The Web-Supported Negotiation Game “Surfing Global Change”: Rules, History and Experiences

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ABSTRACT

The negotiation oriented and partly web-based game “Surfing Global Change” (SGC, © Gilbert Ahamer) was originally invented and implemented by the author and copyright holder for use in advanced interdisciplinary university courses in the spirit of “blended learning.” Didactics of SGC is grounded in “active, self-organized learning”, training of “competence to act” and responsibility for both practicable and sustainable solutions for the future society, hence constructionist “creation of meaning”. This paper presents the rules of the game as a case study of a rule-based online learning tool, used over two dozen times at Austrian universities. The outlay of SGC aims at weighing out competition vs. consensus, self-study vs. team work, sharpening one’s own standpoint vs. readiness to compromise, differentiation into details vs. integration into a whole, and hence, seeks to mirror professional realities. In this spirit, the architecture of SGC provides a framework for “game-based learning” along five interactive game levels. SGC’s rules trigger two distinct processes: social dynamics among peer students in the class and their individual striving for good grades. These two targets provide useful tension during game play.

Keywords: Competitive Discussion, Consensus, Constructivism, Debate, Negotiation Game, Peer Review, Web-Based Learning

1. THEORETICAL FOUNDATION OF THE GAME SURFING GLOBAL CHANGE

The didactic goal and pedagogical strategy of this game is to train students to adopt a proactive and responsible professional role in building a sustainable global society. Didactic and pedagogic foundations are extensively described and reflected in published literature (Ahamer, 2004a).

The learning goal of the entire 5-level game (logo above right in Figure 1) “Surfing Global Change” is to master the procedures of consensus building as practiced and demanded in many developed societies.

In more detail this means (Figure 2):

- Create and organize a team (social self-organization);
- Find and report scientific, technical and political information (academic research);
- Identify and weigh the principal effects of a professional project (assessment);

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Students’ motivation differs widely in university classes (just passing exams vs. being motivated by an intrinsic interest in attaining education), separating students into idealists and pragmatists. Nonetheless, the present game sets out to integrate all of these diverse actors and reach the overall target, namely to foster skills for creating well-founded consensus at the workplace. The principal hope is that this way more students can be motivated and finally better training results can be achieved for an entire class than without the game. This procedural finding (compare Section 6) is valid independent of the course content.

The history of SGC is characterized by representing the third of three “functional generations of web-based teaching” (Section 2); this historic genesis is reported in detail in Ahamer (2010). An emerging new target for the author is: how to steer students’ academic progress?

For the several dozen practical implementations of Surfing Global Change until now, both synchronous and asynchronous web-based communication was employed for usage in class as well as outside of the classroom (USW, 2010). Among others, the following functionalities of a web platform were used (see also levels in Figure 3):

- Anonymous surveys for debriefing and feedback (level 0);
- Structured content for voluminous fact-based information as starting kit (level 1);
- Quizzes for monitoring students’ cognitive performance (level 1);
- Discussion forums for stepwise review and update of standpoints (level 2);
- Quizzes for voting procedures that would define the winning team (level 3-4);
- Quizzes when substantiating own decisions for a winning team (level 3-4);
- Postings in discussion forums including global analyses (level 5).
2. WHICH DIDACTICS TO CHOOSE?

Surfing Global Change grounds in constructivist (Dewey, 1916, 1995) didactic deliberations made earlier by its inventor (Ahamer, 2004a) and prepared by other authors. SGC

- Builds on a tradition of simulation and gaming (Klabbers, 2001);
- Relies on ethics of negotiation (Fischer-Kowalski et al., 1995);
- Is inspired by constructing realities (Foerster, 2003; Kerres, 2001);
- Does not attempt to mathematically simulate complex realities (Meadows, 2001; Burns, 2002), but allows also for mental geography and pictorial pedagogy (Barker, 2011, p. 7);
- Is simulative for real-life processes (Myers, 1999);
- Respects varied patterns of learning dimensions (Shen & Tsai, 2011; Arora et al., 2011, p. 31);
- Includes behavioral patterns such as active engagement, group interaction, feedback, and replication of real world situations (Kim, 2011, p. 12);
- Creates a space of interaction (Castells, 2001) including teachers (Lee et al., 2011)
- Is founded on systems thinking (Richmond, 1993; Ossimitz, 2000);
- Allows for pragmatic strategies (Reilly, 2003);
- Takes care of culturally co-determined strategies (Harvey, 1990, 1996; Hofstede, 2000);
- Trains for participation and civil society (ÖGUT, 2007);
- Takes into account pragmatism as practical philosophy (Rescher, 2004);

<table>
<thead>
<tr>
<th>First generation:</th>
<th>Third generation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>“traditional” courses on Technology Assessment TA Systems Theory &amp; Biology SB</td>
<td>five levels of the game “Surfing Global Change”</td>
</tr>
<tr>
<td>SB: long case study (60)</td>
<td>5</td>
</tr>
<tr>
<td>TA: negotiate case study and post solution</td>
<td>4</td>
</tr>
<tr>
<td>TA: long case study (40) and post team standpoint</td>
<td>3</td>
</tr>
<tr>
<td>TA: short case study (40) and review one colleague</td>
<td>2</td>
</tr>
<tr>
<td>TA: web based quiz (50) SB: web based quiz (70)</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 2. Development of course components comprising 4 weekly hours from classical web teaching in the first generation (left) to SGC as third generation (right).
Uses environmental themes as trigger for the emerging global responsibility of humanity (Rauch, 2000, 2002a, 2002b).

Students playing Surfing Global Change:

- Are thrown into simulated real-world situations;
- Are asked to decide strategically when gaming;
- Feel the intricacies of collisions of interest and;
- Should finally develop “ethics of negotiation”.

