

Studying school communities as multiplex dynamic networks: The “RECENS Wired into Each Other” Dataset, 2010–2013

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Abstract

This article provides an overview of the “Research Center for Educational and Network Studies (RECENS) Wired into each other” longitudinal social network study conducted in 44 secondary-school classrooms in Hungary between 2010 and 2013. Participants were asked to fill out paper-based surveys four times over a 3-year period ($n = 1,767$ students). These surveys explored peer relations and perceptions within each classroom in over 30 distinct network dimensions, including shared social activities, ties of affection, bullying and victimization, perceptions about peers’ traits (including their ethnicity), behaviors, social roles, and status. Alongside the network data, we collected information about students’ individual background (e.g., sex, ethnicity, socioeconomic status) and behaviors (e.g., smoking, studying habits). We further interviewed the main teacher of each classroom to gather data about teaching arrangements and teacher perceptions of students. The current article aims to provide context for the dataset and documentation available online (Vörös et al., 2022). The dataset has been used in several published research articles, and PhD and MA theses in recent years. However, we believe that its publication is still highly relevant, as various measures in the rich dataset remain unexplored to date. After describing the study and available data, we review the main topics the study team and our colleagues have explored in recent years. We then outline a few promising directions for further inquiry into the data, which could all leverage the unique multiplex information gathered in the surveyed communities.

Keywords

network data collection, adolescence, education, longitudinal data, multiplex networks

Overview

In 2010–2013, our team, the Research Center for Educational and Network Studies (RECENS), collected longitudinal social network data using surveys among secondary school students in Hungary.¹ Our project was, and still is, unique in its

endeavor to capture the multiplexity of interpersonal relations among adolescents in schools. We studied the evolution of peer relations in >30 different aspects, including various forms of contact, ties of affection, perceptions of traits and behaviors, attributions of status and social roles, and bullying. We followed the evolution of these social networks alongside a set of individual behaviors and attitudes in >40 student communities. The dataset has so far led to novel insights about the mechanisms

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behind status competition, group formation, ethnic integration (with a focus on the Roma minority group), bullying and victimization, school performance, and substance use. While the data collection had finished years ago, there are still understudied topics in our rich dataset. In this article, we present an overview of the data, review some of our key findings, and highlight potential areas to explore using our dataset. The full dataset and a detailed technical report can be publicly accessed via the UK Data Service’s ReShare repository (Vörös et al., 2022).²

Data Collection

We collected data from 44 secondary school classrooms in seven schools and four towns in Hungary. The schools were selected by expert sampling; thus, the dataset is not representative of Hungarian schools. All classrooms in the 9th (first secondary school) grade of 2010–2011 were surveyed in participating schools four times over 3 years. This led to the observation of $n = 1,767$ unique students overall. In each survey wave, students were asked to complete paper-based questionnaires in one supervised classroom session. In addition, class head teachers responsible for the administrative matters of each classroom were asked to answer a different questionnaire about teaching practices and their students.

Data Files and Formats

The data are stored in three datasets, introduced below. Respondents can be linked across datasets by their anonymous identifiers.

Student Social Networks Dataset

We asked students to nominate their peers from their classroom in over 30 relational dimensions. These included different types of social contact (e.g., in school, outside of school, in free time), ties of affection (from friendship to enmity), peer perceptions of individual traits (e.g., shy, aggressive), abilities (e.g., smart), dyadic roles (e.g., trust), social roles in the class (e.g., leader, organizer), bullying (physical and verbal, from the bully and victim perspectives), and ethnicity (non-Roma Hungarian, Roma Hungarian, other). The network dataset is stored in numerous text files (csv). Each file contains an adjacency matrix for a given network item in the questionnaire from a

specific classroom in a given wave. Detailed guidance on the use of the network data files is provided in the Technical Report in Vörös et al. (2022). The complete list of network items and their coding can be found in the Student Questionnaires and Codebooks document in Vörös et al. (2022).

Student Individual Variables Dataset

In the student questionnaires, we also collected information about individual characteristics, such as family background (e.g., the economic situation of the household, available material and cultural goods, access to services) and ethnic self-identity (Hungarian, Roma, other minority and mixed identities). We also asked them about academic attitudes and aspirations, extracurricular activities, drinking and smoking, and other behaviors and attitudes. This dataset is available as a single text file (csv). The complete variable list and coding can be found in the Student Questionnaires and Codebooks document in Vörös et al. (2022).

Class Head Teacher Dataset

We asked teachers about their background (e.g., age, subject taught), classroom arrangements (e.g., seating order), and their perceptions about students (e.g., who they see as smart, popular, or a clique leader in the community). This dataset is available as a single file, in text-based (csv) format. Although originally the respondents were classroom head teachers, the dataset has been reformatted so that each row refers to a student in a given head teacher’s classroom. The complete variable list and coding can be found in the Teacher Questionnaires and Codebooks in Vörös et al. (2022).

