antecedents (factors such as gender, socioeconomic background, and school resources) set the constraints for student learning about civic-related issues and how it takes place, factors directly related to the learning process (classroom instruction, student activities) are also important elements of context potentially influencing the development of civic-related knowledge and understanding.

The model that we developed for explaining variation in civic knowledge is underpinned by several key theories and perspectives. One is the ecological systems theory (Bronfenbrenner, 1979), which proposes that multiple systems interacting with one another influence young people's cognitive development. Contacts with family, school, peer group, and neighbourhood all contribute to the development of adolescents' knowledge and understanding and act as agents of socialization. Another assumption within this theory is that adolescents play an important role in shaping the ways in which these environments affect their development.

Another perspective on the influence that multiple interacting factors have on the development of knowledge and understanding comes from theories of economic, cultural and social capital (Bourdieu, 1986). Economic capital, as a resource for human capital (skills, knowledge, and qualifications), along with cultural capital (habits and dispositions) and social capital (societal links to other people) provide important elements shaping the development of adolescents. Even though this perspective emphasises the importance of socioeconomic background, it also recognises the relevance of other forms of resources, including those arising out of interactions with other people. Social capital (Coleman, 1988) is of particular relevance in the context of civic-related learning. Generated by the relational structure of interactions inside and outside the family, it facilitates the success of an individual's actions as well as his or her learning outcomes.

During our efforts to explain the variation in the ICCS students' civic knowledge scores, we drew on the above perspectives as well as findings of prior research and the ICCS survey to determine which predictors of variation to use in the multivariate analyses conducted in order to establish an explanatory model.

## **Data and methods**

The paper includes results from analyses of data from the main survey of ICCS which were carried out in 38 participating countries between October 2008 and May 2009. In each country, the sample consisted of over 3000 students from intact classes in the target grades that were selected at random in approximately 150 schools (that were selected on the basis of a probability proportional to size). The target grade was the eighth year of schooling provided that the minimum age of students was 13.5 years. In 36 countries students in grade 8 and in two countries (England and Malta) students in grade 9 were surveyed.

The following international instruments were used in the ICCS data collection:

- The international student test with 80 items in seven different clusters administered in complete rotated design with seven randomly allocated booklets, each consisting of three 15-minute clusters.
- The international student questionnaire (40 minutes length) was administered after the international test booklets.
- The international teacher questionnaire contained questions regarding school context, teaching and learning and took about 30 minutes to answer.
- The international school questionnaire contained questions about school characteristics, school and community context and took 20-30 minutes to be answered.
- The national contexts survey was administered online and collected information from national contexts for civic and citizenship education from national centres including the implementation of this subject area, related policies and practices.

National centres provided information on the national contexts for civic and citizenship education in an on-line survey conducted in two phases in 2007 and 2009. The analysis in this paper will be primarily based on data from the student and school survey instrument with civic knowledge derived from the student test and explanatory variables derived from the student and school questionnaires.

The civic and citizenship knowledge cognitive assessment comprised 80 items. Seventy-four items were multiple-choice questions and six items were constructed response items in which students were required to write responses of between one and four sentences. Student responses to the constructed response items were scored by trained scorers in each country. The ICCS test of Civic Knowledge included a link to the CIVED survey in 1999 through the use of a set of common items within the larger ICCS item pool.

Using the Rasch model (Rasch, 1960) a cognitive scale of ICCS civic knowledge was derived from those 79 ICCS test items that had satisfactory scaling properties. The resulting scale had a highly satisfactory reliability ( $\alpha = 0.84$ ). To obtain accurate summary statistics a plausible values methodology with full conditioning was used for scaling through which five separate estimates are generated for each student. By using these five “plausible values” it is possible to estimate the uncertainty inherent in the measurement process (see von Davier, Gonzalez & Mislevy, 2009). The final reporting scale was set to having a metric with a mean of 500 (the ICCS average score) and a standard deviation of 100 for equally weighted national samples that satisfied guidelines for sample participation. Details on scaling procedures for test items will be provided in the ICCS Technical Report (Schulz, Ainley & Fraillon, forthcoming).

