# Establishing Trust and Relationships through Video Conferencing in Virtual Collaborations:

## An Experience Report on a Global Software Engineering Course

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*Abstract*—The rise of globalization in software engineering places a responsibility on educators to adequately prepare students for the unique challenges and demands of Global Software Engineering. Experiential Learning (EL) is an approach to teaching that emphasizes learning by doing. It can potentially enhance student engagement and, therefore, learning in GSE courses. In this paper, we present our findings based on student reflections about their first experience of virtual collaboration with a guest lecturer in a GSE course. In particular, we report on the challenges and learnings for students during this virtual meeting where they reflect on the importance of a pre-established relationship with the facilitator in cross-site communication. We compare our findings from student reflections with those shared by practitioners in our previous study about the challenges of distributed collaboration. We observed that both students and practitioners consider trust, goodwill, and a good relationship as important aspects in distributed communication and collaboration. Furthermore, we highlight that participating in even a single virtual meeting can help the students experience some of the challenges in GSE. We also provide the implications of such student experiences for the educators planning future GSE courses.

Keywords— GSE Education; Experiential Learning; Learning by doing; Globalization; Communication; Trust; Good Relationship; Introduction.

## I. INTRODUCTION

The rise of Global Software Engineering (GSE) has resulted in a higher demand for students to take on the role of tomorrow's global software engineers [1]. In response, universities strive to design courses that offer authentic learning experience to the learners and prepare them for the unique challenges that GSE entails [2]. Students, as future GSE practitioners, need to learn technical as well as soft skills to effectively contribute in multi-site, multi-cultural teams [1].

To increase the realism and expose students to the challenges that arise in distributed teams, some GSE courses are designed as partnerships across two or more institutions [2]. Such setups allow students to experience cross-cultural interactions, face time zone challenges and work collaboratively on open-ended real world problems [2]. The

learning for students happens while organizing, coordinating and participating in such virtual collaborations where they experience challenges similar to those faced by practitioners. This 'learn-by-experience' technique is recommended in the GSE education literature [2, 3]. However, this is not always possible due to course timetables and the large administrative overhead associated with such courses. Creating learning environments that integrate GSE practices into classroom settings is a daunting task [1, 4]. Course instructors, therefore, face considerable challenges in imparting the desired skills and attitudes to GSE students in a classroom [5, 6].

GSE challenges principally relate to communication and cultural diversity [7]. The experiences reported by instructors conducting GSE courses consider issues arising from cultural diversity as the most problematic [1]. Inadequate face-to-face communication opportunities caused by distance make team interactions more complex and impact work coordination [8]. Tell and Babar argue that in GSE the additional burden caused by the increased level of communication and collaboration requires the usage of dedicated technological support [9], whereas, Clear et al [1] report that communication tools should be used in combination with other technologies to address the challenges of cross-site interaction. The use of technology, however, adds to the existing challenges of communication and collaboration over distance [7].

In this paper, we report our findings from a global information technology project management course and report on the importance of trust in cross-site communication based on student experiences. We observed (as noted in [10]) that trust and good relationships are also important for communication and collaboration in GSE along with the communication-enabling technology. We highlight the benefits of an exercise where students were exposed to GSE challenges through a videoconference call to promote student learning through experience.

This paper is organized as follows; Section II backgrounds the importance of learning by experience in GSE Education and the challenges for educators to design such courses. It also provides the information about the course setting used in this study. Section III provides the methods used to carry out the studies and the techniques used to analyse the empirical data

for the studies reported in this paper. Then, in Section IV, we present our findings based on close analysis of selected student reflections about their video conferencing experience, trust and relationship. Furthermore, we provide a comparison of the student reflections with those reported by the practitioners reported in our previous study [11]. Section V discusses the findings reported in this paper. Section VI briefly summarizes and concludes the paper.

## II. BACKGROUND: GSE EDUCATION AND EXPERIENTIAL LEARNING

It is common knowledge that GSE requires special treatment [1]. Literature in GSE education suggests that teaching approaches in SE are surprisingly outdated and unauthentic. Matthes et al. [12] report that teaching GSE at universities remains in its infancy. The students of GSE are likely to find themselves working in distributed teams when they graduate and enter the workplace. However, university instructors are challenged to impart the theoretical knowledge and equip the students with practical skills required for GSE projects [13].

