

Remote Supervision of Engineering Undergraduates in a Transnational Programme between Scotland and China*

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Due to the nature and challenges of undergraduate teaching in transnational education (TNE) programmes, there are potential drawbacks that distance supervision may create. Indeed, various telecommunications technologies can facilitate remote supervision. However, nonverbal cues are lost in telecommunications media, which means that information and guidance from supervisors can be misjudged or poorly perceived. This is particularly important in the context of joint degree programmes between a greater number of *Western* universities and their international counterparts. Among the aims of this study was to understand Chinese student preferences towards remote supervision. Statistical analysis of data collected from 70 final year electronic engineering students clearly demonstrated that 56% of undergraduates preferred a hybrid approach, which reaped the benefits of telecommunications technology with face-to-face meetings. Furthermore, 80% of students were highly satisfied with the communications effectiveness of social media tools for their supervision purposes. Consequently, we believe that these findings can be used as a pilot model for remotely supervising engineering students in TNE programmes. Therefore, our intention is to share best practices and recommendations that have made a positive impact on undergraduate transnational learners.

Keywords: electronic engineering education; remote supervision; transnational education

1. Introduction

Many *Western* universities are currently engaged in joint TNE programmes with universities located in Asia and South America. In fact, TNE programmes in the UK are now established in all except 15 countries, including Malaysia, Singapore, China and Oman [1]. However, there are challenges in ensuring that these TNE students receive high quality training and supervision during their final year projects, which form a major component of the degree programme.

The practice of supervising students has been well documented by Bernard [2], Leddick [3], Turner [4] and Hemer [5]. Gatfield [6], Murphy [7] and Wadee [8]. For example, Bernard and Leddick provide a thorough historical review of supervision, which takes the reader back to the 1920s, where ethical codes specific to supervision were non-existent. Moreover, Eckstein and Wallerstein described the supervisory process as a chess game that has an *opening*, a *midgame* and an *end game* [9]. They defined the *opening* as a period of assessment, where both supervisor and supervisee analyse each other in terms of strengths and weaknesses. The *mid-game* was considered as a period of conflict, which involved both parties attacking, defending or avoiding each other. Finally, they argued that the

end game involves a silent supervisor who supports a more independent supervisee. Similarly, different kinds of supervision styles have been discussed by Gatfield, Murphy and Wadee. According to these authors, a supervisor might adopt different supervisory styles that depend on the supervisor's knowledge, skills or nature and level of supervision required. Since all these authors assumed on-campus face-to-face supervision, a typical TNE programme will require remote supervision.

Remote supervision has been practiced since the late 1960s, where teachers used to communicate with their supervisees via recorded audio tapes. During the past 20 years, due to the proliferation and advancement of telecommunication technology, remote supervision has now emerged as a cost-effective alternative to face-to-face supervision. However, given the challenges of supervising students and the importance that Bernard places on face-to-face or *clinical* supervision [2], how can TNE teachers ensure that student learning is not compromised?

Clearly, the increased flexibility and freedom that remote supervision brings have enabled inclusive and accessible education for students located in remote areas, where the cost of travel is high [10–12]. However, what is the impact of remote supervision on student learning, and what are the best practices that can be identified? Our study therefore reveals student expectations into how telecommunications technology can enhance remote supervision. Our findings were based on surveys that were

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completed by 70 final year engineering students who were enrolled in a TNE programme between Glasgow University and the University of Electronic Science and Technology of China (UESTC).

2. Analysis of Technologies for Remote Student Supervision

The literature has acknowledged a variety of technologies that can facilitate remote supervision, which is also referred to as *e-supervision* or *cyber-supervision* [13]. These include video conferencing, on-line management systems, telephone conferencing, email, text messaging, social media applications and others. Examples of software platforms that have been used for enabling cyber-supervision include Blackboard, BigBlueButton, Messenger, Google Hangouts, Skype and Adobe Connect. In fact, digital technologies have now enabled supervisees to create their own supervisory support network [13]. Instead of relying on the main supervisor, Wikis, blogs and social media networks have enabled supervisees to interact with other members of their research community.

Accordingly, the forms of remote supervision can be divided into a number of categories. Using the taxonomy of communications technology, we divided the methods of remote supervision in terms of interaction direction, interaction time and whether communication is written or spoken, as illustrated in Fig. 1.

