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COMMUNICATION APPREHENSION IN UK ENGINEERING STUDENTS; A COMPARATIVE STUDY

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Abstract

This study compares and contrasts the levels of communication apprehension of engineering, business, and accounting students. Employers consider graduates to be unprepared for employment and lacking vocational skills. A common demand from them is for the curriculum to include 'communication skills'. Current thinking in communication has indicated a split between communication apprehension and communication development. There are indications that techniques aimed at the development of communication skills will not necessarily resolve communication apprehension. Therefore, in order for the effective development of communication skills to take place it is necessary to diminish the level of communication apprehension that an individual may feel. This study builds upon the work carried out evaluating communication apprehension in undergraduate accountancy students, by comparing accountancy students with engineering and business students. Parallels have been found with accounting students, another numerate discipline. Students in Business Studies (a less analytical discipline) appear not to have the same difficulties.

Introduction

There have been increasing calls for Higher Education to align its processes and products more closely with the needs of industry. Surveys of the opinions of employers in the UK such as those by Roizen and Jepson[1] and Brennan and McGeever[2] indicated that employers considered graduates to be unprepared for employment and lack vocational skills. A common demand from employers is for the curriculum to include 'communication skills', both as a specific skill in its own right and also because of the central role that communication skills could play in developing other desirable attributes.

Current thinking in communication has indicated a split between communication apprehension and communication development. The former is the fear of actually communicating whilst the latter is the ability to maintain and improve an individual's performance. There are indications that techniques aimed at the development of communication skills will not resolve communication apprehension, and that if an individual has a high level of communication

apprehension the techniques will not result in improved communication performance. Therefore, in order for the effective development of communication skills to take place it is necessary to diminish the level of communication apprehension that an individual may feel. Much work has been carried out evaluating communication apprehension in undergraduate accountancy students, and it has been suggested that the conclusions reached might be transferable to other 'numerate' professions. This study compares and contrasts the levels of communication apprehension of engineering, business, and accounting students.

The importance of communication for the engineering student

In 1980 Sir Monty Finniston[3] undertook a major review of the need for engineers, the type of engineering expertise required and the framework for the formation of engineers. He found that professional engineers:

> "...expect to find themselves taking part in, and responding to a more participative process of change, through joint discussions of their work and its impact and effects at many levels...This wider role will require that engineers develop appropriate skills in the following areas:
> - the ability to express and communicate both verbally and in writing
> - managing and participating in meetings
> - mastery of cost and budget information"

The UK Engineering Council is committed to regularly reviewing and updating its regulations for the accreditation of undergraduate courses. The engineer in industry must be "an authority on technology, a leader of others, a communicator" [4]. In the early 1990s the Council embarked upon a fundamental review of the role and formation of professional engineers. The outcomes were published in a new edition of SARTOR (Standards and Routes to Registration) in 1997[5]. This introduced many changes, many of which are not relevant to this study but one of the fundamental new features was an explicit requirement for accredited programmes to develop and assess student transferable skills within the curriculum:

> "All accredited engineering courses must provide for the personal and professional development of students. As all engineering students will not necessarily seek careers in engineering, the emphasis should be on personal development" [5].

It would be good to think that the focus on communication skills over the last 20 years, to meet the accreditation requirements of the professional body, has led to engineering graduates meeting the expectations of employers. However, this is not the case: students[6] and employers[7, 8] have indicated that concerns still exist. The lack of progress over the past two decades lends weight to the argument that perhaps it is not a fundamental lack of skills development that is the issue, but it is the barriers to communicating that need to be addressed.

Communication apprehension

Stanga & Ladd [9] state that despite the importance of communication skills, relatively little is known about the obstacles that students face when attempting to develop their communication

abilities. One of the major obstacles is communication apprehension (CA). Communication apprehension is a widely researched area. Payne and Richmond [10] found nearly a thousand studies in the area. McCroskey [11] defines CA as "an individual's level of fear and anxiety associated with either real or anticipated communication with another person". Individuals who are apprehensive about participating in communicative situations are less able to communicate effectively. Richmond and McCroskey [12] described people who had high levels of communication apprehension as being afraid to communicate and consequently, because it is natural to avoid things they fear, are quiet.

Allen and Bourhis [13] explored the area further and their findings indicated a consistently negative relationship between the level of CA and communication skills. Their results showed that individuals who register higher levels of communication apprehension tend to avoid encounters, display poor cognitive processing during interactions, are perceived as less confident and are characterised as being inattentive and unable to recall important information. Spitzberg and Cupach [14] also noted the effect of communication apprehension on overall communication competence. They reported that the extent to which an individual is free of CA will be influential in determining the level of his/ her communication competence. Boorom, Goolsby and Ramsey [15] argue that CA is not a communication competence but a low level of apprehension is considered to be a necessary, but not sufficient condition, for achieving communication competence.

