Promoting Collaborative Learning in Higher Education: Design Principles for Hybrid Courses

Rachel Levin-Peled, Yael Kali and Yehudit Judy Dori,
Technion, Israel Institute of Technology
rlevinp@techunix.technion.ac.il yaelk@techunix.technion.ac.il yjdori@technion.ac.il

Abstract: This research explores the learning that took place in three hybrid university-level courses in education, which were designed according to three main design-principles: (a)engage learners in peer instruction, (b)involve learners in assessment processes, and (c)reuse student artifacts as resource for further learning. These principles were employed in the courses in different manners according to the goals, contents, and target audience in each of the courses. About 40 graduate, and 260 undergraduate students participated in the study. Data-sources included collaborative and personal artifacts in the courses' sites (wikis, forums, and documents created by teams or individuals), researchers' reflective journal, surveys and interviews. We focus on the first design-principle, and show how learning was promoted by features designed according to this principle in each of the courses. We recommend course-designers and instructors in higher-education to use the design-principles identified and developed in this research to foster meaningful learning in other web-based courses.

Introduction

Many higher education institutions and especially teacher education departments offer hybrid courses, which combine face-to-face with online teaching. Research shows that the combination of face to face with online instruction offers added value in supporting learner-centered and collaborative learning (e.g., Dean, Stahl, Sylwester, & Peat, 2001; Singh, 2003; Frank & Barzilai, 2004). Many of these studies indicate that in order for a hybrid course to encourage meaningful learning, it should be designed to support collaborative, learner-centered instruction, as well as embedded assessment for learning. The literature refers to learner centered teaching as one that supports learner knowledge-building by promoting higher order thinking skills, collaboration, product-construction, and reflection (Birenbaum, 2003; Cobb, 1996; Collison, Elbaum, Haavind, & Tinker 2000; Ewing & Miller, 2002; Mcloughlin & Luca, 2001; Rovai, 2000; Resnick, 1996). Embedded assessment refers to an ongoing process that emphasizes the integration of assessment into the instruction in order to support learning (Birenbaum, 2003; Birenbaum, Breuer, Cascallar, Dochy, Dori, Ridgway, & Wiesemes 2005; Dori, 2003; Mcloughlin & Luca, 2001; Liang & Kim, 2004).

In spite of the potential benefits in using hybrid courses for fostering meaningful learning, many professors use their course websites mainly for administration, for student accessibility to course materials, and for online submission of course-products. Learning in most cases remains traditional. The learners usually remain inactive; social interaction is usually limited, and learners typically are not involved in designing and carrying out the assessment. Consequently, most students are not provided with CSCL features that have been shown to encourage ownership on their own learning, foster their motivation, and improve their learning outcomes (Birenbaum, 2003; Dehoney & Reeves, 1999; Frank & Barzilai, 2004; Liang & Kim, 2004; Herrington, Reeves, & Oliver, 2005).

For pedagogy to be a leading factor in the use of technology (Salomon & Ben-Zvi, in press; Salomon & Perkins, 1996) instructors are required to do more than simply upload learning materials to the course website (Pea, 1994). They should carefully design features that engage learners in active learning, and that build on peer learning – a huge resource, usually neglected in traditional higher-education instruction (Herrington, Reeves, & Oliver, 2005). It is therefore important to formulate, via research, design principles for hybrid courses that support meaningful learning, and to provide examples that illustrate how these principles can be expressed as features in the design of hybrid courses. Defining such principles is especially important for guiding the design of university courses in field of education.

Students who experience these pedagogies in their own learning are most likely to use them in their future practice as instructors (Ewing & Miller, 2002).

In order for design principles to be accessible to instructors and course designers, Kali (Kali, 2006; Kali & Linn, in press) developed the Design Principles Database, as a public infrastructure to publish, connect, discuss, and review design ideas. The database is intended to bridge research and design in the area of educational technologies in a communicable and systematic manner, in order to enable designers to build on the successes and failures of others, rather than reinventing solutions that others have struggled to develop (Kali, 2006).

To respond to the challenges described above, the objectives of this research are to formulate design-principles that translate knowledge about constructivist and socio-cultural learning into general guidelines, design hybrid courses according to these principles, explore the effect of these courses on student learning, refine the principles, and contribute them to the Design Principles Database.