The first part of the analyses included a description of the variation in ICCS civic knowledge across participating countries. The second part consisted of multi-level analyses (Raudenbush & Bryk, 2002; Snijders & Bosker, 1999) where separate two-level models (students nested within schools) were estimated for each participating country to explain variation in civic knowledge. Missing values were substituted with means for continuous and modes for categorical variables and missing indicators for each independent variable (1 = missing, 0 = not missing) were added as additional

predictors to the model. The coefficients for missing indicators were not included in the tables.

## **Explaining variation in civic knowledge**

### ***Predictors of variation in civic knowledge***

Based on the theoretical considerations discussed earlier we used predictor variables that relate to the following broad categories.

- *Student background:* Previous research and the results of this study (see Chapters 3 and 7) identify several student characteristics, including gender and language use, as factors associated with how much students know about civic-related issues.
- *Home background:* ICCS analyses have shown that parental socioeconomic status and home orientation (parental interest and parent–child communication) are factors associated with students’ civic-related learning outcomes (Schulz et. al, 2010). These factors appear to be ones that operate through the provision of a more stimulating environment and so have the potential to enhance students’ future prospects and educational attainment. The activities that adolescents undertake in their homes, such as information-seeking, also seem to constitute a factor that increases young people’s levels of civic knowledge (see Chapter 5).
- *Individual learning context:* Prior research identifies a number of factors related to the learning context at school that are associated with civic knowledge. These include student aspirations, experience with elections, and perceptions of opportunities for open discussions.
- *School characteristics:* Many studies show that school characteristics, such as the average socioeconomic status of the student body, school location (urban versus rural), and neighbourhood or community context have a potential influence on outcomes of civic learning.
- *School learning contexts:* There is some evidence that the learning context of the school may have effects over and above those at the individual level and after controlling for the socioeconomic context. The school learning context includes students’ sense of belonging to the school, students’ (averaged) perceptions of the extent to which classrooms are open to discussion, and students’ general engagement levels at school.
- *Country general context:* As seen in other international studies, the general context of the country and its target population can influence the variation in educational outcomes. Factors include the general economic and social development as well as the composition of the target population (average age).
- *Country curricular context:* Civic and citizenship education is organised in very different ways across countries and the curricular context (including the existence of specialised teachers in this area and assessing curricular content) may influence the variation across countries.

The individual student-background characteristics that we included in our analysis were:

- *Gender*: We coded this variable 1 for females and 0 for males.
- *Use of other language at home*: This variable reflects whether students reported speaking another language than the test language most of the time at home (1 = Yes, 0 = No).

The variables that we used as indicators of students' home backgrounds, including access to communication and media information were as follows:

- *Index of family socioeconomic background* (standardized to have a mean of 0 and a standard deviation of 1 within each country): As prior research and findings from ICCS in Chapter 7 show, socioeconomic background is positively associated with civic knowledge. The index consisted of factor scores from a principal component analysis of highest parental occupation (ISEI scores), highest parental education (ISCED levels in approximate years of education), and number of books at home. Higher scores on the index reflect higher socioeconomic status.
- *Reported parental interest in political and social issues* (0 = both parents not interested or not very interested 1 = at least one parent quite interested or very interested): This variable reflects parents' home orientation.
- *Frequency of discussion of political and social issues with parents* (three-point scale, in which 0 = never or hardly ever, 1 = monthly, 2 = weekly or daily): This variable, recoded from a four-point scale, reflects the occurrence of communication with parents about civic-related themes.
- *Frequency of students' use of media information on political and social issues* (four-point scale, in which 0 = never or hardly ever, 1 = monthly, 2 = weekly, 3 = daily): We computed this variable as the highest frequency reported by students when they were asked how often (1) they watched television or (2) read newspapers to inform themselves about national and international news. The variable reflects communication-seeking behaviour and exposure to information about civic-related issues.

The following variables used in our analyses relate to students' individual learning contexts.