The rules of SGC create border conditions (Kerres, 2000; Bork, 2001) for enhancing

- Game flow (Czikszentmihalyi, 1990) and participants’ focus on the target;
- Both competitive and consensus oriented performance (measured by ♂ & ♀);
- Input of social energy and increase of existing motivation;
- Opportunity for deploying diverse academic & social skills (Figure 2, on the right)
- Academic quality of students’ written products;
- Training effect for negotiation and other social abilities;
- The overall grade resulting from the points collected in the course of this game.

Ultimately, consciousness stems from reflection. Learners could reflect (Tables 3 and 4)

- Themselves (their living culture), in Greek “know yourself” is γνωθι σαυτον;
- Their views of realities (their disciplines (Werlen, 2010, pp. 187-192);
- The value systems against which they check and assess perceived realities.

In this sense, interculturality, interdisciplinarity and multiple value systems are three consecutive substrates of reflection (Ahamer et al., 2011, p. 17; Harvey, 1996, p. 10).

Taking the example of several interdisciplinary courses training the “competence to act“, illustrate how (1) content, (2) communication and (3) assessment have evolved using web based learning. Table 1 defines three

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"generations of web based teaching (WBT)" (Ahamer, 2010) implementing didactic targets (first column) in three functional manners (other columns).

Seen from the perspective of trainers and learners, the bundle of formerly cognition-oriented targets is enriched: find learning targets yourself, form teams, give and take feedback, reflect and stepwise improve own and others’ work. In present wording, this generational shift means reaching Web 2.0, its “core value lying in its potential for building technologies that are open, decentralized, and shared” (Lin et al., 2011, p. 1; Shen & Wu, 2011).

<table>
<thead>
<tr>
<th>characteristics &amp; didactic targets to be transposed …</th>
<th>… in WBT = web based …</th>
<th>teaching: 1st generation</th>
<th>training: 2nd generation</th>
<th>learning: 3rd generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) regarding content:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>open or closed?</td>
<td>closed learning environ-ment: the manuscript</td>
<td>open learning environ-ment: cases to be selected</td>
<td>open learning environment: cases to be found</td>
<td></td>
</tr>
<tr>
<td>prescribe content?</td>
<td>compulsary vs. optional content</td>
<td>content of cases to be created</td>
<td>content for cases to be retrieved</td>
<td></td>
</tr>
<tr>
<td>“truth” = what?</td>
<td>“truth” is correct content</td>
<td>“truth” is plausible and functioning teaching material</td>
<td>“truth” from ethics of negotiable contracts (Horx, 2002)</td>
<td></td>
</tr>
<tr>
<td>how to access “content”?</td>
<td>learn manuscript &amp; answer cases</td>
<td>collaborate in a team</td>
<td>reach consensus between teams</td>
<td></td>
</tr>
<tr>
<td>(2) regarding communication:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>real or virtual?</td>
<td>mostly face-to-face</td>
<td>blended: face-to-face and online</td>
<td>blended: face-to-face and online</td>
<td></td>
</tr>
<tr>
<td>research = what?</td>
<td>dwell into prepared material</td>
<td>create and design own content</td>
<td>create and weigh out consensus</td>
<td></td>
</tr>
<tr>
<td>discussion forum</td>
<td>for posting assignments</td>
<td>for agreeing on procedures &amp; targets</td>
<td>for exchanging and commenting standpoints</td>
<td></td>
</tr>
<tr>
<td>web activity (hits)</td>
<td>low</td>
<td>medium</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>(3) regarding assessment:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quizzes</td>
<td>for determining marks</td>
<td>create own quizzes</td>
<td>for marks and delivering voting decisions</td>
<td></td>
</tr>
<tr>
<td>Surveys</td>
<td>for expectations and feedback</td>
<td>create own surveys</td>
<td>for expectations, feedback &amp; for voting</td>
<td></td>
</tr>
<tr>
<td>composition of final grade</td>
<td>quiz plus two assign-ments graded by teacher</td>
<td>no grades foreseen</td>
<td>quiz, peer review, points gained through voting &amp; from trainer</td>
<td></td>
</tr>
<tr>
<td>learning process</td>
<td>three single events</td>
<td>Continuous</td>
<td>stepwise, with reflection and improvement</td>
<td></td>
</tr>
<tr>
<td>monitored by oneself or by others</td>
<td>trainer monitors</td>
<td>team-monitored</td>
<td>self-monitored</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Usage of three main functionalities of a web platform: “content”, “quizzes”, “communication” for three generations of web learning

<table>
<thead>
<tr>
<th></th>
<th>1st generation</th>
<th>additionally in 2nd generation</th>
<th>additionally in 3rd generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>transparencies on the web</td>
<td>initial survey (stud. wishes)</td>
<td>create own content</td>
<td>download background text</td>
</tr>
<tr>
<td>list of links for content</td>
<td>final survey (feedback)</td>
<td>create own quiz/survey</td>
<td>play 8-4-2-game</td>
</tr>
<tr>
<td>receive software trials</td>
<td>quiz (cognitive knowledge)</td>
<td>upload course content</td>
<td>vote in discussions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>give reason for voting</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>post team’s standpoint</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>read others’ standpoints</td>
</tr>
</tbody>
</table>

Table 3. An example for a matrix filled in by a team (text describing the meaning of each matrix element in detail is not included here)

<table>
<thead>
<tr>
<th>New power plant (sum = 60 points)</th>
<th>Economic</th>
<th>Environmental</th>
<th>Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>15</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. The increase of complexity in assessments for typical course subjects

<table>
<thead>
<tr>
<th>Environmental Technology (UT)</th>
<th>Technology Assessment (TA)</th>
<th>Systems Analysis (SB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• single facts</td>
<td>• weighed assessment</td>
<td>• mutual interdependence</td>
</tr>
<tr>
<td>• still unconnected</td>
<td>• still linear thinking</td>
<td>• systemic thinking</td>
</tr>
</tbody>
</table>
3. COMPARISON OF WBT CHARACTERISTICS OVER THREE GENERATIONS

3.1. Which Functionalities of Web Based Teaching are Used for What?

The three main functionalities of web based teaching (WBT) and consequently of the design of web platforms, namely content, quizzes and communication are employed in the three generations as listed in Table 2.

