

The case for ICT work-integrated learning from graduates in the workplace

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Abstract

An online survey of recent ICT graduates in the workplace was carried out as part of a recent project funded by the Australian Learning and Teaching Council. The survey was concerned with the ICT curriculum in relation to workplace job requirements and university preparation for these requirements. The survey contained quantitative and qualitative components and findings from the former have been published (Koppi *et al.*, 2009). This paper reports on a quantitative comparison of responses from graduates who had workplace experience and those who did not, and a qualitative analysis of text responses from all ICT graduates to open-ended questions concerning the curriculum and their perceived university preparation for the workplace. The overwhelming response from ICT graduates in the workplace was for more industry-related learning. These industry relationships included industry involvement, workplace learning and business experience, up-to-date teaching and technologies, practical applications, and real-world activities. A closer relationship of academia and industry was strongly advocated by ICT graduates in the workplace.

Keywords: ICT curriculum, ICT graduates, professional work requirements, university courses, work-integrated learning

1 Introduction

This paper reports on the findings from an Australian Learning and Teaching Council (ALTC) project (Koppi and Naghdy, 2009) concerned with the Information and Communications Technology (ICT) higher education curriculum. The focus of this paper is on selected quantitative and qualitative data in relation

to work-integrated learning as expressed by recent ICT graduates in the workplace.

Recent graduates who have been in the workplace from one to five years were consulted about their experience of their university curriculum by means of an online survey. A survey of graduates in the workplace was a recommendation from an Australian Universities Teaching Committee (AUTC) project concerned with ICT education (AUTC, 2001). In recent times there have been several surveys of graduates in the workplace (e.g., Chartered Institute of Personnel and Development, 2006; Allen and van der Velden, 2007; Gresty, 2007; Pricewaterhouse Coopers, 2008), and work reported shedding light on requirements of particular aspects of the broader ICT profession (For example: VonKonsky, 2008), but they shed no light on the university curriculum experienced by ICT graduates. This lack of information about the perceptions about the relevance of the ICT curriculum in relation to workplace requirements, and the value of work-integrated learning in particular, is the focus of the analysis of the results from this survey.

Work-integrated learning (WIL) is a common practice in many higher education disciplines in Australia (Fincher *et al.*, 2004; Patrick *et al.*, 2008) and is practiced to different extents in the disciplines comprising ICT. Formal work-integrated learning that is more than simply 'work experience' has advantages that were discussed by Jancauskas *et al.* (2000), who concluded that such structured programs 'provide a mechanism by which industry can contribute to curriculum development, keeping programs up to date and relevant to the real world'. Work-integrated learning is claimed to have mutual benefits for universities, students and industry (Orrell, 2004), and specifically in the ICT context (Poppins and Singh, 2005; Pauling and Komisarczuk, 2007). These benefits have been recognised by Universities Australia (2008), which has advocated a national internships scheme. A discussion paper on the scheme by McIlveen *et al.* (2008) reflects on the substantial benefits of work-integrated learning to the career development of students and opportunities for recruitment by

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employers even though the viability of these schemes depends upon successful partnerships between industry and universities that may be difficult to maintain.

The perspective on work-integrated learning experiences from recent ICT graduates in the workforce will make a useful contribution to the development of such schemes as part of the ICT higher education curriculum.

2 Research method

The project team (Koppi and Naghdy, 2009) designed and prepared an online survey of ICT graduates in the workplace and requested Australian university alumni offices to invite their ICT graduates employed in the last five years to complete the survey. The survey was designed to elicit from graduates in the workforce the abilities they consider important for successful performance in their current professional work, and their perceptions of how well their university course prepared them. The survey's design was based on Scott (2003) but modified for the purposes of this study to give quantitative data and qualitative text responses. There was a total of 37 abilities in four categories: personal/interpersonal; thinking/cognitive; business; and technical. In addition to the quantitative questions, there were six open-ended text-response questions and none of them specifically asked about work-integrated learning:

- In what ways did your university course(s) prepare you well for professional work?
- What aspects were missing from your university courses that you needed for work preparation?
- Were there other experiences (e.g. part-time work) that had an impact on your professional preparation?
- What were the most valuable course(s)/topics at university?
- What were the least valuable course(s)/topics at university?
- Do you have any suggestions for improvement to your university course(s)?