According to Fig. 1, *simplex* communication refers to one-way interaction that may be in real time, or involve a delay due to the non-availability of the sender or the receiver. Thus, email and text messages are simplex forms of written communication that involve a delayed interaction between the supervisor and their student, since the receiver may be unavailable at the time of delivery. On the other

hand, we consider *electronic chat* to be duplex written communication, since participants simultaneously exchange information on-line. However, interaction in this case takes place in whole lines, instead of a word at a time, which results in intermittent communication [14, 15].

Furthermore, the approaches to remote supervision presented in Fig. 1 can either be recorded or transient. For example, a telephone conversation or a video conferencing call is a transient form of communication that is *lost* as soon as it is spoken, whereas a text message or a downloadable video is a recorded form of communication that can be retrieved or replayed at a later time. This latter form of communication can be especially helpful for non-native English-speaking students in TNE programmes.

Currently, social media tools such as Facebook, WeChat, WhatsApp and Skype are being used for remote supervision purposes. Furthermore, short messaging services (SMS) are slowly replacing emails and phone calls due to the rapid proliferation of mobile phones [16]. All the above-mentioned tools have the feature of sending and receiving audio messages, as well as file transfers. However, Skype has a distinct screen sharing facility that is extremely useful during meetings, especially when the instructor or the student needs to draw the attention of the other party to something on their screens. Moreover, all these tools have the audio and video call features, which can be used depending on the nature and need of the meeting. The missed call feature is particularly useful since it informs users about the time and date at which they were contacted.

Recently, more advanced telecommunications software has been developed, such as BigBlueButton and Zoom. These are web-conferencing tools that are meant to improve remote learning and increase student collaboration through features such as screen share, *breakout rooms* and live captioning. The live captioning option is particularly useful for enabling inclusive and accessible education to students with disabilities. Moreover, BigBlueButton and Zoom enable supervisors to save time, especially when multiple students need to be guided simultaneously. This is usually the case during the early stages of project supervision, where students need to be informed about research integrity, data management, referencing methods and plagiarism.

There is another category of *cloud*-based tools that enable supervisors and students to share, co-edit and co-create documents either synchronously or asynchronously. These software tools include Google Drive, OneDrive, Dropbox and ShareLaTeX. More advanced forms of these software tools

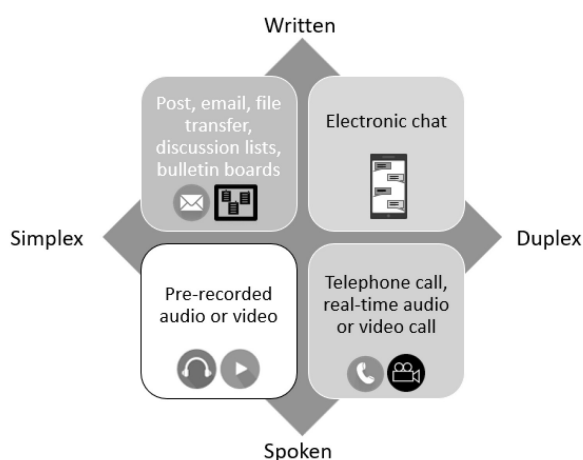


Fig. 1. A summary of the approaches that can be used to supervise undergraduate students.

include Trello and Slack, which enable a group of students to work collaboratively on documents and projects. This practice is extremely useful during the report, thesis and manuscript writing phases of a project. In this case, the track changes feature enables mark-ups, changes and comments made to a document to be shown. Moreover, these tools enable both supervisors and students to efficiently send and receive feedback. Furthermore, conversations can be saved in a systematic manner in order to facilitate project flow and collaboration.

Finally, there is third classification of *development* software tools that include Mahara, Trello and ePDP (e-personal development planning). These software programmes aim to help students keep track of their research experiences, objectives, achievements and future actions plans. Through the effective use of these software tools, supervisors can gain valuable insight into the learning experience of their students, such that they are able to adapt their mentorship process accordingly.

Despite the apparent similarity in some of the aforementioned tools, there are crucial differences in terms of their ease of use, availability and popularity in a specific country or geographic location. For example, WeChat in China is the *de facto* communications tool, whose versatility is further strengthened due to its e-payment platform [17].