Richmond and McCroskey [12] have typified CA as being "trait" or "state". An individual's general unease in communication situations is seen as being a personal "trait", whereas the fear of communicating in specific situations is referred to as "state". Individuals will exhibit both types of CA: they will have a general trait level of CA plus a state reaction to the specific context in which they are attempting to communicate.

The trait typology is supported by Biggers and Masterson [16], who indicated that this would predispose certain individuals to higher levels of anxiety.

The state typology is seen as being situational and is a "transitory orientation toward communication with a given person or group of people": McCroskey [11]. It is not personality based but is a response to situational constraints generated by the perceptions of the other person or persons in a communication situation.

Research method

Various forms of CA have been identified and investigated. The basic split is between oral (OCA) and written communication apprehension (WCA). In order to assess levels of communication apprehension a questionnaire was constructed that was based on the Personal Report of Communication Apprehension (PRCA-24) developed by McCroskey [11] and the instrument developed by Daly and Miller to measure OCA and WCA respectively (both instruments can be found in Simons, Higgins & Lowe [17]. The resulting instrument has two main parts. The first part was designed to gather personal data:

· Age.

· Gender.
· Year / course.
· Previous educational background.
· Self-rating in terms of overall academic ability.

The second part of the instrument consisted of a 48-item questionnaire (with responses being on a 5-point Likert scale). This was divided into two sections: 24 writing communication questions and 24 oral communication items. The oral communication items consisted of four equal subsections that assigned 6 questions each to "interviews", "presentations", "group discussions" and "conversations". The first two categories being described as 'formal' and the latter two as 'informal' contexts. In order to avoid any confusion or misunderstanding of these categorisations a definition of each relevant term was stated on the questionnaire. Interested parties are welcome to correspond with the authors regarding details or to obtain a copy of the questionnaire.

The questionnaire was distributed during a single academic year to a total of 928 students on Engineering, Accounting, and Business Studies degree programmes at Sheffield Hallam University.

Results

Responses were received from 312 Engineering, 236 Accounting and 380 Business Studies students. The analysis of the population in terms of previous educational background is shown in Table 1.

Table 1: Educational Background of students

Educational Background	Accounting	Business	Engineering
Mainly numerate/scientific	32%	6%	65%
Mainly literate/humanities/arts	8%	26%	1%
Mix of the above	60%	68%	34%

There were clear differences between the three groups of students. The engineering group of students has a much higher percentage of male students than the other two areas. The engineering group also has a much higher percentage of mature students. It can also be seen that the Engineering students have a predominantly numerate/ scientific educational background whilst Accounting and Business Studies students come predominantly from a mixed numerate/ literate educational background.

The students were asked to rate their own academic ability in comparison to their fellow students. Their responses are shown in Table 2.

Table 2: Self Ranking of Academic Ability

Ability Ranking	Accounting	Business	Engineering
Much better	5%	3%	7%
Better	18%	17%	29%
Average	73%	78%	56%
Worse	4%	2%	8%

A noticeable difference between the three groups of students is the greater spread of responses from the Engineering students. The Engineering students were more willing to differentiate their personal academic ability from that of their colleagues than the Accounting and Business Studies students were.

The mean CA scores for the Business Studies and Engineering students, the difference between the mean scores, and the significance of the differences as analysed by the t-test (parametrical) are shown in Table 3.

Table 3: Mean Scores and Tests of Significance (Business Studies v Engineering)

	Business	**Engineering**	**Mean Dif.**	**t-test p**
Total CA	126.90	132.89	-5.99	0.000
1. **WCA**	62.68	67.21	-4.53	0.000
2. **OCA**	64.22	65.68	-1.46	n.s.
2.1. Formal OCA	37.00	35.39	1.61	n.s.
2.1.1. interviews	17.67	17.54	0.13	n.s.
2.1.2. presentation	19.33	17.85	1.48	0.000
2.2. Informal OCA	27.22	30.29	-3.07	0.000
2.2.1. groups	13.86	15.02	-1.16	0.000
2.2.2. conversation	13.36	15.27	-1.91	0.000

The table shows that the Engineering students have a significantly higher level of total communication apprehension than the Business Studies students. The predominant factor is that the Engineering students have significantly higher written communication apprehension (WCA). Although there is not a significant difference in the overall scores for oral communication apprehension (OCA) there are differences in the sub sections. Within the Formal OCA classification it can be seen that there is a significant difference for “Presentations”: the Business Studies students have a significantly higher level of communication apprehension. This is reversed in the case of informal situations where in both “groups” and “conversation” situations the Engineering students had significantly higher levels of communication apprehension.

The scores of the Engineers were then compared against those of the Accounting students. The scores for the Engineering students compared with Accounting students, the difference between their means, and the significance of the differences as analysed by the t-test (parametrical) are shown in Table 4.

