Stressed yet Motivated: Web-Based Peer Assessed Competition as an Instructional Approach in Higher Education

Abstract: The study explores peer assessed artifact competitions conducted in a college setting. The competitions utilized a web-based environment for designing and enacting collaborative online activities. Since peer assessed team competitions are extremely effective in promoting learning yet are rarely conducted in higher education the study aimed at disclosing students' feelings about such potentially stressful circumstances. The peer assessed competitions were favorably accepted by most of the students who claimed that it improved their performance. Moreover, students level of stress was correlated with putting more efforts into the products and feeling that as a result its' quality improved. In addition, peer assessments were highly correlated with the instructor's assessments and students reported they trusted them regardless the rating received. Finally, Fear of Failure, as a personality trait, predicted which students would report being anxious about the competition. Implications for supporting such students are discussed.

Introduction

Research indicates that team competition as an instructional approach produces higher learning performances than cooperative learning or competition among individuals (Slavin, 1980; Slavin et al., 1984; Fu et al., 2009; Ke & Grabowski, 2007). In team competitions a certain number of individuals cooperate as a group to compete against other groups. Such competitions are reported to be designed and successfully applied across various higher education programs such as Business Management (Corner et al. 2006; Casile, & Wheeler, 2005), Engineering (Cramer & Curten, 2005; Sansalone, 1990), Computing (Fu et al. 2009), and Instructional Design (Kinzie et al. 1998; Rowland, 1994). For instance, Corner et al. (2006) describe a case team competition that takes place every year where business management students analyze real-world complex case faculty members produced with the help of local businesses. Students give excellent evaluations to this activity and faculty members believe it is a wonderful experience. Cramer & Kurten (2005) too, describe a team competition occurring each year - where engineering students design , develop and test a Canoe made of concrete - as a peak experience in the program. However, all these studies ignore one of the most important pedagogical resources relevant to team competition – peer assessments; typically, students' teams are assessed and ranked by juries or faculty member, but not by the students themselves.

In higher education, peers have almost no input regarding their friends' projects flaws and merits, ways to improve it, etc. Yet, socio-constructivists theories argue that peers are one of the most influential factors in knowledge construction (Cole, 1996; Lave & Wenger, 1991). Peer assessment, in particular, has been shown to have many advantages. Studies have indicated that peer assessment assists students to create higher quality artifacts, as a consequence of better understanding of assessment criteria which they use when they play the role of assessors (Falchikov, 2003; Smith et al. 2002; Kali & Ronen, 2008). Since peer assessments are rarely used in competitive settings in higher education there is hardly any study that explored how students feel about exposing their work to peers under such circumstances. One of the purposes of this study is to answer this question.

Assuming that peer assessed competitions might have pedagogical advantages, orchestrating it (assigning artifacts for peer assessments, calculating and publishing the results, etc.) is logistically complex, hence, decrease faculties' incentive to embrace such an initiative. Recent e-leaning environments may provides an efficient solution to this challenge, by facilitating the design, orchestration and enactment of peer assessed competition activities, especially when dealing with artifacts that are produced in digital formats.

The CeLS (Collaborative e-Learning Structures), a web-based environment for designing and enacting collaborative online activities (Ronen et. al., 2006), provides an efficient solution to such a challenge. Using a friendly and intuitive interface lecturers use the CeLS to plan the competition and afterwards the successive stages are automatically handled by the system, e.g., students submit their product (the environment is designed to absorb multimedia artifacts), then, the environment randomly assigns a predetermined number of anonymous artifacts for each student to assess, then, the students submit their assessments. Finally, each artifact is publicly presented with peers' mean score plus anonymous verbal comments, adjacent to it. Typically each student receives scores and verbal comments form about 10-20 peers - depending on number of students in the class and number of artifacts each student is required to assess. Such a process allows for each artifact to be analyzed from multiple perspectives and gives each student a rich and multifaceted feedback. Since the CeLS environment supports the lecturer in structuring the activity and automates its enactment - using peer assessed competition as an instructional strategy hardly puts extra demands on the lecturer. In our study the CeLS environment was used to handle peer assessed competition activities in college level courses.

