EXTREME PROGRAMMING REQUIRES EXTREMELY EFFECTIVE COMMUNICATION: TEACHING EFFECTIVE COMMUNICATION SKILLS TO STUDENTS IN AN IT DEGREE

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Abstract

The ability to communicate effectively is an important skill for IT graduates, particularly in light of the increasing acceptance and success of Extreme Programming methods. This paper describes an effective communication module taught as part of a subject focused on Extreme Programming. An assessment of student's perceptions of effective communication and their attitudes to the pedagogical techniques employed was undertaken. Specifically, students seem aware of the value of effective communication and felt that role-play activities, discussion, small-group activities and lectures contributed the most to their learning. Consideration of student opinions provides insight into how the course can be improved and offers some guidance to other academics wishing to incorporate communication-skills modules into IT courses.

Keywords

effective communication, teaching techniques, Extreme Programming

Introduction

It is increasingly recognised that the curricula of computer science and IT degrees often focus on technical content, ignoring or deprioritising the importance of teaching effective communication skills (Fornaro, 2000; McGinnes, 1994). Yet, IT professionals are expected to be able to communicate proficiently with users, clients, management and indeed, each other. Research has shown that teamwork skills (including the ability to communicate effectively) facilitate an increase in quality of output and productivity in the IT industry (Fornaro, 2000). It cannot be assumed that IT graduates will learn to communicate effectively on the job (McGinnes, 1994). Thus, teaching undergraduate IT students to communicate effectively is an essential part of preparing them to be successful in a work environment.

Recently, the value of effective communication skills in the IT industry has been highlighted by the increasing acceptance and success of a software development methodology called Extreme Programming (XP) (Beck, 2000). Extreme Programming is characterised by pair programming (all production code is written by two people at one computer), rapid development iterations and releases, on-site customer involvement, a "test-first" approach to development, collective ownership of all code and an open team-room workspace. Unlike traditional software development methodologies in which solo programmers can be found, team involvement is crucial in Extreme Programming. Team members support each other, learn from each other and feed creatively off each other.

Another difference between traditional software methodologies and Extreme Programming is the style of communication. Traditional software development approaches are characterised by paper communication: each development phase typically concludes with the production of a document (e.g. requirements specification, design documents, etc.). Extreme Programming, on the other hand, is based on human communication. It is important for software developers who employ Extreme

Programming techniques to be able to keep each other informed, resolve issues as they arise, interact productively with customers and generally communicate effectively.

Information Environments Program

The Bachelor of Information Environments (BInfEnv) degree is a design-focused, studio-based information technology degree. The degree augments the core courses from The University of Queensland's standard IT degree with a stream of design courses and integrative studio-based projects undertaken every semester. The studio projects integrate and reinforce learning by requiring students to apply the knowledge and skills gained in other courses to open-ended real-world design projects. The studio model is based on the architectural studio and involves teamwork, collaborative learning, interactive problem solving, presentations, and peer review.

In order to familiarise Bachelor of Information Environments students with Extreme Programming, the XP methodology was introduced into the curriculum in 2000. In 2001 the subject in which Extreme Programming is taught was revamped to include a module on communication skills. It was considered important to incorporate communication skills into the curriculum not only because of the role they play in Extreme Programming, but also because the ability to communicate effectively is a valuable skill in the vast majority of workplaces. To this end, a number of students had reported difficulties with working in groups (through personal communication with staff and feedback via webpages and subject evaluation forms), moreover, it had become apparent, from observation in class and personal interactions, that many students had difficulty expressing concerns and resolving conflict with their peers.

