Designing, implementing and evaluating a self-and-peer assessment tool for e-learning environments

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E-Learning Technologies and Evidence-Based Assessment Approaches

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Chapter X
Designing, Implementing and Evaluating a Self-and-Peer Assessment Tool for E-Learning Environments

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ABSTRACT

There is considerable evidence of student scepticism regarding the purpose of team assignments and high levels of concern for the fairness of assessment when all team members receive the same grade. This chapter considers online self-and-peer assessment (SAPA) as a fair, valid and reliable method of assessing team processes and individualising grades. A pilot study is detailed that evaluated an online self-and-peer continuous assessment (SAPCA—a particular form of SAPA) tool originally developed for small classes of architecture students. The tool was adapted for large classes of up to 1,000 business communication students in a semester. The student sample trialling SAPCA studied on three dispersed campuses, as well as in off-campus and off-shore modes. The chapter proceeds from a literature review of SAPA, to a description of findings from four years of research, testing and development, and finally to a case study of SAPCA implementation with a total of 1,800 students enrolled in a business communication program.
INTRODUCTION

How can students be helped to develop teamwork skills at university and how can instructors assess these skills? During four years of researching these questions at an Australian university, focus has sharpened on the development of an online Self-and-Peer Continuous Assessment (SAPCA—a particular form of self-and-peer assessment) tool allowing for the individualisation of grades in teamwork assignments. Research has examined three interconnected areas; fair assessment, formative assessment, and reflective learning. Studies have involved diverse course cohorts, ranging from eighty to close to 1000 students, drawn from two faculties; a faculty of Science and Technology and one of Business and Law. Three courses offered in three degree programs have tested the SAPCA model. In one, around 1800 students enrol in a course offered in two semesters each year, on three campuses, in off-campus mode and at two offshore partnership campuses. Up to fourteen different members of staff are involved in the delivery of this unit at any one time, with uniform teaching materials and a strict comparability of assessment protocol. Approximately 60% of the cohort comprises full-fee-paying, International students, primarily from South East Asia, China and the Indian Sub-continent. Team compositions in this cohort can range from monocultural teams consisting Caucasian Australian same-gender students with English as their first language, to mixed-sex multicultural teams where the majority of students have English as a second language. It could be said that the SAPCA model has been piloted under the most testing of educational conditions. What follows is a synopsis of our findings; starting with a literature review, moving on to a description of the findings from four years of researching, testing and developing SAPCA, and finally to a case study of the SAPCA model tested in 2007 by way of the 1800 student, two-semester Business and Law course described above.

BACKGROUND

The reasons for the use of student teamwork in the completion of assessment tasks are many (Fermelis, 2006). It is posited that teamwork can lead to an improvement in student learning (James, McInnis, & Devlin, 2002). This improvement might be due to one or more of the following factors: the development of social behavioural skills and higher order thinking skills as well as promoting inclusive participation (Cohen, 1994); the development of critical thinking skills (Dochy, Segers, & Sluijsmans, 1999; Gokhale, 1995; Sluijsmans, Dochy, & Moerkerke, 1999); moving students from a passive to more active learning role (McGourty, Dominick, & Reilly, 1998); the ability to tackle more substantially-sized assessment projects (Goldfinch & Raeside, 1990); or that students learn from their peers within the team (van den Berg, Admiraal, & Pilot, 2006). It is also commonly identified that teamwork can develop skills that are sought by employers (Clark, Davies, & Skeers, 2005; Goldfinch & Raeside, 1990; Hanrahan & Isaacs, 2001), especially a range of non-technical ‘generic’ skills (James, et al., 2002; McGourty, et al., 1998), including interpersonal skills (Goldfinch & Raeside, 1990) and the capacity for lifelong learning (Hanrahan & Isaacs, 2001). Teamwork is cited as being more representative of the real world of work in a professional practice context, and, for students from the design-based disciplines, ideas and experience can be combined collectively for a superior result (Barber, 2004). Finally, used appropriately, student teamwork is one option for addressing issues related to rising student numbers in higher education (Ballantyne, Hughes, & Mylonas, 2002; Goldfinch & Raeside, 1990; James, et al., 2002), including: the expanding demand for physical resources in assessment (Brown, 1995); increasing student-to-staff ratios (Davies, 2000); and the drive from governments and other funding bodies for increased efficiency in higher education (Hanrahan & Isaacs, 2001).
However, the use of teamwork is not without challenges that require serious pedagogical considerations. It has been known since the 1900s that teamwork can be subject to the ‘Ringelmann effect’ otherwise known as social loafing, where the combined output of the team is less than would be expected from combining the output of individual team members (Kravitz & Martin, 1986). Teamwork may be subject to problems of team discipline and/or domination of the team by the most assertive members (Brown, 1995). Team members who are academically weaker may become “passengers” gaining a free ride from the efforts of other members (Goldfinch & Raeside, 1990). This ‘free-riding’ poses a question we shall consider in relation to assessment objectives in the section ‘Forms of formative SAPCA feedback’; namely, how to encourage active participation by all team members (Cohen, 1994). If teamwork is employed in assessment activities because it is a desirable skill for students to develop, then we should, as we shall discuss in the section ‘General Principles of SAPCA’, seek to assess the teamwork process itself (Clark, et al., 2005; Freeman & McKenzie, 2002), as well as devise a method for the fair assessment of the contribution of each individual team member (Brown, 1995; James, et al., 2002), so that equitable individual marks/grades can be awarded (see the section ‘Making Assessments and the Individualisation of Team Scores using SAPCA’).

Student self- and peer assessment (SAPA) is often proposed as a solution to motivation, process and assessment issues in team-based assessment (Fermelis, 2006; Tucker, 2008; Tucker and Reynolds 2006). SAPA of teamwork may take a range of forms, with the basic premise being that students provide some form of assessment of the contributions to the teamwork process made by both themselves and the other team members. Such assessment can be: qualitative and/or quantitative; formative and/or summative; informal and/or formal; and periodic or one-off (Dochy, et al., 1999). Advocates of SAPA suggest that it can increase student engagement (Michaelson 1992), with a consequent improvement in learning, through a number of mechanisms, including: giving increased responsibility, autonomy and power to students (Falchikov & Goldfinch, 2000; Taras, 2008); if students know that their contribution is to be assessed there will be less ‘free-riding’ (Johnston & Miles, 2004); it encourages students to consider the learning objectives and desired performance levels of assessment (McGourty, Dominick, & Reilly, 1998); encouragement of reflective thinking (Dochy, et al. 1999; Freeman & McKenzie, 2002; McGourty, Dominick, & Reilly, 1998); and the process of providing feedback to others can make one focus on improving one’s own performance (Davies, 2000; Freeman & McKenzie, 2002; McGourty, et al., 1998; Sluijsmans, Dochy, & Moerkerke, 1999). In addition to learning benefits, SAPA is seen as contributing to generic skills development by offering students experience in giving and receiving critical appraisal (Sivan, 2000). Apart from student benefits, for academic staff with the responsibility for assessment, SAPA is a practical mechanism for the individualisation of student results from a teamwork exercise (Freeman & McKenzie, 2002; Goldfinch & Raeside, 1990; Raban & Litchfield, 2006; Walker, 2001), as well as a means for the provision of some additional formative feedback/assessment for students in the face of increasing class sizes (Davies, 2000; Mulder & Pearce, 2007; Topping, 1998).