Almost all Chinese students use WeChat for their daily communication needs, as well as their financial transactions in super stores, restaurants, banks and other applications. In comparison to other social media tools, WeChat is most popular in China since it is highly customised for the local needs of the Chinese people. Another important aspect is the availability of the services and the tools in a particular geographical location. For instance, Google services are restricted in China. Thus, staff and students are obliged to use alternative cloud-based services such as Baidu and OneDrive instead of Google Drive.

3. Methods

According to a survey that was completed by 36 medical students from the University of Glasgow, the most important aspects of a successful supervisor included: (a) being well-informed about the course and the research project; (b) being available and approachable; (c) being interested in the project; (d) providing comments; and (e) ensuring that the project was of appropriate size and degree of difficulty [18]. However, these were identified attributes from an on-campus Western degree programme. We therefore obtained the necessary ethical approvals from the University of Glasgow to carry out a detailed survey that aimed to under-

stand what tools and approaches engineering students prefer to use in a TNE programme between Glasgow and the University of Electronic Science and Technology of China (UESTC).

The survey also aimed to gather student opinions regarding the willingness of supervisors to adopt technologies that enable remote supervision. We invited 184 final year project students to take part in on-line surveys. All participants were final year Electronic Engineering students and the language of instruction was English. All TNE students completed their projects in UESTC. A list of student projects were proposed by staff before the start of the academic year. Examples of FYPs included designing an energy harvesting system for wearable electronic devices, designing a diffraction grating for improving the efficiency of solar cells, designing a multisensory robot for environmental monitoring and designing an energy efficient ultra-reliable low latency communications (URLLC) system. To harmonise staff and students expectations, the learning outcomes and assessment methods were discussed at the start of the project [19]. At the end of the assessment period, students had to produce a FYP report and deliver an oral presentation.

Results were obtained from 70 students completed the survey (38% response rate). This response rate easily surpasses the 12% response rate deemed acceptable for a class size of 200 for a 10% sampling error and 80% confidence level. It is also higher than the average on-line response rate (33.3%) for the evaluation of teaching and learning resources in eight different studies [20].

4. Results and Discussion

According to the on-line surveys, when final year project students were asked about the most important attribute in a supervisor, almost 63% voted for a *responsive* supervisor, as shown in Fig. 2a. Furthermore, only 6% of students chose a supervisor on the basis of their expert *knowledge*. In addition to responsiveness, students chose a supervisor on the basis of their *friendliness* and their ability to provide *encouragement* (11.4%).

In fact, nearly all final year project students disliked the idea of professors who solely supervised their students remotely (4.3%), as shown in Fig. 2b. Interestingly, when asked about their preference regarding the method of supervision, 56% of final year project students preferred a combination of remote and face-to-face supervision. Moreover, the majority of students preferred to meet at least once every month (87%), as shown from the responses in Fig. 2c. In fact, the use of telecommunications technology can cater for the needs of students who prefer to meet with their supervisors on a random or