The study

This study explores the pedagogical aspects of a peer assessed competition as an instructional approach in higher education. Our aim was to assess the quality and perceived value of the feedbacks students give their peers, and to figure out some of the motivational factors related to the fact that students know that their products will be assessed and ranked by their peers, and eventually will be publicly discussed in front of the whole class. How do students feel about such circumstances? Do they feel intimidated? Does it energize them? Do they put more effort into the project then they would normally do? Are personality traits, such as fear of failure, related to the ways they deal with the knowledge their products will be 'exposed' and assessed by their peers? Does fear of failure inhibit competitiveness? Do they appreciate their peers' feedback? In particular the study addresses three issues:

- How reliable are peer assessments? Do they correlate with the instructor's assessments? Do students trust peer judges?
- To what extent students feel that the web-based competition motivated them and encouraged them to submit better artifacts or, on the contrary, inhibited them and harmed their performance?
- Is Fear of Failure, as a personality trait, related to students' attitudes toward web-based competitions? Better understanding of the psychological dynamics related to such competitions might help us support students who dislike such activities and experience excessive stress related to them.

Participants & Activities

Participants were 1st and 2nd year undergraduate students in an Instructional Technology B.A. program in a technological college. The program's curriculum is fully dedicated to instructional technologies (there are no other majors or minors) and students are involved in many team projects during their 3 years study. In the first two years all students take the same compulsory courses, while elective courses are offered only in the 3rd year. As a result of these circumstances students' cohorts form very cohesive groups. This fact may have implications on the ways students' experienced different aspects of the activity, such as the need to assess peers, the experience of being assessed by peers, and the experience of overt competition, as will be demonstrated in students' quotes reported later on.

41 1st first year students participated in an Introduction to Psychology course. As part of the social psychology unit students were asked to apply attitude-change theories and design a poster and a brochure that encourage parents to consider sending their children to schools that adopt constructivists' principles. Peers' assessment and competition in this group dealt with the poster and its efficacy and potential impact for raising awareness and attitude-change.

44 2nd year students participated in a Web based Inquiry Learning course. As part of the course the students were asked to design and develop a prototype of a WebQuest (Dodge, 1995) dealing with an historical dilemma (related to world war II) the lecturer provided. Peers' assessment and competition in this group dealt with the WebQuest design. Students were encouraged to use a rubric (Dodge, 2001) to support the design and the assessments process. The rubric contained assessment dimensions such as the effectiveness of motivational strategies used to provide an engaging webquest, the appropriate use of collaborative learning strategies, the sophistication of the task design in terms of encouraging higher-order thinking, etc.

Method & Tools

At the beginning of the semester students completed a Fear of Failure personality questionnaire (Performance Failure Appraisal Inventory, Conroy, Willow & Metzler, 2002). The questionnaire measures the strength of individuals' beliefs in five aversive consequences of failing: fear of experiencing shame and embarrassment, fear of devaluing one's self-esteem, fear of having an uncertain future, fear of important others losing interest and fear of upsetting important others. The scores obtained from these five consequences are moderately- to strongly-correlated with each other and their common variance can be modeled with a single higher-order factor representing a general fear of failure. The breakdown of Fear of Failure to such 5 scales enables one to better understand the exact cause of fear and properly address it (Conroy, Willow & Metzler, 2002). Fear of failure, general, is believed to intimidate need for achievement and compositeness (McClelland, 1961).

During the semester students participated in the competition activity and were asked to assess their peers' projects and grade the artifacts. The specific activities and their web-based implementation are detailed in the next section. The competition activities were an integral part of the courses; participation as assessors was credited while the actual grades for the artifacts were given *only by the instructor* and students' assessments and ranking did not influence it.

Following the experience students answered a questionnaire (14 multiple selection items and one open question) reflecting on their feelings and attitudes related to participating in the web-based competition and their preferences regarding such projects. The questionnaire asked students to provide Likert type ratings to items such as: "the fact that my artifact was rated by my peers: stressed me, made me put more effort into the project, made me conduct more improvement trials, ended up improving my artifact", "peers' assessments seem valid to me", "I would like to have more such competitive-like activities". The open question asked for students' opinion about the competitive activity.

