

Global Engineers, Global People? Integrating intercultural learning outcomes in the engineering curriculum

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INTRODUCTION

Against a background of continuing globalization, business leaders have repeatedly called for graduates to have 'global competencies', particularly communication skills and the ability to work in diverse teams [1,2,3]. Despite these calls, official learning outcomes for engineering programs in Flanders, Belgium, as elsewhere in Europe, rarely go beyond token phrases like 'operating in an intercultural environment' or 'having insight in working in an international environment' [4,5]. While such 'placeholder' terminology may be a sign of a more general wish to instill these qualities in engineering students, it offers no direction as to just how engineering educators should go about attaining or assessing these learning outcomes. Therefore, there is a clear need to identify or develop a valid competency framework for operationalizing learning outcomes in connection with working in an intercultural environment in the engineering curriculum.

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First established in 2009 after two phases of data collection (2003-7) and analysis, the Global People Competency Framework [henceforth *GPCF*] is a comprehensive and concrete set of resources and models for both students and educators for nurturing intercultural competence [6]. It was developed out of the intercultural interaction experiences of staff at British and Chinese universities when they were collaborating on a number of joint teacher training projects. Having emerged from a relatively limited context in terms of nationality (British, Chinese) and sector/discipline (education), its suitability for use in different contexts needs to be investigated. This study is the first to do so systematically.

In this paper, the authors present ongoing research on the suitability of *GPCF* for engineering curricula by investigating student reception of the framework and exploring whether there are areas where adaptation would be beneficial.

1 BACKGROUND

It has been acknowledged in journals of engineering education that there is a need for intercultural learning goals and outcomes [2,7]. There are nonetheless various ways in which this need could be addressed. Rather than developing a wholly new framework of outcomes, the approach taken here focuses on engineering students' reception and ongoing understanding of an existing and fully elaborated framework of intercultural learning goals.

An important premise of this approach is the belief that the success of any framework of learning outcomes or developmental competencies stands or falls with the degree to which each acquisition thereof can be grasped by students, by way of its terminology and by way of its examples. Accordingly, focusing on engineering students' reception of an existing framework provides the opportunity to ask whether such prescribed competencies truly speak to the students' world and the students' concerns. With what facility are students able to relate to examples, and to provide similar examples of their own?

There are a number of factors that make the *GPCF* an attractive model of intercultural competencies and learning outcomes for engineering students. The first is that the *GPCF* can be understood as 'project-driven' in two senses; as project-based and as project-oriented. The *GPCF* is project-based because it is not just a product of armchair reflection but the result of researching a five-year professional collaboration between UK and Chinese higher education institutions. It is project-oriented in the sense that it can work as a toolbook, directing people to think about what sorts of intercultural situations may arise in project work [8], making it particularly relevant to an engineering education context. In our view, such a project-oriented focus is seldom employed in current frameworks of intercultural competencies.

Second, the *GPCF* is made attractive by the fact that it possesses considerable granularity when it comes to both its categorization and its own exemplification of intercultural competencies. It does not stop short at broad, catch-all headings, and instead offers four main clusters ["Knowledge and ideas," "Communication," "Relationships," "Personal qualities and dispositions"] containing twenty-two detailed descriptors of intercultural interaction. It thereby shows a willingness to engage with the complexity of intercultural encounters. Moreover, it is a framework rich in examples, which can offer firm footholds for students and instructors alike.

2 METHOD

2.1 Participants

In 2012 data was collected from 262 students of engineering at Groep T in Leuven, from both Flanders and abroad (mainly Asia, most of whom Chinese) towards the end of a semester-long intercultural communication module that students take in the second year of their bachelor program. The main objectives of this course (1,5 ECTS) are to raise student awareness of how interculturality plays a role in their personal and professional lives and to develop strategies for being effective at communicating across cultures. The class setting itself provides an important forum for this exercise as the course is taught in English so that students from the Dutch and the English program tracks can be mixed in newly-composed class groups of about twenty students. When the students completed the questionnaire, they had been introduced to some essentialist (e.g. R.D. Lewis' *When cultures collide*) as well as non-essentialist (e.g. A. Holliday, M. Hyde & J. Kullman's *Intercultural communication*) approaches to intercultural communication. They had also carried out a team assignment (ethnographic field work, interviewing, staging an intervention, ...) focusing on an intercultural encounter of their choice.