Context

Three hybrid courses that took place at the Department of Education in Technology and Science at the Technion were studied. The courses were designed and taught by the authors of this paper. A brief description of each course follows.

Course 1: Educational Philosophy

The objective of this course is to help undergraduate students construct an educational philosophy that would lead them as educators or as educational researchers. All the course meetings are conducted face-to-face. The course website guides students through group-activities, some conducted at class-meetings and some, designed to take place in between the meetings. Course activities are built around three dimensions: (1) A theoretical dimension, in which learners study relevant literature and discuss ideas in the area of educational philosophy, (2) a "school inquiry" dimension, in which learners analyze and assess one school they select from a given list of “interesting schools”, and (3) the "ideal school" dimension, in which learners apply knowledge gained through the other dimensions by designing and presenting a conceptual model of a school that represents their own educational perspectives.

Course 2: Learning and instruction in online environments

The course, designed for undergraduate and graduate students, focuses on theoretical and practical aspects in online learning and instruction. The first few weeks take place online and are devoted to community-building and discussion on students’ initial perceptions about online learning. In the second part of the course, students work in groups to build their own online "mini-course", which focuses on one issue about online learning and instruction which they specialize in (e.g., creating a sense of a community, the role of the teacher, supporting metacognitive processes, etc.). In the final part of the course students study each others’ mini-courses, taught by their peers, provide feedback to each other, and reflect on the whole process.

Course 3: Assessment of educational projects

The objective of the course is to provide graduate students with tools that will endow them with initial preparation as future assessment experts in science and technology education. The course includes face-to-face meetings and online forum discussions. The students read a diverse collection of articles on assessment, and each week a team of two students is in charge of posing questions and leading the online discussion. Each student is assessed via multidimensional assessment based on her/his contribution to the online forum discussion both as leader and participant, presenting the summary in class, including a comparison with two other articles, and a final project. The students are involved in developing the assessment criteria and their implementation in the course.

Methods

This study is part of a larger ongoing design-based research that studies the iterative design process of the three courses between the years 2004 to 2007. It explores how refinement of the various *features* comprising each course affected student learning in several enactments of these courses: 6

enactments of course 1, 2 enactments of course 2, and 3 enactments of course 3. A *feature* in this study refers to the design of any element that supports learning (e.g., an assignment that guides students in creating presentations of "a day in a student's life" in their ideal school, in course 1; guidelines for using appropriate "voice and tone" when instructing an online course, in course 2; an assignment that scaffolds students in self-assessment, in course 3). The study reported here, is a snapshot of the larger study, focusing on the learning that took place in the *current* state of design of each of the courses. More specifically, we study how *different* features in each of the courses, which employ a *common* design principle affected student learning.

Unit of analysis and sample

The unit of analysis in this study is *a feature*; meaning the effect of a single feature in a single course on student learning. Since features in the courses were refined at various stages of the iterative design process, the sample-size used to collect data varies for each feature. The total number of students in all enactments of all courses is 312 (Educational philosophy, 229; Learning and instruction in online environments, 48; Assessment of educational projects, 35). However, the sample-size used to study features that were redesigned in the last enactment of a course, includes only students who learned the course in that specific run. Sample-size used to study other features, which stayed constant for several enactment of a course, and when no significant difference was found between student performances in these enactments, includes the total number of students who studied the course in these iterations. The sample-size for each piece of evidence is mentioned in the description of each outcome below.

Data sources

The main data source was the rich set of group and individual artifacts created by students in each of the courses. Some were created on the course site, using tools such as Wikis and forums, and others, such as Office documents were uploaded to the courses' sites. Another important data source was a researchers' reflective journal, in which we documented, after each lesson important events, discussions, and issues that came up in the enactments. The journal was written by one of the researchers and sent to the other researchers for adding comments and negotiating interpretations. To support our analysis of student learning from these two resources, we also conducted Lykert-type and open-ended surveys in each of the courses, which required student to reflect about their learning, using various features in the courses.

Data analysis

Using our "feature" unit of analysis, we sought to triangulate different types of evidence to support any claim we make about the effect of a feature in a course on student learning. For each feature we initially analyzed students' understanding-performances (Gardner, 1991; Perkins, 1992) as expressed in artifacts they created when using this feature. We then came up with an assumption about the learning that took place using this feature. Finally, we sought corroborations to this assumption from other sources such as the journal and the surveys.