Like teamwork, SAPA itself is not without issues that deserve consideration. SAPA is a broad term that covers a range of assessment possibilities and implementations (Dochy, et al., 1999)—and the most appropriate combination will depend on the requirements of the situation. Peer assessment may lead to ill-will between team members, or, if team members avoid honest criticism of their peers, it may fail to accurately reflect individual efforts or become more of a measure of member personality than contribution (Goldfinch & Raeside, 1990). A key question about SAPA that is used for summa-
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tive purposes relates to the validity and reliability of assessment made by students. However, a large body of research reports good correlation between assessments made by students and academic staff (Falchikov & Goldfinch, 2000; Sluijsmans, et al., 1999; Stefani, 1994; Topping, 1998). As we touch upon in the next section, in the case of the use of SAPA to assess the teamwork process rather than the absolute merit of the teamwork product, members from within the team are probably better placed than external academic staff to make this assessment (Brown, 1995). Finally, there is no clear evidence that, regardless of the absolute level of reliability of SAPA, it is any less reliable than traditional assessments made by academic staff (Walker, 2001).

The literature provides some guidance on the characteristics of an effective SAPA system. SAPA can require students to make their assessment based on specific dimensions/criteria, or to make a simple, holistic assessment of team member contribution. An analysis of published cases of peer assessment found that holistic assessments by students more closely resembled assessments by academic staff than did methods involving rating on multiple dimensions (Falchikov & Goldfinch, 2000). Another study compared a peer assessment scheme incorporating a range of dimensions, each with detailed descriptors, against one that required a more straightforward holistic assessment of contribution based on each team member having ‘100 percent’, which they were free to divide amongst the team members in any manner which they felt reflected each member’s contribution to the group’s work. It was found that the ‘holistic’ group reported a more positive rating of teamwork, suggesting that this SAPA approach might be more supportive of the aims of teamwork, and lead to a greater spread in individual marks than a system based in detailed criteria (Lejk & Wyvill, 2002). Collecting SAPA ratings anonymously can avoid the potential for team conflict arising from negative performance ratings/feedback, and has also been found to lead to a greater spread in individual marks, perhaps due to team members feeling freer to rate truthfully when their identity and rating is secret. Additionally, in the absence of collusion between raters, anonymous/secret rating is more statistically reliable, as the ratings awarded by one member should not influence any other rater (Sharp, 2006). It is suggested that a SAPA system should include a rating period or window during which a rater can modify their rating based on further reflection of team performance in isolation from possible peer pressure (Willey & Freeman, 2006).

A normal aim of employing SAPA is to facilitate the individualisation of team member marks. A range of approaches to individualisation exist, but many involve using student SAPA ratings (whether holistic or multi-criterion) to compute a multiplicative scaling factor (MSF) used as the basis to convert an overall combined team mark into individual student marks (Brown, 1995; Goldfinch & Raeside, 1990; Johnston & Miles, 2004; Raban & Litchfield, 2006; Willey & Freeman, 2006). As with any marking exercise, the slavish use of formulae to individualise teamwork marks should be avoided, as this may lead to anomalous results (Goldfinch & Raeside, 1990; Sharp, 2006). It is observed that the individualisation factors derived through SAPA seldom suggest the extreme modification of individual marks (Johnston & Miles, 2004), and that SAPA results are only one of the factors that should be taken into account when determining final individual marks for teamwork (Luca & McLoughlin, 2002). One approach is to use the presence of ‘extreme’ MSFs (outside of some predetermined upper and lower band) to signal the need for further investigation of team performance and/or possible individualisation of teamwork marks (Willey & Freeman, 2006). While the ultimate aim of SAPA might include the individualisation of teamwork marks, the inclusion of multiple (continuous) SAPA stages during a teamwork activity offers the possibility of valuable formative feedback as well, as students have the opportunity to modify their
performance and approach to teamwork as the activity proceeds (Walker, 2001). Improvement in student performance has been observed in teamwork contexts incorporating multiple instances of SAPA (McGourty, et al., 1998).

While SAPA is often cited as a strategy for reducing assessment workload, the administration of a SAPA system for a large class can become a daunting workload in its own right (Ballantyne, et al., 2002; Mulder & Pearce, 2007). The emergence of computer-assisted SAPA systems was noted in the 1990s (Goldfinch & Raeside, 1990; Topping, 1998), and since that time the use and evaluation of many online SAPA systems providing assistance to both students and academic staff have been reported (Freeman & McKenzie, 2002; Lin, Liu, & Yuan, 2001; McGourty, et al., 1998; Raban & Litchfield, 2006; Sitthiworachart & Joy, 2003; Wen & Tsai, 2008). Computer-supported learning systems, including SAPA, have been shown to foster student engagement with learning activities, and can provide an independent administrative record of student teamwork activity (Resta & Laferrière, 2007). However the successful use of student teamwork involves much more than effective assessment (computer-based, online or otherwise). It includes the design of assessment tasks suited for completion by teams, development of teamwork skills by students and the on-going management of team dynamics during the course of the teamwork. Design of processes and tools for the assessment of teamwork in isolation of consideration of these other factors is unlikely to produce a successful outcome (Freeman & McKenzie, 2002).

SELF-AND-PEER CONTINUOUS ASSESSMENT

General Principles of Self-and-Peer Continuous Assessment

Based on the use and development over three years of online SAPA as a solution to teamwork problems for cohorts of between eighty and 180 students in an Australian school of Architecture, we have previously published the following findings and recommendations (Tucker & Reynolds, 2006):

1. If teamwork assignments are to reflect the type of willing and productive collaboration demanded by professional practice, then the completed assignment can only be assessed as a product of that collaboration, whereas the assessment of an individual’s contribution to the project must focus rather on the process of arriving at that product. Since tutors are party to only a fraction of that process, then, as Brown has shown (1995), the students themselves are best placed to accurately evaluate contributions to process.

2. Students find peer assessment to be more manageable and a more accurate reflection of individual contribution when it is continuous throughout a teamwork assignment (as multiple periodic assessments of process), rather than a one-off assessment of the product occurring at the end of the assignment.