Web-Based Competition: Instructional Design and Implementation

The competition activities were performed with CeLS (Collaborative e-Learning Structures), a web-based environment for designing and enacting collaborative online activities (Ronen et. al., 2006). The system offers content free templates and a searchable repository of sample activities that were implemented with students. Teachers can explore these resources and adapt them to suit their needs or create new activities from basic building blocks. CeLS unique feature is the ability to design activities that use learners' artifacts from previous stages according to various Social Settings (e.g., one team accesses another team's project, a whole class gives improvement ideas to one team, etc.). The Social Settings determine which and how many artifacts would be presented to each participant for further interaction. This feature is exploited in order to design the competition activities and to facilitate their enactment in a real setting. The general structure of a competition activity consists of three stages (Figure 1):

Stage 1 presents the activity and provides a dedicated place for the artifacts submission. The submission interface is adapted by the teacher to suit the artifact's requirements: in the posters competition, in our study, the interface invited students to summit JPG files up to 300kB and in the WebQuest competition a the interface provided a location for submitting a proper link to a website. The artifacts submitted can be individual or group products, as defined by the Social Settings. In our case the artifacts were group products. This definition would enable either of the group members to submit the artifact then ensure that in the assessment stage a student would not be presented with her own group's artifact.
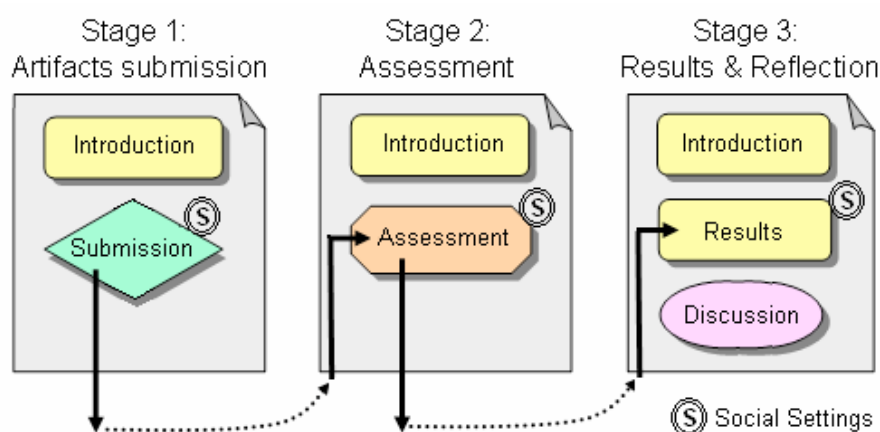

Figure 1. The general structure of a competition activity implemented with CeLS.

Stage 2: The Assessment stage starts with relevant instructions, then (some or all) peer artifacts are presented for voting (see Figure 2a). The artifacts are presented anonymously to the peers. If the activity involves assessing many artifacts (as in the Poster competition) or if the artifacts are complex and their assessment requires considerable effort (as in the WebQuest competition), it would be advisable to restrict the load and present each judge with a limited number of artifacts. Therefore, each judge in the Poster competition was asked to assess 8 artifacts (Figure 2a) while in the WebQuest competition only 5 artifacts were assessed by each student. Students were allowed a couple of days for these assessments. The Assessment interface in our competition activities was adjusted so that each assessor had to provide an overall grade and verbal justifications and explanations. If an activity would require a more detailed evaluation addressing various criteria, the Assessment interface could be a questionnaire or a rubric.

Stage 3 presents the competition overall results (see example Figure 2b). The teacher can show the assessment details (grades and justifications) for all artifacts (presented anonymously) to all students or to present each participant only with the details for his own product.

Figure 2 presents partial sample screens from Stage 2 and Stage 3 of the poster competition.
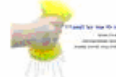
Figure 2. Sample screens from the poster competition. (a) Stage 2 (b) Stage 3.

Results

First we will present data regarding the quality and worth trustfulness of peers' assessments and to what extent they feel their peers judged their artifact fairly. Then we will present students' attitudes toward competing and being assessed by peers and their perception of the impact of the competition approach on the quality of the artifacts. Finally, we will report about the relationships between Fear of Failure as a personality trait and students' attitudes toward web-based competition activities.

Students as Assessors

Table 1 presents the correlations between students' mean ratings of artifacts and the lecturer's independent ratings. Similar to Kali & Ronen (2008) findings, students' mean ratings seem to be valid and correlate nicely with the instructor's grades.

Table 1: Correlations between students' mean ratings of artifacts and the lecturer's independent ratings.

Activity	# of Artifacts	r	p
Year 1: Poster Competition	20	0.82	0.000004
Year 2: WebQuest Competition	24	0.68	0.0001

There is a noticeable difference between the two correlations presented in Table 1. The higher correlation between students and instructor in the Poster competition is probably due to the fact that the artifact is less complex and less multi dimensional then the WebQuest one. In the WebQuest activity the assessment process was much more demanding. As a result some students were biased by salient features (such as interface and visual design) rather than assessing factors such as the pedagogical value of the WebQuest, resulting in a lower correlation between students' and instructor's assessments.

