Examining Collaborative Clinical Reasoning within Synchronous Computer-Supported Collaborative Learning: A Cross-Cultural Comparison of Dutch and Finnish Medicine Students

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Abstract: Mastering Collaborative Clinical Reasoning (CCR) can be challenging for medical students as they are required reach collaborative treatment decisions through effective argumentation. Computer-supported collaborative learning (CSCL) contexts are effective for facilitating CCR. Internationalization in higher education introduces additional challenges for CCR, such as communication barriers, process losses, and conflicts. To enhance CCR instruction via CSCL approaches, understanding cultural differences in argumentation differences is vital. This study examined CCR argumentation differences between Dutch and Finnish undergraduate medicine student groups. Despite both cultures being individualistic, Finnish students displayed more group-oriented, and data-supported arguments, while Dutch students were more pragmatic and assertive. Future research should focus on integrating scaffolding interventions in CSCL to explicitly teach clinical argumentation and intercultural competence.

Introduction

Global health education incorporates clinical reasoning skills into medical curricula to equip future health professionals for diagnostic decision-making. Collaborative clinical reasoning (CCR) among physicians aims to establish effective treatment plans, enhance patient safety and improve team performance (Gordon et al., 2012). Despite its benefits, challenges such as weak evidence and hindered information-sharing persist (de Leng & Gijlers, 2015), partly due to individualistic teaching approaches (Kiesewetter et al., 2022), highlighting the need for collaborative learning. Globalization has increased cultural diversity in healthcare teams, affecting CCR quality due to communication challenges and conflicts (Gonzalez-Caminal & Kangasperko, 2023), therefore posing challenges for collaborative learning, Despite multicultural teams being common, there's insufficient focus on collaborative argumentation and intercultural competencies.

To tackle these issues, computer-supported collaborative learning (CSCL) using tailored tools can be employed. In multicultural contexts, CSCL creates a supportive environment promoting equitable participation, and enhancing intercultural awareness (Popov et al., 2014). In medical education, CSCL tools scaffold students' argumentative CCR by facilitating evidence-based hypotheses and diagnostic decisions, by highlighting appropriate argumentative components (Noroozi et al., 2013). Developing argumentative knowledge is crucial for CCR and can serve as evidence of students' CCR quality (Ju & Choi, 2018; Si et al., 2018). Nonetheless, the existing body of research focuses on asynchronous collaboration, providing limited insights into efficacious CSCL pedagogical strategies for enhancing synchronous CCR practice (Blondon et al., 2017; Gordon et al., 2012).

This paper investigates how the quality of the clinical argumentation between two culturally individualistic student populations – Finland and the Netherlands – compares. The study seeks to enhance intercultural competence in medical education curricula and integrate argumentation scaffolding tools for CCR in synchronous CSCL. It attempts to answer the following research question - Do the culturally homogeneous Dutch and Finnish medicine student groups display the same level of CCR argumentative quality?

Theoretical framework

Collaborative Clinical Reasoning (CCR) in Computer-Supported Collaborative Learning (CSCL)

Collaborative Clinical Reasoning (CCR) is the process whereby medical experts work together to analyze, justify, and negotiate diagnostic, prognostic, and therapeutic issues to establish a mutual understanding of the patient's condition and the approach to its treatment (Blondon et al., 2017; Kiesewetter et al., 2022). Clinical reasoning is a core skill in medical education, aiming at the development of students' and practitioners' diagnostic competence – the capacity to synthesize biomedical and clinical to generate effective therapeutic solutions (Hege et al., 2018).

In interprofessional healthcare contexts, the complexity of medical cases, the demands of specialized care, and the rigorous patient safety regulations often require collaboration among multiple practitioners. Physicians must therefore not only exhibit clinical expertise for effective problem-solving, but also adeptness in interpersonal competences encompassing information-sharing, elicitation, negotiation, and coordination in complex, time-pressing scenarios (Kiesewetter et al., 2022), alongside proficiency in cross-disciplinary and intercultural collaboration (Radkowitsch et al., 2021). Computer-supported collaborative learning (CSCL) environments provide controlled practice settings for learners to enhance clinical reasoning at their own speed, gaining insights from diagnostic errors while avoiding patient harm (Hege et al., 2018). In CSCL medical education, digital tools, including visualization and argumentation tools, facilitate knowledge co-construction (Fischer et al., 2014). Visualization tools like web microscopes, interactive diagrams, and virtual patient simulations aid comprehension of complex medical topics, such as pathology and radiology (de Leng & Gijlers, 2015; Si et al., 2018).

CCR argumentation dimensions

Argumentation plays a pivotal role in scientific reasoning and disciplinary knowledge acquisition (Weinberger et al., 2007). Its quality not only facilitates knowledge recognition but also serves as a benchmark for assessing CCR proficiency. Within the context of CSCL among medical students, understanding argument construction and its social dimension is paramount for knowledge acquisition. Arguments are analyzed as single components or in sequences (Weinberger & Fischer, 2006). In CCR, argument soundness requires three fundamental components: *claim(s):* the position advanced, ground with *data:* facts and *warrants:* reasons justifying the transition from the data to the claim. Arguments might possess *qualifier*s limiting the claim's validity, and r*ebuttals,* invalidating the claim. High quality argumentative sequences consist of *counterarguments* challenging the initial *argument* and *integrations* synthesizing the initial argument and the counterargument. Discourse can also be characterized by *non-argumentative mov*es with no propositional value like questions, coordinating moves, and meta-statements. Balancing these, promotes deeper thinking and knowledge construction in complex problem resolution.