The resulting main trend is a shift away from the usage of content-oriented towards the usage of communication-oriented functionalities in the web platform. The sharply increasing hit frequency underlines such a view and suggests that for students a discussion forum is a tool to create public space for the members.

Digital media may serve as a vehicle for self-guided learning in thematically and communicatively open structures. Didactic deliberations and fundaments are largely available in (Ahamer, 2004a). Web platforms are able to create public space as an easily accessible “home” for newly forming groups and as mentally comfortable living room for learners.

Seen from the perspective of trainers and learners, the bundle of formerly cognition-centered targets is enriched: find targets, form teams, give and receive feedback, reflect and stepwise improve own and others’ pieces of work.

The overall trend regarding assessments consists in a shift of roles: initially only the lecturer has the power to grade, later on well-defined sub-portions of grading tasks are performed by peer students. Such a development is well in line with a finding for another level, namely that for the assessment of university studies both internal and external evaluation is necessary (Reissert & Carstensen 1998).

3.2. How did Assessment and Grading Develop?

Figure 2 comprises the development of course units from the first to the third generation taking the described lectures as an example. It is visible that the invention of the web based negotiation game “Surfing Global Change” by the author equals further development of two earlier interdisciplinary web based lectures.

During these years and in the three generations, the teacher’s original power of evaluating and grading students was gradually ceded to the students. Grades are no longer based on merely “correct answering”, but on review processes and achieving consensus with other participants.

This article has told the story of steady development of university courses while gradually increasing the complexity of communication and assessment structures. The guiding philosophy is web based collaborative learning in cases and constructionism.

4. THE RULES OF THE GAME SURFING GLOBAL CHANGE

Surfing Global Change (© G. Ahamer, Figure 3) has won a place in the highest awarded European prize in media didactics Medidaprix (2007, photo of graphics see there).

4.1. Inception Phase (Level 0): Introductory Course

Experience has shown that it is helpful to acquire a sufficient level of knowledge in the first place. In our case of last year’s courses in “Technology Assessment”, “Systems Analysis”, “Environmental Technology” and “Global Change”, the students had acquired during their preceding four years of studies a level of technologically oriented knowledge that was deemed sufficient in most cases. At least, it would appear difficult to increase such fact-based, technical and cognitive skills in a targeted way during the ongoing course. Therefore, SGC is a game for advanced students in the final phase of their studies, who can be expected to draw on earlier achievements in several disciplines which then must only be connected with each other in the present integrative exercise.

Hence delivery of content in the classical sense is focused on procedural knowledge,
which is believed to constitute “relevant learning” (Rogers, 1974): like for example the ten major steps in “technology assessment” processes (Rakos et al., 1988) or the characteristic forms of “systems thinking” (Ossimitz, 2000). Deliberately, the generation of task-centered knowledge and the generation of facts are left up to the students because the process of screening available information (e.g., from the internet) is already an important step when forming opinions.

Intentionally, the inception phase (amounting to e.g., a block of an entire day if the entire game spreads across 4 hours/week in a semester) was kept at a slow pace in order to allow students to familiarize themselves with the ‘unusual’ course target, the technicalities of the web platform and its functions and the resulting necessities for engaging in intra-class communication. Additionally, the students were also taught some fact-oriented content on matters related to environmental protection which was the subject of one of the courses. Students were led onto a pedagogical path where they could “rediscover” basic physical, chemical or technical insights during the course together with the trainer (Montessori, 1996).

Apart from procedural knowledge, positive sentiments related to the courses’ targets were believed to be essential by the trainer which is why enough time was devoted to foster them. For that purpose, an initial web based survey with ten questions such as “what are your expectations” was conducted. On the technical level, this “initial survey” also introduced students to the quiz environment so that they would encounter less difficulty in the exam situation later on. Students were led onto a pedagogical path where they could “rediscover” basic physical, chemical or technical insights during the course together with the trainer (Montessori, 1996).

To sum it up, the introductory phase sets out to get students acquainted with the targets of this game, its background, its procedures & technicalities and the social and procedural aims, but also to deliver basic fact-oriented knowledge to a necessary extent. This level 0 phase should create empathy among students and prepare team building.

The result of level 0 is empathy with the subject and with the targets of SGC.

The social setting is conversation and presentation over the course of some days in the classroom.

4.2. Rules for Level 1: Understand the Content and Sharpen the Target

During the subsequent level 1 (or if necessary also a second time later on), A web based quiz is held during class that plays the role of a traditional written exam.

\[(success \text{ in the web based quiz}) = \text{points} \]

Points collected there contribute roughly one third to the final grade of the individual students. Questions are formulated in a way to exclude mere reproduction of pieces of text which serves as a means to decrease the probability of cheating.