The quantitative data were analysed by the SPSS statistical software package. The qualitative text responses were analysed manually by a multi-stage iterative approach. The first stage involved reading of the responses to enable provisional categories of responses to be created. The second stage involved allocating responses to categories and modifying the categories until all responses were allocated. The third stage included the use of 'Find' in Microsoft Word to count the number of responses in the categories and to verify category creation and response allocation. Thus the categories were created from the text responses themselves rather than imposing a set of pre-ordained categories. Examples of categories are: industry and real-world experiences; practical skills; teaching issues; group work; programming issues; and written communication. The categories identified during the text analysis enabled the number of responses per category to be counted to give a quantitative

estimation. Once the categories were created, responses were searched again to find expressions (quotes) from the respondents that would serve to illustrate the categories. This paper reports on findings concerned with work-integrated learning which is "an umbrella term used for a range of approaches and strategies that integrate theory with the practice of work within a purposefully designed curriculum." (Patrick *et al.*, 2008).

3 Results and discussion

There were 719 valid responses from the graduates in the workplace and these represented 21 Australian universities (out of a total of 38 public universities). It is not possible to estimate the proportion of people that have obtained ICT degrees in the last five years this figure represents because the completeness of the records of each university alumni office is unknown as is the effectiveness of the targeted alumni contact mechanism. Nevertheless the number of responses is sizeable and allowed quantitative and qualitative analyses.

To create valid responses, the discriminating criteria used were the completion of an ICT degree and having worked in the ICT industry since graduation or in a job that utilises ICT training for no longer than 5 years. Graduates from other disciplines or who had no workplace experience following graduation were removed. There was a wide range of ICT degree names. There were between 533 and 660 text responses for each of the open-ended questions listed above. Quantitative results are presented for the abilities given in the questionnaire where there was a significantly different response from people with an internship or workplace learning experience. Qualitative results concerned with general aspects of work-integrated learning are given from an analysis of the six open-ended text responses.

3.1 Quantitative analysis

About 40% of respondents had participated in an internship or workplace learning whilst doing their degree. At the time of the survey, all the respondents were in the workforce and it could be expected that there would be no significant differences in responses between those who had prior internship or workplace experience and those who did not. However there were significant differences in responses between these two groups. It seems that graduates with prior internship or workplace experience are in a stronger position to indicate the importance of the abilities listed for the workplace because of their relatively greater combined work and industry experience. For those graduates who have had an internship or workplace learning experience, we have listed their significantly higher rankings of statements in Table 1. This shows that people with an internship or workplace experience ranked the 14 items higher in importance than people without that experience.

Table 1: Significantly ($p \leq 0.05$, Mann-Whitney Test) higher rankings of statements by people with an internship or workplace learning (WIL) for the importance of abilities in the workplace

Ability
Ability to speak to groups of people effectively
Ability to communicate effectively in writing
Ability to communicate effectively in visual or graphical formats
Ability to communicate effectively and appropriately using electronic media
Ability to contribute positively to team-based projects
A willingness to face and learn from my errors and listen openly to feedback
Ability to synthesise information into appropriate formats
Ability to represent and interpret information in a variety of formats (e.g., graphical, text or multimedia)
Ability to identify the core issue in any situation from a mass of detail
Ability to understand, appreciate and meet the needs of your clients
Having exposure to ICT professionals prior to my current job
Having the practical skills to generate creative solutions to abstract problems
Researching publications to prepare documents/reports/presentations
Having experience with industry-based project work

Table 2: Significantly ($p \leq 0.05$, Mann-Whitney Test) higher rankings of statements by people with an internship or workplace learning (WIL) for the university preparation

Ability
Ability to contribute positively to team-based projects
Having experience with industry-based project work
Having numerical skills
Giving presentations

Table 2 shows the significantly higher ranking of statements with respect to university preparation by people with the same experience. This shows that people with an internship or workplace experience ranked the four items higher in university preparation than people without that experience. It seems that people with workplace experience while at university appreciate the ability to contribute to team-based projects more than people without that experience. Similarly, an appreciation of experience with industry-based project work while at university is ranked higher by people with workplace experience. Likewise, university preparation of numerical skills and giving presentations are ranked higher by people with workplace experience. Several respondents commented on how important it was to be able to give presentations in the workplace and illustrates the point that people with an experience of the requirements of the workplace are more amenable to university teaching. People with an internship or workplace experience also significantly indicated: 'My part-time job helped me prepare for the workplace'.