Findings

We first describe three of the major design principles that this study formalized (based on a literature review), refined, and contributed to the Design Principles Database. We then focus on the first principle, and show how learning was promoted by features designed according to this principle in each of the courses.

Principle 1: Engage learners in instruction of their peers

This principle calls for creating opportunities for students to serve as instructors of their peers. Playing the role of the instructor, whether the learners are a small group, or the whole class, and whether the instruction is done individually or in peer-teaching, has many advantages. Peer-instruction activities, when designed appropriately, can encourage students to deepen their understanding of contents, become more attentive to ideas brought up by peers, take responsibility about their own learning, enhance metacognitive skills, and increase motivation (Topping, 1996). Students who can reflect on their way of thinking and learning can set up learning goals and carry them out, choose appropriate learning strategies, and supervise their advancement towards achieving these goals (Linn & Hsi; 2000).

Principle 2: Reuse student artifacts as resource for learning

This principle advocates the use of artifacts developed by learners, as resources for further learning of their peers (Dillenbourg, 2002; Ronen et al., 2005). In this manner, the artifacts, created by individuals, or in groups, can support the learning of those who struggled to interpret and process a certain body of knowledge, as well as others, who can benefit from the products of this process (Bransford, Brown & Cocking, 1999). Scardamalia & Berieter (1994) argue that environments that support the development of a knowledge-building community, enable learners to share knowledge and artifacts, so that this knowledge becomes part of the environment, and other learners can build on and further advance this knowledge. They refer to such supports, in which the classroom community works to produce a collective product as second-order environments. They distinguish these environments from first order environments, in which the knowledge produced by learners is "merely a summary report of what is in individual minds".

Principle 3: Involve learners in assessment processes

This principle calls for involving learners in forming assessment criteria and in carrying out the embedded assessment in a course. Involving the learners in the objectives, design, and execution of the assessment encourages taking responsibility on the learning and improving student learning outcomes (Birenbaum, 2003; Dori, 2003; Mcloughlin & Luca, 2001). There are many ways to involve learners in assessment processes. These include designing activities in which students take part in developing assessment criteria, providing feedback to each other's artifacts, and participating in peer and self assessment. Many studies have shown that involving students in assessment is a powerful approach for leveraging learning processes in a variety of contexts (e.g., Falchikov, 2003; McConnell, 2002; Suthers, Toth, & Weiner, 1997; Topping, 1998; 2003). Learning outcomes from involving students in assessment processes are related to: (a) leveraging student understanding of assessment criteria, and thus supporting students in creating improved artifacts, (b) learning by reviewing peers' work, (c) consideration of a wide range of feedback, and (d) development of assessment skills (Ronen and Langley, 2004; Zariski, 1996; Dominick et al., 1997; Miller, 2003).

Course Name	Principles	Engage learners in instruction of their peers	Reuse student artifacts as resource for learning	Involve learners in assessment processes
Educational Philosophy	Features	Whole-class collaboratively constructed Wiki table to summarize jigsaw activity about philosophical approaches	Table summarizing philosophical approaches, constructed earlier by students, used for an analysis activity	Students develop criteria and participate in peer assessment of "ideal school" projects presented by their peers
Learning and instruction in online environments		Mini-course designed, developed & instructed online by students	Student participation in online mini courses developed and instructed by peers	Students evaluate the functioning of their peers as instructors of mini-courses
Assessment of educational projects		Theoretical topics in assessment taught by students via online and face to face discussions	Final projects based on contents gained in lessons instructed by peers	Multidimensional assessment of performance and assessors

Figure 1- Application of the three design principles via features in the three courses

The three design principles described above were the major principles that guided the design of the three courses in this study. Figure 1 illustrates how these principles were applied via different features in each of the courses. The features marked by the bold rectangle represent features that employ the design principle *"Engage learners in instruction of their peers"*. We describe these features in detail and provide evidence of their effect on learning below.