A rather simple and common interactive game serves to sharpen perception of the factual setting of the task: a modified “8-4-2 words” game (similar to the Delphi method, see Thiagarajan, 2001; Kolar, 1988) should help students to further focus on the target of the game. Three questions for definitions of key terms like ‘Global Change’ or ‘sustainability’ are posed, e.g.:

1. Concerning the course’s content & perspective (‘Global Change’, consensus’),
2. A target, aim or other central notion (e.g., ‘sustainability’) and
3. The chosen topic (e.g., a railway tunnel project, mobile phone antennas) are iteratively elaborated in the following way using the web platform:
   - Each student anonymously posts an answer in eight words during class;
   - The answers (= definitions) are read anonymously to all students and a vote is cast for the best answer including
a short sentence of explaining their decision;
- The statistical result is displayed by the trainer together with all the (anonymous) explanations in order to allow for a learning effect;
- For each posting or voting action a student receives one point from the trainer;
- The same procedure as above starts with four words, then with two words;
- Aim: viewing other colleagues’ answers allows for reevaluating one’s own perception in an undisturbed and private atmosphere without outside social pressure.

(Each posting or voting on the web platform for the 8-4-2 game) = 1 point ♂

In order to increase the students’ early awareness of the problem structure,

- The future two “thematic matrices” (e.g., having the structure of a 3x4 matrix) can be designed together with the students in an iterative procedure.

The purpose of this preparatory exercise is to provide a first identification of the project’s side-effects in the spirit of TA. Two matrices are necessary for playing SGC.

To sum it up, level 1 should encourage students to discern and define their area of interest as well as to sharpen the perception of the chosen topic, to differentiate the basic aspects of the intended project theme but also to process underlying fact-oriented and technical knowledge (Barrows, 2002). Substrate of web based interaction is simple and one-dimensional definitions on the spot.

The result of level 1 is understood as key content.

The social setting is moderate and anonymous competition during class mediated via the web that has no effect on the resulting points and which comprises units of one hour.

4.3. Rules for Level 2: Write and Reflect a Standpoint

After having learned and understood the basic content, students “warm up” for levels 3-4 and head for the first truly interactive and differentiated web based activity: they prepare their own standpoint based on profound research at the library, as well as researching other literature and searching the internet for one week. Individually acting students obey the following rules:

- Each student posts under his/her name in the discussion forum a text of one page per person (trainer defines: exactly or minimum 1 page);
- In case students want to form groups they consequently must post a document with as many pages as there are students;
- During the rest of the course all posted texts are freely accessible: each student downloads the text document (at home or at university), reads it, comments on it and incorporates these comments into the last version making use of the functionality “track changes” which is common in programs like word;
- The reviewing student posts the document with the comments by making use of the “reply” function in the discussion forum thus creating extra separate threads for each initial standpoint and the associated comments regardless of the time of posting;
- Together with his/her listed comments the reviewer awards the author a number of points (n). The reviewer can choose between one and five points as a reward for the author’s quality of work;
- In case the reviewed author decides to post an updated version of his/her text, all reviewers prior to that time receive their reward for the review (5-n) that is equal to the difference between the points granted and the maximum of five;
• All students can review each others’ work mutually, the only restriction being (in order to avoid gifts) that a reviewed person cannot review his/her reviewer;
• Additionally, the trainer reads the final versions of all papers and awards points accordingly.

This level 2 formula

\[
(reviewer's\ potential\ reward) = 5 \text{ points } \beta - (author's\ reward\ granted\ by\ reviewer)
\]

tries to introduce a momentum of game, risk and strategy into the originally merely fact-based review process, as reviewers will compromise between the colleagues’ definite advantage and their own potential advantage. This formula sets out to create border conditions for optimization of text quality employing the vehicle of “striving for one’s own profit”.

To sum it up, level 2 should encourage students to view, compose, reflect and update a concise standpoint of their own. This activity clearly exceeds minimalist copying of text fragments downloaded from the web as at this level an own statement is produced together with listing pros and cons for a limited and single thematic aspect.

The result of level 2 is one argued and substantiated standpoint per student.

The social setting is constructive criticism & moderate competition between selected partners under almost no time constraints for several weeks.

4.4. Rules for Level 3: Weigh Aspects of a Topic

After having decided on two (because one half of the class is engaged in discussion, while the other half is observing) concrete topics - e.g., projects in civil engineering - for the “core of SGC” in levels 3&4 and after the decision for a suitable matrix either by the students or the trainer

• The students decide which role (which type of actor) they want to adopt as a team within the chosen topic, e.g.:
  1. Proponent of the (building) project,
  2. Civil authority deciding on the permission to implement this project (e.g., by means of an environmental impact assessment procedure eia);
  3. Lobby of economy and industry;
  4. Lobby of the environmentalists.
• The generation of teams is governed by the formula

\[
(individual's\ points \beta) = (team's\ points \beta) / (number\ of\ team\ members),
\]

therefore the team size is expected to be optimized between being very small (not enough manpower) and very large (too little share of reward);
• Each team has one team speaker for communicating decisions externally;
• Only the team speaker is nominated to the trainer, the process of team generation, constitution and definition of internal roles is left up to the students;
• Team leaders have the right to expulse members (e.g., if not collaborating);
• The students have one week to prepare common and shared standpoints in teams (two pages / person) on the topic that was agreed on beforehand;
• After one week the (mostly four) teams post their standpoint in form of a consistent and balanced document on the web platform
• On the day of the level 3 game, all individual teams are asked to sit at their tables in the center of the classroom (inner part of figure 4 and figure 7) and they are given a sheet of paper with the matrix (e.g., 3x3 or 3x4, showing headings for rows and columns as well as definitions for each matrix square similar to table 3);
• As outlined in figure 5, for 20 minutes each team has to place (mostly a total of 60 according to the envisaged length of the discussion) chips into each square thus
weighing the relative importance of the effects of the project in the sense of a preliminary assessment which is handed over only to the trainer who acts as a moderator.