Graduates with an internship or workplace learning experience ranked communication in all forms and formats (including client liaison) higher than those without workplace experience. This also included university preparation in giving presentations and probably reflects an appreciation of university efforts in the development of a broad range of communication skills that are necessary for the workplace. It also

seems that the academic ability of researching publications for various communication purposes is appreciated more by people with workplace experience.

Graduates with workplace experience also ranked higher the importance of teamwork in the workplace and preparation for it while at university. The importance of teamwork in the workplace was also noted by Taft (2007) and Nagarajan and Edwards (2008). Greater importance of problem-solving abilities was also given by respondents with workplace experience. These were indicated by 'Ability to identify the core issue in any situation from a mass of detail' and 'Having the practical skills to generate creative solutions to abstract problems' and to some extent by 'Ability to represent and interpret information in a variety of formats'. Many of the text responses also noted the importance of problem-solving abilities.

The importance of exposure to ICT professionals prior to current work was ranked more highly by people with workplace experience as was having experience with industry-based project work in the workplace and while at university. Respondents also stated that their part-time job (which may have been of any kind) also helped in workplace preparation. This workplace exposure also seems to indicate the development of greater maturity as evidenced by the higher ranking of a willingness to face and learn from errors and listening to feedback.

Based on this feedback from graduates, workplace experience has apparently contributed to the preparation of work-ready graduates from a number of perspectives, particularly in the areas of communication and problem solving.

3.2 Qualitative analysis

This was concerned with the analysis of the text responses to the six open-ended questions listed in section 2. Responses which were concerned with the theme of work-integrated learning and the views expressed by the graduates with respect to their university preparation were identified and categorised for each question and have been reported under those same headings. In the sections below, indented text blocks in italic are direct anonymous quotes by survey respondents. Rarely was a respondent quoted twice but it was possible because the same respondents contributed to many categories.

3.3 Effective preparation for professional work

There were 660 responses to this question. Only 5% of respondents remarked that their degree was of little or no use in preparing them for their professional work. 18% of respondents noted that theoretical and fundamental knowledge was the most important preparation for professional work. Several respondents noted that the theoretical basis has a longer currency than the technology that changes rapidly. Nevertheless, technological capabilities were ranked next in importance (13% of respondents) because they are required in their current jobs.

Nearly half of the responses were concerned with the universities preparing graduates well in the generic attributes that are perceived as being of relevance to the workplace. These included team and group work, problem solving abilities, presentations, writing, critical thinking and analysis, and communication in general.

Some respondents gave detailed responses about how their university had prepared them for work in a comprehensive way, e.g.:

My course prepared me by teaching me; 1) essay writing, 2) technical writing, 3) programming, 4) group work, 5) presentations and public speaking, 6) how to convey my ideas verbally and in writing, 7) how to be a salesman, 8) how to [be] innovative, 9) how [to] work effectively in groups, 10) how to write reports, 11) how to dress in the corporate world, 12) how to write a resume/CV, 13) how to take part in a business meeting etc.

Showed me to think in a logical and structured manner, so that when I need to plan for new situations and upcoming projects, I know exactly how to go about it. Gave me such a

broad range of topic knowledge, I can understand and communicate with professional people from many disciplines e.g. finance, marketing, IT.

Provided strong theoretical background and reasonable technical skills and exposure to a wide range of technology. Introduced social skills and ability to speak in front of groups of people. Left me confident exploring new technologies due to strong researching skills and strong fundamental understanding of IT systems.

I developed skills in time management, research, independent thought, decision making, presentation etc. I learnt how to quickly identify the core needs of a project and to develop logical and progressive pathways to problem solving and project design. I also strengthened my skills of both self evaluation and outcomes assessment.

A few respondents noted how university had helped them with independent learning and 'learning how to learn', which they considered to be an important ability in a rapidly changing world, e.g.:

A university degree teaches you how to learn and think by yourself, it, for the most part, does not teach the job specific skills/experience required to do your job.

Provided me with an environment in which I could develop many cognitive and personal skills that I utilise on a day to day basis. I have heard it said that university teaches you how to learn. This is what I have gained from my degree. The technical content has turned out to be irrelevant to my current employment. By the time I move into an area that is relevant to the technical content of my degree, the technical content will probably be outdated.