In social contexts, arguments' link to peer contributions influences knowledge acquisition. On the lowest level, arguments can be *externalizations* thought articulation, *elicitations* (response stimulation or questioning), or might serve for *quick-consensus building*. Conversely, *Conflict* and *Integration-oriented consensus-building* enhance argumentative quality by encouraging adaptive beliefs, and critical thinking through peer reasoning.

Cross-cultural differences in CCR

Cultural diversity shapes learners' argumentation and learning abilities (Weinberger et al., 2007). Despite assertions of universal reasoning norms (Mercier, 2011), cultural factors impact engagement, argument types, and discourse quality (Hornikx & ter Haar, 2013). Cultural differences, therefore, significantly impact group dynamics, including trust-building and conflict resolution, requiring careful consideration in CSCL.

Comparisons between culturally proximate homogeneous groups can unveil cultural effects on argumentation patterns (Hornikx & ter Haar, 2013; Hornikx & Hoeken, 2007). Understanding these patterns can guide the development of effective scaffolds for intercultural collaboration, enhancing thus intercultural competence. Hofstede's (1991) framework presents six cultural dimensions as dual continua, enhancing cultural understanding and enabling cross-cultural assessments. The Individualist-Collectivist dimension entails that individualists prioritize personal goals, while collectivists emphasize group success, identity, norms, and commitments. Popov et al., 2014, found that learners from individualistic cultures, outperformed those from collectivist background.

Cross-cultural studies show Dutch participants favor direct communication and decentralized team management (Labrie et al., 2020), while Finnish participants prefer indirect communication and emphasize collaboration (Kim & Bonk, 2002; Marttunen & Laurinen, 2002). However, there's limited research on how cultural homogeneity-heterogeneity affects argumentative quality, underlining the necessity to comprehend learners' cultural backgrounds for adaptive learning environments (Hornikx & ter Haar, 2013).

Methods

Design and Instrumentation

This study which is part of a larger quasi-experimental research, compares two distinct cohorts of medical students hailing from universities in the Netherlands and Finland. In this study, we narrow our focus to examine the outcomes within the homogeneous Dutch and Finnish groups to get a deeper understanding of the characteristic differences in CCR quality All groups worked on a CSCL scenario in microscopic pathology classes, incorporating an open-source web microscope, VQuest assessment tool, and PRISMA dashboard for collective visualization.

Respondents and procedure

In a study with n=67 students, including n=31 second-year Dutch and n=36 third-year Finnish students, all recently completing a microscopic pathology course, participants were divided into eleven groups: five culturally diverse, three Dutch, and three Finnish, each with around six students. We focus on the homogenous groups: D1 (n=7), D2 (n=6), D3 (n=7), F1 (n=6), F2 (n=6), F3 (n=7), with four female and two male students in each group. Ethical approval was obtained, and students provided informed consent. The study involved a 4-hour session with two phases introducing VQuest for solving medical cases, including group tasks, breakout sessions, and plenary discussions. In plenary sessions, instructors guided discussions for decision-sharing, feedback, and reflective learning. Cameras were often off for confidentiality during breakout sessions, impacting communication.

Analysis

We assessed students' Critical Clinical Reasoning (CCR) argumentative discourse using Weinberger and Fischer's (2006) framework. Dialogues were transcribed and coded on the micro-level (claim, warrant, data, rebuttal, qualifier) and macro levels (argument-ARG, counterargument-CARG, integration-INT) of argumentation, including non-argumentative moves (Non-ARG). Social co-construction modes were coded as Externalization-EXT, Elicitation-ELC, quick consensus-building –CNS, Integration-oriented consensus-building – Int-CNS, and Conflict-oriented consensus-building –Con-CNS. Inter-coder reliability ($\alpha = 0.923$) was high.

Results and discussion

Our research delved into the argumentation styles of Dutch and Finnish students, revealing significant cultural variations consistent with Hofstede's findings (1991). While past intercultural studies in CSCL primarily focused on asynchronous contexts (van der Meijden, 2005), our work contributes by examining synchronous processes. Participants' argumentation styles mirrored their respective cultures, with Finnish students displaying a tendency to initiate more arguments and provide extensive data to support their claims. This contrasts with Dutch students, who adopted a more pragmatic, albeit less substantiated approach. Analysis revealed distinctions between Dutch and Finnish groups. Finnish students leaned towards theoretical underpinnings, possibly due to Finland's higher uncertainty avoidance tendencies (Labrie et al., 2020), while Dutch students incorporated more elicitations reflecting their communication norms. Finnish groups favored consensus-building with qualifiers, mirroring their communication style, while Dutch groups emphasized unanimity through elicitations, aligning with Dutch communication tendencies (Hornikx & Hoeken, 2007). Finnish students showed deeper engagement in CCR, reflecting a theory-oriented approach, in line with Hofstede's uncertainty avoidance index, while Dutch students exhibited pragmatism, reflecting cultural individualism.

Limitations and future research

Our study, though limited by an exploratory approach and confidentiality constraints, highlights the urgent need for future research to employ experimental designs and larger sample sizes. This will allow for a deeper understanding of collaborative clinical reasoning (CCR) in synchronous contexts, ultimately optimizing learning environments. Moreover, leveraging frameworks such as Ju and Choi's (2018) can aid in the development of culturally tailored interventions, promoting the construction of robust clinical claims. Exploring the influence of cultural differences on CCR further, and implementing supportive tools like collaborative diagrams and argumentation maps, will enhance argument formation during collaborative CCR stages. Future studies should also integrate multilevel analyses to untangle the complexity of data structures and explore the effects of various cultural dimensions on CCR quality, as suggested by Janssen et al. (2013). In conclusion, our research sheds light on the intricate interplay between culture and argumentation styles in CCR, providing valuable insights for educators and researchers alike.

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