Students' comments to artifacts were interesting, non-repetitive, and provided an enriching and insightful analysis of the artifacts. It seems that a feedback given only by the instructor could not provide the intellectual and emotional impact of such a multiple perspectives feedback to many artifacts (see examples in Figure 3).
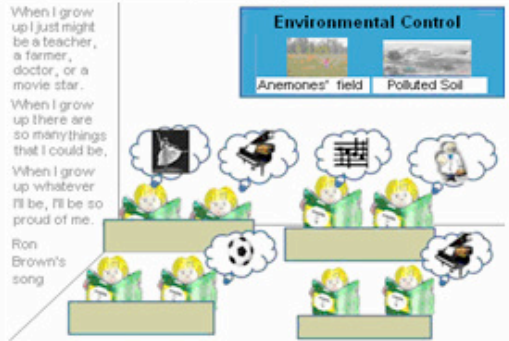
A poster ranked highly by peers and instructor		A poster ranked poorly by peers and instructor	
Peer grade	Justification	Peer grade	Justification
9	A very nice way to represent symbolically the idea (the sponge), plus a strong appeal to emotion. The verbal information is also very focused; it offers an alternative which emphasizes experiential, constructivist learning principles. Alfi Kuhn's ideas are very well represented in this poster.	6	It seems that the message intended to be delivered is that classroom materials are neither interesting nor relevant to children. They have big dreams and should be provided with means to reach these dreams. An alternative is missing: What should be done in order to bring relevance to the educational system?
9	I love the message which brings me back to the time where I studies History and had to learn by heart many 'dry' facts. It stresses the point that students absorb the material using rote learning and then they 'vomit' it. Loved it.	5	Overload of text and of visual elements as well. There is no clear saying. It is impossible to understand from the poster what is the problem and how to deal with it. The graphic design isn't impressive either.
8	This poster may cause actual attitude change! Parents would not want their children to be like a sponge with no understanding! Parents would like their child to learn, develop, understanding. The idea is very well capsulated and is very clear. The message will have a strong emotional impact on parents.	5	Although it is obvious that a lot of work and thought was put in the poster no real message is delivered, particularly when the topic we are dealing with is considered. One has to 'shock' the audience more heavily with clear-cut sentences that indicate what is the problem and what should be done to fix it.
9	Uses humor in an effective strategy. Does not use a simplistic one-sided attitude change strategy but rather a sophisticated message delivered lightly and clearly.	7	Good idea but it is somewhat unclear – the conformity on the one hand versus the over-emphasized wish to be unique on the other – but who/what could help children become unique? What is the next step?

Figure 3. Examples of posters and few sample peers' assessments.

Most students in both classes (about 80%) felt that peer assessments to their own artifacts were valid and fair. No significant correlation was found between the appreciation of peer grades' validity and the actual grades granted by the peers, meaning that this view was shared also by students whose artifacts were judged less favorably by their peers.

Competition as an Instructional Strategy – Student's Views

The analysis of 1st and 2nd year students' responses to the reflective questionnaire and interviews revealed very similar distributions, therefore we shall refer to both groups as a whole (N=85).

Most students felt that the awareness to the fact that their artifacts would be exposed and assessed by peers resulted in a better product (Table 2).

Table 2 : Perceived impact of the awareness that the artifacts would be assessed by peers on artifacts' quality.

Perceived impact on artifacts' quality (%)				
None	Little	Some	Large	Very large
14	20	40	22	4

Only few students (4%) reported that the competition was somewhat "paralyzing" resulting in a detrimental effect upon their artifacts.

As could be expected, self reported motivation caused by the competition (items such as "the fact that my artifact was rated by my peers: made me put more effort into the project") was significantly correlated with the perception of positive effect on products' quality (r=0.72 p<0.000001). The more interesting finding is related to the perception of stress caused by the competition activity (based on the item: "the fact that my artifact was graded by my peers stressed me"). Even if no correlation was found between the degree of stress caused by the activity and the perceived impact on products' quality, the estimation of stress was significantly correlated with the perception of effort devoted to the creation of the artifacts (r=0.33 p<0.001), meaning that students who

admitted to being more stressed also felt that they have devoted more time and effort to the activity. The beneficial effect of "some stress" is demonstrated in Table 3 that presents the student's perceptions of the competition activity as motivating and as stressing.