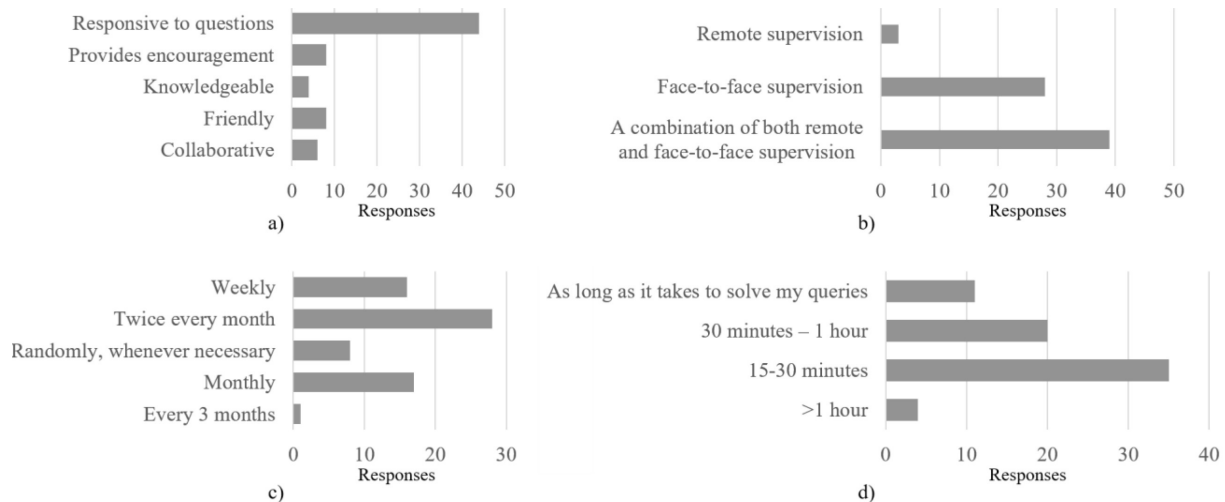


Fig. 2. Students' response to: (a) what is the single most important attribute of a good supervisor?; (b) what type of supervision do you prefer?; (c) how often do you think it is necessary to arrange face-to-face meetings with your supervisor?; and (d) how long should the meetings with your supervisor last?

ad-hoc basis, as indicated in Fig. 2c. This is perhaps most important during the initial stages of a final year project, where students need plenty of support in the beginning. As for the duration of the meetings, 50% of students prefer to meet with their supervisors for 15–30 minutes. Less than 6% indicated that meetings should exceed one hour. Similarly, almost 16% indicated that there should be no time restrictions. Supervisors should devote as little or as long time needed to resolve a student's questions, as shown in the results of Fig. 2d.

It is, therefore, obvious that TNE students prefer to see the facial expressions of their supervisors during their meetings. This is sometimes important for students who are not native English speakers, as

shown from the results in Fig. 3a. Rather than sending critical written feedback to supervisees, which can have a damaging effect on the supervisees [21], we recommend that supervisors adopt the mixed use of text and voice messages.

Consequently, it appears that any form of successful supervision needs to ensure that a supervisor can provide timely feedback and guidance. The range of previously mentioned telecommunications tools can ensure that this takes place. However, for remote supervision to be successful, participants need to be well versed in technology. This was confirmed in a study by Chapman, who indicated that their participants were already skilful users of technology and were quite familiar with on-line

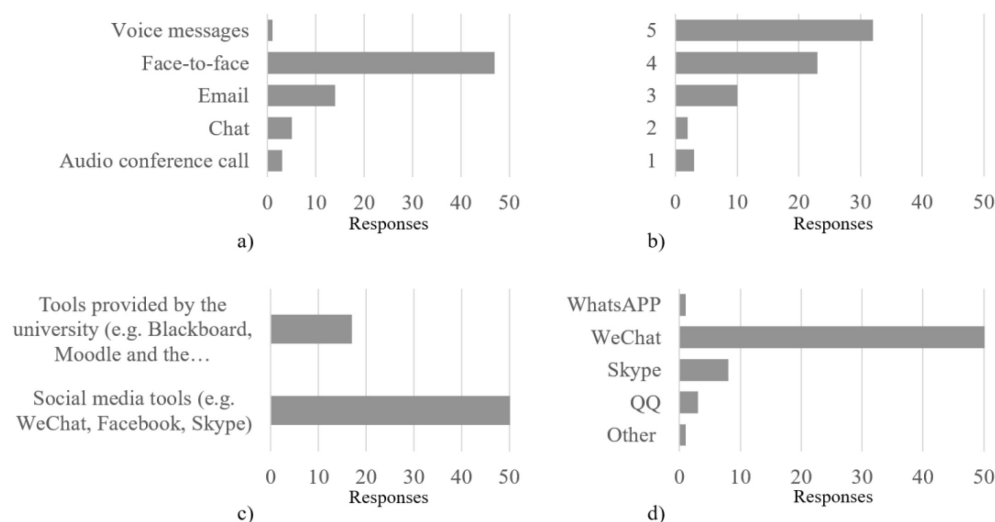


Fig. 3. Students' responses to: (a) which method of communication do you prefer to use with your supervisor?; (b) on a scale of 1 to 5, how strongly do you support the use of modern communications tools to facilitate on-line learning?; (c) given that you had to use software tools for your remote supervision, which type of tool would you prefer?; and (d) which type of voice/video communication tools do you prefer for your remote supervision?

education techniques [22]. Since this is not true for everyone, they cautioned that their results might not be similar for everyone engaged in cyber-supervision. In fact, the vast majority of students expect that their supervisors are welcoming and supportive of using modern communications tools to facilitate on-line or virtual meetings, as shown in Fig. 3b.