3. The quality of teamwork as measured in grades increases in problem- and project-based learning assignments when continuous peer assessment is used to assess individual contributions ahead of other assessment models, such as teacher-only assessment of individual contributions to group work or the awarding of all team members the same grade.

4. Students greatly prefer the individualised assessment of their assignment contributions based on online SAPA rather than all team members being allocated the same mark.

We have found the use of continuous online SAPA throughout the duration of an assessment task to lead to a participatory student-centred assessment forum where reflective learning aids the
development of interpersonal, professional, cognitive and conflict management skills needed to filter and synthesise more efficiently the information necessary for working in teams. The mechanics of such a Self-and-Peer Continuous Assessment model (or SAPCA as we shall refer to it from now on) are described in detail below.

**Designing Assignments for SAPCA**

SAPCA requires students to rate each other’s contributions and performance holistically and on a regular basis throughout the duration of a team assignment. In common with other online SAPA systems such as TeCTra (Raban & Litchfield, 2007), SAPCA aims to create a formative and summative assessment environment that encourages students to learn peer-assessing skills using quantitative ratings and qualitative comments. In order to give students a clear indication of what stages of the assessment task they are rating, it is best to specify project progress targets coinciding with rating periods. These targets may or may not be assessed, although, as is the often the case with lengthy assignments, we have found that students are more likely to contribute throughout the duration of a project if progress targets are assessed. Instructors must be careful, however, that the assessment loadings of periodic submissions, compared to the loading of the final submission, accurately reflect the relative importance attached to the process and the products of teamwork. What follows below is a description (Tucker, Fermelis, & Palmer, 2007) of how these periodic quantitative and qualitative assessments can be used to individualise contributions to the collaborative process.

**Making Assessments and the Individualisation of Team Scores Using SAPCA**

On completion of an assignment and after using SAPCA, each team is awarded a team mark by instructors. The team mark is then individualised if there is evidence of unequal contributions by team members. The decision to individualise is predicated on the evidence within periodic SAPCA ratings, peer comments and feedback, on tutor feedback and any other information received by the unit co-ordinator. As noted elsewhere (Willey & Freeman, 2006), the recommended approach is to use an ‘extreme’ SAPCA rating range outside of a predetermined upper and lower band to signal the need for further investigation of team performance.

Throughout a team assignment, students are required by SAPCA to make regular holistic ratings of their own and their team-mates’ contributions to process. Students are asked to award ratings holistically, taking into consideration whether each member attended meetings and tutorials, actively communicated with team-mates, participated in decision-making, completed work they were designated to the required standard and/or form, met deadlines and shared the workload. Cohorts are informed that making assessments is regarded as one indication of active participation in the assignment. Individual students make assessments by logging on to a password protected web-site accessed via an online study portal. They are given a time entry window to make their assessment. At any time during this window students are able to change their entries. The log-in page asks students to select an appropriate course code - in order to allow for the likelihood that students may be involved in multiple team assignments. Figure 1 below is a screen-shot of the SAPCA tool as students see it after having accessed the appropriate course code.

As can be seen from Figure 1, students are asked to make three different types of assessment. The first measure asks them to award a holistic relative contribution score for each team member. This score must add up to the total number of members in the team. Thus, for example, if it is believed that all team members contributed evenly, the student awards everyone (including
themselves) a rating of 1. The intent of this first measure is to encourage students to consider the question of workload distribution. The first measure is complemented by a second asking students to rate the individual “performance” of all team members, using a drop-down menu, on a five point multiple-response Likert scale ranging from 1 for “Inadequate” to 5 for “Excellent.” Likert evaluation, which is commonly used to rate aspects of the group experience (Ellis & Hafner, 2005), allows for the coding of responses and the subsequent statistical analysis of possible patterns of bias. While the Likert evaluation aims to encourage students to consider the quality, as opposed to the quantity, of each other’s contributions, it is translated into a numeric value that is used in combination with the quantitative relative contribution assessment to produce a holistic rating of each member’s contribution.

The combination of two modes of assessments makes less likely peer over-marking, which is a problem common to many peer assessment methods (Falchikov, 1986; Freeman & McKenzie, 2000). The purpose of the third qualitative measure, which elicits comments on the performance of their peers, is twofold; firstly, to elucidate for instructors ratings, anomalies and unexpected final evaluations and, secondly, to develop in students the evaluation, feedback and reflective skills that are key objectives of teamwork learning. As Dominick et al. (1997) have found, students who complete the qualitative feedback section, even if they themselves do not receive feedback in the forms of constructive or informative comments, might become motivated to improve their own performance. Figure 2 below is a screen-shot of the SAPCA model as students see it when accessing feedback.

At the end of each periodic assessment, and at the conclusion of the team assignment, an assessment matrix is generated for each team that calculates for every student a multiplicative scaling factor (MSF). Importantly, before the calculation is made, all self assessment marks are removed from the matrix to negate the bias of self over-marking. The MSF is calculated as follows:

Figure 1. SAPCA screenshot
1. Individual Total Peer Assessment (ITPA): total of each team member’s Relative Contribution (RC*) plus Individual Performance (IP**) scores
2. Team Total Peer Assessment (TTPA): total of all team members’ ITPA scores
3. Team Mean Peer Assessment (TMPA): TTPA divided by the number of team members
4. Multiplicative Scaling Factor (MSF) for each student: ITPA divided by TMPA

Where:
* RC scores are restricted to between 0.5 and 1.5.
** IP scores are between 1 and 5.

The MSF a student sees at the end of each periodic assessment, and then at the completion of the assignment, therefore indicates how peers’ ratings of that student compare to the mean rating for the team. As explained to students, if their rating is less than 1 they are considered to be performing below the average team performance. Equivalently, if their rating is greater than 1 they are considered to be performing higher than the average. Students are advised to aim for a rating of close to 1 or greater. Trials have indicated that SAPCA ratings of between 0.8 and 1.2 are the norm (Tucker, 2008). A wide range in SAPCA student scores within any team triggers investigations into the evenness of student contributions. Thus, the online interface for instructors clearly displays a SAPCA range for each team (Figure 3), which is calculated by subtracting the lowest student rating from the highest and which can be interpreted as a measure of how great is the inequity between team member contributions. We have found that varying the text size of the figure representing the range in proportion to the range helps highlight those teams that require further investigation. Trials have indicated a range of greater than 0.3 to be an appropriate trigger for investigation.