- *Expected education*: Students were asked about the highest educational level they expected to complete. Because this variable reflects an intended engagement with education, it is an important potential predictor of civic knowledge, parental expectations, and individual aspirations. We used the international ISCED classifications to determine education levels and then transformed these into approximate total years of expected further education.
- *Perception of openness with respect to classroom discussions of political and social issues*: We standardized this predictor, which is an IRT (item response theory) scale, to have a mean of 0 and standard deviation of 1 at the student level within each participating country. The variable is based on the ICCS students' reports about the frequency with which they observed certain events during discussions of political and social issues in class, and it reflects the extent to which students consider they are free to express opinions in class and to discuss civic-related issues.

- *Recent voting for class representative or school parliament* (0 = never voted or voted more than 12 months ago, 1 = voted within the last 12 months): This variable reflects students' recent personal experience with democratic decision-making at school.

The school-level variables that we used as reflections of school characteristics were:

- *School socioeconomic context*: We computed this variable as the average of student scores on the composite index of socioeconomic background. It reflects the "social intake" of schools and the social context in which students learn. We standardized the scale to have a mean of 0 and a standard deviation of 1 at the school level within each participating country.
- *School location*: This variable, derived from the school questionnaire, asked principals about the size of the community beyond the school (1 = schools in communities with over 15,000 inhabitants, 0 = rural schools). In some countries, the distinction between rural and urban schools is important and has implications for resources, learning opportunities, and community context.
- *Principals' perceptions of social tensions in the local community*: This measure, based on a school questionnaire IRT scale that we standardized to have a mean of 0 and a standard deviation of 1 within each participating country, was derived from principals' ratings ("to a large extent," "to a moderate extent," "to a small extent," "not at all") of statements reflecting 12 possible sources of social tensions in the local community. The scale had an international reliability (Cronbach's alpha) of 0.88. We consider this measure to be an indicator of social problems in the community that have the potential to adversely affect civic-related learning outcomes.

We used the following school-level variables as reflections of the school learning context:

- *Principals' perceptions of students' sense of belonging to the school*: We standardized this measure, based on a school questionnaire IRT scale, to have a mean of 0 and a standard deviation of 1 within each participating country. We derived it from principals' ratings ("to a large extent," "to a moderate extent," "to a small extent," "not at all") of statements describing four possible student behaviours.<sup>1</sup> The scale had an international reliability (Cronbach's alpha) of 0.79. We saw this measure as an indicator of school climate in general and of the extent to which the school environment supports engagement and learning in particular.
- *School average of open classroom climate*: This measure, derived as the average student score on perceptions of openness in classroom discussions<sup>2</sup> of political and social issues, provides a measure of the extent to which classes at school are receptive (open) to students discussing civic-related themes. We standardized the scale score to have a mean of 0 and a standard deviation of 1 at the school level within each participating country.
- *School percentage of student electoral participation*: We based this measure on the percentage of students who reported that they had participated in

<sup>1</sup> The statements were "Students enjoy being in school," "Students work with enthusiasm," "Students take pride in this school," and "Students feel part of the school community."

<sup>2</sup> The scale is described above as one of the student-level predictors related to the school context.



classroom or school parliament elections during the last 12 months. We considered that this variable would provide an indicator of students' general civic engagement at school—engagement that may, in turn, influence students' acquisition of civic knowledge.

Whereas the student and school level variables had already been used in two-level analyses presented in the international report on ICCS (Schulz et. al, 2010), we extended these models by including country-level variables.

The following country-level variables are included as reflections of the general country context:

- *Average age of students in target grade:* For each national dataset we calculated the average age of students and divided this variable by 12 so that effect coefficients reflect the change in score point per one month.
- *Human Development Index:* This measure is a composite index with a minimum value of 0 and a maximum value of 1 derived from country statistics on life expectancy at birth, adult literacy rate, combined gross enrolment ratio in education and GDP per capita.<sup>3</sup> The index was multiplied with 100 so that effect coefficients reflect the change with one hundredth of the index.

In addition, we used the following country-level variables as reflections of the curricular country context for civic and citizenship education based on data derived from the ICCS national contexts survey:

- *Specialist teachers of civic and citizenship education at target grade:* This variable indicates (1= yes, 0 = no) whether in the country teachers specialised in the learning area teach at the target grade.
- *Assessment of civic and citizenship education:* This variable indicates (1= yes, 0 = no) whether in the country the learning area is formally assessed.