- This preparation time is designed to further foster the teams and their internal roles: it is recommended to define internal roles, e.g., one responsible speaker per matrix element;

- The rule for the level 3 discussions (Figure 5) is as follows: the trainer (or supporting software) randomly selects one matrix square after the other and checks, which teams have placed chips;

- Only teams having placed chips discuss the respective subject within the allotted discussion time (if appropriate with 10 min. as a minimum).

\[
(time \text{ in minutes}) = \frac{(sum \text{ of chips placed on this square})}{(number \text{ of involved teams})}
\]

- The remaining teams at the tables not having placed chips plus the students belonging to the other subject (spectators outer part of Figure 4) form the public with a right to vote (e.g., directly or also via the platform);

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**Figure 4. Suitable classroom**

![Image of a suitable classroom layout]

**Figure 5. Time plan for level 3 discussions**

![Image of a time plan for level 3 discussions]
Optionally a jury (e.g., of external experts or selected students or the trainer himself/herself) is present in the room; the trainer marks start and end of the discussion (e.g., with an alarm clock or an internet-based software) but refrains from participating in the content or procedure; after the end of the discussion the “public” has the following options for voting: 1. Each single participating team won the discussion; 2. A concrete and substantial consensus was reached among the teams; 3. No team won the discussion (e.g., only seemingly a consensus).

In case (1) only the winning team receives the reward according to the following formula, in case (2) all involved teams, in case (3) no team receives the reward. The voting public may give a reason for their decision, but they need not do so and they receive one point for each posted reason.

Criteria for polling are:
- Quality and clarity of academic argumentation;
- Quality of communication of arguments;
- Discipline in discussion;
- Ability to perceive and understand other teams’ arguments.

The trainer or the software keeps record of all teams’ point score throughout the game. A final session allows students to reflect on their performance in discussion, on expected and unexpected social processes (e.g., open or hidden alliances) and on achievements made.

In a very simplified form this level 3 will be used as a web game.

To **sum it up**, we see an atmosphere of competition in level 3 which heads towards an argumentative battle between standpoints (compare Naidu et al., 2003). Different standpoints are induced and personalized by different teams playing different societal roles. The main interest of the teams is to win or else to reach a consensus. Moments of play or even gambling are introduced by putting at stake the relative weight of aspects (= matrix elements). Possibly realistic democratic (or even Machiavellist) effects are generated by a rather decisive voting procedure.

The results of level 3 are decisions between standpoints.

The social setting is vivid competition on the spot between teams who can develop strategies to win against others under severe time constraints.

**4.5. Rules for Level 4: Negotiate a Complex Project**

After having differentiated the complex topic into its aspects by means of the matrix and after having collected and weighed the arguments during the competitive discussion, the next task is to integrate the diverse aspects into a balanced consensus that can serve as a solution and that is accepted by the stakeholders.

- The same teams as in level 3 prepare a proposal for a common solution for the topic’s project for one week;
- Each team speaker posts this proposal on the platform one day before the level 4 discussion event takes place;
- On the last day all team members study through the other teams’ proposals critically with a view for enabling solutions to existing obstacles;
- In class, all teams sit around a table and have to agree on a solution (= several items written down) after a period of half an hour of self-organized discussion;
- The text of the consensus must be posted and agreed on by all team speakers;
- Each team makes use of “external experts” (must be at least one expert, may be more) who is hired in a “free market of knowledge” and acts as follows;
• Each team in need of expert advice publicly writes (e.g., on the blackboard) the concrete question or the field for which assistance is needed together with the number of points the team is willing to award for successful advice;
• The team selects an expert from the persons responding to the call;
• The chosen expert sits with the team during the discussion;
• Ultimately, a player might be recruited as an expert by a competing team.

(Entire team attributes points for expert assistance) $$\rightarrow$$ (Successful expert receives points)

- A total of 60 points is at stake and will be awarded to each team after a final polling round with only two options to vote for the present spectators (= roughly the other half of the class having chosen the other topic):
  - Thumbs up: a real and profound consensus was found between all teams;
  - Thumbs down: no such consensus was reached between all teams.
- Each voting student receives one point when posting a reason for the decision;
- The entire process of level 4 and hence the involved work of an expert is defined as successful if the majority of votes is “yes” (potential team’s points $$\Rightarrow$$) = (total of 60 points available)

To sum it up, an atmosphere of co-operation and consensus (which is substantially different from ‘compromise’) should predominate in level 4. The different standpoints are integrated into one coherent view and merged into an acceptable solution that is beneficial to the common good (which is modeled by the subgroup of present stakeholders).

The results of level 4 are integrated adverse standpoints.

The social setting is calm consensus and co-operation. Different aspects of a complex topic are personalized by different (physically discernable) actors in class.

4.6. Rules for Level 5: Recognize and Interpret Complex Megatrends

After having learned to integrate adverse standpoints that are physically visible as different teams and that defend their own importance by argumentation, gamers are led to the next step. Individuals or freely aggregated groups of students should be able to independently ar-

Figure 6. The global long-term trend shows replacement of economic sectors in overall economic activity
rive at different solutions for one and the same problem and should train to view a complex matter from different angles.

For that purpose, students are asked to interpret complex reality as measured by global long-term trends which are taken from the author’s “Global Change Data Base” (GCBD, compare Figure 6 and see Ahamer, 2001). This interdisciplinary database shows data for the past three decades for practically all countries of the world for variables in the fields of economy, energy, population, land use, agriculture and forestry, human development indicators and social indicators. By means of regression analyses, the “analytical tool of the GCDB” provides graphically oriented as well as quantitative output which serves as a starting point for interpretations that weigh out intervening factors and which could explain recent global techno-socio-economic history for representative world regions.

The trainer assesses the depth and clarity of these analyses, hence

\[
(\text{team's points } \varphi) = (\text{reward given by the trainer for the quality of its analysis})
\]

An additional tool for establishing and visualizing the system’s interrelations and for drawing up a small quantitative explanation model could be the tool “Stella” by HPS (2003) which has a user-friendly profile facilitated by its graphical interface.

