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# Understanding Evidence-Based Interventions for Cross-Cultural Group Work: A Learning Analytics Perspective

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## ABSTRACT

As the numbers of international students worldwide continue to rise, one common challenge is how best to socially integrate diverse groups of students. Indeed, research demonstrates that many students form social and learning relationships with those from the same cultural background, despite benefits of cross-cultural communication. This lack of social cohesion negatively affects students, particularly when it comes to their perceptions of collaborative group work. However, few studies have analysed measurable student behaviours in group work, such as with learning analytics, to determine how culture and existing social networks influence measurable differences in contributions. Similarly, little is known about what evidence-based interventions lead to more equal participation between diverse students. In this research, learning analytics is combined with social network analysis to determine the role of social connections on group work participation, and highlight replicable interventions that can help promote social cohesion in diverse classrooms.

## Keywords

Learning analytics, social network analysis, social learning analytics, social learning, social networks, group work, international students, cross-cultural collaboration

## 1. INTRODUCTION

With more than 4.5 million international students at registered universities worldwide [1], higher education campuses have become unique spaces for cross-cultural communication. University students today have the opportunity to learn from peers from around the world, allowing them to exchange and consider new ideas [2] and build cross-cultural communication competencies. However, research has demonstrated that many students have social and learning networks comprised mostly of those from a similar cultural background [3, 4], which damages these potential benefits.

This lack of social cohesion negatively affects collaboration in the classroom, particularly in the case of group learning activities. For example, research has demonstrated that many students prefer to work with those from their own background [5, 6]. One commonly cited reason for this is the perception of unequal contributions to group work between diverse group members [2].

However, current research tends to consider students' reflections of this problem, such as by surveys, rather than analysing actual behaviours to determine if and how they differ, such as with learning analytics. After all, learning analytics research has previously highlighted that students do indeed contribute to group work differently [7]. Yet, many learning analytics studies do not consider whether cultural backgrounds and existing social networks influence measurable academic behaviours, despite the urging of a growing field of social learning analytics [8, 9]. Thus, this research seeks to gain a better understanding of the complex role of culture and social networks on group work behaviours, as well as insights into how learning analytics can be used to simultaneously promote social cohesion and improve learning outcomes in group work.

## 2. BACKGROUND

### 2.1 Students' social connections and social network diversity

Previous research has highlighted that social and learning connections are positive influences on students' higher education experiences. This is perhaps best described in the seminal work of Tinto [10, 11], who argues that university cultures and communities are important factors in student success. Indeed, more recent research has demonstrated that feeling connected with the campus community can benefit student attainment and retention [12, 13].

One important benefit provided by the campus community is the opportunity to interact with diverse classmates. For example, [14] argues that communication with those from diverse backgrounds can help students encounter and evaluate new ideas. Connecting with diverse classmates also gives students opportunities to develop important cross-cultural communication competencies, which are key skills often sought by employers in many fields [15, 16].

However, evidence suggests that students' social and learning connections on campus are often limited to those of a similar cultural background [4, 17, 18]. For example, [3] found in a survey of 454 international students from 10 American universities that 38% had no close friendships with host students. In the UK, [19] conducted 60 focus groups and 40 interviews and found that a culture of 'passive xenophobia' existed towards international students from host students. Using social network analysis, [20] found substantial self-segregation between students

of different cultural backgrounds. However, few studies have analysed existing student social and learning networks to determine how they affect students' measurable contributions and behaviours in the classroom. To better understand this complex topic, this research considers contributions to cross-cultural group work.

## 2.2 Group work activities with diverse group members

One way to encourage communication between diverse groups of students is through group work. After all, assigning students to group work activities with diverse group members can 'force' students to work with one another, when they might not otherwise have a reason to communicate [21]. Similarly, [22] found that assigning students in a diverse classroom to small groups at random led to increased exchanges of knowledge and more diverse friendships over time.