During multivariate analyses, issues relating to missing data are more prevalent than in other forms of analysis because of the simultaneous inclusion of numerous variables. To address the missing data issue, we first excluded from the analyses the small proportion of students for whom there was no student questionnaire data and then adjusted the indicator variable for the remaining students (Cohen & Cohen, 1975).<sup>4</sup> The tables that we present in this chapter do not include the country-level results for missing indicator variables. More detailed information on the multilevel

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<sup>3</sup> Taken from United Nations Development Programme's Human Development Report 2009, except for Chinese Taipei taken from Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C. Statistical Yearbook 2009. Data for England are for the United Kingdom and those for Belgium (Flemish) for Belgium.

<sup>4</sup> Generally, there are two types of missing data: (1) no questionnaire data at all, either for the student or their school, and (2) no data for individual variables. For the final model, 92 percent of cases, on average, remained in the analysis (the across-country range was 70 to 98 percent). In two countries (the Dominican Republic and Paraguay), just over 15 percent of the samples were excluded and their results were annotated in the tables. Not unexpectedly, students with missing data tended to have lower civic knowledge scores. On average, across countries, and after controlling for all other variables in the model, the negative effects of having missing data were -30 civic knowledge score points for expected years of education and for media information, -21 for openness in classroom discussions, -12 for discussions of political and social issues with parents, and -23 for parental interest. Students from schools with missing school-questionnaire data scored, on average, four points below the average score for all other students.

modelling and treatment of missing data will appear in the ICCS technical report (Schulz, Ainley & Fraillon, forthcoming).

Given the hierarchical nature of the data, we decided to undertake the multivariate regression as a multilevel analysis (see Raudenbush & Bryk, 2002). Countries where IEA sample participation requirements had not been met (Hong Kong SAR and the Netherlands) or where there were fewer than 50 schools (Liechtenstein and Luxembourg) could not be included in the multilevel analysis of ICCS data. We used the software package HLM 6.08 (Raudenbush, Bryk, Cheong, & Congdon, 2004) to estimate the models and data at the school and student levels. This software package allows estimation of results for sets of plausible values.

Because, in most countries, the ICCS research team sampled one intact classroom per school, we could not disentangle classroom-level and school-level variance. In two small countries (Cyprus and Malta), two classrooms in each school were sampled; in a few other countries, more than one classroom in each school was sampled. This situation needs to be taken into account when interpreting these results.

### ***Three-level model results***

In the international report of ICCS, we reported estimates of models 1 to 4 separately for each national sample, assuming two-level hierarchical models with students nested within schools (Schulz et. al, 2010). Table 2 shows how much variance was found at student and school level within in each country as well as the amount of variance explained at each level by model 4 including all student and school level predictors. This information is presented in the table not only in percentages but also as a bar chart: the longer the bar, the larger the overall variance. Note that each bar's position relative to the vertical axis indicates whether more variance was found within schools (left-hand side of the axis) or between schools (right-hand side). The darker shading at each side of the vertical axis indicates how much of the variance was explained by the multilevel model.

*Table 1: Total explained variance in civic knowledge by two-level models within countries*

As is evident in the table, there was a considerable range in the extent of overall variance across countries. Furthermore, the proportions of variance between schools<sup>5</sup> in the second column varied considerably among countries—from 6 percent to 52 percent (with an inter-quartile range of 20 to 37 percent). Similar to findings from other international studies, countries with comprehensive education systems, such as Finland and Norway, tended to have lower proportions of variance between schools.<sup>6</sup>

When examining the percentage of variance explained by the model predictors for each country, we can see that, at the student level, between 9 and 31 percent (with an average of 21 percent) could be attributed to the student-level predictors. The percentages of explained school-level variance ranged from 31 to 85 percent, with an average of 63 percent. Further details on the results from two-level models with ICCS data can be found in the international report on ICCS (Schulz et. al, 2010, pp 220ff.).

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<sup>5</sup> This proportion is often referred to as the intra-class correlation.

<sup>6</sup> Note, however, that because of the sampling design, the estimates are not optimal measures of between-school variance. This is why it is not possible to disentangle between-class and between-school variance.