Feature 1: Whole-class collaboratively constructed Wiki table (Course 1)

This feature was introduced after the first enactment of the Educational Philosophy course, in which students claimed that they had difficulties in understanding three philosophical approaches that were studied in a Jigsaw activity. As a response, we supported learning from the this activity by designing this feature in three successive stages: (a) In the first stage students acquire knowledge in specialization groups – each individual takes part in a specialization group, which studies, via literature reading and discussion in a forum, one philosophical perspective (as in the original Jigsaw activity). (b) In the second stage all the students in the class collaboratively create a Wiki table from contributions of individuals and groups – at this stage the individuals return to their home-groups as experts in one perspective, and are responsible to teach this perspective to other members of their group. Each group is now responsible to fill the contents of one row in the Wiki table, which synthesizes one aspect in each of the perspectives. As a result, a whole class knowledge table, exemplified in Figure 2, is obtained. (c) In the third stage, students are invited to edit and refine contributions of their peers in the Wiki table. The Wiki table created in this feature serves as a resource for further learning (see Figure1: principle "Reuse student artifacts as resource for learning" as applied in Course 1).

	Philosophical Perspective 1: Essentialism	**Philosophical Perspective 2: Progressivism**	**Philosophical Perspective 3: Existentialism**	
Aspect 1 (of 6): Teacher's role	Contribution of expert student to Aspect 1	Contribution of expert student to Aspect 1	Contribution of expert student to Aspect 1	Contribution of group A to the class Product
Aspect 2 (of 6): Learner's role	Contribution of expert student to Aspect 2	Contribution of expert student to Aspect 2	Contribution of expert student to Aspect 2	Contribution of group B to the class Product
Aspect 3 (of 6): The School System	Contribution of expert student to Aspect 3	Contribution of expert student to Aspect 3	Contribution of expert student to Aspect 3	Contribution of group C to the class Product

Figure 2: Schematic representation of feature 1 - Whole-class collaboratively constructed Wiki table

In order to examine the effect of this feature on student understanding of the three philosophical perspectives, we analyzed the quality of the collaborative Wiki tables created by students. The quality of the table represents students' ability to distinguish between nuances in each of the philosophical perspectives according to the various aspects, and therefore depicts their understanding of these perspectives. This was assessed by comparing the information in each of the table cells to a reference table created by the instructors. Since the collaborative table was a feature introduced at the second enactment of the Educational Philosophy course, and since no significant differences were found in the quality of these tables in the further enactments, we use here a sample of N=149 comprised of students from five enactments of the course. The analysis indicated that the information constructed collaboratively in each of these enactments was very similar to the reference table, leading to a mean value 95% (SD = 1.2%) for the

five tables. This finding indicates that the process of learning a philosophical perspective in a specialization group, then having to teach this knowledge to peers in the home group, and having the responsibility of creating knowledge for the whole class in the collaborative Wiki table, supported student understanding of the contents.

Another outcome that indicates that the collaborative table was a productive support for student learning was received from the survey. A question about the collaborative Wiki table, which was added to the survey at the 6th enactment of the course, indicated that students (N=25) valued the use of this feature as one which contributed very much to their learning (4.0 in a scale of 1 to 5) (Figure 3). Interestingly, although this feature is comprised of literature reading, and online discussion of literature, these aspects, when examined individually, were rated lower (literature reading 3.8; online discussion of literature 3.5).