However, cross-cultural group work can be challenging and students have expressed concerns and frustrations with participating in it. For example, previous qualitative and survey-based research has found that students prefer to work with those from their own cultural background [5, 6, 23]. In a survey of over 140 students, [2] found that 'free-riding' (i.e. those who contribute very little to a group work activity) was a top complaint in cross-cultural group work. However, research on this topic tends to rely on student reflections or perceptions of cross-cultural group work, such as by survey or interviews. Little research has analysed actual, measurable student behaviours in group work, such as with learning analytics, to determine if student perceptions are correct: that those from different cultural backgrounds do make different contributions to group work.

After all, much research has concluded that students do indeed contribute to group work in different, and often unequal, ways. For example, [7] analysed student VLE behaviours in virtual math teams using k-means clustering and found varying levels of participation. Similarly, [24] found that 80% of forum posts in online asynchronous group work were contributed by only 20% of participants. Qualitative differences in the content of contributions was also found in a fine-grained analysis by [25]. However, little research on this topic has considered *why* students contribute to group work in different ways. Additionally, research in this area, and in the learning analytics field as a whole, has a tendency to homogenize students' backgrounds by not considering how their cultural traits and social networks play a role in their learning behaviours. Finally, a major gap in current research is what evidence-based interventions can drive more equal contributions to cross-cultural group work, thus encouraging the exchange of new ideas and aiding in students' development of cross-cultural communication competencies.

## 3. RESEARCH QUESTIONS

Keeping in mind these gaps in current knowledge, this research seeks to answer the following research questions:

- In what ways do social and learning behaviours in group work differ between diverse groups of students?
- How does culture and social connections influence the ways that students contribute to group work?
- Which evidence-based interventions promote social cohesion and more equal participation in group work between diverse groups of students?

## 4. PROPOSED METHODOLOGIES

### 4.1 Learning analytics

In this research, student-generated behavioural traces, such as log data in an online group work activity, and student performance-related data, such as assignment markings, will be analysed to understand how behaviours differ between cultures. In the initial pilot study of this research (discussed in section 5), a chat function in the participants' VLE was used. However, this provided only simplistic data, such as the number of posts or summed word count submitted. In the final study of this research, the Udio program created by Cast will be used, which can provide more nuanced and fine-grained data. By using learning analytics, this research can focus on the measurable behaviours of students in group work, rather than relying solely on student perspectives and reflections of the activity.

One common critique of learning analytics is that it will 'fail to make sustained and meaningful contributions to learning and teaching' [26]. Thus, it is important for this research project to move beyond theoretical and predictive learning analytics and aim, instead, to determine evidence-based and replicable interventions that can drive social cohesion and equal group work participation in diverse classrooms. Thus, the final study of this research will be a randomised control trial with at least two intervention groups. These interventions can be considered successful if they lead to measurable outcome improvements, such as more diverse social networks or more equal contributions to group work between diverse students, as measured by learning analytics and social network analysis, which will be described next.

### 4.2 Social network analysis

Social network analysis (SNA) will be used in this research to gain a better understanding of students' social and learning network patterns. SNA provides tools to analyse social and learning connections between students by demonstrating relationship patterns visually and quantitatively [27]. In this research, SNA surveys will be used, which ask participants to mark classmates they are friends with, work often with, or have learned from. SNA surveys can be distributed to the same group of participants over several time points to discover how social and learning networks change over time, as has been demonstrated in previous research [22, 28]. By analysing whether participants' social networks have diversified over time, SNA can help determine whether group work interventions successfully lead to more connections between diverse students.

Previous studies have suggested that SNA findings are more robust when combined with other methods [29, 30]. Additionally, researchers have argued that learning analytics in particular can benefit from an understanding of how social networks influence student behaviours [8, 9]. Thus, combining learning analytics and SNA methods will provide robust quantitative data that will aid in understanding student behaviours in group work.

### 4.3 Qualitative Interviews

Although learning analytics and SNA studies tend to be heavily quantitative, a mixed-methods approach will be adopted in this research by also conducting interviews or focus groups with a selected number of participants. After all, [31] argue that quantitative research is better 'triangulated' when it is informed by qualitative data. This triangulation is particularly important in

this research, as culture is a complex topic that is difficult to fully quantify. In this study, qualitative data will be used to confirm and build upon quantitative findings, as well as inform potential interventions to test in future studies.