There are no significant differences in the scores for total communication apprehension or in the constituent categories of written and oral communication apprehension between Engineering and Accounting students. The only significant difference is in OCA in formal situations where the accounting students have higher levels in both “interviews” and “presentations”.

By using the information gathered in the first section of the questionnaire it was possible to analyse the data by specific factors to test if they are any significant relationships with communication apprehension.

Table 4: Mean Scores and Tests of Significance (Accounting v Engineering)

	Accounting	Engineering	Mean Dif.	t-test p
Total CA	135.13	132.89	2.24	n.s.
1. **WCA**	67.70	67.21	0.49	n.s.
2. **OCA**	67.43	65.68	1.75	n.s.
2.1. Formal OCA	37.84	35.39	2.45	0.000
2.1.1. interviews	18.83	17.54	1.29	0.001
2.1.2. presentation	19.01	17.85	1.16	0.004
2.2. Informal OCA	29.59	30.29	-0.69	n.s.
2.2.1. groups	14.70	15.02	-0.32	n.s.
2.2.2. conversation	14.89	15.27	-0.38	n.s.

In Table 5 the CA scores for the three groups of students are analysed by the self-rating of the student's own overall academic ability when compared to fellow students.

Table 5. CA by Academic Self Rating for Engineering Students.

		Engineering		Accounting		Business	
	Self rating	**Mean**	**Anova**	**Mean**	**Anova**	**Mean**	**Anova**
Total	much better	131.64	0.024	119.66	0.000	117.72	0.000
	better	128.55		124.45		119.00	
	average	134.01		137.68		128.60	
	worse	141.88		152.40		144.01	
WCA	much better	63.50	0.031	60.08	0.002	58.36	0.000
	better	65.58		64.43		59.02	
	average	67.77		68.53		63.35	
	worse	72.64		76.60		74.88	
OCA	much better	68.14	0.048	59.58	0.000	59.36	0.010
	better	62.97		60.02		59.98	
	average	66.24		69.15		65.25	
	worse	69.24		75.80		69.13	

The results for both Accounting and Business Studies students exhibit the same trend, that is, the higher the academic self-confidence of the students, the lower their communication apprehension. The Engineering students do not register this trend in OCA and consequently this is also reflected in total communication apprehension. However, the trend for the Engineers is the same as for the other two groups in WCA. It is noticeable that although, as mentioned earlier, the range of academic self rating by the Engineers was much greater than the other two groups their range of mean scores as shown above is much less than for the others. For example, in the case of oral communication apprehension the range of mean scores for Engineers is 5.17 (that is 62.97 to 68.14) as against 16.22 (75.90 to 59.58) and 9.77 (69.13 to 59.36) respectively for Accounting and Business Studies students.

Discussion and conclusions

The introduction to this paper suggested that previous work analysing communication apprehension amongst accountancy students may be transferable to students in other numerate professions. This work therefore contrasts the predominantly numerate accounting and engineering students with business students.

The students' self-rankings of academic ability (Table 2) indicates a notable willingness to discriminate by the engineers. One might argue that students in numerate disciplines would naturally be more 'self aware' of their ability (answers are often 'right' or 'wrong', with little room for varying degrees of correctness), but if that argument holds true, then similar responses would be expected from the accounting students. However, the maturity of the engineers surveyed might also explain their greater self-awareness. In addition it might also be expected that the emphasis given to analytical problem solving (the need to apply imagination and innovation within a numerical context) within engineering courses may lead engineering students to demonstrate a more reflective approach than that reported by the accounting students. Further work has already started that will analyse this in more detail by tracking students in a longitudinal study over the duration of their undergraduate studies.

Tables 3 and 4 give an overview of students in the three disciplines, and their attitude towards communication. Engineers and accountants displayed very similar characteristics, but the engineering students were more comfortable in a formal environment. This is perhaps to be expected, given the almost entirely numerate background of the engineering students (Table 1). Numerical analysis is generally well structured and the similarly structured framework of interviews and presentations may set the engineering students more at ease (i.e. the certainty of the domain giving reassurance). The more diverse educational (60% mixed) background of the accounting students might account for the difference. There are however, more significant differences between the engineering and business students. The engineers display significantly higher levels of total communications apprehension. In particular, the engineers are uncomfortable about communicating in writing. Additionally, the engineers do not feel comfortable in informal oral communication (unstructured environments), whereas the situation is reversed in the formal (interviews and presentations) situation. It would appear that the formation of engineers does not encourage or support communication in discursive, informal or unpredictable environments. This view is reinforced by similar traits in accounting students.