It was noted occasionally that universities cannot be expected to fully prepare someone for the workplace, e.g.:

Realistically, I don't think any university course can fully prepare any person [for] the real world. The individual has to come to terms and realise that once he/she enters into the job market, it is a whole new learning process again, exactly like entering into the 1st year of uni.

In general, respondents noted favourably the abilities and skills they had learned in preparation for the workplace but did not indicate the conditions under which this learning had taken place. Further insights

into work-integrated learning are given in responses to the remaining questions.

Apart from my qualifications my university course prepared me for work by learning to think for myself, manage my time appropriately, solve problems, have confidence in my abilities.

3.4 Aspects missing from preparation for professional work

There were 612 responses to this question. Only 4% of respondents said there was nothing missing from their courses. The dominant criticism of university courses was concerned with lack of association with industry and real-world experiences. Over one-third of respondents commented on this, e.g.:

More hands-on technical and industry related curriculum.

Courses must be more real life industry specific.

Strong logical skills, real world examples. Less of a focus on the "real world common knowledge" basics such as scholarship skills and social sciences, and more focus on the required skills and methods of problem solving. Ask for real world problems and solutions, from real industries, and then teach students how to solve these and discuss the real problems.

Many participants even stating that they would prefer learning from the industry experts, e.g.:

I would like to see university courses more aligned with industry. University courses should not be designed by academic educators, but by industry experts who know what's going on out there. Due to the changing nature of IT, the subjects should be updated every couple of years.

Better to have industry based learning, e.g. engage in real project work or work closely with the industry.

Industry placement – I cannot stress that enough... This stemmed directly from recruiters preferring students with industry experience.

The next most common criticism (17%) of university courses was that they were out of date in many respects, including technologies, industry trends and teacher knowledge were inadequate or lacking. 14% of respondents noted the importance of a range of

business skills are and that more than technical competence is required for the workplace. Related to industry is the practical application of theory to the real-world (12%). The main criticisms of teaching (only 4%) included a lack of industry awareness.

Regarding aspects missing from university preparation as a whole, about 70% of the responses were concerned with workplace aspects and industry practices. However, a few comments noted that retraining for industry was inevitable, e.g.:

I believe you will always need to retrain a graduate. The investment is in their ability to understand and work through complex problems. Pay back comes one or two years after hiring a graduate, if you can keep them.

3.5 Other experiences (such as part-time work) impacting on workplace preparation

There were 605 responses to this question. The great majority of the respondents were positive about their part-time work experience (some included work placement) and its contribution to their professional development. Examples of comments include:

My organisational skills were honed by running a university sporting club, being on the social committee at my college and being involved in the running of my college. My work experience was invaluable because it gave me insight into current technologies and relevancy to many subjects and topics within subjects.

An understanding of a real world full-time work environment meant that I was more focused on achieving as much understanding in my uni degree as possible, which in turn, meant that I was more prepared for post-uni employment in ICT.

The 12 week placements I completed were of real benefit. If I could do it again I would look for a cadetship. The cadetship is a far better way to learn a profession.

Working in the job while studying is the best method for learning.

Part time work always helps even though not directly. Any work experience helps towards the overall growth.

Part-time work in hospitality during my study term. This provided excellent communication and conflict resolution skills.

Part time work puts education in perspective.

Many indicated how their part-time or full-time work experiences had been in their chosen discipline. This experience within the industry was therefore of great benefit to them in their courses, e.g.:

I had already being working in the industry for over 20 years which helped with an understanding of what was really needed against what was actually taught. I had a strong understanding of all the Microsoft suites.

I worked as a trainer (full-time) while studying for the degree (part-time) and this gave me the insight of the ever evolving ICT world. In addition, as a trainer I needed to have good presentation and communication skills in order to convey my teachings into meaningful and easily understandable information to the students/clients. And at the same time I was able to gain some knowledge on ICT skills that was not taught in the university.

I worked full time in the industry I was studying for the whole time of my degree. I felt that this not only gave me the opportunity to immediately put my knowledge into practice but it also has provided me with experience and a better employment position at the end.

I worked full-time for an ICT company while studying, so in a lot of ways my work helped to prepare me for university as much as university helped to prepare me for work.