To facilitate this investigation, a hyperlink takes instructors from the SAPCA range to a list of team members (Figure 4), from which further hyperlinks lead to the qualitative comments made about each team member (Figure 5). The team list (Figure 4) lists five measures of performance for each team member;

1. MSF (1) calculated without self ratings,
2. MSF (2) calculated with self-ratings,
3. Average contribution rating,

Figure 2. SAPCA feedback screenshot
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Figure 3. SAPCA instructor feedback screenshot indicating ratings ranges

Figure 4. SAPCA instructor feedback team-list screenshot indicating five measures of performance: self (MSF1), self (MSF2), cont (average contribution), perf (average performance), and self-range (degree of self under or over-rating). Note. Names have been blanked out.
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4. Average performance rating,
5. The difference between MSF1 and MSF2.

MSF1 is the measure that is used for individualising grades for it disregards self over-rating. The fifth measure indicates the degree to which a student under or over-rates, for this can be important to know when instructors are making further investigations into team dynamics.

Forms of Student Participation

We shall consider now two decisions facing instructors about to introduce some form of SAPA into a program. First, should participation in SAPA be compulsory or voluntary, and second, if participation is compulsory, how should that participation be enforced? The consequences of making participation in SAPA optional are best illustrated by the example of two studies. We reported in 2006 on an early pilot of SAPA in an architectural design course (Tucker & Rollo, 2006). Students were offered three options of mark allocation; either by SAPA conducted via round-the-table negotiation, by one-off paper-based anonymous SAPA or by opting out of SAPA and choosing instead to simply allocate marks evenly. Most teams selected the third option, but these teams were later identified as experiencing the most team conflicts, generally due to “free riding” or uneven contributions. In our 2007 study, it was possible to consider the consequences of compulsory versus optional participation in SAPA by comparing participation rates across four cohorts. For three of the cohorts SAPCA was compulsory, but for the fourth, individuals (not teams) were able to opt out. Participation rates for each cohort were calculated by comparing the actual number of SAPA ratings made to the total if all students had completed all ratings.

Figure 5. SAPA instructor feedback detailed ratings screenshot including qualitative comments. Note. Names have been blanked out.
Participation rates for the three cohorts where SAPCA was compulsorily were 82%, 67%, and 57%. For the cohort given the choice of opting out of SAPCA the participation rate was only 25%. Reasons for the wide range of participation in the compulsory SAPCA units are evident when we consider the second question facing instructors; how should we enforce participation?

Our experience suggests the only practical way of enforcing SAPCA participation in large cohorts is to allocate marks for the quantity of ratings made by each student rather than for the quality of their SAPCA participation. In small cohorts it may be possible to assess participation by assigning marks according to the quality of qualitative comments made, but this becomes unwieldy in large cohorts where a lengthy assignment may see thousands of qualitative comments recorded. There are two methods of awarding marks; either by rewarding participation or by penalising non-participation. We have compared these two methods across three cohorts. In two cohorts, students were rewarded a bonus equivalent to 2% of the assignment marks each time they completed the ratings. In the other cohort, students were penalised 2% of the assignment marks each time they failed to complete ratings. In the two cohorts that were rewarded for making ratings, the participation rates were 67% and 57%. In the cohort that was penalised for not submitting ratings, the participation rate was 82%. The message of these findings is clear; SAPCA must be compulsory and the compulsion to participate is far stronger when student marks are penalised for non-participation.

**Forms of Formative SAPCA Feedback**

It is possible when employing SAPCA to expose students to qualitative peer feedback only (peer comments), to quantitative feedback only (peer ratings), to both forms of feedback or to no peer feedback at all. Instructors should consider and compare the benefits of these different reflective formative feedback components in light of the pedagogic aims of the team assignments they have designed. In the interest of achieving an appropriate balance between formative and summative feedback, of encouraging reflection throughout a project (Dochy, et al., 1999; Freeman & McKenzie, 2002; McGourty, et al., 1998) and of enabling students to respond to feedback (Walker, 2001), we have found it best to expose students to at least one peer feedback component. As might be expected, students are less resistant to receiving, and more readily willing to give, quantitative over qualitative feedback. In the cohorts we have studied, there are a number of reasons for this preference. Firstly, in small teams there are problems of maintaining anonymity when qualitative peer feedback comments are made visible. For, although the orders in which scores and comments appear can and should be randomised, often students are still able to determine through elimination who has written what. As well as leading to conflict, this can discourage students from making accurate and honest assessments. Secondly, in multicultural cohorts, students with English as a second language may have problems making comments and interpreting feedback and they may also feel that their use of English might identify them to teammates. Thus, we have found that such students make significantly fewer comments in multi-cultural teams than when in monocultural teams.

**SAPCA EFFECTIVENESS**

**SAPCA Transparency**

As the primary focus of assessment should be to encourage, direct and reinforce learning, then a primary aim of team assessment should be to enable the learning of teamwork skills. Assessment tasks devised for a course or unit involving teamwork should therefore not only explicitly reflect in scope and depth the stated objectives of
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that course; they should also reflect the pedagogic objectives of team assignments in that course. It follows that assessment transparency should not only entail giving students a precise explanation of how a SAPA tool operates, but that students should also be made aware of the pedagogical intent of the tool and, in the case of research, of the research aims of testing that tool. Furthermore, as a result of our early studies into the teaching of group design projects (Tucker, 2008), we recommend that the teaching of teamwork skills be introduced into any curriculum where teamwork assignments are to be used. The importance of assessment transparency to instructors using our SAPCA tool led to the inclusion of presentations to students on the pedagogical intent of the model, as well as tutorial exercises that informed students’ abilities to assess and provide feedback on the work of others. These sub-skills were presented to the students as being prerequisite to effective teamwork, itself a core graduate skill or attribute.

Software and Procedural Refinements

It is worth here touching upon refinements to our SAPCA tool introduced prior, during and after its testing with large cohorts. These included:

1. Creation of a model team for student demonstration purposes;
2. Students receiving a screen message indicating successful entry of ratings and comments;
3. Students being permitted to edit ratings and comments within each time window;
4. Instructors being able to quickly download complete listings of all student teams, of ranges of multiplicative scaling factors, of individualised rating scores and of comments by and about any team member; and
5. Students being encouraged to regard their final entry as a global one (i.e., one that assesses the duration of an assignment) that could then account for a weighted proportion of the MSF.

This last refinement requires explanation. Many students complained that weekly displayed MSFs did not accurately reflect actual team-mate contributions. It was revealed that many viewed their early ratings as inaccurate because the ratings had been based on misplaced trust. Gearing-up periods for new teams can be lengthy when some team members have a poor work ethic or a lack of motivation. Communication between team members may in such cases be shallow; a problem exacerbated if team members previously did not know each other. In such situations, peers may have little evidence of how much a team member has contributed and therefore can be misled when rating. The likelihood of poorly performing team members deliberately misleading team-mates about contribution is increased when the contribution is being peer assessed. Team members’ misconceptions of team-mates’ contributions may not be revealed until it is too late to accurately reflect uneven contribution within SAPCA ratings. A weighted final global rating allows students the opportunity to redress such inequalities. The comparisons of weekly MSFs to global ratings can also indicate the dynamics of a team for instructors, which is especially useful when there has been conflict, or in the event of student appeals against their individualised assignment scores.