In this paper the analytical approach first presented in the international report is extended to the estimation of different three-level models with students nested within schools nested within countries. To obtain baseline estimates of the proportion of variance within schools, between schools within countries and between countries, we first estimated a three-level model with random intercepts of schools and countries without any predictors (null model).

*Table 2: Estimated proportions of variance in civic knowledge at the levels of students, schools and countries*

Table 2 shows that more than half of the overall variance was recorded within schools, somewhat less than a quarter was between schools within countries and slightly less than one quarter of the overall variance was between countries.

When interpreting results from a multilevel analysis, one should always keep in mind that effects at the first (student) level have a different meaning from those in a single-level regression analysis. This is because student-level effects reflect the effect a variable has within schools. Multilevel analysis also allows one to estimate random effects models, where within-school effects vary across schools. However, in this first analysis of ICCS data regarding factors influencing civic knowledge, we estimated all student-level effects as fixed effects that did not vary across schools and all school-level effects as fixed across countries.

It is also important, when interpreting the regression coefficients, to note that scores for all scales (at the student or the school level) are standardized to a unit reflecting national standard deviations. Consequently, the effect coefficients for the student-level or school-level scales indicate the change in score points on the international civic knowledge scale in terms of one national standard deviation. However, the coefficients for the categorical variables (e.g. gender) reflect the effect with respect to the change in one category.<sup>7</sup>

When conducting the multilevel analysis of civic knowledge, we estimated five different models:

- Model 0 (“null model”): included no predictor variables;
- Model 1: included only student and home background variables as predictors;
- Model 2: added in the above individual-learning-context variables;
- Model 3: added in the above school characteristics;
- Model 4: added in the above school-learning-context variables;
- Model 5: added in the above country general context variables;
- Model 6: added in the above country curricular context variables.

Because Model 0 provides estimates of the variance at each level (within and between schools) before the inclusion of predictors, it provides the point from which to determine how much the subsequent models explained the variance. Model 6 is the full model because it includes all predictors. Models 1 to 5 provide information about

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<sup>7</sup> A consequence of this approach is that it does not invoke assumptions about the cross-national validity of the socioeconomic index (SEI) scale or other questionnaire scales.

how much of the variance is explained at each step of adding in predictors from the previous set of variables.

*Table 3: Results from three-level models explaining civic knowledge*

Table 3 shows the (unstandardised) regression coefficient for all six different models as well as the estimates of explained variance in civic knowledge scores. Among student and home background variables, female gender, socioeconomic backgrounds, discussion of political or social issues with parents and media information on political/social issues are significantly positive predictors in all models. Among the student-level variables reflecting the individual learning context, expected years of further education, perceptions of openness in classroom discussions as well as the experience of voting in school elections were found to be positive predictors.

Among schools characteristics, the average socioeconomic background appeared to be strong positive predictor and also principals' report on social tensions in the local community were found to have a significant negative association with civic knowledge. Rural school location did not show a significant effect in this model. Among school level variables reflecting the learning context only the average perception of openness in class discussions at schools was found to have significant positive effect on civic knowledge scores.

At the country level, the human development index appeared to be a strong predictor of civic knowledge. In addition, after controlling for HDI, the average age of students in the target grade was positively associated with student achievement in this learning area.

Both country-level variables reflecting the curricular context (specialist teachers and assessments in civic and citizenship education) had positive effects but were not significant. However, we should recognise that with 34 units at the country level there is not much statistical power.

## **Conclusion and discussion**

In this paper we have analysed which factors explain variations in civic knowledge using data from 34 countries that participated in ICCS. The modelling approach developed for the first international report (Schulz et. al, 2010) was developed further from comparative two-level models to a three-level model using additional data at the country level.

When comparing variance overall, as well as the variance at student and school levels within countries, there are considerable differences among countries both in the overall variation of civic knowledge scores as well as of the proportion that is attributable to the school level. The three-level model shows that about half of the overall variation is found at the student level, a quarter of the variance at the school level and another quarter between countries.

Predictors included in the final model related to student background, student variables related to the home and school context, school characteristics, school learning context, general country context and the countries' curricular context explained 14 percent of the variance within schools, about half of the variation between schools within countries and over 80 percent of the between-country variance.