To sum it up, a self-guided integrative (global) view is the target of level 5.

The results of level 5 are analytical texts in which main effects and side-effects are valued as such and properly assessed in their effects on reality.

The social setting is focused and consistent work (individually or in teams) where the more active experiences of preceding levels are reflected, generalized and where the social energy of the class calmly phases out.

4.7. Adding up all Five Levels: Formula for the Total Score

The following list shows all formulas in all levels stemming from the rules listed. In each level the following sources sum up:

- **Level 0**: participation in initial (and final) survey = 1 point $\mathcal{C}$ each;
- **Level 1**:
  - (success in web-based quiz) = points $\mathcal{C}$;
  - (each posting or voting in the web platform for the 8-4-2 game) = 1 point $\mathcal{C}$.
- **Level 2**:
  - author’s reward granted by reviewer = points $\mathcal{C}$;
  - (reviewer’s potential reward) = 5 points $\mathcal{C}$ – (author’s reward granted by reviewer);
  - assessment by trainer = points $\mathcal{C}$.
- **Level 3**:
  - (potential team’s points $\mathcal{C}$) = (sum of chips set on this square), if won:
    - (individual’s points $\mathcal{C}$) = (team’s points $\mathcal{C}$) / (number of team members)
    - (each posting of reason for a vote via the web platform) = 1 point $\mathcal{C}$ each
    - assessment by trainer = points $\mathcal{C}$
- **Level 4**:
  - (potential team’s points $\mathcal{C}$) = (sum of chips set on this square), if won:
    - (individual’s points $\mathcal{C}$) = (team’s points $\mathcal{C}$) / (number of team members)
    - (entire team pays points for expert assistance $\mathcal{C}$) → (successful expert receives points $\varphi$);
    - (each posting of reason for a vote via the web platform) = 1 point $\mathcal{C}$ each
    - assessment by trainer = points $\mathcal{C}$.
• Level 5:
  ◦ (team’s points ♀) = (reward given by the trainer for the quality of its analysis).

The set of SGC rules was first published for a conference paper (Ahamer, 2004b), is copyrighted by the author and was frequently implemented at two universities for interdisciplinary teaching (Figure 7), sometimes including student-made podcasts (Struck et al., 2011).

5. THE RESULTING SOCIAL PROCEDURES IN THE FIVE LEVELS OF SGC

SGC sets out to allow for standpoints to evolve organically (Figure 8) along five levels as follows:

1. Small isolated packages of traditional content stemming from single disciplines, representing only one side;
2. A process of text-oriented criticism at a slow pace permitting deliberation on a one-to-one basis (Sivan, 2000; Ronteltap & Eurelings, 2002) mediated via asynchronous virtual communication;
3. A quick process of situation-dependent need to present and defend own arguments as a function of the adversary’s behavior and strategy on a many-to-many basis inside a team in synchronous real-time communication (Reilly, 2003; Schwartz & Teach, 2002; Salter, 2002);
4. A consolidation process with less pressing time restrictions in real-time communication on a many-in-one-boat basis in the need of consensus in synchronous real-time communication (Klabbers, 2003; Kirk, 2004);
5. A closing activity of creating a view integrating the many standpoints heard until now by creating an analysis outside severe time restrictions within an individual or freely chosen team we-just-for-us basis in a web mediated asynchronous communication process (Myers, 1999; Meadows, 2001).

The social skill of molding different or even contradictory standpoints into one multifaceted view is crucial to the interdisciplinary matters the author had to teach for the last nine years (Table 4) as web-supported “blended learning”. In this light, Surfing Global Change could be seen as a dramatic shell that is useful for interdisciplinary university courses when making use of new didactic concepts.

Figure 7. An implementation of Surfing Global Change on “Ecological and economical heating methods” in May 2010 at Graz University. The four (or five) tables for the level 3 discussion are manned by teams of two or three students. © Gilbert Ahamer.
Implementing Surfing Global Change at two universities to date has shown that the target of enhancing competence for consensus finding and academic substantiation has been reached for a majority of the 1000 students involved.

A thorough analysis of the social dynamics generated by Surfing Global Change is elaborated in Ahamer (2001a,b). Monitoring of the evolution of WBT and a literature review is done in Ahamer (2012).

May Surfing Global Change enhance (socially, economically and environmentally) sustainable development!

6. THE WEB IMPLEMENTATION OF SGC

Based on the rules described earlier, an original web based negotiation game “Surfing Global Change” (Figure 9) was invented and implemented (Ahamer, 2004b).

6.1. Extra Feature: Points and Pionss

This role-play is inspired by the conviction that equilibrium between two major complementary groups of skills has to be reached for successful professional life, namely competition and consensus (Figure 10). Corresponding types of rewards are points ♂ for competitive skills and pions ♀ for consensus oriented skills. Students therefore might choose various paths towards success!

Along five levels (implemented in Figure 9), players

1. Learn content, formulate definitions and pass a quiz;
2. Write, reflect, comment, assess and update an individual standpoint;
3. Try to make their team win in a competitive discussion under time constraints;

Figure 8. Symbolic depiction of the social and communicative setting, in which the five phases of SGC are developing: the evolution from delving into individual technical details towards a coherent or even holistic view.
4. Try to find a consensus with all other acting teams aided by hired experts view the own case study in the framework of global megatrends.

Until March 2004, SGC was implemented five times for Graz University and FH Joanneum in interdisciplinary courses for advanced semesters: the resulting social dynamics was monitored by a number of independent experts invited by the author like (Rauch, 2003). Until 2011 more than two dozen implementations took place.