Consistent communication between team-mates and between students and instructors is essential. We have thus found it important to establish online discussion areas to allow students to ask and answer questions and for instructors to identify and monitor unexpected problems. In addition, it is helpful to add to the SAPCA tool a protocol that automatically emails students weekly reminders to make ratings. Finally, students appreciate being provided with information about early research findings from SAPCA piloting. This
information might include an indication of the number of students and entries made, the number of individuals whose scores were individualised and an overview of what has been learnt as a result of the students’ efforts.

A detailed description of the technical software demands of establishing SAPA tools is beyond the scope of this chapter, for these demands and associated difficulties vary from institution to institution with different system architectures of online study environments. SAPA is used in a wide variety of applications, with the functional requirements of each implementation being determined by the particular combination of factors, including academic discipline, purpose of assessment, formality of assessment and number of assessments (Dochy, et al., 1999). While a wide range of online SAPA systems has been reported in the literature, all are premised on the requirements of their specific application, and are not automatically or even easily reused in a different assessment context. Additional factors which need to be considered include portability of software between differing operating systems, computer hardware setups, network configurations, database environments and institutional software approval processes. It has been observed that the development of an online peer assessment system for a single specific application may be relatively straightforward, but that extending the tool for more general use even in the same institution proves a significantly greater challenge (Mulder & Pearce, 2007).

One final procedural recommendation, which clearly applies to all online SAPA tools in light of the large volumes of electronic data that can be generated, is the necessity for regular automated data backup. The implications of data loss are obvious; not the least being loss of student confidence in the tool due to software crashes, no matter how brief, for such confidence is prerequisite to the effective application of online tools.

CASE STUDY: PRINCIPLES ARISING FROM THE USE OF SAPCA IN LARGE, MULTI-CAMPUS, MULTI-COHORT CONTEXTS

Introduction and Nature of the Course and Cohort

Following the successful use and ongoing development of SAPCA with Architecture students over a period of three years, it was trialled with a much larger, multi-campus student cohort in 2007. The aim was to determine the tool’s robustness and adaptability and to continue its refinement within a markedly different and more complex teamwork context. A Business Communication course within a faculty of Business and Law was selected because its course convenor desired a computerised SAPA tool following the forced abandonment of a paper-based SAPA system of individualisation due to the increasing size and diversity of the student cohort.

The trial cohort comprised a total of 1,835 students enrolled in semesters one (754 students) and two (1,081 students). Enrolments were dispersed - located at three different campuses within the state of Victoria, in off-campus mode within and beyond Australia, and at two partner campuses in Asia. Approximately 70% of the cohort comprised non-English speaking background (NESB) ‘International students’, mostly from wider Asia and the sub-continent. At any one time, up to fourteen different instructors were directly involved in teaching the course.

The teamwork assignment comprised an oral and written report task worth 30 percent of final marks. Students worked in self-selected teams of four, with a total of 443 student teams completing the team assignment across the two semesters. Because of the university’s strict comparability of assessment policy, all students were required to undergo comparable teaching/learning experiences and identical assessment tasks. An added
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challenge was therefore the need for SAPCA to be introduced and utilised in the same manner by all instructors for all enrolled students.

preparation of SAPCA documentation

incorporating SAPCA within this new and complex context demonstrated that the tool was sufficiently robust and revealed a number of additional principles for successful implementation. It was found there is a need for careful creation of clear SAPCA documentation with a focus on the student audience rather than on technology. For this trial, preliminary course overview materials contained a concise rationale for use of SAPCA in connection with the team assignment tasks with sufficient introductory information to meet the strategic and planning needs of all students, and the needs of off-campus and part-time students in particular. To facilitate error-free data entry by an instructor and the electronic creation of team sites within the SAPCA database, a team registration proforma was devised for newly formed teams to register their class number, unique team name, team members’ names, student ID numbers and online usernames. A clear and comprehensive document containing easy-to-follow instructions was then created to guide students’ SAPCA registration and the submission of their ratings. This document performed a vital role and required a convincing and motivating rationale for SAPCA and complete but non-excessive information, presenting helpful headings and subheadings, dot points, checklists and Help contact details. The course convenor then drafted one further document - a reminder email which included a précis of instructions, cross-referenced to complete documentation, and an Internet hotlink to the online SAPCA system.

All documentation was uploaded onto the course study portal website for ongoing student access. An online discussion area was created in preparation for the team registration and the first SAPCA rating period. An online frequently asked questions (FAQ) area was not provided but in hindsight this addition could have reduced the time spent by the course convenor in trouble-shooting the more predictable problems experienced by individual students. A SAPCA online database was constructed and populated with student names, university identification number and university email prefix, as these were readily available within the greater university database. This was in readiness for the convenor to later key in student team details.

nature of the team assignment and team formation

It is important for team assignments to be carefully planned and introduced. Students in the Business Communication course were prepared for their team experience by being made aware of the potential benefits of teamwork and provided with specific strategies and skills likely to facilitate a positive teamwork experience. A multi-channel approach was used to minimise the chance of any students being excluded from this preparation. Supportive content was included in lectures and reading materials, team member behaviours conducive to effective team assignment outcomes were discussed during tutorials, and a speed-meeting exercise was conducted to assist students to form their teams (Fermelis, 2006). Online meeting areas were created to allow absent and off-campus students to find each other and form teams. To create a sense of psychological identification and ownership after team formation, students were set simple team tasks designed to produce enjoyable and successful initial collaborative experiences (Fermelis, 2006), which they completed via face-to-face or in e-meetings. Teams collaborated to choose a team name and report topic, allocate specific team roles and complete their team proforma for the course convenor.
Introducing SAPCA and Training Staff

No matter how strongly committed the course convenor, with large cohorts it is the class instructors who are entrusted with encouraging, motivating and inducting students into their SAPCA experience. It is therefore vital to ensure that all instructors are both committed and co-operative regarding the use of SAPCA as a pedagogic tool and for the individualisation of student assessment. In our trial, instructors were fully briefed on how to motivate students and assist them to register and commence making SAPCA ratings. Most fully embraced the concept of the individualisation of student results for the purpose of ‘fair’ student assessment in a team assignment situation, particularly when they had previously experienced students in some of ‘their’ class teams suffer great distress at the disappointing contributions by team mates who failed to complete tasks on time, failed to attend team meetings or failed to remain in contact. Other instructors required greater persuasion, believing that it was part of the team assignment experience for students to resolve their own team problems, and that SAPCA explanations, demonstrations and registrations simply stole time away from other classroom activities. Whilst no instructor refused to communicate to their students that they were required to submit SAPCA entries, over time it became clear that some instructors encouraged their students more than other instructors. Unsurprisingly, there was evidence in the trial that more enthusiastic instructors seemed to achieve greater success in inspiring students to participate than did less committed and less co-operative instructors.