Given the choice, approximately 76% of students prefer to use social media tools rather than tools provided by their university to communicate with their supervisors, as shown from the results in Fig. 3c. These findings are important for faculty members in Western countries to consider, especially those who are still not inclined to adopt social media tools into their teaching practices due to *cultural resistance, pedagogical issues or institutional constraints* [23].

Furthermore, given the restrictions to various social media applications (such as Twitter and Facebook) in China, it was important for us to understand what applications students prefer to use locally. According to our survey, the overwhelming majority (80%) of students prefer to use WeChat, as shown from the results displayed in Fig. 3d. Other local social media applications include QQ, which received approximately 7% of student responses. QQ is an application that is supported by one of China's largest Internet service providers, which is called Tencent Holdings Limited.

Similarly, students can appreciate that both parties need to understand each other in order for the supervisory process to succeed. Any technology will not be useful unless both parties can understand each other. In the case of a TNE programme with a Western university, both parties therefore need to be competent in the English language.

Nevertheless, there are three important limitations to this study. The first is concerned with the nature of the projects. Our study has been confined to electronic engineering students. It did not consider the preferences of FYP students in other engineering disciplines, such as civil, mechanical or aerospace engineering. Such projects might

require more extensive student-supervisor discussions. Second, this study was confined to the experiences of students in the Glasgow College UESTC programme. It did not consider the preferences of other TNE students in Chengdu or China. Third, our study only focussed on the experiences of FYP students in an undergraduate electronic engineering programme. It did not consider the preferences of post-graduate students, who might need other supervisory requirements.

5. Recommendations

Solely relying on the technical features of a software programme will not ensure successful remote supervision. In fact, to ensure successful remote supervision of TNE students, staff and students need to carefully choose telecommunications solutions that are best suited to the culture and background of the students as well as the tool's popularity, availability and ease of use. As previously mentioned, this study aimed to understand what tools are best suited to the culture and background of Chinese students who are physically located in Chengdu.

The main challenges that have been identified by the surveyed TNE students can be grouped into four main areas. These challenges were concerned with: a) sending and receiving timely feedback; b) the learning curve required in using a new telecommunications tool; c) poor internet connectivity; and d) difficulties with understanding communication. Based upon the findings of the research, the authors have developed a set of recommendations for TNE programmes, which are summarised in Table 1.

6. Conclusions

This article highlights the importance of harmonising the expectations of both students and supervisors in the context of a successful TNE programme. Our study confirms that the most important attribute of a successful supervisor is the provision of timely feedback. In the case of a

Table 1. Recommendations for remotely supervising TNE electronic engineering students

Challenges				
	Timely Feedback	Learning Curve	Poor Connectivity	Communications Difficulty
Recommendations	Bi-monthly meetings. Meetings <30 minutes in duration. Use video conferencing tools and collaborative platforms where local staff/students can engage with one another. Examples of telecoms tools include Baidu, Skype, OneDrive and WeChat.	Use of telecoms tools that students are already familiar with. Social media tools and platforms that are used in regular daily activity. Examples of telecoms tools include WeChat and QQ.	Set up dedicated labs and meeting rooms with high speed connections. Labs and meeting rooms must have appropriate telecoms tools installed, such as Skype, WeChat, Baidu and OneDrive.	Duplex forms of communication to overcome language barriers and to provide students with sufficient time to absorb feedback. Text and/or voice messages. "Hybrid" clinical and remote supervisions.

TNE programme, where there is a lack of shared time and physical space, we have concluded that communication via social media tools is just as effective as face-to-face meetings. The content and flexibility that social media applications can now offer enable its users to communicate in a variety of methods. For example, applications such as WeChat enable its users to exchange voice, images, videos and documents all as part of a text message. We are therefore convinced that the appropriate use of telecommunications tools will enable supervisors to provide students with the necessary feedback than can be easily digested. Rather than sending critical written feedback to supervisees, which can have a damaging effect on the supervisees, we recommend that supervisors adopt the mixed use of both text and voice messages.

This can be particularly beneficial in dealing with passive students or those who are inhibited from asking for help when problems arise. In these circumstances, the authors believe that recorded voice messages can be better than email or text. They are also convinced that a hybrid approach that combines occasional face-to-face supervisions with cyber-supervision can be an effective approach to improve the quality of supervision.

In terms of the technologies, rather than relying on services provided by the university, students clearly prefer to use social media tools to communicate with their supervisors. The type of social media tool will vary from one country to another. In the case of China, 80% of students prefer to use WeChat.

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