Detailed statistical evaluation of students’ results has shown that cognitive performance (e.g., measured by quiz grades), skills of authoring academic articles, skills of reviewing them, and skills of discussion are to a large extent uncorrelated with each other and could be seen as independently varying in student classes. For the time being the conclusion is made that such skills have to be measured and assessed separately from each other in order to draw a complete picture of a personality. SGC tried to encompass a wide range of skills, SGC trains for life.

A special feature of SGC is the complementarity of “points” and “pionts”, the minimum of which defines the final course grades. In case of practical difficulties, it could also be left out by trainers using SGC for the first time. Nevertheless, the sense of this architectural feature should be focused on here: SGC sets out to implement both didactic targets in one course, namely

- The classic subject-centered “learning” as well as;
• The new interaction-centered generation of consensus.

It is not the intention to neglect one for the sake of the other in SGC and hence the minimum of both types of rewards counts for the final grade. Different characteristics of both interlaced components are pondered on symbolically in the graphic representation (Figure 11).

6.2. Processes of Self-optimization Planned to Steer SGC

This section reflects on how the set of rules contains self-optimizing subsets that eventually are more capable of steering than mere commandments. Experience with the game implementation shows that different classes find quite different approaches as a function of their preferences as students in different specialties.

Figure 10. Double nature of skills trained in SGC: competition and consensus. A landscape of skills where the number of small icons of carrots or points ♂ and pomegranates or pions ♂ indicates how each individual player has performed to collect rewards.

Figure 11. The complementarity of points and pions in SGC implements two types of didactic goals and is represented by the icons of carrots and pomegranates.
In general, the design of SGC prefers optimizing feedback circles rather than explicit directives and interdictions for establishing a social structure.

1. The team size for levels 3 and 4 is planned to be governed by the following antagonistic mechanisms:
   a. The more members a team has, the higher is its potential to elaborate profound standpoints and to incorporate actors suitable for various discussion phases;
   b. The fewer members a team has, the higher is an individual’s fraction of the rewards gained by the team, as defined by the formula: team points / members = player’s points.

2. Anonymous postings in the 8-4-2 game of level 1 encourage unconventional contributions as no damage of own interest needs to be expected;

3. In level 2, the degree of collaborative / confrontative behavior when reviewing as well as the effort for high-quality review is governed by the potential rewards that a reviewer can receive;

4. In level 3, the degree to which a team retains or gives up own standpoints in order to make a positive impression on the voting public;

5. In level 3, the amount of chips set on a square is a function of the team’s concrete insight into that matter (plus the team’s strategy);

6. In level 4, the image of a player influences chances to be selected as an expert in case of more than one offers;

7. In level 4, the amount of offered rewards influences the chances of hiring a strong expert (market mechanism);

8. In general: hard work versus free rider & mere strategy with a view to the rewards received; in particular: the team speaker has the right to expulse a team member in case of non-existing collaboration;

9. Define your own themes / increased effort and empathy at work;

10. Points ♂ / points ♀ as basic balance between content/confrontation and consensus; expressed by the formula: grade = min(♂, ♀).

As a very generalized interpretation, the task of designing SGC is equivalent to finding an answer to the question: which societal rules facilitate a desired direction of human evolution towards quality of life and sustainability?

Systems thinking is present both in the content and process of SGC.
• Regarding the systemic view on self-organizing processes;
• Regarding the content, typical courses for SGC to date were “Environmental Technology,” “Technology Assessment” and “Systems Analysis” and 20 other subjects at Graz University lectured for “Environmental Systems Analysis” and “Global Studies.”

7. STUDENT FEEDBACK

Typical student groups amounted from 6 to 40 SGC participants during the past eight years, with a typical average of 20 students. Statistically valid evaluation of all courses will be done in a future paper. In order to be able to provide anonymous uncensored student feedback in full length, the most recent result from February 2011 from the course “Dialogue on our future: climate change, dwindling resources, dissociation of society” with 6 ECTS credits in team teaching comprising four lecturers (IP, 2011) is presented here; they are representative also for other years given the similar direction of answers. The first section presents the survey administered by the university, the second section presents the survey organised by the author; both are strictly anonymous.

7.1. Feedback from the Official University-Wide Assessment Tool

Four out of the seven students finishing the course have provided answers to this survey (Figure 12), most of them focusing on “(strongly) agree” choices for answer.

Additional free text answers:

(1) What do you like about this course?
   ○ The familiar personal climate, the exchange between professors and students enabled by the small number of participants, the topics presented, generally the lecturers.
   ○ The extent of “freedom” in the group assignments and discussions

(2) What don’t you like about this course?
   ○ ?
   ○ -

7.2. Feedback from the Survey Handed out by the Lecturer

Three out of the seven students have provided answers via the web platform WebCT (http://www.webct.com). Since 1999, at the end of each SGC course the following set of questions has been posed to all participants (word-by-word translation by the author):

1. General impression compared with initial expectations:
   ○ Was more substantial and all-embracing than I expected;
   ○ More work than expected, but also learned more;
   ○ My impression is very positive to a large extent. I liked the style of instruction and the lifelike realistic discussions very much. Finally, the workload was more intense than expected but retrospectively I find that it paid off.

2. Especially the following should be improved:
   ○ Communication between lecturer and students regarding the written work to do;
   ○ Climate change lecture notes were too far-ranging for this course and the exam only assessed general facts relating to climate change;
   ○ I can hardly apply propositions for improvement because this course was meant for a larger group and we were only very few due to many cancellations [the high level of required activity and input was repeatedly addressed, author’s remark] and we had to improvise a little during the assignments which by the way I found positive because in life not everything goes according to plan.