It is widely recognized that distance hinders building trust and good relationships among distributed stakeholders [14]. The results of a recently published systematic literature review in [1], confirm that instructors carrying out GSE courses report global distance to be the most problematic issue. Cultural diversity (differences in communication styles, social norms, religious beliefs, and treatment of gender [1]) as part of global distance was also reported as a major challenge in several other studies [15, 16].

GSE educators continually seek ways to engage students in the learning process. Technology being at the forefront of this movement can promote a learner-centered environment if it is appropriately integrated with course content [17]. Educators who incorporate technology effectively in their courses can expect to achieve higher levels of learning and can make their course content 'alive' [17]. It is well established that without intentional engagement of the student the desired learning cannot take place [18]. Today's students clamour for more technology and are comfortable in using it to build relationships, communicate in real-time and engage in the learning process [17].

As per Freire [19], if we are to serve the purpose of education 'the critical consciousness of learners needs to be raised' by means of experiential encounters. Since the inherent challenges in SE education are amplified in GSE education, new approaches are needed deal with these problems [1, 20]. Educators can limit these challenges and cater for the needs of future practitioners by introducing theoretical courses and simulation approaches that can complement full inter-institutional collaborations as noted by Clear et al. in [1].

One of the approaches to achieve such results is the Experiential Learning (EL) or *'learning by doing'*; a notion proposed by Dewey in [21]. In experiential learning, a link is established between theory and practice when learners go through a cycle of experience, concept, reflection and action [22]. EL is a proven and powerful approach to teaching and learning based on one incontestable reality: "people learn best through experience" [22]. The approach has seeped into academia and has gained popularity across many disciplines because of its well-documented benefits that relate to student empowerment and engagement [23]. Experiential learning immerses students in an experience and encourages them to reflect about their experience [24]. Classroom-based EL can be in the form of role-playing, simulations, games, group activities or case studies [24]. Monasor and colleagues similarly recommend in [15], an active and collaborative learning approach to teach GSD, in which students 'learn by doing' instead of listening to the expert talking about his/her experience. Two of the most commonly used techniques with the aim to impart collaborative learning are project-based learning [25] and role playing [26]. While project-based learning offers active student participation in teams it is more resource-demanding as compared to role playing games where students play different roles (user, engineer, client, or analyst) in simulated scenarios [27]. The resource and coordination-intensive effort underlying GSE courses often prevents universities to run 'Full Immersion' courses. Such courses generally require full cooperation from other participating institutes or the industry and leave the institutes with a very limited level of control [28]. The institutes then have to find a point on the continuum below (See Figure 1).
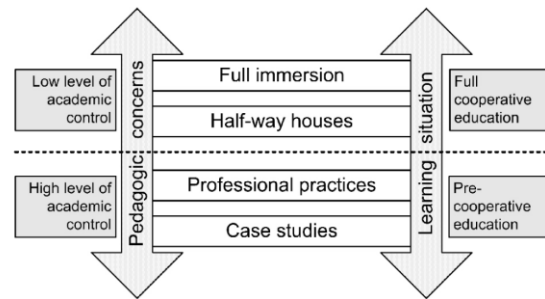


Fig 1. The co-operative education continuum [28]

Constrained by resources, the educators are relying more on cross-institutional responses as extensions to the "Half-way houses" model shown in Figure 1. These arrangements require strong cooperation with industry or among institutes but allow low level academic control [28].

## III. METHODS

In this paper, we report on two GSE studies; one performed in an educational setting on students (S1) and the other on GSE practitioners (S2). The study performed on students (S1) analyses student reflections and their experiences to understand the challenges of remote collaboration and the importance of trust and relationship. The other study (S2) was carried out on practitioners to identify GSE challenges in real life settings on two projects reported in [11]. S2 is used to compare the findings from S1.