Introducing SAPCA and Inducting Students

The introduction of any form of SAPA to a large, dispersed and diverse student cohort of varying English speaking abilities and course participation habits requires careful planning and clear, consistent and effectively presented information. A multi-channel approach is more likely to achieve success than reliance on a single communication channel. Thus, once teams had been formed and SAPCA introduced, the detailed instructions and team registration proforma were explained via individual email messages, online postings, and lecture demonstrations. Because the unit was not available to first year students, induction and training were not complicated by issues of transition into university life. Although timetabling clashes, distances between campuses, and geographic dispersion of off-campus and off-shore students prevented the course convenor from personally inducting all students, the convenor ensured that the SAPCA access, registration and rating process was demonstrated with one on-campus tutorial group for each separate instructor. Instructors on other campuses were emailed documentation and trained by the course convenor by telephone. Off-campus and off-shore students were sent both e-copies and hard copies of SAPCA instructions, which appeared to introduce a more personal and thoughtful dimension for these cohorts. Off-campus students followed these instructions to work through the process themselves with support provided via the SAPCA online discussion site, email and telephone. During the first semester a range of minor problems were encountered, leading to refinements of the tool and documentation which greatly reduced the number of problems experienced in semester two.

Managing SAPCA throughout the Team Assignment

Once students had successfully registered and personalised their password, they were obliged to make a series of seven (semester one) or five (semester two) weekly SAPCA entries in relation to their team experiences. Ongoing instructor enthusiasm, support and encouragement were required throughout this period, not only to main-
tain student motivation and compliance but also to assist them with problems and improve teamwork learning outcomes. Although only a very small percentage of students experienced problems, in a large cohort this still meant a significant number of students needed individualised assistance. Some students were physically or electronically ‘absent’ during team formation and/or SAPCA induction. Other students had enrolled late and so were not included within the SAPCA database. Others wanted to join existing teams, form new teams, change teams or discontinue the course. Many students were unable to complete some entries because of absence due to illness, work obligations or holidays; others suffered software or hardware failure. Within one particular period an unexpected server failure prevented a large number of students from submitting their entries. Remembering to submit SAPCA entries was another common problem for many students, so email reminder messages complete with SAPCA hotlink were sent out to all enrolled students immediately prior to the opening of each time entry window. The fast identification, resolution and prevention of problems were key to the management of SAPCA and maintaining student enthusiasm throughout the life of their team assignment.

Using SAPCA during the Team Assignment

Notwithstanding the development and refinements which accompanied implementing SAPCA, students appeared to embrace the opportunity to provide feedback via the tool as an ongoing contribution to their own assessment and that of their team mates. They embraced the concept of ‘fair’ assessment, with individualisation as a response to the quantity and quality of their contributions, with only two complaints being received. The first student was quietened when confronted with the consistently low ratings and somewhat negative comments made by his team mates. The other was from a highly motivated off-campus student who felt that the individualisation had been too conservative. Students found the tool to be both intuitively sound and user friendly. In fact a small number of users found the tool so easy to use, that they were unsure whether or not they had successfully completed an entry. A feature was then added to clarify this that informed students of successful completion. An interesting observation was that off-campus students in particular appeared to relish the opportunity to provide often extensive feedback in relation to under-performing team-mates. This was in contrast to at least some on-campus students who actively self-censored their comments in order to maintain friendly face-to-face relationships.

Using SAPCA Data to Individualise Student Results

As described above, the use of SAPCA is aimed at the equitable individualisation of student scores for team assignment tasks by including formative and summative assessment of the assignment process whilst maintaining validity and reliability. Although individualisation can be achieved by use of paper-based instruments, large student enrolments render manual individualisation methods unfeasible. In such situations online SAPCA is a tool that can quickly and efficiently identify teams with uneven contributions and enable the calculation of individualised team scores.

In SAPCA, the sets of ratings entered by team members produce a numerical MSF for each team member. The tool also provides the instructor with a figure representing the range between highest and lowest MSF within each team. This range figure effectively represented the level of (in)equity within each team. In semester one of the trial, the instructors decided that a range greater than 0.3 was indicative of unequal team member contributions, so 72 out of 185 teams were identified as potentially requiring individualisation of team scores. This first stage of
the individualisation process was both fast and clear. In the second phase, each student member’s MSF, which reflected the quantity and quality of their contributions to the team task, was to be multiplied by their team score. For example, in a situation where the team assignment had scored 65% and one team member’s MSF was 1.1, their final individualised score would become 71.5%. Their team-mate’s MSF of 0.9 would then individualise that student’s score to 58.5%. The individualisation effectively redistributed scores within each team.

In practice, this second phase was more problematic than had been anticipated, but for different reasons in the two semesters. In the first semester, although students had been advised that it was compulsory to submit all seven sets of SAPCA ratings, it became apparent that for some teams there were MSF inconsistencies due to large numbers of ‘missed’ assessment ratings by some team members. Even though a default rating had been devised for missed assessments, due to a software bug the default was found to actually slightly reward the miscreants whilst slightly penalising those who had diligently submitted ratings. It was deemed impossible to determine from MSFs alone which students had simply neglected to submit their SAPCA ratings and which students had been precluded by circumstances beyond their control. As it was deemed unfair to reward tardy students and penalise precluded students, the course convenor examined the qualitative comments submitted to SAPCA about each student. This qualitative data helped complete a picture of member’s efforts within their team, enabling individualisation to proceed manually but conservatively because of diminished reliability.

Redistribution of a team’s marks typically resulted in one or two students’ scores being increased by 5-10% and one or two other students’ scores being reduced by 5-10%. The scores of 29 teams were individualised, however in some teams data was insufficient to use for valid score redistribution. For teams with low SAPCA participation, this second phase was thus both frustrating and time-consuming for the course convenor. In the second trial semester, the default weekly ratings were adjusted to slightly advantage students who conscientiously made SAPA entries each week and disadvantage their less diligent team-mates. Unfortunately, at the beginning of this second semester the course convenor role was unexpectedly transferred to an instructor who insisted that SAPCA not be compulsory for the team assignment. Thus, although all students were inducted into SAPCA, they were instructed that SAPCA was optional. It was encouraging to find that approximately 25% of the 1081 students still submitted SAPCA entries, but this submission rate was deemed insufficient for the convenor to validly complete any individualisation of team scores.

