SURFING GLOBAL CHANGE: Negotiating sustainable solutions

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SURFING GLOBAL CHANGE (SGC) serves as a procedural shell for attaining sustainable solutions for any interdisciplinary issue and is intended for use in advanced university courses. The participants' activities evolve through five levels from individual argumentation to molding one's own views for the "common good." The paradigm of "ethics of negotiation" is implemented using a guided, step-by-step procedure that is characterized by mutual evaluation among the participants and by the dissolution of the traditional roles within education. Despite the existence of an elaborate structure of game rules, the setting of SGC provides for flexibility concerning the choice of themes, the definition of roles, the means of information retrieval, the selection of emphasis within the issue to be negotiated, the exploration of solutions, and notably, the allocation of "success" to the participants. SGC is therefore also usable as a tool for training in areas ripe for innovative social procedures.

KEYWORDS: *case studies; consensus; controversial discussion; global change; interdisciplinary negotiation game; peer review; sustainable solutions; systems analysis; techno-socio-economic megatrends; technology assessment*

Basic data

Learning objectives: To increase the participants' capacity to act, to train their competence in finding practicable and enduring solutions in a pattern of competing interests, to convey an interdisciplinary view of technological projects in the tradition of technology assessment and systems thinking, and to experience the shifting of the assessor's role from the lecturer to the participants.

Game objectives: To collect as many points within the five levels using two case studies that are to be chosen by the participants:
Level 1: To acquire knowledge and achieve the best possible results in a quiz.
Level 2: To provide a well-founded argument and to comment on the points of view of other participants.
Level 3: To win a confrontational discussion, as assessed by peer participants.
Level 4: To achieve consensus with the same or similar discussion partners.
Level 5: To place the case study within a broader context of long-term global trends.

Examples of case studies: A proposed or existing highway project, railway tunnel, power plant, a new university campus, antennas for mobile phones, and so on.

Debriefing formats:
Level 1: Anonymous surveys.
Level 2: Written reviews without time constraints.
Level 3: Vivid discussion under time constraints.

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Level 4: Consensus building without severe time constraints.
Level 5: Critique and extension of the facilitator's point of view.

Target audience: Advanced university students developing interdisciplinary competence, also applicable to corporate or international teams of experts.

Playing time: Typically one semester (also feasible in 2 weeks to 1 year) with typically one half-day meeting per week; the equivalent of a university course with 2 to 6 weekly hours.

Debriefing time: Integrated into the full duration of the course, equivalent to some 20% of the total duration.

Number of participants required: Most appropriate for classes with 16 to 30 students (suitable for 8 to ~40). The participants are divided into two groups corresponding to the two project themes, with typically four to five roles per theme, each role being played by a team of typically one to four participants.

Participation materials included: Paper sheets for each participant to work on, documents prepared in advance defining the game rules, a sufficient knowledge base (e.g., lecture notes) with quizzes prepared, a pot to collect small papers with definitions in Level 1, sticky tape for hanging up the written standpoints on the wall for Levels 2 to 4; for the facilitator, a list of participants to document and add the points won by each participant.

Debriefing materials included: Copies with prepared quizzes and surveys.

Computer/Internet configuration (optional): A PC with a normal Internet browser is helpful for any participant searching additional fact-based information. Optionally, the quizzes, surveys, and standpoints could be made available through the Internet.

Other equipment required: Sufficient access to the documents containing the points of view of co-participants during playing time; LCD projector (for projecting PC screen content) during classes is helpful; in Levels 3 and 4, the facilitator needs a pair of dice and a kitchen alarm clock together with printouts (for each team) of the thematic matrices as filled in by role players (described later).

Introduction: The concept

Are you looking for a scenario and dramatic shell for your course, for consulting activities, or for solving interdisciplinary problems among distributed participants? Do you need to adapt flexibly to ever new themes arising from the participants' inclinations? Do you want to pass beyond fact-oriented questioning of students via one-way exams? Are you ready to take high risks by redefining the roles of participant versus facilitator by immersing everyone in a structure of mutual assessment? Then you might wish to try out the newly designed SURFING GLOBAL CHANGE (SGC).