The data for this study was collected from the instructor, course evaluations and conversations with two students about their experiences of the course. The qualitative data from the students was analysed using directed content analysis technique as described by Hsieh and Shannon in [29].

In our recent study [11] on two GSD projects, we reported the challenges faced by practitioners in GSE projects and the role of technology in remote collaboration. Using semi-structured interviews, qualitative data from 32 practitioners was collected. A Thematic Content Analysis technique was applied to draw findings from the collected data [30]. In this paper, we reflect on the findings from real life projects identified in our previous study [11] and compare them with the findings observed in the study reported in this paper.

### A. The Course Settings

This paper describes a Masters level course run at Auckland University of Technology, Global IT Project Management. The course covers the principles and pragmatics of IT project management with a focus on globally delivered projects and global virtual teams. A key topic of the course is coordination, communication and collaboration mechanisms in distributed teams. The course covered the following topics: communication; leadership; establishing trust; stakeholder management; cultural awareness; planning, execution and control; organization structure; team development; technologies that support collaboration; and time zone differences. The course was comprised of 12 two-hour meetings which were a mix of teacher directed lectures and discussion. Coursework included an individual reflective essay which required students to reflect on their own personality, leadership style, and personal cultural identity and how these impact their own behaviour and are received by others in global, multi-cultural teams.

Designing GSE courses that can provide students practical and hands-on experience on all aspects of the course is not easy. It requires a great deal of resources and extra effort (new theoretical tools, techniques and additional coordination overhead). Considering the lack of available resources in the GSE course described in this paper, a web conference was used to simulate real-world virtual meetings. This role playing technique for experiential learning was applied in this GSE course as it was relatively less resource intensive. It was aimed to promote student engagement as well as to enhance their learning experience [17].

One of the main goals of the course was to expose students to the challenges of working in distributed teams. Students worked on a large group project in teams of three or four. Each student group was comprised of individuals from multiple cultures since there was a large number of international students in the course. While the groups did communicate using various collaborative software, they also had the opportunity to meet in person regularly since they were all local to Auckland. This, of course, is not realistic of many distributed software teams.

To provide students with an authentic GSE learning experience of virtual collaboration (VC), a video conference meeting was arranged with a GSE expert. Video conferencing as a principal mode of VC comes as a second best option to face to face (F2F) meetings. Such meetings are necessary in virtually all GSE projects to reach out for experts not readily available for a F2F meeting, improve response time and save cost [31]. The down side is the difficulty of establishing trust,

added coordination overhead and the use of technology which itself can be quite challenging [32]. Because of their diverse cultural backgrounds students may find communication using videoconferencing tools (such as Skype) to be quite a challenge.

To expose students to the challenges associated with virtually collaborating with someone whom they have not met in person, a guest lecturer joined the class via Skype. The lecturer and guest lecturer (a GSE expert) were located in Victoria, BC, Canada, while the students were in their normal classroom in Auckland, New Zealand. The students did not have experience in meeting someone new via a video conference. The guest lecturer introduced some necessary information for the final project report, so it was important for the students to participate.

There was a 19 hour time difference between the two sites, so students also noticed the challenges that would occur when team members shift their schedules to ensure overlapping work time across sites.

The GSE course described in this paper had a significant number of resource constraints as is typical in the academic environment. There were no pre-established collaborative arrangements for a joint global course, skill set of the students for a GSE project were unknown and the lecturer was newly appointed and had limited preparation time. Therefore, the course could not be setup as a "Full Immersion" course [28] (See Figure 1). Furthermore, the additional cost and effort overhead required for setting up simulations tools as suggested by Monasor et al in [33] as a useful way to establish trust among distributed team members was also not possible in this study. This paper describes video conferencing as one of the ways to simulate *‘GSE-like’* settings to provide students with realistic learning experiences despite the limitations discussed above.

## IV. Findings

In this section we report the findings on the basis of information shared by the students in the GSE course and compare them with the findings reported by the practitioners in our previous research [11, 34].

### A. Challenges for the Students

In this one short virtual collaboration meeting, students reported challenges similar to findings from GSE research as described below.