Table 3: Student's perceptions of the competition as a motivating and as a stressing activity (N=85).

| | | Motivation (%) | | | |
		none	some	much	Total
Stress (%)	none	**4**	**23**	**23**	50
	some	**2**	**20**	**24**	46
	much	**1**		**3**	4
	Total	7	43	50	100

Even if most (60%) would favor using competition activities in academic courses, in their detailed comments many recommended not to "overuse" this strategy and to restrict it to once in a semester in order not to impose an "exaggerated" workload. The quantitative aspects were supported by students' written comments. Following are few examples of students' opinions regarding peer judged competition as an instructional method:

Positive opinions:
- It is very motivating. It made me put lots of effort. I think that without the competitive factor I wouldn't have achieved such a success in this WebQuest activity. In addition the CeLS environment allowed us all to see each others' products, which is very nice for comparing and learning.
- The number of WebQuests we had to assess (5) was just right. I would not ask students to assess more then that. I believe competition is always a good idea. The fact that the leading products were presented and discussed in class made me feel really good after all the effort I have put in it.
- I am a competitive type so this method really helped me to achieve a meaningful product. I was enriched by viewing the elaborated products of my peers. To summarize, it was fun and educative.

Ambivalent opinions:
- I think the competitive activity is useful, efficient and contributing as long as a rubric is provided and the grading process is led by it. In this WebQuest activity we were encouraged to use a rubric. According to the competition results, it seems that not everyone used it - so there isn't enough uniformity in the grades given by peers and in some cases there weren't sufficient explanations to support assigned grades.
- I think that to some extent the competition did stimulate interest and encouraged teams to produce better WebQuests – yet, personally I believe that it is not always good to conduct such competitions since it might create tensions between class members, create uncomfortable situations, or unreliable results.
- I don't like so much competitive activities. Working in a primary school I saw cases where students gave up in advance, since they thought they don't have a chance. On the other hand – I think that from time to time, such an experience could be a fun and refreshing.
- Competition could paralyze people with low self-confidence – yet, with right team work such a problem might be less dominant. I believe in competition, believe it motivates, and produces higher quality products. Of course one shouldn't exaggerate and put people into too much pressure.
- Competition is a good yet problematic method. It was difficult for me to assess close friends from our class. In addition, competitive students would not want to give high grade to others that might surpass them. In a small and cohesive class as ours - it is hard to critique others.

Negative opinions:
- Some people need to learn how to provide feedback to others – and the lecturer needs to stress it.
- After reading the feedback given to our WebQuest I was pissed off. I realized that people drastically punished us for criteria that weren't relevant. It seems that people didn't realize what the purpose of the activity was. Some groups created a fully functioning web site rather then a prototype. As a result feedback focused on usability and visual design aspects rather then the criteria defined by the rubric provided.
- The problem with competition is that it puts pressure on those who are highly anxious. I am sorry that in our class (1st year, poster project) anxiety is more salient then healthy competition. But maybe it is only our class and when time passes it will change.

One can see the competitive activity raised some intense emotions. Some students loved it while others were skeptical about their peers' feedback and worried about augmenting the anxiety level in class. It seems that most of the students felt that activity was refreshing and fruitful yet shouldn't be implemented too often.

Fear of failure and students' attitudes toward Web-based competition

Fear of failure was found to be related to participants' negative attitudes towards web-based competition. There was a considerable correlation (r=.47 p<.01) between Fear of Failure (sub-scale related to devaluing one's self-esteem) and participants' reporting that the competition paralyzed them. Similarly, Fear of failure (sub-scale related fear of upsetting important others) was correlated to students' preference to have peers assessments

without numeric grades and competitive aspects (r=.4 p<.01). On the other hand, Fear of Failure (sub-scale related to fear of experiencing shame and embarrassment) was correlated with reporting about conducting more improvement trials (r=.32 p<.01).

It seems, thus, that fear of failure has different dimensions and is not a holistic psychological phenomenon with uniform consequences. Some dimensions (e.g., devaluing one's self esteem, or fear of upsetting important others) might inhibit students and consequently cause a decline in performance, whereas others (such as fear of experiencing shame and embarrassment), on the contrary, might boost students' motivation and make them invest more effort in their artifacts. Such fine differentiations might give instructors a clue regarding ways to support students who experience excessive stress related to peer-assessed competitions. For instance, instructors could encourage anxious students to try and diminish the direct, and at times painful, connection between their products and their self-esteem. Alternatively, an instructor could gently suggest that as grownups, important others might perceive such students more favorably then dominant persons related to their past.

