

Supplementary File 2 – Glossary of Social Network Analysis (SNA) Terms

Introduction

Social Network Analysis (SNA) is a methodological approach used to map and measure relationships and flows between people, groups, or organisations. In the context of this study, SNA is utilised to objectively quantify collaborative behaviours and peer interactions within face-to-face Problem-Based Learning (PBL) groups. This glossary is provided to assist medical educators and readers who may be unfamiliar with network science terminology.

Basic Network Components

- **Node (or Actor):** The fundamental unit of a network. In this study, a node represents an individual medical student or a PBL facilitator within the group.
- **Edge (or Tie):** The connection or relationship between two nodes. In this study, an edge represents a peer nomination or a recognised collaborative interaction between two students.
- **Directed Tie:** A connection that has a specific direction, indicating the flow of interaction. For example, if Student A nominates Student B as a top collaborator, the tie is directed from A to B.
- **Weighted Tie:** A connection where the strength or intensity of the interaction is quantified. In this manuscript, edge weights are calculated using a 50:50 hybrid ratio of ranked peer nominations and rubric-based collaboration scores.
- **Sociogram:** A visual representation or map of the network. Nodes are typically depicted as circles, and edges are drawn as lines connecting them.

Node-Level Measures (Individual Metrics)

- **Centrality:** A general concept referring to the structural importance or prominence of a node within the network.
- **In-degree Centrality:** The total number of incoming ties a node receives. In a PBL setting, high in-degree centrality indicates that a student is frequently nominated by their peers, reflecting high peer recognition and perceived collaborative value.
- **Out-degree Centrality:** The total number of outgoing ties a node initiates. This reflects how actively a student acknowledges or nominates their peers within the group.
- **Betweenness Centrality:** A measure of how often a node acts as a bridge along the shortest path between two other nodes. A student with high betweenness centrality connects different subgroups or isolated peers, acting as a crucial intermediary for information flow.

- **Closeness Centrality:** A measure of how quickly a node can reach all other nodes in the network. A student with high closeness centrality is efficiently positioned to interact with the rest of the group and disseminate information rapidly.

Network-Level Measures (Group Metrics)

- **Density:** The proportion of actual connections present in a network compared to the total number of possible connections. A higher density indicates a highly cohesive PBL group where most students interact with one another.
- **Transitivity (or Clustering Coefficient):** The tendency for nodes to form closely knit triangles. If Student A works closely with Student B, and Student B works closely with Student C, transitivity measures the likelihood that Student A also works closely with Student C. High transitivity suggests strong group solidarity.
- **Diameter:** The longest of all the calculated shortest paths between any two nodes in the network. It represents the maximum structural distance across the PBL group, indicating how spread out the network is.