#### 1) Language and Cultural Challenges

In the virtual meeting carried out in this course, language was a barrier for students communicating in English as their second language. Fearing misunderstandings that may be caused by the difficulties in expressing themselves in English, some of the students did not actively participate in the virtual meeting [1, 35].

For students cultural distance is known to affect the style of their interaction [1]. For example, in the arranged virtual meeting with the expert in this course, some students showed reluctance to ask questions and not express their opinion.

Rather they relied on their classmates to verify and confirm what was being discussed.

*"I found myself explaining what things [what the guest lecturer meant] to one of my friends as English was not the first language of that person. It was interesting."* Jacqueline

### 2) Lack of experience

The lack of prior experience of such virtual meetings was also a factor that kept some of the student participation to a minimal. They were not too comfortable to ask questions from someone because of the fact that it was a virtual meeting and also because they were interacting with a GSE expert for the first time.

*"This was something that I hadn't experienced ...I was a little bit afraid to raise questions. It was because I am meeting a person for the first time, so I was limited to what I can do as compared to her being present physically."* Marco

The effectiveness of communication with the guest lecturer was hindered due to the lack of a prior relationship with her. Not having enough knowledge about the guest lecturer as a person (or the personality) made the students a bit more conscious and reduced the quality of conversation.

*"so talking to the guest lecturer who I did not know wasn't as good as much as it could be if I was meeting a real person. I did not know who they are what they are like how they speak, what they like what they don't like, what type of a character they are. So you are always a bit cautious in the beginning."* Marco

### 3) Limitations with Tools

One of the main limitations of some virtual collaborations (the inability to see the gestures) hindered communication between the students and the guest lecturer [31]. The students considered that the inability to view the complete picture of the guest lecturer affected the quality of the conversation.

*"I could only see her face and not the whole body and couldn't see her gestures during the conversation."* Marco

One of the students recalled the incident where a student joined the conversation late. It not only interrupted the conversation but also caused delay as the person joining in had to be briefed about the conversation that had already taken place. The students experienced delay in communication as a real life GSE challenge where facilitators would have to accommodate a remote team member who would join late due to personal or technical reasons.

*"I remember we had one student who could not join us in the classroom and had to join us from Skype. There was a slight delay of bringing him in the conference call that was a bit of a challenge. It was actually quite funny because we had already started our conversation and this person joined in late. So we had to interrupt our conversation and give him a small introduction of what was discussed."* Marco

Having the experience in the classroom can help mitigate the feelings of uncertainty when the students engage in such meetings in the future. Also, the awareness of the possible challenges faced during such simulated environments can help the students to become better prepared for the real life GSE work.

*"Once you have actually done your first video conference ... based on that experience now you are more ready in terms of what to expect".* Marco

### B. Enablers of Effective Communication:Students

Trust and pre-established relationships facilitated student participation and enabled effective communication during the web conference session.

Students indicated that having the lecturer there to mediate the conversation helped them be more comfortable to interact and ask questions to the guest lecturer. Having both the lecturer and the guest lecturer collocated during the video conference also highlighted the differences between collaborating with someone you are familiar with compared to someone you have not met previously in a video conference.

*"The lecturer being there [with the guest lecturer] helped because we had [previously] interacted with her in the lectures so her being there helped in terms of us opening up and asking questions."* Jacqueline

During an in-class debrief in the following lecture, students commented on how it was much easier to talk with the lecturer because of their previously developed relationship. They noted that it was much easier to understand the lecturer's non-verbal cues as well. Students were cautious in talking to the guest lecturer because of the lack of a prior relationship. One student shared his views about the lecturer's presence with the guest lecturer during the interview. It is interesting to note that the student considered that if the lecturer was not collocated with the guest lecturer it would have caused delay.

*"If she wasn't there it would have been difficult to ask questions and slow."* Jacqueline

### C. Enablers of Effective Communication: Practioners

The insights from the students closely echo the sentiments of the interviewed practitioners [11, 34], who stated that goodwill, trust and collaborative relationships enable distributed team members to overcome technological as well as other challenges. One of the team members suggested what when trust and a good relationship is missing technology becomes an additional obstacle in distributed collaboration.