Data Details

Response rate	71%–100% in schools, 41%–100% in classrooms; see Section 2.4 of the Technical Report in Vörös et al. (2022) for exact figures.
Non-respondent bias	Some classrooms have high rates of non-response and should be used with caution or omitted from certain analyses. We had no means to

²The dataset and documentation can be downloaded here: <https://reshare.ukdataservice.ac.uk/855460/>.

	test whether non-response was random or systematic due to lack of data about non-respondents. Based on informal discussions with teachers, students with attendance problems were likely overrepresented among non-respondents. In many cases, these students were not active members of the class community and networks. This suggests that our response rates are conservative.
Theoretical grounding	Our project was inspired by classic studies of school community dynamics using network questionnaires (e.g., Coleman, 1961). The study design aimed at creating a dataset that is suitable for analyses by state-of-the-art statistical network models, with focus on network-network and network-behavior co-evolution (Steglich et al., 2010). The network item battery was created based on earlier research into the multiplexity of peer perceptions in school settings (see Vörös & Snijders, 2017 for a review). The individual items were based on widely used questions in sociological and education research, which were adapted to our empirical context.
Publications using the data	There is a growing list of research publications using the dataset. We are currently aware of over a dozen peer-reviewed research articles in English and Hungarian, five defended PhD theses in English, and an edited volume in Hungarian. We provide highlights of this body of work in Section 5 of this article. For a list of publications as of 2022, see Section 4 of the Technical Report in Vörös et al. (2022).
Empirical context	Secondary-school classrooms (9–11th grades) in Hungary.
Respondents	Secondary-school students (9–11th grades) from seven schools.
Longitudinal	Yes. Data was collected in four waves in 2010–2013: October/November 2010, April 2011, April 2012, and April 2013.

Temporality	Low. While student values and behaviors may be characteristic of the time and place, general social network processes are likely comparable in student communities elsewhere and in other periods.
Analytic utility	The data can be especially valuable for studies into the multiplexity and dynamics of social networks and social influence processes in school settings. We highlight a few key substantive areas in Sections 5 and 6 of this article. Further pointers can be read in Section 5 of the Technical Report in Vörös et al. (2022).
Known issues	Some classrooms may not be suitable for complete-network analyses due to low response rates. Some may not be appropriate for longitudinal analyses due to high student turnover. See Sections 2.4–2.6 of the Technical Report in Vörös et al. (2022) for details.

Topics Explored in Published Work

Ethnicity

Articles exploring interethnic relations among students build on a particular strength of the data: uniquely, we measured ethnicity not only through self-identification but also through the perception of peers and teachers. These studies found that friendships (Boda et al., 2020; Boda & Néray, 2015), spending time together and positive affections (Boda, 2021) are more likely within than between ethnic groups. Interethnic friendships were also shown to be lower quality than same-ethnic friendships in terms of trust, perceived helpfulness, time spent together, and mutuality (Kisfalusi, 2016a). In addition, studies found evidence for interethnic dislike (Boda et al., 2020; Boda & Néray, 2015) and bullying (Kisfalusi et al., 2020) and for ethnic minority students to be perceived as less smart by their classmates than their majority peers (Grow et al., 2016). Majority-ethnic students were also shown to be less likely to find minority-ethnic peers attractive, and to be willing to date them, than other majority students (Lőrincz, 2016). Finally, ethnic perceptions were found to depend on students' friendships (Boda, 2019; Kisfalusi, 2018), and socioeconomic status (Kisfalusi, 2018), and to be subject to social influence from classmates and friends (Boda, 2018).

Negative Ties

Another line of work explored the patterns and dynamics of negative ties in the surveyed communities. One of the first PhD dissertations utilizing the data analyzed the interrelated dynamics of negative ties and status positions (Pál, 2016). This study was motivated by prior groundwork that explored the structure of negative ties in schools in two pilot projects (Csaba & Pál, 2010, 2013). Further, Boda and Néray (2015) found that inter-ethnic negative ties are more likely than those within ethnic groups. They also showed that negativity within minority-ethnic Roma groups tends to be directed toward students who are perceived but do not identify as minority. Studying the joint dynamics of gossip and reputation networks, Kisfalusi and Takács (2018) found that adolescents tend to gossip about classmates they do not like and look down on peers who spread negative gossip. Lastly, Stadtfeld et al. (2020) showed that negative and positive ties need to be considered jointly to explain processes of group formation.