Female gender, socioeconomic background, discussion of political/social with parents and the frequency of media information were identified as the most important predictors of civic knowledge related to the student and home background. Student level predictors of civic knowledge related to the individual learning context were students' educational aspirations, perceptions of openness in classroom discussions and experience with voting at school.

The socioeconomic context of the school was the most important school-level predictor of civic knowledge related to school characteristics but also school principals' perception of social tensions in the community was found to be a negative predictor. Among the school-level variables that were related to the learning context we only identified the average student perception of openness in classroom discussions as a significant predictor of civic knowledge.

Between-country variations in civic knowledge were strongly related to the general human development in participating countries as well as (to a smaller extent) to the average age of students in the countries' target grades. Variables indicating the curricular context (presence of specialist teachers and assessment in the learning area) did have positive but no statistically significant effects in the three-level model.

In the analyses for this paper we used a three-level model with fixed coefficients. The overall results are similar to those we found when undertaking two-level analyses for national samples. However, the analyses suggested different effects in different countries and further three-level modelling should concentrate on modelling the differences in slopes between countries and explore to what extent this variation is influenced by factors at the country level. Furthermore, we will attempt to include more country-level information and review to what extent further curricular factors may have effects on between-country variation in civic knowledge as well as on the variation in associations between school-level factors and students' knowledge scores.

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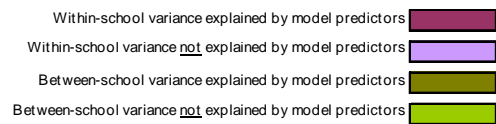
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**Table 1 Total and explained variance in civic knowledge**

Country	Total variance	% of variance between schools	Variance without controls		% of variance explained by model		Variance within schools		Variance between schools	
			Within schools	Between schools	Within schools	Between schools	10,000	5,000	5,000	10,000
Austria	8820	27	6413	2406	18	69				
Belgium (Flemish)†	6773	44	3790	2982	10	69				
Bulgaria	9876	48	5099	4777	18	73				
Chile	7537	31	5178	2359	12	81				
Chinese Taipei	9308	21	7348	1960	28	77				
Colombia	6190	28	4439	1751	15	60				
Cyprus^	8534	6	8029	505	29	71				
Czech Republic †	7758	26	5743	2014	19	80				
Denmark†	9767	16	8206	1561	28	69				
Dominican Republic ~	4575	22	3553	1022	16	57				
England ‡	10828	35	7038	3790	21	78				
Estonia	8207	24	6263	1945	22	69				
Finland	6918	9	6287	631	22	35				
Greece	10038	26	7391	2647	28	44				
Guatemala <sup>1</sup>	5773	40	3460	2312	9	75				
Indonesia	4328	38	2702	1626	11	46				
Ireland	10466	35	6812	3654	22	64				
Italy	7564	16	6352	1212	28	47				
Korea, Republic of <sup>1</sup>	6666	7	6199	466	27	69				
Latvia	6726	27	4909	1817	18	48				
Lithuania	6470	19	5216	1254	30	50				
Malta^	9700	52	4682	5019	12	85				
Mexico	7050	31	4836	2214	13	68				
New Zealand†	11985	41	7060	4925	18	69				
Norway †	8639	9	7900	740	31	51				
Paraguay <sup>1</sup> ~	8004	39	4904	3101	16	69				
Poland	9751	23	7486	2266	27	68				
Russian Federation	7438	40	4432	3006	20	39				
Slovak Republic <sup>2</sup>	8069	31	5592	2477	21	60				
Slovenia	7254	9	6609	645	31	31				
Spain	7218	28	5204	2014	22	68				
Sweden	10009	18	8245	1764	24	75				
Switzerland †	6573	40	3945	2628	9	62				
Thailand†	5325	34	3507	1817	21	61				
<b>ICCS average</b>	<b>7945</b>	<b>28</b>	<b>5730</b>	<b>2215</b>	<b>21</b>	<b>63</b>				



Because results are rounded to the nearest whole number, some totals may appear inconsistent.

† Met guidelines for sampling participation rates only after replacement schools were included.

‡ Nearly satisfied guidelines for sample participation only after replacement schools were included.