Yes – working at Nortel Networks was invaluable in gaining insight and understanding what is relevant in a practical work environment as compared to a theoretical educational perspective.

Yes, skills picked up during my part-time and contract work help[ed] me in listening, speaking, presenting and networking.

However, many respondents did not indicate when the part-time work occurred, whether it was in an ICT-related job or some other field. Some indicated that the work even though in a field unrelated to ICT was still beneficial to them, e.g.:

Growing up working on construction sites prepared me more for my job than the degree did!

I did a cadetship at the BHP (later Bluescope) steelworks. [I] learned a lot more there than at uni for preparation for a life in industry.

I was working full time for the Department of Treasury and Finance throughout the last year of my university degree. This experience provided me with a great understanding [of] the business environment of a large government agency and also an appreciation of deadlines, timeframes, milestones etc.

I learnt so much faster at work than in uni. When I finished by bachelor of science part-time, I was learning in three months at uni what I'd normally learn in two weeks at work.

A number of respondents also spoke of the direct and ongoing networking benefits they have reaped from their part-time work. For example:

I worked full-time in a related field, so that had massive benefits, possibly more so than my uni course. Though the degree is still the required key.

Part time work definitely has played a very important factor in my profession. I can say due to the experience gained I have been able to make numerous contacts and also learn more about different workplaces. It is th[r]ough contacts that I have found new employment opportunities.

Part-time work had a major positive impact on my preparation. The work I do now is similar to but at a higher level than during my degree.

These responses show that the professional development for an ICT career can occur through work experience in a wide range of job situations even though a combination of university study and related professional ICT work appears to be the most useful combination. From these responses, it could be argued that work integrated learning in preparation for an ICT career could occur in a variety of professional job situations.

3.6 Most valuable course(s)/topics at university

There were 642 responses to this question. Nearly 90% of respondents referred to specific ICT domain courses or topics; very few referred to 'soft' or generic topics. Three per cent relate to aspects of communication and 11% to the value of project work, particularly capstone project experiences, e.g.:

My final semester information systems project was the most valuable course I undertook as this was a real-world project and the

competitive aspect of the course helped provide incentive to work hard. If an ICT degree consisted of a year of basic concept book-learning and a further four semesters each containing major real-world projects such as this, the course would prepare students better than any other professional development that is available at the moment. The degree would be just about entirely experience-based. There is just no substitute for the kind of value that adds to a young professional!

I would also rate my project work in my last semester as a very useful learning experience. We spent a lot of time on it, learned a lot, and it was probably the most realistic real-world course I had.

21% of respondents referred to the value of business courses and topics which was the largest category. Programming of all kinds closely followed (19%), with aspects of databases and project management at 12% each. Many other subjects were mentioned as most valuable, and it is likely that many of the responses from the graduates were related to their current daily work.

A listing of most valuable courses and topics does not add to information regarding work-integrated learning because the respondents did not indicate how or where the learning occurred. However, since business-related subjects were the most commonly expressed by graduates in the workplace, the implication is that knowledge in this area is relevant to daily work and that it may be gained to some extent by participation in work-integrated learning.

3.7 Least valuable course(s)/topics at university

There were 576 responses to this question. 25% of respondents noted that every subject was valuable, and those listed as the least valuable are all in single figure percentages. One respondent noted that they found an appreciation of subjects taught had grown since joining the workforce:

Can't think of any. But I can think of subjects that I thought were less valuable at the time and I paid less attention to. It would have been good to have a reminder of how [these] subjects would help in the workplace back then. Maybe you should let the students read the answers to these questionnaires.

Several respondents commented that their responses were influenced by their current job rather than implying what was of little value in their degree. Nevertheless, there were comments concerning the teaching of out-of-date technologies or courses that

were not perceived as relevant. Work-integrated learning would address these issues, as noted by Jancauskas *et al.* (2000) and (Orrell, 2004) for example.

3.8 Suggestions for improvement of university courses

There were 533 responses to this question. 34% of respondents directly expressed the need for greater industry-associated learning, e.g.:

Have key people from the industry to talk about real experiences not fully rely on theory – design more course material that's more industry related.

... better teaming with industry professionals – teaching by people with substantial industry experience and understanding.