2.2 Data collection

As a course requirement, all students filled out a web-based questionnaire on LimeSurvey, consisting of four sections: (a) biodata (name, nationality, main language spoken at home, age, gender); (b) five 5-point Likert-type questions, ranging from 'strongly disagree' to 'strongly agree', for assessing their attitudes towards the comprehensibility, relevance, coverage and usability of the GPCF, with usability referring to the framework's power of revealing insight in behavior as well as to its applicability in practical situations; (c) four open questions to elicit examples of how GPCF helped students to understand their own and other people's behavior and to handle intercultural situations; and (d) two concluding open questions, asking students to identify lacunas in GPCF and suggest improvements. Students were instructed to complete all questions but were assured that the attitudes that they expressed would not affect their score for the course. They were also informed that their answers would contribute towards the on-going validation of the GPCF by the Centre for Applied Linguistics at the University of Warwick.

2.3 Data analysis

Student responses to the closed questions were categorized according to geographical origin, contrasting the responses of the Belgian (n=213) and the Asian (n=42) students, while leaving out the small number of responses of other origins (n=7). The Likert scale responses were then collated into a smaller set of three categories: 1) disagree or strongly disagree, 2) neither agree nor disagree, and 3) agree or strongly agree.

In a second phase of analysis, students' answers to open questions were analyzed using NVivo. Students responses were coded for mention of the specific framework clusters such as "Communication," "Knowledge," and "Relationships," as well as for coverage of indicators of comprehension and application, such as "examples," "growth," "recommendations," and "advice." These outputs were qualitatively examined for frequency of citation of the GPCF and for critical instances of student reflection on the framework.

3 FINDINGS

3.1 Student ratings of understandability, relevance, coverage, and usability

The data in *Table 1* indicates a widely positive reception of GPCF by the students on all four dimensions: understandability, relevance, coverage, and usability. While the Belgian home students and the Asian abroad students assign similar ratings to the usability of the framework in helping them to understand what it takes to be interculturally competent, the Belgian home students report lower usability scores when it comes to putting this into practice. Another finding is that the Asian abroad students tend to assign the higher ratings except for when they are asked about the extent to which the framework covers their personal experiences.

Table 1. Student ratings of understandability, relevance, coverage and usability

understandability	1. I found the Global People competency framework easy to understand		
	(Strongly) Disagree	Neither (Dis)Agree	(Strongly) Agree
All (n = 262)	10.7%	37.8%	51.5%
Belgian (n = 213)	10.8%	39.4%	49.7%
Asian (n = 42)	11.9%	23.8%	64.2%
relevance	2. Very few of the skills/personal qualities described in the Global People competency framework were relevant to my personal intercultural experiences		
	(Strongly) Disagree	Neither (Dis)Agree	(Strongly) Agree
All	49.3%	39.7%	11.1%
Belgian	47.3%	41.3%	10.3%
Asian	54.7%	33.3%	11.9%
coverage	3. In my personal life, I have experienced intercultural situations that did not seem to be covered by the Global People competency framework		
	(Strongly) Disagree	Neither (Dis)Agree	(Strongly) Agree
All	47.7%	34.7%	17.5%
Belgian	51.6%	34.7%	13.6%
Asian	31.0%	35.7%	33.3%
usability 1	4. Studying the Global People framework has helped me to understand the range of skills and personal qualities needed to handle intercultural situations effectively		
	(Strongly) Disagree	Neither (Dis)Agree	(Strongly) Agree
All	9.5%	27.1%	63.3%
Belgian	9.8%	28.2%	61.9%
Asian	9.5%	21.4%	69.1%
usability 2	5. Becoming familiar with the Global People competency framework has helped me handle intercultural situations more effectively		
	(Strongly) Disagree	Neither (Dis)Agree	(Strongly) Agree
All	14.9%	35.9%	49.3%
Belgian	15.9%	39%	45.1%
Asian	9.5%	21.4%	69.0%