The relationship between academic self-rating (perhaps better described as academic self-confidence) and communication apprehension is articulated in Table 5. In written communication apprehension, all three groups of students exhibit the same trend; apprehension increases as academic self-confidence decreases. This is not surprising; one would perhaps expect the weaker students to find writing more difficult. However, the same trend is not found in oral communication. Here, the self-rated 'better' engineers recorded significant concern about speaking. This perhaps reflects their wish to analyse and evaluate a situation before committing themselves, and thus they may feel better writing (planned and structured) than speaking (ad-hoc and reactive). This trend in oral communication swamps the written communication results, thus influencing the overall results.

In summary, it is possible to draw a number of broad, general conclusions. It would appear that students studying numerate disciplines prefer more formal communication environments. Similarly, a numerate background prior to higher education indicates the likelihood of increased total communication apprehension, and more particularly, a fear of writing. Furthermore, engineering students, irrespective of their background are apprehensive about writing. Whilst these conclusions may not be particularly surprising, they do provide clear evidence to support the experiences that have been reported by the employers of new graduates.

For many years, the engineering education community has focused on building opportunities for students to develop communication skills as an integral part of the undergraduate curriculum. This study indicates that, even after some two decades of 'reform', engineering students are still apprehensive about communicating, and employers are still reporting weaknesses in the communication abilities of new graduates. Parallels have been found in accounting students, another numerate discipline. Business Studies students appear not to have the same difficulties. One might therefore argue that opportunity for communications practice does not remove communications apprehension. The implication for higher education may therefore be a need to work at removing the fear of communication, rather than providing communication practice. Longitudinal studies of engineering, business and accounting students are now under way to correlate actual academic performance (rather than self-rated ability) with communication apprehension, and to furthermore formally evaluate the success of schemes which provide practice in communication skills. The team at Sheffield Hallam are actively reviewing their communication skill support tutorials in the first year of undergraduate study in order to pilot schemes addressing fear of communication. In addition, the University has embarked upon an academic restructuring exercise in which communications and engineering staff have been brought together in a single faculty. In addition, one of the authors has just been appointed as Head of Learning and Teaching in the new faculty, with the development of student learning skills as a central theme in his job description.

References

1. J. Roizen and M. Jepson, Degrees for Jobs: Employer expectations of HE, SRHE/ NFER - Nelson, Guildford (1985).

2. J. Brennan and P. McGeever, CNAA Graduates: Their employment and their experience after College, CNAA Development Services, no13, (1987).

3. M. Finniston, Engineering Our Future; Report of the Committee of Inquiry into the Engineering Profession, London, HMSO, Cmnd 7794 (1980).

4. Engineering Council, An Integrated Engineering Degree Programme-Consultative Document, London, Engineering Council (1988).

5. Engineering Council, Standards and Routes to Registration, London, Engineering Council.

6. IEE, Issues in Engineering education, paper at IEE Policy Forum on the education and initial professional development of professional engineers (1996).

7. G. M. Blair, Project management skills for electrical engineers in Proceedings of the Teaching of Electronic Engineering Degree Courses, Hull (1992).

8. J. Parnaby, The requirements for engineering degree courses and graduate engineers: an industrial viewpoint, in Engineering Science and education Journal, Vol. 7, No 4 (1998).

9. K. G. Stanga and R. T. Ladd, Oral communication apprehension in beginning accounting majors: an exploratory study. Issues in Accounting Education, 5, (2), pp180-194 (1990).

10. S. K. Payne and V. P. Richmond, A bibliography of related research and theory. In J.A. Day and J.C. McCroskey (Eds.), Avoiding Communication, Beverly Hills, California, Sage Publications (1984).

11. J. C. McCroskey, The communication apprehension perspective, in J.A. Daly and J. C. McCroskey (Eds.), Avoiding Communication, Beverly Hills, California, Sage Publications (1984).

12. V. P Richmond and J. C. McCroskey, Communication Apprehension, Avoidance and Effectiveness. Scottsdale, AZ, Gorusch (1989).

13. M. Allen and J. Bourhis, The relationship of communication apprehension to communication behaviour: A meta-analysis. Communication Quarterly, 44, (2), pp214-226 (1996).

14. B. H Spitzberg, and W. R. Cupach, Interpersonal Communication Competence, Beverly Hills, California, Sage (1984).

15. M. L. Boorom, J. R., Goolsby, and R. P. Ramsey, Relational communication traits and their effect on adaptiveness and sales performance. Academy of Marketing Science Journal, 26, (1), pp16-30 (1998).

16. T. Biggers and J.T. Masterson, Communication Apprehension as a personality trait: An emotional defence of a concept. Communication Monographs, 51, (4) pp381-390 (1984).

17. K. Simons, M. Higgins and D. Lowe, A profile of communication apprehension in accounting majors: Implications for teaching and curriculum revision. Journal of Accounting Education, 13, (3), pp299-318 (1995).

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