A theoretical criticism of SAPA, albeit one which appears to have no empirical support, is that students whose scores have been individualised down will complain or appeal, adding to instructor workloads. It was therefore gratifying to observe the almost universal acceptance by students, during the semester-one trial, of their individualised scores. It is suggested that this indication of high student satisfaction was because SAPCA had been explicitly introduced as a vehicle facilitating fair assessment in team assignments in relation to the quantity and quality of student contributions, rather than as a “punishment” for free riding team members.

**Issues for Particular Sub-Groups of Students**

As part of the trial of SAPCA with architecture and business communication undergraduate students, participants were offered the opportunity to complete an entry and/or exit questionnaire. The questionnaires included twenty items and were completed by 490 students aged between 18 and 40
years with a mean age of 20. It is beyond the scope of this chapter to delve in great statistical detail into the differential experiences and perceptions of SAPCA by different sub-groupings of students. Nonetheless, it is interesting to consider particular findings in relation to general students’ attitudes towards SAPCA as well as make particular observations in relation to the SAPCA experiences and perceptions of specific sub-cohorts.

The literature (Garbett, 2004; Hart & Stone, 2002; Monk-Turner & Payne, 2005; Morris & Hayes, 1997), our survey data and anecdotal evidence from students and instructors involved in this SAPCA trial consistently indicate that what students dislike most about team assignments is their perception of unfairness and inequity when all team members are awarded the same score. Our pilot survey promisingly revealed that students hold more positive views of group work after having used SAPCA. There was a statistically significant increase in positive views towards SAPCA from the beginning of semester (M 2.54 SD .39) to the end of semester (M 2.60 SD .43) (t (287) = 1.91, p<.05). However, the eta squared statistic (.01) indicated a small effect size. This finding is line with the improvement reported by instructors in student satisfaction and class spirit using the online SAPCA tool during team assignments in comparison to that experienced in equivalent past assignments that utilised no or more rudimentary forms of peer assessment. Increased maturity and confidence in many students as the assignments progressed was also apparent. Numerous students reported that SAPCA provided a “pressure valve” throughout assignments that allowed teams to function harmoniously despite unequal levels of skill and contributions. The SAPCA model may be seen to have allowed students to become more tolerant of the differential learning and assessment aspirations of their peers. Consequently our online SAPCA tool seems to have changed for the better the group dynamics seen in teams collaborating in the Architecture and Business Communication courses under study.

Online and face-to-face discussions with all student sub-cohorts consistently indicated that they were enthusiastic about the equity and fairness of individualised scores for their team assignment task, particularly if they aspired to high scores or had previously felt disadvantaged by their team assignment experiences. Nonetheless, many semester-one students asked whether or not SAPCA was compulsory, suggesting that they would not submit SAPCA ratings and comments unless they were to be penalised for non-compliance. During semester two, approximately 25% of the second semester students submitted entries after having received instructions that SAPCA was optional. This suggests that students’ desire to minimise learning and assessment activities may be stronger than their belief in the importance of fair and equitable team assignment scores.

The survey results indicate that NESB students may have experienced difficulties with participating in the team assignment task and with composing the qualitative comments about their team-mates’ contributions. There was an approximately even split in the questionnaire data between native English speakers (266, 54.3%) and NESB students (224, 45.7%). Table 1 illustrates the findings. NESB students were less positive about teamwork than those with English as their first language. An independent sample t-test was conducted to compare self-and-peer assessment attitude scores for students with English as their first and second language. There was a trend for NESB students to hold more negative attitudes towards self-and-peer assessment compared to students with English as their first language.

Many English speaking students were observed to relish the opportunity to candidly and at great length vent their frustrations about their underperforming team-mates. In contrast, International, NESB and overseas-born students generally made their comments cautious and polite. Some appeared unsure of the notion of individualisation of scores, which could reflect
a collectivist perception of team loyalty. Many seemed to submit stereotypical and generic remarks, possibly reflecting lack of experience in how to give positive feedback and/or limited vocabulary, and suggesting a need for additional training. Interestingly, a small number of NESB students submitted bland early comments but used their final entries as an opportunity to admonish their recalcitrant and lazy team-mates for having let down their teams.

Even though NESB students were less positive about teamwork than those whose first language was English, International students (a sub-group who may or may not have been native English speakers) were found to be more positive than Domestic students about group work (refer to Table 1). This conundrum is in need of further research to better understand the precise nature of the mechanisms at work. Differences in team formation preferences were also found to exist between the Domestic and International cohorts, with the former finding it more important than International students to choose their own team members rather than having them allocated by instructors. Further research might be able to illuminate if the factors behind this are related to collectivist versus individualist attitudes, or differential attitudes toward authority. Alternatively, the finding may relate to previous experiences in team assignments. Our study revealed that previous experiences of working in groups influenced, as might be expected, overall views of team work. For there was a significant difference between students who perceived previous teams as functional and those who perceived their previous teams as dysfunctional on attitudes towards team work in general.

There were some interesting qualitative differences observed with the SAPCA experiences of on-campus students in comparison to off-shore student sub-cohorts or those studying in off-campus or distance mode. On-campus students appeared to experience significant problems with the anonymity and frankness of their SAPCA comments. During induction, Business Communication students had been instructed to provide positive and constructive but frank feedback to their team-mates. Off-campus Business Communication students were so compliant with this instruction that the SAPCA IT support consultant independently commented on the frankness of their entries compared to those of the on-campus Architecture and Building students. In contrast, there was anecdotal evidence that the comments of

<table>
<thead>
<tr>
<th>Question</th>
<th>English Speaking students</th>
<th>NESB</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Attitudes towards teamwork</td>
<td>M 2.44 SD .537</td>
<td>M 2.73 SD .56</td>
<td>F (1, 464) = 1.754, p = 0.001; partial eta squared = 0.065</td>
</tr>
<tr>
<td>Attitudes towards SAPA</td>
<td>M 2.64, SD 0.374</td>
<td>M 2.71, SD 0.43</td>
<td>t(364) =1.903, p =.058.</td>
</tr>
<tr>
<td>Importance of choosing team mates</td>
<td>M 2.74, SD .57</td>
<td>M 2.42, SD .52</td>
<td>F (1, 464) = 11.496, p = 0.001; partial eta squared = 0.075</td>
</tr>
<tr>
<td>Prior teamwork experience</td>
<td>M 2.01, SD 0.97</td>
<td>M 2.21, SD 0.93</td>
<td>F (1, 464) = 4.831, p = 0.02; partial eta squared = 0.01.</td>
</tr>
<tr>
<td>Attitudes towards teamwork</td>
<td>M 2.49, SD .49</td>
<td>M 3.01, SD .56</td>
<td>F (1, 410) = 92.70, p = 0.001; partial eta squared = 0.184.</td>
</tr>
</tbody>
</table>
on-campus students may not have always reflected students’ true feelings. Individual students from some on-campus teams, for which contribution was rated as “even” by SAPCA, confided in the course instructors that they had been reluctant to be frank in SAPCA because this would have created embarrassment for them in later team meetings, tutorial classes or incidental encounters. Off-campus students apparently were immune to this problem, presumably because they were unlikely to ever meet their team-mates again.