Bullying and victimization

The RECENS team has studied the effects of ethnic perceptions and peer status on bullying behavior. Both Roma and non-Roma students were more likely to report bullying peers they perceived as Roma than peers they perceived as non-Roma (Kisfalusi et al., 2020), while students’ self-declared ethnicity was not significantly associated with the likelihood of bullying or victimization. In line with the results of Boda and Néray (2015), Roma students were found to bully peers they perceived as Roma but who self-identified with the majority group (Kisfalusi, 2016b). Regarding peer status, Pál (2016) found that not being accepted or respected increases the chance of victimization and bullying. These patterns are in line with the literature and suggest that bullying and victimization are closely intertwined with status processes in adolescent communities (Pál et al., 2016).

Peer Status and Reputation

The dataset provides multiple opportunities for inferring peer status. A comparison of various status measures highlighted key differences between traditional definitions based on friendship nominations and perceived popularity (Vörös et al., 2019). Different definitions of status and popularity were also shown to have distinct links to peer perceptions of traits and behaviors (Vörös & Snijders, 2017). Further, studies

explored the connections between status and group cohesion: Vörös (2016) analyzed status processes that may be linked to the emergence of informal groups in classrooms, while Pál et al. (2016) showed that discrepancies between attributed and perceived status prompt negative ties (Pál, 2016; Pál et al., 2016). In turn, it was found that both status and negative ties can be linked to gossip reported by participants (Estévez et al., 2022; Kisfalusi et al., 2019; Kisfalusi & Takács, 2018). Lastly, ability attributions were found to be strongly influenced by status generalization processes across ethnicity and gender (Grow et al., 2016).

Student Outcomes: Academic Competence and Health Behaviors

By linking our student dataset, classroom seating data from our teacher interviews, and national math and reading comprehension test scores, it was possible to investigate the effects of friends and desk-mates on the development of academic competencies. Keller and Takács (2019) found that after controlling for previous test scores and classroom-fixed effects reading, but not math, competence score development was influenced by desk-mates. They also showed that the desk-mate effect mediates or moderates the ethnic test-score gap between Roma and non-Roma students. Further, the dataset has been used to study the links between social networks and health behaviors. Different measures of popularity were found to be related to smoking (Mandácskó & Panyik, 2013). Friends also influenced smoking and drinking in a longitudinal analysis of eight classrooms from the sample (Radó et al., 2024).

Unexplored Topics for Future Research

Networks of Social Activities

Interactions with peers are connected to the development of social competence in childhood and adolescence (e.g., Cauce, 1986; Ladd, 1999). Our study mapped five different forms of social activities occurring between students. The measures can be categorized based on the context of contact: whether students socialize in school (sitting next to each other in classes), outside of school but in organized settings (extracurricular activities and studying together), or in their free time (going home from school, spending free time together). These social activity networks have not been examined in our dataset yet. Studying

the structure of activities can contribute to the understanding of the development of social ties, like friendship or enmity, and social competence.

Weak and Strong Ties of Affection

The dataset contains several measures that help to assess the valence and strength of affection between students. Ties of affection were measured on a five-point scale, ranging from strong dislike to friendship. We measured further aspects of the quality and background of relationships, such as acquaintance prior to the start of secondary school and current and past romantic affiliation. Studying these networks can contribute to a better understanding of relationship dynamics in adolescent groups, including the emergence and stability of friendships (e.g., Poulin & Chan, 2010) and clustering and group formation (e.g., Davis, 1970).

Peer Perceptions of Attributes, Behaviors, and Social Roles

The dataset contains network measures of peer perceptions about various attributes, behaviors, and informal social roles of classmates. The use of such measures is motivated by a strand of developmental psychology that aims to identify peers in different status positions in communities (for a review, see Vörös & Snijders, 2017). The approach also stems from a sociological inquiry going back to Coleman's classic school study in the US (Coleman, 1961) which, among other contributions, explored the role of leaders and role models in student communities. Our peer perception items can be analyzed both on the individual, as aggregate centrality scores, and network level, as dyadic ties. The dataset provides a unique opportunity to understand how interpersonal perceptions are formed in classrooms, and how they may be linked to social relations, such as friendship, and various individual outcomes.

Selection and Influence Processes Across Multiple Networks

Our dataset is ideally suited for Stochastic Actor Oriented Models (SAOMs) to disentangle social influence and selection processes between multiple networks and behaviors (Snijders et al., 2010; Steglich et al., 2010). While multiple applications of such SAOMs have been published across a range of social science disciplines in the past years, most of these focus on a single type of social tie, typically

friendship, while neglecting other social relations—see the “Applications” page of the RSiena website³ for examples and a growing list of exceptions. Our data provides an opportunity to extend this line of work to various types of social ties between students. For example, one can model the influence of role models or enemies on student relationships and behavior. These models can help us to understand the social processes occurring without intervention and identify the most influential peers for an intervention (Zingora et al., 2020).

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³<https://www.stats.ox.ac.uk/~snijders/siena/>

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