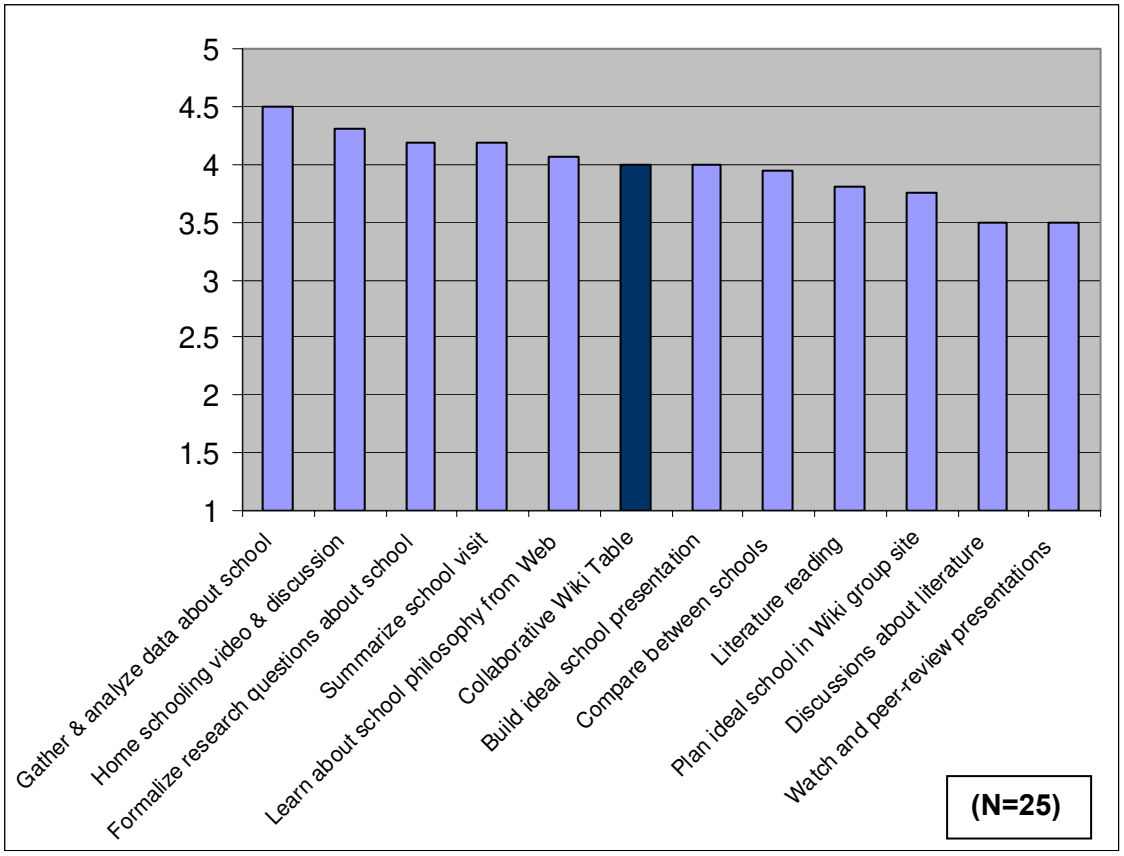

Figure 3: Average student rating of various course aspects in a scale of 1-5

Feature 2: Students design, develop, and instruct an online mini-course(Course 2)

This feature scaffolds students (working in groups) to design and develop their own two-week mini-course. Each group first learns the contents for their mini-course (issues in online learning and instruction) by reading and discussing relevant literature, then they design activities that implement these contents, and finally they teach (online) their mini-course to the rest of the class. The mini-courses created in this feature serve as a resource for further learning (see Figure1: principle "Reuse student artifacts as resource for learning" as applied in Course 2).

To evaluate the effect of the process of designing and teaching the mini-courses on student learning about theoretical and practical aspects in online instruction, we analyzed the process of designing the mini-courses and the final artifacts in three aspects: (a) students' *understanding of the contents* (as reflected in online discussion students participated in during the process of designing their mini-courses), (b) the *design of activities* (to what extent activities supported the contents and a socio-constructivist

approach, were clear, and inviting, and (c) the *quality of instruction* of the courses (the extent to which instructors were attentive to their learners' emerging needs, in terms of understanding procedures, comprehension of contents, and collaboration with other learners).

Since the feature only changed slightly in the second enactment, and since no significant difference was found between the two enactments regarding the quality of mini-courses, we merged data from the two enactments of the course (total of N=48, number of groups = 15). Outcomes indicate that the mean values for the three aspects were as follows: *Understanding of contents* – 84% (SD=16%), *Design of activities* – 90% (SD=12%), and *Quality of instruction* – 88% (SD= 14%). The rather high variance can be explained by the fact that participants were a mix of undergraduate and graduate students. However, the high mean value, indicates that the quality of the mini-courses were high for the analyzed aspects. This indicates that the feature supported students' learning, especially of practical aspects in online learning and instruction.

These findings were strengthened by the analysis of the survey (N=48), which revealed that students perceived the mini-courses as a great contribution to their learning. In a scale of 1-5, the construct "Reading and discussing the literature in preparation for designing the mini-course" received a score of 4.8 (SD=0.4), "Design and development of the mini-course" 4.8 (SD=0.5), and "Instruction of the mini-course" 4.7 (SD=0.6).