Facilitating Development of Student Skills

A major rationale for team assignments within higher education is that they foster reflective student learning and the development of the teamwork skills valued by employers and thereby facilitate lifelong learning. Within this Business Communication case study there is consistent evidence of the first two types of learning, which would imply that lifelong learning may later follow.

The team assignment task unquestionably increased students’ awareness of interpersonal communication and teamwork. They were formally introduced into teamwork skills, roles and strategies, but in order to satisfactorily complete their team tasks students were compelled to interact with their team-mates and were unable to avoid practising and therefore developing their teamwork skills throughout the assignment period. Students had been provided with a meta-language and framework for discussing interpersonal and team communication, which they were required to utilise during personal journals maintained throughout this period. On these journal entries they were separately and individually assessed and also examined. Making analytical journal entries for an instructor assessor audience should thus be seen to have complemented SAPCA.

The concepts and terminology of interpersonal communication were rarely included within the SAPCA comments, but then again the latter were created to be read by team-mates rather than by instructors. By making regular SAPCA entries, students were both engaging with the assignment task and reflecting on their own contributions, as well as those of their team-mates, on a regular basis throughout the life of the team. It is unclear at the present time whether and to what extent the MSF scores and published peer comments may have impacted on their learning experiences, although it is undeniable that these assessments provided an impetus for at least some students to improve their contributions. Similarly, it is not possible to claim that students’ exposure to a team assignment and to SAPCA will facilitate lifelong learning. However, it would be difficult to argue that students’ team experiences within this course, in which SAPCA played a major role, failed to assist development of awareness, self-reflection, conceptual frameworks, skills and strategies.

FUTURE DIRECTIONS

An enduring message from the literature is the need to expand the comparatively meagre body of research related to the impact of participation on SAPA activities on students’ final unit results (Dochy, et al., 1999; Hanrahan & Isaacs, 2001; Strauss & Alice, 2007). For instance, it has already been noted that the balance between detailed rating criteria versus global/holistic ratings has an impact on the amount of qualitative feedback provided by raters, and hence, an impact on the balance of formative and summative effects of SAPA; further research into this assessment trade-off effect is suggested (Miller, 2003).

While there has been a significant “open source” movement in the development of SAPA software tools, with many systems based on freely available database and web server technologies, for the reasons outlined in the section ‘Software and Procedural Refinements’, the reality is that free access to SAPA system software source code
is not the same as free access to a working SAPA system that is tailored to the specific needs of a particular application. A more recent development in the open source arena are “social software” applications, such as blogs, wikis and social networking sites, which have as their essence the collaborative collection, ordering and interpretation of user-created content. These software systems provide new tools that are inherently aligned to the collaborative and critically reflective activities underpinning SAPA. They offer an emerging and interesting option for the development of the next generation of SAPA software tools.

A number of questions have arisen from our study requiring further investigation because their consideration is beyond the scope of the data generated. These can be conveniently summarised as follows:

1. What is the impact of ratings and comments on student contributions to team assignments?
2. Can different attitudes towards SAPCA and teamwork in general, between Domestic and International students and between International students of different nationalities, be attributed to the reported communal versus independent learning styles of Western versus Eastern cultures?
3. Are there differences between males and females in their ability and willingness to evaluate their peers?
4. Do NESB students in multilingual cohorts experience language barriers as restrictive to using SAPCA?

What We Would Like to Do Differently in the Future

The testing of the SAPCA tool with Business Communication students proved it to be sufficiently robust and adaptable to work with a very large and complex cohort and for a very different type of team assignment devised as part of a very different course, compared to the architectural design assignments for which the tool was originally devised. As mentioned earlier, several enhancements were made to the SAPCA tool before, during and after the time it was tested. A number of these refinements are worth stressing:

1. Make SAPCA mandatory for the team assignment with bonus points for compliance, and simultaneously configure a default for missed submissions that slightly disadvantages the miscreants;
2. Make the MSF visible to students throughout the assignment period, enabling under-performing team-members to become aware of how they were being perceived by their team-mates, and thus providing an opportunity for them to self-reflect and improve their participation;
3. Make comments visible to the instructor/assessor only, to be referred to in the case of student complaints or appeals regarding their individualised scores. Introducing clarity to the identity of the reader audience ensures confidentiality and improves comment frankness and accuracy;
4. Automate the email reminders to be sent electronically to students at the commencement of the ratings period;
5. Extend each ratings period to maximise the number of SAPCA entries made and reduce the number of student messages sent to the course convenor in relation to missed submissions;
6. Include a FAQ site within the course SAPCA online discussion site to enable students to quickly self-access solutions to predictable problems.

One final suggestion for improvement relates to curriculum decisions. The institution should have a policy of encouraging all courses with team assignments to make use of a SAPA tool for the individualisation of team assignments where
the assignment objectives are reinforced (rather than compromised) with individualisation. This would increase student compliance and reduce any reluctance to make SAPA entries. Such a policy would also gradually create a pool of experienced students who could help induct and train “naïve” SAPA users. It would also guarantee instructor commitment to and support of the SAPA tool, and reduce the burden of instructor induction. In the Architecture and Building school that has trialled and developed SAPCA over three years, the tool has been used repeatedly in multiple courses so that students now see it as a routine and necessary aspect of their teamwork projects.

CONCLUSION

In line with other studies on peer assessment, we have found SAPCA to promote independent, reflective, critical learning, to enhance in students the motivation for participation and to encourage students to take responsibility for their learning. Moreover, online SAPA systems have been found to solve problems of confidentiality and improve assessment efficiency. The findings of our pilot studies therefore support the positive contribution of online self-and-peer assessment within student group-based assignments.

Despite the size of the pilot classes, team assignment scores were available to students far earlier than in previous years because accessing peer assessment data via online SAPCA required substantially less time than the collation of individual paper-based assessments. It is encouraging that the acceptance of individualised team assignment scores was almost universal within the two experimental cohorts. Indeed, not one student made a complaint about the individualisation of their mark within Architecture. Within the Business Communication cohort, only two teams registered complaints and these were quickly resolved. Of course, with increasing academic workloads leaving little time for either manual paper-based or more elaborate self-and-peer assessment methods, it is more important than ever that it is easy both for students to make ratings and for instructors to quickly access ratings, MSFs and final individualised team results.

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