Discussion

The findings support previous reports which provide evidence that peer assessments are trust worthy, reliable, and in many cases highly correlate with instructors' assessments (Kali & Ronen, 2008). Students' verbal comments in our study demonstrate the emotional and intellectual advantage of feedback provided from multiple perspectives as compared to feedback provided exclusively from the instructor. Students' comment to peers' artifacts seem to be enriching, interesting, stimulating and honest. Despite the concerns of few, most students reported they trusted their friends' feedback, and this was true also for students who did not do so well.

Most students believe that the awareness to the fact that their products would be assessed by their peers boosted their motivation and as a result they submitted better artifacts. The fact that the experience of stress was positively correlated with effort invested supports the famous inverted U theory (e.g., Muse et al., 2003) which claims that moderate amounts of stress improves performance. However, our data suggests that some students might experience intense stress related to peer ranking and competition; Students who tend to devalue themselves as a result of failure, and students who tend to fear they upset important others when they fail – seem to have experienced the competition as paralyzing and would prefer not be ranked by their peers. On the other hand students who tend to feel embarrassed as a result of failure seem to put more effort and improve their performance. These findings shed some light on the possible dynamics causing some students to be paralyzed by competitive-like activities and provide some clues on how an instructor might support them.

The academic grading system is based on competitive sorting. Many believe that competition is detrimental to learning and to intrinsic motivation and call for the minimization of its effects by means of educational strategies such as collaborative learning (Kohn, 1992). Do competitive learning activities augment the harmful effects of grading and competitive sorting? Our quantitative and qualitative data supports studies that claim the team competition is and effective and engaging experience (Slavin, 1980; Slavin et al., 1984; Fu et al., 2009; Ke & Grabowski, 2007). Recent motivation theories (Covington & Wiedenhaupt, 1997) argue that intrinsic and extrinsic motivations are two independent dimensions (they suggest a quadripolar model rather than a bipolar one). Thus, despite the fact that competition factors might increase extrinsic motivation, one might still be intrinsically involved in a task, as long as it is intriguing, fun, and more similar to 'play' rather then 'work' (Covington & Wiedenhaupt, 1997). One can be stressed yet intrinsically motivated at the same time. Nemerow (1996) reached similar conclusions: In a study applying both competitive and noncompetitive games, students were surveyed to find out how they felt about the games and what they learned from them. Results indicated that competitive games helped students improve self-esteem, peer relationships, and learning, yet, the students described the competition as motivating but also producing pressure.

The competitive learning experience in our study seemed to endorse a playful climate and to intrinsically engage most of our students and caused many of them to believe they improved their performance. Other higher education studies which experimented with similar, fun, team competition activities support this notion (e.g., Corner et al. 2006; Casile, & Wheeler, 2005; Cramer & Curten, 2005; Kinzie et al. 1998).

Summary & Concluding Remarks

The fact that the team competition activities energized students in our study and made them believe that it improved their products might indicate that when a favorable social climate is created most learners might enjoy and benefit from the 'public' exposure and competitive situation involved with peer ranking and assessments. The rich and divers nature of multiple perspective feedback seems to have a good potential of augmenting learning processes and meta-cognitive self-assessment abilities (White & Frederiksen, 2000). Teachers in higher education should consider using more often such strategies in any discipline where the creation of original artifacts is relevant. As long as they succeed to create a playful, psychologically safe learning environment, chances are most students will get intrinsically involved, enjoy the experience, and as a result of assessing others' work, become more reflective about their own learning. Using a web-based environment such as CeLS takes care of the logistic hassles and increases the chances that faculty members will enjoy the experience as well.

References

Cramer, S., Kurten, J. (2005). Inspire Future Engineers with the Concrete Canoe Competition. *Tech Directions, 65* (4), 17-19.

Casile, M. & Wheeler, J. V. (2005). The Magnetic Sentences Industry Game: A Competitive In-Class Experience of Business-Level Strategy. *Journal of Management Education, 29*(5), 696-713.

Cole, M. (1996). *Culture in mind.* Cambridge, MA: Harvard University Press.