Evidence to the type of learning that took place in this process can be found in responses to an general open-ended question in the survey. In these responses students explained in which manners the design of the mini-courses contributed to their learning. For instance, one student said "It was a great experience to instruct the mini-courses, we had to deal with many issues such as, what to do when the learning takes different directions than we planed, how do we support participation, how do we refer to posts in the forum which we don't agree with"

Feature 3: Theoretical topics in assessment taught by students (Course 3)

In this feature pairs of students are responsible to teach a topic about assessment to the rest of the class. They first study the topic, as the rest of the class does, from a pre-assigned list of articles. Then they lead an online discussion; they pose introductory questions in the forum, and are responsible for facilitating the discussion. Finally, they present a summary of the online discussion during a face to face meeting, and using additional references they find, they deepen the dialogue. Artifacts created in this activity (the online discussion, and the summary) serve as a resource for further learning by peers in final projects (see figure1: principle "Reuse student artifacts as resource for learning" as applied in Course 3) and for multidimensional assessment of performance (figure 1: principle "Involve learners in assessment processes" as applied in course 3).

To assess the impact of this feature on student learning, we examined the grades that were given by the instructors specifically for this feature. Two rubrics were used to provide these scores. The *criteria for leading the online discussion* included: (a) Posing questions that require higher order thinking skills; (b) Attentiveness to peers; (c) Processing and elaboration of the discussion by providing intermediate summaries; and d) Voice and tone that invite collaboration and foster a good atmosphere in the discussion. The *criteria for leading the face to face discussion* included: (a) The quality of the online discussion summary; (b) Oral presentation of discussion and of further reading in an academic standard; and (c) Clarity, flow and originality in presentation.

We refer to the sample as N=35, comprised of graduate students in three enactments of the course (no significant differences were found between student performances in those enactments). The analysis indicates that grades for this specific feature were extremely high; Using the rubrics described above, the mean score for leading the online discussion was 98% (SD=3%), and 93% (SD=4.3%) for leading the face to face discussions. The score for the online component was provided by the instructor (10% of the final score in the course) and the score for the face to face component was provided by peer assessment (10% of the final grade). In order to express such high performances, students had to gain deep understanding and knowledge in the area assessment, and acquire leadership skills that are highly important for their careers.

Retrospective interviews, which were conducted about one to three years after the course, with students from all 3 iterations, indicate that students perceived the fact that they were required to take the role of an instructor in the course as a highly enriching learning experience. In many of the interviews the issue of responsibility and motivation, which were fostered by playing the instructor's role, were mentioned. For instance one student says "I new that in the moment of truth I will need to instruct part of the course. It gave me a great motivation… I felt that the challenge is greater than understanding; I also had to think how to make the contents interesting for others. Our responsibility for the success of the course was one that is higher than usually given in other graduate courses". The high motivation and responsibility brought students to become more critical and thus deepen their understanding of the contents. For instance, another student says "Serving as an instructor forced me to think deeper about the article, to ask myself questions and to find unresolved issues", or "Playing the role of the instructor is the thing I remember most from the course. I remember very well all the nuances of the contents that I was responsible for teaching. This is knowledge that I can retrieve from my mind at any relevant time". Another student noted that "the course provided me with inspiration and guidance about how to construct a new course for my high-school students in industry and management department". It is also important to note that having students play the role of the instructor involved putting them in a certain degree of anxiety, but that students saw this stress eventually as positive. For instance, a student says "This was a difficult period for me due to the high pressure I was in. I almost left the course, but was encouraged to stay, and today I am very thankful for that!"

Conclusions

The three design principles, articulated in this study i.e., *Engage learners in peer instruction, Involve learners in assessment processes, and Reuse student artifacts as resource for further learning,* were derived from known socio-constructivist approaches for instruction. Nonetheless, the large gap between the body of knowledge in the CSCL field, and the practices in higher education instruction requires that this knowledge would be articulated and published in a useful way for instructors, with examples of features that have been successful in several settings. The strength of the design principles described in this research is that although each principle was applied using different features in each course, one can see their major impact on the learning following the objectives set for each course: developing an educational perception (Educational philosophy), coping with challenges in online learning and instruction (Learning and instruction in online environment), and preparation of the learners as future assessment experts (Assessment of educational projects). It is important to note that the features described in this study are a consequence of an iterative design process, in which features were refined in several cycles in the larger research this study is part of. For instance, the idea to design the collaborative table using a Wiki technology emerged from findings showing that students did not feel ownership of the collaborative table. We assumed that enabling students to edit each other's cells would increase their ownership, an assumption which was later confirmed. It is our belief that the collection of design principles identified in this work and their publication in the Design Principles Database, along with links to the detailed examples of the features in the three courses, will constitute a resource that would enable instructors, and other course developers to apply these ideas in other hybrid courses. Yet, it is important to note that these principles cannot be used as recipes for designing courses. They gain their strength in being part of the Design Principles Database, in which design principles derived from other design-based research studies are contributed from the community.