3.2 Student references to intercultural competencies

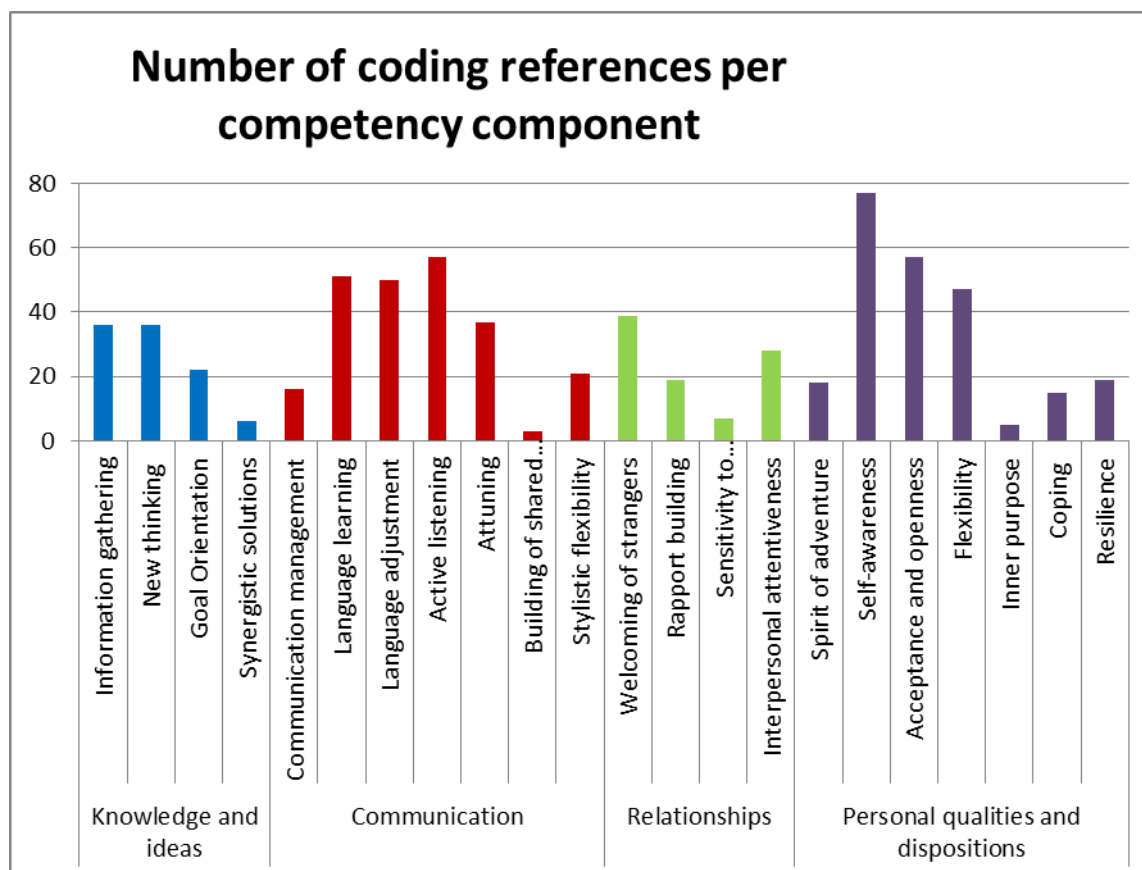
In their answers to the open questions the students referred more frequently to the clusters 'Communication' and 'Personal Qualities and Dispositions' than to the two remaining clusters, both in absolute numbers and after correcting for the number of competency components per cluster (*Table 2*).