Conroy D. E., Willow J. P., Metzler J. N. (2002). Multidimensional Fear of Failure Measurement: The Performance Failure Appraisal Inventory. *Journal of Applied Sport Psychology, 14* (2), 76-90.

Corner, P. D., Bowden, S., Clark, D., Collins, E., Gibb, J., Kearins, K., Pavlovich, K. (2006). Grounded Learning from a Strategy Case Competition. *Journal of Management Education, 30*(3), 431-454.

Covington, M. V., & Wiedenhaupt, S. (1997). Turning work into play: The nature and nurturing of intrinsic task engagement. In R. P. Perry & J. C. Smart, (Eds.), *Effective teaching in higher education: Research and practice*, (pp. 101-114). Agathon Press, New York.

Dodge, B. (1995). WebQuests: A technique for Internet-based learning. *Distance Educator, 1*(2), 10-13.

Dodge, B. (2001). *A Rubric for Evaluating WebQuests.* Retrieved October 12, 2009 from http://webquest.sdsu.edu/webquestrubric.html

Falchikov, N. (2003). Involving students in assessment. *Psychology Learning and Teaching, 3*(2), 102-108.

Falchikov, N., & Goldfinch, J. (2000). Student Peer Assessment in Higher Education: A meta-analysis comparing peer and teacher marks. *Review of Educational Researc, 70*(3), 287-322.

Fu, F.L., Wu, Y.L., Ho, H.C. (2009). An Investigation of CoOpetitive Pedagogic Design for Knowledge Creation in Web-Based Learning. *Computers & Education, 53*(3), 550-562.

Kali, Y., & Ronen M. (2008). Assessing the assessors: Added value in web-based multi-cycle peer assessment in higher education, *Research and Practice in Technology Enhanced Learning, 3*(1), 3-32.

Ke, F., & Grabowski, B. (2007). Game playing for Math learning: Cooperative or not? *British Journal of Educational Technology, 38*(2), 249–259.

Kinzie, M.B., Hrabe, M.E., Larsen, V. A. (1998). An Instructional Design Case Event: Exploring Issues in Professional Practice. *Educational Technology Research and Development, 46*(1), 53-71.

Kohn, A. (1992). Resistance to Cooperative Learning: Making Sense of Its Deletion and Dilution. *Journal of Education, (174)*2, 38-56.

Lave, J. & Wenger, E. (1991). *Situated learning. Legitimate peripheral participation.* Cambridge: Cambridge University Press.

McClelland, D. C. (1961). Methods of Measuring Human Motivation, in J.W. Atkinson, (ed.), *The Achieving Society*, pp. 41-43. Princeton, N.J.

Muse, L. A., Harris, S. G., & Feild, S. H. (2003). Has the Inverted-U Theory of Stress and Job Performance Had a Fair Test*? Human Performance, 16*(4), 349–364.

Nemerow, L.G. (1996). Do Classroom Games Improve Motivation and Learning? *Teaching and Change, 3* (4), 356-566.

Ronen, M., Kohen-Vacs, D. & Raz-Fogel, N. (2006). Adopt & Adapt: Structuring, Sharing and Reusing Asynchronous Collaborative Pedagogy. In Barab, S., Hay, K., & Hickey., D. (Eds), *Proceedings of the 7th international conference on Learning sciences* (pp. 599-606). International Society of the Learning Sciences (ISLS).

Rowland, G. (1994). Educating Instructional Designers: Different Methods for Different Outcomes. *Educational Technology, 34*(6), 5-11.

Sansalone, M. (1990). Teaching Structural Concepts through Case Studies and Competitions. *Engineering Education, 80*(4), 472-475.

Slavin, R. E. (1980). Cooperative learning. *Review of Educational Research, 50(2),* 315–342.

Slavin, R. E., Leavey, M. B., & Madden, N. A. (1984). Combining cooperative learning and individualized instruction: Effects on student mathematics achievement, attitudes, and behaviors. *The Elementary School Journal, 84*(4), 408–422.

Smith, H., Cooper, A., & Lancaster, L. (2002). Improving the quality of undergraduate peer assessment: A case for student and staff development. *Innovations in Education and Teaching International, 39*(1), 71-81.

White, B. Y., & Frederiksen, J. R. (2000). Technological tools and instructional approaches for making scientific inquiry accessible to all. In M. J. Jacobson & R. B. Kozma (Eds.), *Innovation in science and mathematics education* (pp. 321-35). Mahwah, NJ: Lawrence Erlbaum Associates.