References

Birenbaum, M. (2003). New insights into learning and teaching and their implications for assessment. In Segers, M., Dochy, F. & Cascallar, E. (Eds.). Optimizing New Modes of Assessment: In Search of Qualities and Standards (pp. 13-36). Dordrecht: Kluwer Academic Publishers.

Birenbaum, M., Breuer K., Cascallar E., Dochy F., Dori Y., Ridgway J. & Wiesemes R. (2006 March/April.). A Learning Integrated Assessment System. In: EARLI Series of Position Papers. R. Wiesemes, G. Nickmans A. (Eds.) To appear in Educational Research Review.

Bransford, J., Brown, A. L., & Cocking, R. R. (1999). How people learn: Brain, mind, experience, and school. Washington, D.C.: National Academy Press.

Cobb, P. (1996). Where is the mind? A coordination of socio-cultural and cognitive constructivist perspectives. In C. W. Fosnot (Ed.), Constructivism: Theory, perspectives and practice (pp. 34 - 52). New York: Teachers College Press.

Collison, G., Elbaum, B., Haavind, S., & Tinker R. (2000). Facilitating online learning: Effective strategies for moderators. Atwood Publishing.

Dean. P., Stahl, M., Sylwester, D., & Peat J. (2001). Effectiveness of combined delivery modalities for distance learning and resident learning; Quarterly Review of Distance Education.

Dehoney, J., & Reeves, T. (1999). Instructional and social dimensions of class web pages. Journal of Computing in Higher Education, 10 (2), 19

Dillenbourg, P. (2002). Over-scripting CSCL: The risks of blending collaborative learning with instructional design. In P. A. Kirschner (Ed.), Three worlds of CSCL: Can we support CSCL? (pp. 61- 91). Heerlen: Open University of the Netherlands.

Dominick P. G., Reilly, R. R., & McGourty J. (1997). The effects of peer feedback on team member behavior. Group and Organization Management, 22, 508-520.

Dori, Y. J. (2003). From nationwide standardized testing to school-based alternative embedded assessment in Israel: Students' performance in the "Matriculation 2000" Project. Journal of Research In Science Teaching, 40(1), 34-52.

Ewing, J., & Miller, D. (2002). A framework for evaluating computer supported collaborative learning. Educational Technology & Society 5 (1). [On-line]. Available: http://ifets.ieee.org/periodical/vol_1_2002/ewing.html

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

Frank, M., & Barzilai, A. (2004). Designing course web sites for supporting lecture-based courses in higher education - some pedagogical aspects. International Journal of Instructional Technology & Distance Learning. Vol. 1, No. 12. [On-line]. Available: http://www.itdl.org/Journal/Dec_04/index.htm

Gardner, H. (1991). The unschooled mind: How children think and how schools should teach. New York: Basic Books.

Herrington, J., Reeves, T.C., & Oliver, R. (2005). Online learning and information delivery: Digital myopia. Journal of Interactive Learning Research, 16 (4), p. 353-367.

Hoadley, C. M. (2004). Methodological Alignment in Design-Based Research. Educational Psychologist, 39(4), 203–212 http://www.tophe.net/papers/Hoadley-EdPsychol-2004.pdf

Kali, Y. (2006). Collaborative knowledge-building using the Design Principles Database. International Journal of Computer Support for Collaborative Learning.

Kali, Y., & Linn, M.C. (in press). Technology enhanced support strategies for inquiry learning, in Spector, J. M., Merrill, M. D., van Merriënboer J. J. G., & Driscoll, M. P. (Eds.) (in progress). Handbook of Research on Educational Communications and Technology (3rd ed.). Lawrence Erlbaum Associates.