Table 2. Distribution of coding references over competency clusters

Cluster of competencies	Number of coding references	Number of components	Average number of coding references per component
Knowledge & ideas	102	4	26
Communication	281	7	40
Relationships	100	4	25
Personal qualities and dispositions	242	7	35
Total	725	22	

Likewise, the most frequently cited competency components also belong to the stated clusters: active listening (n=57), language learning (51), and language adjustment (50) for 'Communication', and self-awareness (77), acceptance and openness (57), and flexibility (47) for 'Personal Qualities and Dispositions' (*Figure 1*). The least cited components, however, are distributed over all four clusters: sensitivity to social/professional context (7), synergistic solutions (6), inner purpose (5), and building shared knowledge (3).

Figure 1. Distribution of coding references over competency components



3.3 Student recommendations

In the two concluding questions students were asked to identify lacunas and suggest improvements to the framework. As for the suggested improvements 56 references were coded, of which 23 constituted a request for expanding the examples to other contexts (regions, projects, domains) or for increasing the number of examples for each competency. In addition, the following recommendations were made by four to six students each: to simplify the language in which the definitions are phrased, to simplify the framework itself, to expand the advice section at the end of each competency, and to improve the website by including video and interactive features. Students could not name any competencies that should be added to the framework and frequently referred to their limited personal intercultural experience as an explanation.

4 DISCUSSION

The results from the questionnaire indicate that the GPCF provides a suitable basis for operationalizing intercultural learning outcomes for engineering students, even in the early stages of their studies. Both the Belgian home students and the Asian abroad students consider the framework easy to understand, relevant to their experiences, and useful in understanding and in guiding behavior in intercultural encounters. On some accounts the ratings reveal differences between both groups and it needs to be explored further to what extent these differences are related to the origin (Belgium or Asia, particularly China), the status of the student (home student, abroad student), or other factors. In addition, some competencies and clusters of the framework were less frequently referred to than others. Could that be because those competencies are simply less relevant in their lives at this moment? Or is the explanation to be sought in the framework itself, perhaps a consequence of intricate language, an unclear illustration, or a construct that is particularly complex to comprehend?

In order to gain insight into these and other processes, we need to explore in more detail the 725 references that have so far been coded in the responses to the open questions. Together these references constitute a promising collection of vignettes as indicators of success (or failure) in intercultural encounters, in which students narrate how the GPCF has helped them to understand their past behavior and to guide their current and future behavior in intercultural encounters. An initial investigation seems to suggest that in order for students to grow aware of intercultural competence, it is important that they can relate the competencies they learn about to personal experiences that are characterized by a recognizable degree of 'strangeness'. It is through their experiences that students see how they can apply the framework. As an example the following verbatim account of a male Belgian student demonstrates how the competencies 'information gathering', 'flexibility', and 'self-awareness', combined with personal experience, can help develop new personal qualities:

I think the information gathering topic is very useful. Before you work with for example Chinese students it is very useful if you know that they are, as we say in our culture, shy. They will not lead a team meeting, maybe because they are in a strange country I don't know, but to me they act a bit shy. The fact that I now ask them to divide the tasks, and ask them to explain their task so I know they understood it has made me quite flexible towards their culture (flexibility). I'm aware of the fact that their culture is different, and that it seems quite strange to us (self-awareness).

The students' clear calls in the questionnaire for additional and recognizable illustrations of the defined competencies is a further indication of the prominence of concrete experiences in the intercultural learning process.

5 CONCLUSION

In this paper we provided evidence that the GPCF constitutes a suitable competency framework for operationalizing learning outcomes in connection with working in an intercultural environment in the engineering curriculum. Engineering students, both home and abroad students, indicated that they find the framework comprehensible, relevant, and applicable. We also presented findings that suggest it is vital to confront our students with the intercultural in conjunction with the competency framework, no matter which framework engineering educators may eventually turn to.

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