## 5. PRELIMINARY RESULTS

At present, two studies have been conducted for this PhD research, which will be described next.

### 5.1 Study 1

A pilot study was conducted in a UK university with 58 Master's-level students from thirteen countries. This study took place in a computer lab environment, where participants were placed at random in small groups with diverse group members. In their small groups, participants used an online chat as their sole means of communication, and worked with assigned group members to determine a solution to a Harvard Business School case study problem. In this study, learning analytics data were collected from the university's VLE system and used to measure the quantity of students' contributions to the online chat. Individual chat messages were also coded using the Community of Inquiry coding system [32, 33] for content analysis. Additionally, participants were given an SNA survey to better understand the amount of diversity present in their social networks. In order to measure participant's cultural traits, demographic information about participants' countries of origins was obtained and converted to Hofstede's Cultural Dimensions [34], which quantifies cultural traits on a set of six scales.

Analysis of the pilot study data indicated that both cultural traits and the amount of diversity present in participants' social networks were important influences on the quantity and quality of student contributions to the online chat. Bivariate analysis indicated that several of Hofstede's Cultural Dimensions correlated with both behavioural traces in the chat and the Community of Inquiry coding categories. Linear regression analyses were also conducted, which demonstrated that Hofstede's Cultural Dimensions could predict students' number of contributions, summed word count submitted, and several of the Community of Inquiry codes. In terms of the SNA survey, students with more diverse learning networks were more likely to contribute more posts to the chat activity. Also considered was student achievement in the module and gender, but there were no significant differences in the quantity or quality of contributions. Altogether, this research highlighted that cultural backgrounds and learning relationships do indeed lead to measurable differences in group work behaviours. However, further research is now needed to understand which evidence-based interventions lead to more equal participation between diverse group members.

### 5.2 Study 2

One goal of this research project is to understand *why* there are measurable differences in student behaviours between cultures. Thus, a mixed-methods study was conducted by interviewing 20 students about how culture and social networks affect their own contributions to cross-cultural group work, as well as interventions that they feel would help make cross-cultural group work more successful. Building on previous work from LAK [35, 36], participants were selected based on a preliminary analysis of quantitative data from a larger module of over 900 students. Quantitative data available included student attendance, module grades, Academic Motivation Scales, and demographic data. To select interview participants, a cluster analysis was conducted on

the larger data set, which demonstrated three clusters that primarily centred on student module grades.

Twenty participants from seventeen countries participated in a semi-structured, in-depth interview. The analysis of this qualitative data is currently underway, and a thematic analysis is being used to understand emerging themes from the interviews. Findings indicate that social connections and group dynamics influence and encourage contributions to cross-cultural group work. At the same time, interviewed students felt that teachers can play an important role in developing such group dynamics by providing opportunities for students to build social connections with their group members.

## 6. FINAL STUDY

The final stage of this research aims to determine which evidence-based interventions can lead to measurable improvements in student contributions to group work. Thus, the final study in this research will be a randomised control trial study, to be conducted in autumn 2016 in a large-scale classroom of approximately 1200 students. This study will occur in a computer lab setting, similar in methods to Study 1. The interventions used in this study will be informed by current literature and the results of Study 1 and Study 2. This final study will determine whether selected interventions can indeed help drive more equal contributions between diverse participants to cross-cultural group work.

## 7. CONTRIBUTION TO THE FIELD

This research seeks to close gaps in current knowledge about the role of cultural traits and social networks on group work participation, as well as provide an understanding of measurable differences in academic behaviours between diverse students. In a broader sense, the study will help foster a general understanding of how learning analytics can be combined with other tools, such as social network analysis, to target specific student demographics with evidence-based interventions that lead to measurable results in learning outcomes. The sub-field of social learning analytics can also benefit from an increased understanding of how learning analytics can support social cohesion and diversified learning networks in the classroom. Finally, these results will contribute to understanding of how to best support cross-cultural communication between diverse groups of students at university campuses.

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