<sup>1</sup> Country surveyed the same cohort of students but at the beginning of the next school year.

<sup>2</sup> National Desired Population does not cover all of International Desired Population

~ Percentages of cases included in model < 90%

^ School census data with two classrooms per school



**Table 2** Variance estimation for baseline model

Level	Variance estimate	% of variance
Students	4594	54
Schools	1947	23
Countries	2036	24
<b>Total</b>	<b>8577</b>	<b>100</b>

**Table 3** Results from Three-Level Model Analysis

Predictor variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
<b>Student background</b>						
Gender (female)	<b>18.3</b> (1.6)	<b>11.1</b> (1.9)	<b>11.1</b> (1.9)	<b>11.2</b> (1.9)	<b>11.2</b> (1.9)	<b>11.2</b> (1.9)
Use of other language at home	-5.6 (9.1)	-5.6 (8.4)	-4.8 (8.3)	-4.5 (8.2)	-4.4 (8.2)	-4.4 (8.2)
<b>Home background</b>						
Index of socioeconomic background	<b>13.3</b> (2.2)	<b>10.2</b> (1.6)	<b>9.0</b> (1.6)	<b>9.0</b> (1.6)	<b>9.0</b> (1.6)	<b>9.0</b> (1.6)
Parental interest in political/social issues	2.9 (1.8)	0.4 (1.6)	0.4 (1.7)	0.3 (1.6)	0.3 (1.6)	0.3 (1.6)
Discussion with parents of political/social issues	<b>5.7</b> (1.3)	<b>3.1</b> (1.1)	<b>3.1</b> (1.1)	<b>3.1</b> (1.1)	<b>3.1</b> (1.1)	<b>3.1</b> (1.1)
Media information on political/social issues	<b>7.2</b> (0.6)	<b>4.9</b> (0.6)	<b>5.0</b> (0.6)	<b>5.0</b> (0.6)	<b>5.0</b> (0.6)	<b>5.0</b> (0.6)
<b>Individual learning context</b>						
Expected years of further education		<b>6.9</b> (0.8)	<b>6.8</b> (0.9)	<b>6.8</b> (0.8)	<b>6.8</b> (0.8)	<b>6.8</b> (0.8)
Perception of openness in classroom discussions		<b>9.9</b> (0.9)	<b>9.9</b> (0.9)	<b>9.3</b> (0.8)	<b>9.3</b> (0.8)	<b>9.3</b> (0.8)
Voting for class representative or school parliament		<b>13.0</b> (2.6)	<b>13.0</b> (2.6)	<b>13.0</b> (2.6)	<b>13.0</b> (2.6)	<b>13.0</b> (2.6)
<b>School characteristics</b>						
School average of socioeconomic background			<b>15.7</b> (1.6)	<b>13.9</b> (1.5)	<b>13.9</b> (1.5)	<b>13.9</b> (1.5)
School location (rural)			0.0 (2.0)	0.9 (1.6)	0.9 (1.6)	0.9 (1.6)
Social tensions in local community			<b>-3.5</b> (0.8)	<b>-2.4</b> (1.0)	<b>-2.5</b> (1.0)	<b>-2.5</b> (1.0)
<b>School learning context</b>						
Students' sense of belonging				1.5 (1.8)	1.5 (1.8)	1.5 (1.8)
School average of openness in class discussions				<b>11.5</b> (2.1)	<b>11.4</b> (2.1)	<b>11.4</b> (2.1)
Percent student electoral participation at school				0.0 (0.1)	0.0 (0.1)	0.0 (0.1)
<b>General context</b>						
Average age of students in target grade (months)					<b>3.7</b> (1.5)	<b>4.3</b> (1.3)
Human Development Index (0.01)					<b>4.7</b> (0.3)	<b>5.2</b> (0.4)
<b>Curricular context</b>						
Specialised subject area teachers						17.9 (10.6)
Assessment of subject area						15.5 (11.3)
<b>Variance explained at:</b>						
Student level	7	14	14	14	14	14
School level	25	37	50	55	55	55
Country level	5	10	15	18	76	81

() Standard errors appear in parentheses.

Coefficients statistically significant at  $p > 0.05$  in **bold**.