**Tools for Collaborative Learning: One Page Reports and Posters:**

**Introduction**

Education is about motivation, knowledge transfer and assessment. It is an active process of teaching, learning and testing. These activities always involve students and often require teachers. Because availability of information on the Internet is far beyond individual teacher’s and textbook’s knowledge, the teacher’s role has changed from information source to tour guide. Even the process of examination can be preset, but many hidden dangers lurk in this department with regard to reliability and validity. These educational activities take place in many contexts and through many media, and now e-Learning is in its ascendency.

One page reports and posters are robust tools that can address all these activities effectively and efficiently. These processes are active, creative and student centered. The methods are not new; indeed poster presentations are common in most academic conferences and one page reports have been used in many academic disciplines and business organizations. However as a focused strategy for collaborative learning these processes merit special attention, formal evaluation and refinement followed by strategic implementation as part of the educational process.

**One Page Reports**

“Toyota Motor Manufacturing expects all employees to write **one**-**page** **reports** whenever possible, using graphics as much as possible” (Carnes, 1997). The same expectation was experienced by the author in General Motors from the early 1990s. One page reports and posters are succinct, creative, informative and compelling communications. They may represent individual or group efforts. Whereas some organizations provide detailed content requirements, formatting guidelines and templates, probably the most useful requirements should be a title, name(s), context and date, the rest should be left to the student(s), who should be given free rein to use creative verbiage, color, pictures, charts, graphs, references etc. Other guidelines, in a research context, may include such conventional frameworks as introduction, background, literature survey, methods, results, discussion, conclusions and references. In product development the sections could include purpose, process, product and evaluation. The now wide availability of material, including images, on the Internet should be exploited to the fullest extent possible, with a requirement that sources and copyrights should be acknowledged. It should be expected that plagiarism spotting utilities such as “Turnitin” will identify high percentages; the only crime here is if due credit is not given to the original authors.

The role of these one page reports and posters in collaborative learning is to ensure group based, product focused, analytic and creative discussion. Group size flexibility may be allowed with groups ranging from one to five or six; some students may have logistic challenges that get in the way of collaboration or simply prefer to work alone. However, with contemporary communications such as Internet chat rooms and other social media, collaboration is rarely a barrier. The product focus and time deadlines do require social issues of situational leadership and contributions of individual responsibilities and skills; these are all part of the educational process.

The use of one page reports and posters in full time and part time education generally requires a one page report in the form of focused group homework every week and the presentation of a more elaborate poster, perhaps an extension of one of the reports, at the end of the course. The reports and posters may be presented either in hard copy or electronic forms, or both; they may use any utility, such as Microsoft Word, PowerPoint, a Spreadsheet or more specific software, all of which allow multiple forms of verbal, numeric and graphical communication. Above all, one page reports should tell a clear, concise, cohesive, comprehensive and compelling story.

**One Page Reports and Posters**

“A picture is worth a thousand words,” (Arthur Brisbane, 1911). Traditional text is sequential, as we learn to read we develop semantic frameworks which are retained and updated as the material is read. On occasion, we supplement our vulnerable memories by back tracking to earlier sections of the prose. Pictures on the other hand are non-sequential, or rather the sequence of information acquisition is not necessarily dictated by any rules of order; instead the picture creator uses emphases to attract attention and then encourages a search throughout the picture for detail to complete the story. The observer of a picture can use any search strategy and can backtrack easily.

One page reports and posters are pictures, albeit containing text and other media that require some sequential perception to enable comprehension. The artists who create these devices have a wide range of tools, much richer than words alone. One particularly powerful tool that can serve to link the various elements of the picture is the “concept map”, sometimes called a “mind map”. This tool comes in various forms. It may be hierarchical. Often the links between spatial elements on the map have grammatical forms – the “investigator” of this “problem” collected “data” using this “instrument“ which was analyzed by these “methods” and resulted in these “conclusions”. From each node (noun) in the concept map the reviewer may be drawn to greater detail in the small print or to a picture or chart which tell a detailed story. Of course this level of analysis of a poster or one page report will usually be implicit, although some students have formally used concept mapping frameworks to create their masterpiece.