I would say that a brief outposting to the industry in some way (such as a weekly or even monthly trip to a local ICT business) could benefit students really well, especially younger students who may not have had any experience in working full-time at all.

Maybe more of the courses could include some liaison with industry to give the students access to actual work experience during their studies.

Offering courses together with industry partners.

There were also calls for industry-associated learning that may help to either ease the debt burden from a university course, or help the student gain work experience in order to join the industry, e.g.:

Add some course[s] for more practical industry focus. So graduate[s] can join in industry easily.

Make all university courses that lead to professions, cadetships. Let those companies who benefit the most from universities pay for the training. I believe then that some loyalty to employers will be returned. At the moment graduates come out with \$50,000 in HECS and have been working 70–80 hours a week to survive. They therefore want to get as much money as possible and don't owe their employers anything. I believe that if you asked those that completed a cadetship how long they stayed with their employer who paid for it, it would be much longer than those that had to pay for it themselves.

Industry experience is vital and without it, a degree is of no use.

If the university aligned itself with the ICT industry, it would make the postgraduate students work harder, and it would tend to open up the “closed teams” in industry. This must ultimately be good for the industry and good for the student and good for the country.

22% of respondents were concerned with out-of date issues, including methodologies, technologies, and programming languages, and 19% complained about teachers with a lack of industry experience and engaging in teaching activities that were not perceived as relevant to industry. Recommended improvements in practical, real-world and business issues amounted to over 20% of responses. 11% of respondents were in favour of less theory and fundamentals and wanted more practical application, and only 3% of respondents advocated more theory and fundamentals. Few respondents mentioned group work or other generic skills.

Teach more in depth on subjects that are valuable to getting a job, teach the students industry standard software, encompass industry placement, introduce the students to the world in which they will be walking in to after their 3–4 years by introducing them to industry professionals.

Academics need to look at what is out there in the real world and cater for it – I think an industry type of course should be included in ICT degrees.

Look to moving a lot more quickly with curriculum and involve industry in the design and delivery to a much higher extent.

The calls for greater industry involvement in learning and teaching, up-to-date practical and relevant industry-based technologies and practices, real-life examples, and business knowledge related to industry amounted to over 70% of the total responses.

I think it would be useful to have more contact with industry through for example having working programmers delivering guest lectures.

Incorporate industry placements and/or work experience as a compulsory element for graduation.

Provide practical industry experience please.

Industry placement is a must.

4 Conclusion

The quantitative and qualitative analysis of survey responses from ICT graduates in the workplace has revealed a range of issues concerned with work-integrated learning. Graduates with work experience appreciated the importance of communication, problem solving and teamwork more so than graduates without work experience. In relation to these abilities, graduates with work experience observed that their readiness to engage in university learning was enhanced because they were aware of the relevance of these abilities in the workplace. Furthermore, graduates commented that workplace experience provided a framework for integration of university studies which leads to greater engagement and better learning.

The analysis of open text responses from graduates to a range of questions about the university curriculum has revealed a strong desire for more work-integrated learning. In regard to missing aspects of university preparation for the workplace, and aspects for improvement of university courses, the overwhelming response from graduates in the workplace was concerned with greater industry involvement mainly because academia was perceived as somewhat remote from industry. This included direct industry involvement in curriculum development and teaching to ensure it was up to date and relevant to the real world. Workplace learning by many respondents was seen as an essential component of their university program, and placements of 12 weeks or less were considered too brief. While fundamental theories were seen as providing a firm foundation for a dynamic and changing discipline, the need for their practical relevance and application to the real world were stressed. There will always be a challenge in academia to bridge the gap between theory and the real needs of industry (Anderson, 2001), but that is not the topic of this paper. Our work here was to report the graduates perspectives on how they felt university had prepared them, or not prepared them, for their place in the ICT industry.

Work-integrated learning is an umbrella term that includes learning and teaching practices that incorporate or reflect industry practices and real-life examples or case studies. As advocated by the graduates, and others (e.g., Orrell, 2004; Poppins and Singh, 2005; Pauling and Komisarczuk, 2007) greater association of industry with academia would bring mutual benefits to students, teachers and industry. We would also advocate, echoing the call from one of the respondents, that universities “should let the students read the answers to these questionnaires” in this paper. It may help current students understand the need for these skills being emphasised in their university experience.

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