*"If there is a goodwill and an excellent collaborative relationship ... there is a shared vision and the vision to move forward. When some of those elements are lacking the technology can become an additional obstacle."* Product Owner

Practitioners stated that pre-established trust and good relationships can even be an influencing factor of project decisions. For example, the practitioners noted that they choose a leaner medium of communication (audio conferencing) over a richer medium (video conferencing) due to the freedom they needed during the meeting and also because of a lack of good relationship with the remote team.

*"We actually don't do video, we project it on the screen and have the audio on. We don't really need to look at [the vendor] video conferencing."* Business Analyst

Since the practitioners at one site did not want the remote site to know about their "quiet communication" (using paper & body signals) during the meeting they didn't not want to use video conferencing.

*"the audio conferencing is probably the most effective, mainly because we can communicate amongst each other by signals, by pointing the things on bits of paper, and by passing messages, so that we [decide] and say that we don't agree on the approach or response while the teleconference is on."* Product Owner

### D. General Student Learning

The student highlighted some other general learning related to video conferencing from the experience:

*1) Be organized. "I learnt that it is quite important to have some questions written down for the speaker and be ready for the meeting. Also have an agenda about what points are going to be discussed. So when you meet the person (online) you don't go wondering oh what do I need to talk about and what questions to raise. Just the preparation I found it to be most useful for meeting new people, doing video conferencing, that's my lessons learnt." Marco*

*2) Don't interrupt. "Always allow the speakers to finish their thoughts and ideas before jumping in or interrupting them. Keeping in mind that it is a two way communication so allowing them to finish their thought before interrupting them." Marco*

These are learning insights that may not be as clear when students are using collaborative tools only within their teams where there may already be some pre-established relationships.

## V. IMPLICATIONS FOR GSE EDUCATORS

We found that a relatively minor experience such as a single video conference meeting could be quite valuable for students. It provides the students with an opportunity to get a sense for the challenges of working in globally distributed teams, that can help trigger their reflections and can introduce some degree of reality into a more theoretical course. Integrating such an exercise in a GSE course could be a viable option for instructors who are unable to implement a full immersion style course. Based on our feedback, we provide the following suggestions for a video conference exercise:

- Invite a speaker whom the students have no prior relationship to participate from a distance.

- The lecturer should facilitate to help overcome initial hesitations and facilitate in building relationships among distributed team members.

- The lecturer should be located with the guest speaker rather than the students so that the students can more easily grasp the differences in talking to known versus unknown individuals from a distance. If geographic locations do not allow this, another option would be to have a separate

video conference session with only the lecturer being remote prior to the conference with the guest speaker.

- Plan the meeting to allow specific opportunities to engage all attendees. If participation by students is not possible during the session, allow a question and answer session at the end to seek broader engagement and learning.

- Arrange the right equipment and have the technical support available because technology may not always work as planned.

- Encourage all participants to arrive early and call in to the meeting so that they can ensure the software and connections are working fine.

- Conclude with a discussion to allow students to reflect and learn from the other students' insights.

Given the limited number of student reflections used to draw our findings, our results may not be generalizable in other GSE contexts. However, we believe that the recommendations can be useful for GSE educators having resource constraints similar to those identified in this study.

## VI. CONCLUSION

Preparing students for the unique challenges of global software engineering is an arduous task for educators. GSE courses need to be designed in a way to enhance student engagement and student learning. One such approach is the use of Experiential Learning which focuses on 'learning by doing'. It augments theoretical aspects of GSE courses with simulation or role playing to provide an authentic learning experience for students.

In this paper, we have shown that a simple exercise of arranging a virtual meeting through videoconferencing can expose the students to the realities of GSE and enable them to experience some of the challenges first hand. We believe that in GSE course designs where full immersion is not possible due to resource constraints such exercises can be incorporated to encourage greater student engagement and learning. Furthermore, reflections on such simple experiences can provide valuable insights for students as well as educators. In this paper, we have also highlighted that the quality of communication can be enhanced if the participants have a sense of trust and good relationship with members in a virtual collaboration.

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