3. My comment regarding the content of the course:
◦ Too broad contents for the short period of time, therefore many things could only be treated superficially;
◦ Especially in the areas climate change and participation I memorized much (because of the interactive style of the course) but also the other topics were very interesting and instructive;
◦ In total the course content was very interesting. However, I had hoped that we specialize more on something specific. I am aware that this course on “future dialogue” has many cornerstones and we don’t have so much time.

4. Was the degree of difficulty adequate?
◦ Was ok;
◦ Yes;
◦ In fact, there was a challenge, especially in discussions where you had to embody a role or a side that you are actually opposing in real life.

5. Was the content understandable?
◦ To 97.5%;
◦ Yes;
◦ I think each participant had already some degree of pre-understanding for the topics that were presented in a very comprehensible manner. What I liked much were the personal impressions in between that you gave from your work.

6. Style of the lecture?
◦ 6 continuous hours of instruction are much; 4 hours spread out over several days would be better;
◦ Style? It was a course where one was “condemned” to collaborate. One could, rather one had to express opinions regarding all issues because there were other views regarding the topics.

7. Opportunity to collaborate?
◦ Regarding the role play [in the lecture on “participation”, the author]: sufficient;
◦ Different according to the lecturers. I prefer the opportunity to discuss;
◦ Opportunity to discuss: I would formulate it differently: one was simply forced to contribute.

8. Possibility to provide one’s own viewpoint:
◦ Expandable;
◦ Also according to lecturer. Not so much with two out of the four lecturers.
◦ Was always given and always asked for.

9. Boring versus appealing:
◦ Appealing;
◦ Appealing. At any rate. The content very much stimulates students’ own thinking;
◦ Because the themes were always intriguing, the entire course was also interesting.

10. Demand for previous factual knowledge necessary to follow the course?
◦ None (when not related to discussions)
◦ Understandable for all, also without prior knowledge. But advantageous in climate change lecture.
◦ A certain amount of pre-existing knowledge should be contributed in order to actively participate in the course. Imho such courses only make sense when students actively participate in the course.

11. Mode of presentation:
◦ Good;
◦ Very good! Always offered personal impressions, encouraged students to cooperate and thus created a very relaxed climate.

12. Clarity about the meaning of this course?
◦ Not at the outset;
◦ Existed;
◦ Is perfectly present.

13. Suitability of the web-based lecture notes?
◦ Too many old documents in WebCT that distracted me;
◦ The course was very well prepared. We always had everything at hand that we needed.

14. What else did I want to say?
◦ Maybe it would have made more sense to go through the lecture notes in more detail;
◦ I am happy to have participated in this course, if I had time I would again at-
tend such an interdisciplinary practical [students need only one such course for their curriculum, remark by author];

◦ Firstly thank you for this interdisciplinary practical, I liked it very much. We could always contribute and express our opinions. I hope you offer a course again in the next semester; it would be tempting for me.

8. CONCLUSIONS AND PRACTICAL IMPLICATIONS

This paper presents the rules of the web-supported negotiation game “Surfing Global Change (SGC, © Gilbert Ahamer) in Section 4, preceded by general didactic deliberations and followed by an analysis of several SGC implementations.

Concluding from the courses described in this paper, participating students can be observed to pass on through consecutive steps as a function of novelty and appeal:

1. **Learn facts**
2. **Play with facts** according to game rules
3. **Play with rules** in an autopoietic way.

Such a didactic setting paves the way for

- **Interdisciplinary** (looking at different single aspects of complex realities);
- **Intercultural** (looking through different lenses);
- **Interparadigmatic** (reframing oneself in different value systems) learning and teaching.

The most important implications for practitioners are:

- The approach of Surfing Global Change roots in pragmatism (Rescher, 2004);
- It is possible to provide learner-centered, self-adaptive course design for online-supported courses;
- It is useful to apply multi-level didactic architecture with a growing degree from simple to difficult social procedures;
- It seems effective to gradually reduce the purely cognitive character of (traditional) learning design in order to facilitate peer review allowing for rehearsal and repetition of key content while strengthening the socialization component;
- Web as a resource is helpful when supported by face-to-face contact and personal experiences conveyed by the trainer;
- For different learner types among students it is helpful to provide a self-adaptive structure mainly consisting of guided and structured peer review situations involving mutual student assessment (cf. Chang et al., 2011);
- It is helpful to walk through a changing emotional landscape during the didactic procedure, ranging from individual work to competition, antagonistic and then collaborative teamwork;
- It proves time-saving for the facilitator to outsource most of the correction and commenting exercises to peer students who in turn accumulate experience in this important role as reviewers;
- At the same time students learn social implications of their behavior: each action of expressing themselves in class implies a social, community-related gesture by which they will be additionally assessed;
- Allows students from different cognitive cultures to step in (Lin & Ward, 2011);
- The above negotiation game is more suitable for multi-stakeholder course themes than for traditional courses conveying scientific content that implies classical drill.

The key lesson to the instructor is: a structured change of roles teaches better than one role. May interesting experiences be made by game based learning contribute to developing a sustainable and humane future!
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*Gilbert Ahamer decides to change living conditions through education. Peer-oriented and self-responsible learning processes appear as most effective after years of studies in physics, environment, economy and geography. He provides a framework and process for students suitable for construction consensus in climate change, energy economics, air emissions, spatial planning, public participation, EU enlargement, long-term global trend analysis and developmental global studies – all his earlier fields of professional activity for institutions such as the Austrian Environment Agency in Vienna, the International Institute for Applied Systems Analysis in Laxenburg, the Municipality of Graz or the Academy of Sciences in Salzburg. He has implemented his invention “Surfing Global Change” several dozen times at five Austrian Universities and was intrigued by the enthusiasm of students following the track of constructing their own solutions.*