**Assessment**

Academia has developed many forms of evaluation over the centuries, from viva – voce examinations, through multiple choice, short answer, problem solving, scenario based questions, and extensive reports, theses, dissertations and refereed publications. These devices vary widely in their reliability and validity, depending on their usage. It is increasingly common to develop rubrics to guide, or even dictate evaluation which include a set of criteria and multiple ordinal levels of performance in each criterion. A challenge, especially with very detailed criteria and large class sizes is bias due to “the halo effect” (Peacock, 2002, Cooper, 1981). The reviewer may be particularly influenced by a one feature of the report and grade all other criteria accordingly. Another problem of bias is a general shift up or down for a set of reports or drift one way or another over a series of evaluations. Frequent calibration by reference to the rubric is a time consuming and thus neglected activity. A widely held response to evaluator calibration is strict training in the use of a particular rubric, and sometimes a trend towards increase in the complexity of the rubric. But even this approach is vulnerable to the effects of the essential subjectivity of the human grading process, and the always present time pressure.

Alternative approaches to grading and feedback, especially in the context of these one page reports and posters, includes the use of a panel of judges and peer grading, using simple rubrics; delegating particular criteria to different evaluators may also be an option. Such approaches comprehend subjectivity and bias and the statistical value of replication will inevitably produce a more reliable result. There are familiar precedents to panel based grading in art, science and business, such as music, gymnastics, the job interview, professional certification, promotion systems, grant proposal evaluation and university program accreditation; they all use a set of, sometimes weighted, criteria that are evaluated on some, usually ordinal, scale by one or a group of variably qualified and experienced judges, who invariably exhibit human behaviors of subjectivity and bias. One way of dealing with variable spread and skewness in the results from small panels is to eliminate the top and bottom scores and average the rest. The peer grading approach, especially with large groups, can also solicit verbal comments on individual reports or posters, which when extracted and grouped can produce informative feedback. These comments may be classified according to the Kano model of “must have”, “the more the better” and the “excitement” factor, perhaps using both positive and negative assessments. Where panel, peer and individual teacher approaches are used then attention must be paid to the weighting of these contributions to the final score; a 30:20:50 ratio has been used recently and accepted as being fair.

Where individuals evaluate reports, even with clear rubrics, there will still be variability in the level and scale of the set of numbers or letter grades that emanate from the process. Sometimes there will be too may “As”, sometimes too many “Fs”. These results are not necessarily due to incompetent graders; rather they are more likely due to normal subjectivity and bias; on occasion this bias may be extreme, due to prejudice or even maliciously motivated. It should be noted that the spread (standard deviation) of scores on an individual criterion has more effect on the final amalgamated total score or rank than the average criterion score and the prescribed criterion weighting. The most appropriate statistical solution to this problem of an unwanted shift or spread is to superimpose a linear transformation to the individual criterion scores. An alternative approach is to reduce all the criterion data to ranked scores and then assign a predefined quantity to each grade level. In practice such interventions may not be deemed necessary or even considered valid. If a qualified, and assumed unbiased, judge, using a validated rubric calls the grade an “A” then an “A” it should be. This assumption is the norm in most teacher graded reports.

Prior to this recent exploration of one page reports and posters the author had quite extensive experience with these media in large scale automobile manufacturing industry and in space research project monitoring. Recent experience with this process of one page reports and a final course project poster has covered ten classes at two universities in Industrial Engineering, Human Factors, Occupational Biomechanics, System Safety and Aerospace Human Factors. The average size of these classes was about 50 and the average number of groups per class about 12; the choice to carry out individual projects did occur, but not very frequently; chosen group sizes of two, three and four were the norm.