Effective Communication Module

The effective communication module was taught during the first four weeks of semester, prior to an eight-week module focused on the Extreme Programming methodology. The communication module was based on the work of Wellen and Noller (unpublished) and consisted of five teaching blocks that were based on 5 different skills: effective listening, disclosure, assertion, anger management and problem solving. Effective listening involved improving student's understanding of each other's communications and being able to show and clarify that understanding verbally and non-verbally. Disclosure incorporated both the ability to recognise the legitimacy of one's concerns, and also being able to express those concerns in a non-blaming, constructive manner. Assertion involved helping students to recognise assertive, aggressive and non-assertive behaviour in themselves and others, and to understand the benefits of assertive behaviour. Anger management involved familiarising students with coping strategies that prevent expressing anger in indirect or hurtful ways, showing students how to deal with feelings of anger when they arise, and finding effective and constructive methods of expressing anger. Finally, the problem solving teaching block aimed to help students distinguish collusive, competitive and cooperative problem solving behaviours and provide them with a methodology for effective cooperative problem solving.

Pedagogical Techniques

Effective communication skills are different in many ways to the other skills students are taught in an I.T degree. Moreover, it is possible that some IT students might perceive communication skills as less relevant to their careers than other more technical skills. Given the uniqueness of the skill-set being presented to the students and the potential resistance to the content, the staff developing and teaching the communication module were motivated to find the most effective teaching techniques and to assess students' perceptions of both the content of the classes and the pedagogical techniques employed.

Very little research has investigated teaching and learning communication skills within IT degrees. However, research, conducted with students of other disciplines, has shown that small groups provide a relatively safe environment in which students can explore and practice communication skills (Hudson, Doyle, & Venezia, 1991) and that role-playing often helps students understand and develop effective communication techniques (Costanzo, 1992; Hudson, Doyle, & Venezia, 1991). Based on these findings, small group activities and role-play were incorporated into the communication module. In the interest of exploring the utility of a variety of methods, a number of other teaching techniques were also used (lectures, discussion, personal reflection, group reports, and feedback from staff and students).

Method

A questionnaire was used to assess students' perceptions of effective communication skills generally and also the relative merit of the various teaching techniques employed. The questionnaire was delivered to students in class time two weeks after the conclusion of the effective communication module. The questionnaire included both qualitative open-ended questions that assessed; how students felt the communication module could be improved and over what time frame the course should be taught, and quantitative questions (7 point likert scales, 1 'not at all' to 7 'very much') which assessed; the extent to which students had experienced communication problems during group work, how valuable and important communication skills are, how enjoyable and helpful the various learning techniques were, and how important the five specific communication skills covered in the module are in a group work environment. Twenty-eight male and five female students (approximately 80% of the class) voluntarily completed the questionnaire. Participants ranged in age from 18 to 39 years with an average age of 21.8 years.

Results

The results were originally analysed using inferential techniques. The statistically significant findings using inferential techniques were largely identical to the conclusions that can be drawn from descriptive statistics. Given the small sample size and the relative simplicity of the analyses undertaken only descriptive results are reported in this paper.

Perceptions of communication skills

The majority of students indicated that they had experienced communication problems during previous group work (mean=4.66, SD=1.33). On average students perceived communication skills to be valuable (mean=5.48, SD=0.87) and important (mean=5.55, SD=0.87). Specifically, students felt that problem solving (mean=5.97, SD=0.95), effective listening (mean=5.88, SD=0.82) and anger management (mean=5.76, SD=1.03) were relatively important skills, whereas assertion was perceived to be slightly less important (mean=5.42, SD=1.03) and disclosure was perceived to be of least importance (mean=4.97, SD=1.21).

Perceptions of teaching methods

On average, students perceived discussion (mean=5.42, SD=1.06), lectures (mean=5.33, SD=1.16), role-play (mean=5.33, SD=1.05), small group activities (mean=5.3, SD=0.77) and personal reflection (mean=5.28, SD=0.92) as contributing more to their learning than group reports (mean=5.06, SD=0.88), feedback from staff (mean=4.91, SD=1.1) or feedback from students (mean=4.48, SD=1.35). With respect to student's enjoyment of teaching methods, role-play (mean=5.24, SD=1.28), discussion (mean=5.19,SD=1.15) and small group activities (mean=5.09, SD=0.91) were on average, more popular than feedback from staff (mean=4.85, SD=1.23), group reports (mean=4.79, SD=1.11), lectures (mean=4.7, SD=1.24), personal reflection (mean=4.69, SD=0.93) or feedback from students (mean=4.67, SD=1.05). In terms of their relative understanding of the five content areas taught, students on average perceived themselves as grasping effective listening (mean=5.75, SD=0.8) very well, anger management (mean=5.47, SD=1.14), problem solving (mean=5.47, SD=0.92) and assertion (mean=5.34, SD=0.79) fairly well, and disclosure least well (mean=4.97, SD=1.15).