Liang, X., & Kim, C. (2004). Classroom assessment in web-based instructional environment: instructors experience. Practical Assessment, Research & Evaluation, 9(7). [On-line]. Available: http://pareonline.net/getvn.asp?v=9&n=7

Linn M., & Hsi, S. (2000). Computers, Teachers, Peers. Science Learning Partners. Lawrence Erlbaum Associated, Publishers, Mahwah, New Jersey, London.

McLoughlin, C., & Luca, J. (2001). Assessment methodologies in transition: Changing practices in web-based learning. In L. Richardson and J. Lidstone (Eds), Flexible Learning for a Flexible Society, 516-526. Proceedings of ASET-HERDSA 2000 Conference, Toowoomba, Qld, 2-5 July 2000. ASET and HERDSA. [On-line]. Available: http://www.aset.org.au/confs/aset-herdsa2000/procs/mcloughlin1.html

McConnell, D. (2002). Collaborative assessment as a learning event in E-learning environments. In 543 G. Stahl (Ed.), Proceedings of CSCL 2002.Computer support for collaborative learning: 544 Foundations for a CSCL community (pp. 566–567). Mahwah, New Jersey: Lawrence Erlbaum.

Miller, P. J. (2003) The effect of scoring criteria specificity on peer and self-assessment. Assessment & Evaluation in Higher Education, 28(4), 383 - 394

Pea, R. (1994). Seeing what we build together: Distributed multimedia learning environments for transformative communications. Journal of the Learning Sciences, 3 (3), 285 – 299

Perkins, D.N. (1992). Smart schools: From training memories to educating minds: New York: The Free Press.

Resnick, M. (1996). "Distributed Constructionism" Proceedings of the International Conference on the Learning Sciences Association for the Advancement of Computing in Education Northwestern University

Ronen, M., & Langley, D. (2004). Scaffolding complex tasks by open online submission: emerging patterns and profiles Journal of Asynchronous Learning Networks JALN 8, (4). [On-line]. Available: http://www.aln.org/publications/jaln/v8n4/index.asp

Ronen, M., Kohen-Vacs, D., & Raz-Fogel, N. Structuring, sharing and reusing asynchronous collaborative pedagogy. Submitted to ICLS 2006.

Rovai, A.P. (2000). Online and traditional assessment: what is the difference? The Internet and Higher Education, 3, 141-151

Salomon, G., & Ben- Zvi, D. (in press). The difficult marriage between education and technology: Is the marriage doomed? In: L. Verschaffel, F. Dochy, M. Boekaerts & S. Vosniadou (Eds.) (in press). Instructional psychology: Past, present and future trends: Fifteen essays in honour of Erik De Corte. A book in the "Advances in Learning and Instruction Series" of Elsevier.

Salomon, G., & Perkins, D. N. (1996). Learning in wonderland: What computers really offer to education. In S. Kerr (ED.). Technology and the future of education. (pp. 111-130). NSSE Yearbook. Chicago: University of Chicago Press.

Scardamalia, M., & Bereiter, C. (1994). Computer support for knowledge-building communities. The Journal of the Learning Sciences, 3(3), 265-283.

Singh, H. (2003) Building Effective Blended Learning Programs. Educational Technology, 43(6), 51

Suthers. D.D., Toth, E.E., & Weiner, A. (1997). An integrated approach to implementing collaborative inquiry in the Classroom. Proceedings of CSCL 1997 (Toronto, Ontario). In Hall, R., Miyake, N., & Enydey, N. (Eds.), The second international conference on Computer Support for Collaborative learning (pp. 272-279).

Topping, K.J. (1996). The Effectiveness of Peer Tutoring in Higher and Further Education: A typology and review of the literature. Higher Education 32 (3) 321-345

Topping, K.J. (1998) Peer assessment between students in college and university. Review of Educational Research 68 (3) 249-276

Topping, , K.J. (2003). Self and peer assessment in school and university: reliability, validity and utility. In Segers, M., Dochy, F. & Cascallar, E. (Eds.). Optimizing New Modes of Assessment: In Search of Qualities and Standards (pp. 55-87). Dordrecht: Kluwer Academic Publishers.

Zariski, A. (1996). Student peer assessment in tertiary education: Promise, perils and practice. In Abbott, J. and Willcoxson, L. (Eds), Teaching and Learning Within and Across Disciplines, p189-200. Proceedings of the 5th Annual Teaching Learning Forum, Murdoch University, February 1996. Perth: Murdoch University.