A few technical problems were experienced: some students couldn’t understand the meaning of “1” and attempted to present multiple page dissertations; other groups, in their enthusiasm for detail, used unreadable font size; a common error was to omit references for the clearly downloaded images, charts and even verbiage. Groups quickly became more creative with color, font and layout as the courses progressed and avoided the earlier technical shortcomings.

Grading of these one page homework reports presented the most serious problem. The simple grading rubric had three equally weighted criteria – breadth, depth and presentation, each scored on a five (six) point scale – from “Fantastic” to “Absent”; creation of verbal anchors for these scales is a fine art. A single one page report generally represented only 3% - 5% of the final grade. The quality of the submissions of most groups resulted in full marks generally being awarded. This observation attested to the motivational value of this continuous assessment item. However, this criterion based, non-discriminative grading of group submissions delegated the role of norm-based evaluation of individuals to later assessment components.

 **Posters**

The final group based posters were presented on the last day of class, each poster representing 20% - 30% of the overall course grade, the final examination contributing 50% to 70% depending on the class. The posters were placed horizontally around the class and each class member rated (using a simple rubric) each poster (including their own) on score sheets that only contained a numerical (ID) reference. A comments column was provided for the solicitation of verbal supplements to the numeric score. After this peer grading process class members were asked to provide reflections on the back of the score sheet regarding course content, format and one page report and poster continuous assessment process. An alternative format was explored in which groups gave a short 10 minute presentation on their topic, either directly via the poster or with the aid of projected slides or a lap top presentation. Although the oral presentation medium has its advocates it was replaced in later classes by questions and answers from peers and the teacher. A second round of grading involved the teacher, academic colleagues and teaching assistants. In general only 5 to 10 minutes was required per poster. Whereas student groups had generally received full marks for their one page reports, there was greater discrimination between the posters, although generally speaking they received high marks. An alternative panel evaluation approach for the posters, borrowing from psychophysics, can use paired comparisons and the movement and grouping of items around the board room table to establish ranked rather than numeric scores. This process can use collaboration (rather than independence) among the panel of judges. Such processes are particularly effective in reaching consensus regarding the top and bottom (fail) submissions.

Score amalgamation was through a straightforward spreadsheet tool that assigned the pre-defined weights to the peers, teacher and colleagues / teaching assistants. The final course grade can follow a standardization / linear transformation process to bring them within an expected range. The calculation of rankings for criteria also helps to remove the numerical score biases. One outcome of the panel approach to poster evaluation was that there was generally a high correlation among the different judges, with regard to poster quality. Where substantial discrepancies occurred, panel discussions were used to resolve the problem. The opportunity to offer reflections on the course and one page report and poster process generally produced very positive comments. Another informal observation was of the obvious pride shown by the group members as they presented their creative posters. Furthermore, rather than shelf storage of traditional reports, the one page reports and posters are conveniently displayed in circulation areas to inform, educate and impress other students and visitors.

**Discussion**

The underlying driver of this process is that it is student centered, group based and creative. It is inherently motivational with a defined product (the one page report or process), a deadline, the encouragement of creativity, explicitly collaborative and a contribution to the course grade. The process enhances knowledge acquisition by reference to the class material, search for other sources, particularly the extremely rich Internet and consolidation into a concise communication. One page reports and posters are amenable to criterion based or norm based assessment, using rubrics, peers and panels of judges. The one page reports offer practice in the medium before the final poster development. Rather than factually based quizzes and other continuous assessment devices these one page reports and posters must involve discussion, creative communication design and joint responsibility. The individual student contributions to the group products were raised as a concern. This can be resolved by within group peer review, but such approaches are likely to be divisive, even if anonymous. The counter to this relative contribution criticism is that discrimination between individuals will invariably occur with the final examinations. At a higher level most students will have to contribute to group projects in their later employment, hence this training in collaborative learning will contribute another skill for their success in industry.