Qualitative analysis revealed that the majority of students (78.1%) felt that weekly classes distributed over a four week period was the most preferable delivery method, 12.5% of students indicated a preference for a more concentrated block of teaching (two or three days) and the remaining 10% of students indicated a preference for other alternatives. In terms of how the communication skills module could be improved, the most common suggestions were to include more practical examples of skills and to incorporate more role-play activities.

Discussion

Effective Communication Skills

Overall, there is good support for teaching communication skills within an IT degree. Not only are

communication skills important as a skill for Extreme Programming but also students indicated having experienced a moderate degree of difficulty working in groups that could largely be mediated by the introduction of more effective communication. Moreover, students seem to recognise the value and importance of effective communication.

It is interesting to note that students perceived disclosure as less important in a group environment than the other skills taught in the module. This is potentially concerning as disclosure is a skill designed to facilitate the expression of one's own concerns and problems which is essential in a group work environment. The fact that students indicated disclosure to be the least well-understood skill suggests that slightly more effort may be needed on the part of teaching staff to explain the concept of effective disclosure and its role as a part of effective communication. Although replication and generalisation are needed, this may also indicate that disclosure is a slightly harder concept for some students to grasp.

Teaching Techniques

The teaching techniques that students' seemed to most enjoy were role-play, discussion and group work. Students' enjoyment of these techniques is a recommendation for their inclusion in effective communication lessons. This recommendation is strengthened by research that suggests that these techniques contribute to learning (Costanzo, 1992; Hudson, Doyle, & Venezia, 1991), by the students' own perceptions of the contribution these techniques made to their understanding, and by the suggestion by some students that the course could be improved by more role play. Conversely, students felt that reports from other groups and feedback from their peers contributed a great deal less to their learning. This opens up the possibility that less focus should be placed on these techniques in class. However, the measures taken in the present study assess students' perception of how much they learnt from the reports and feedback of others. These measures do not assess the value for students of reporting their own ideas back to the class or being challenged to consider the ideas of others. Hence, further research is required to adequately assess the pedagogical value of these techniques.

Conclusions and Future Research

The present study suggests that students in the Information Environments degree are relatively aware of the importance of communication skills and that they value certain teaching techniques over others. Before these findings can be confidently extended to I.T students generally, further replication and generalisation of the results is required. Moreover, the present study focused on student's subjective attitudes and beliefs. Future research will be directed firstly, at more objective assessments of the extent to which students in the Information Environments degree acquire the effective communication skills taught and secondly, at assessing the extent and manner of student use of effective communication skills during Extreme Programming tasks.

References

Costanzo, M. (1992). Training students to decode verbal and nonverbal cues: Effects on confidence and performance. *Journal of Educational Psychology, 84*(3), 308-313.

Beck, K. (2000) *Extreme Programming Explained: Embrace Change*. Reading,MA:Addison-Wesley.

Fornaro, R.J., Heil, M.R., & Jones, V.E. (2000). Cross-functional teams used in computer science design capstone courses. 30th ASEE/IEEE Frontiers in Education Conference: Kansas City.

Hudson, P.E., Doyle, R.E., Venezia, J.F. (1991). A comparison of two group methods of teaching communication skills to high school students. *The Journal of Specialists in Group Work, 16,*(4), 255-263.

McGinnes, S. (1994). Communication and collaboration: Skills for the new IT Professional. [Online] Available: http://www.ulst.ac.uk/cticomp/mcgin.html

Wellen, J. & Noller, P. (unpublished) Communication Skills Workbook: A guide to more effective ways of relating to others.