Dynamic computational social network analysis of language learner interactions: Novel insights for study-abroad second language acquisition

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Target-language (TL, L2) gains are often listed as the primary outcomes and goals of international student mobility. The experience of potential immersion in an L2-speaking community coupled with the opportunity of engaging in meaningful communication are commonly believed to be conducive to accelerated progress. However, despite "folk beliefs" that mere presence in an L2-speaking country will automatically facilitate language acquisition virtually through osmosis, not all learners benefit equally from study-abroad sojourns, and considerable variation has been evinced in their linguistic attainment.

One line of enquiry that has attempted to explain the varied picture has investigated students' social networks as a factor conditioning their interactions and—subsequently—progress. However, most of the extant studies have i) focused on sojourners' interactions with native speakers of the TL, passing over their communication with other interactants ii) only investigating participants' egocentric networks (asking students to nominate the persons they talked to, but without gaining respective insight from the nominated alters), iii) if at all, used solely global metrics of the networks extracted, and iv) only measured presojourn proficiency and one-shot post-stay gains.

This contribution analyses the longitudinal development of the social interaction network and its influence on L2 gains of 41 U.S. sojourners enrolled in a 3-month intensive study abroad Arabic program. Unlike extant research, the current study i) focuses on students' interactions with their alma mater classmates as well as other agents ii) reconstructing their complete network (in line with the computational social network analytic methodology laid out in Paradowski, Jarynowski, Jelińska & Czopek, 2021; Paradowski, Jarynowski, Czopek & Jelińska, 2021; Paradowski, Cierpich-Kozieł, Chen & Ochab, 2022), iii) tracing the impact of each individual student's position in the social graph using centrality metrics, and iv) includes a dynamic developmental perspective with three measurement points at 4-week intervals each, gauging the extent to which changes in the interaction networks translate to changes in progress along a range of dimensions. The data were collected using a specially developed questionnaire. This asked the students about a range of background and attitudinal/affective measures, their competence in other languages, their language use and communication with each other classmate from their home institution as well as with other groups of interlocutors, their subjective assessment of how well their group were integrated, as well as about their self-perceived progress, both overall and across specific skills/competencies, during the month preceding the current survey administration. Objective progress (global) was measured by deducting presojourn Oral Proficiency Interview scores from postsojourn scores.

The learners formed mostly same-gender cliques changing minimally, with gender homophily strengthening over time. Closeness centrality significantly correlated with TL use and self-perceived gains in linguistic and cultural competence, suggesting communication with classmates might facilitate L2 use and development. The best peer-connected students tended to be highly motivated females with high starting L2 proficiency. Interaction with classmates aligned with initial Arabic proficiency and multilingualism. Motivation to learn Arabic, degree of multilingualism, more central and popular positioning in the network, and self-reported progress across most skills were positively correlated. The level of motivation itself in turn seemingly may have been predetermined by prior competence in FLs. In the next step, in order to ascertain the

relative impact of the independent variables, we ran a multiple regression analysis. After removing spurious variables as well as predictors resulting in multicollinearity, we ended up with a model including five predictors altogether explaining nearly half of the variance in objective L2 progress ($F_{(5,21)}$=5.485,adj. R^2=.463,p=.002; see Table 1). The significant predictors are presojourn proficiency in Arabic (negative; large effect size), the degree of multilingualism (medium-large effect), perceived integration of the U.S. student group (negative; medium-large effect), and in-degree—the number of alters speaking to the student (small-medium effect). We also discuss non-trivial changes in the interaction network and progress over time.

The approach contributes novel methodology and rigorous insights into the dynamics of study-abroad SLA, and offers tangible recommendations for study-abroad program stakeholders.

Fig. 1: *Network of peer interaction among the 41 SA sojourners during the first month*
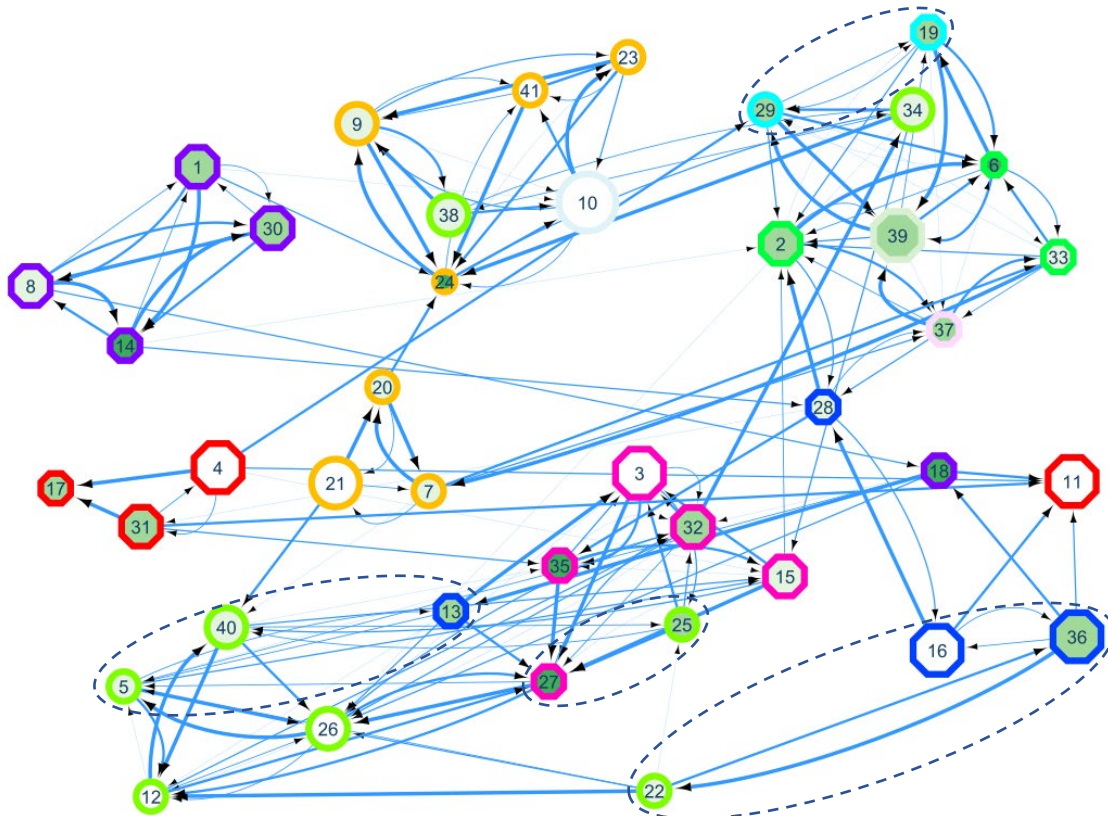
Note: SA sojourners during the first month of their immersion. Circles indicate female, octagons male participants. Same border color indicates proximal accommodation in the city's topography. Node color intensity reflects presojourn OPI score; node size objectively measured post-sojourn progress. Arrows show each student's top 5 declared contacts/interlocutors, with arrow thickness reflecting reported frequency/intensity of communication. Dashed-line ellipses highlight students who were married to or dating each other at the time of the sojourn. Visualization generated from questionnaire data using Cytoscape with the Compound Spring Embedder Layout.

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