Through a **set of five levels** (see Figure 1), participants are led step-by-step toward an improvement of their skills in self-directed work while creating solutions to complex problems. SGC ranges from learning content, writing and reflecting on personal viewpoints, confrontational debates, consensus-oriented discussions, to integrating the project theme into global mega trends.

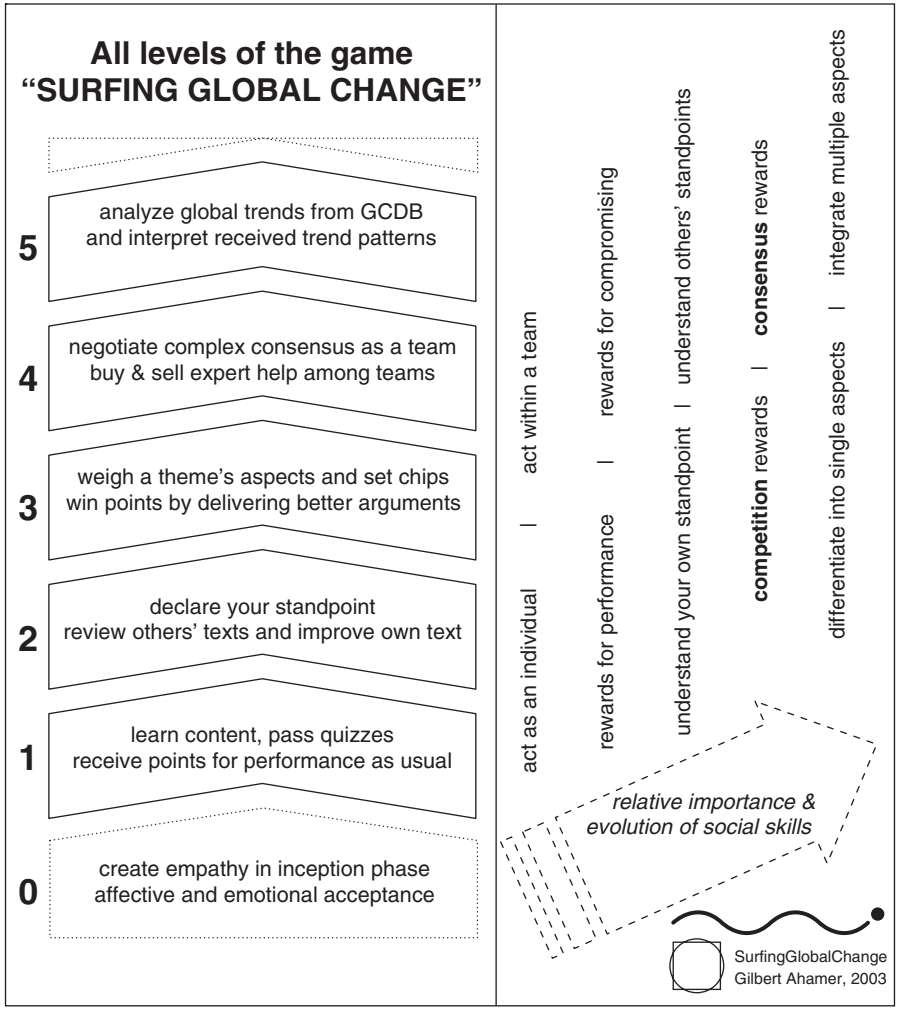

FIGURE 1: The Five Levels of SURFING GLOBAL CHANGE
NOTE: The game develops participants' academic and social skills through five levels. GCDB = Global Change Data Base.

Through these five levels, beginning with individual efforts and moving on to collaborative team work, the participants are challenged initially to fight their way toward a target and later to integrate their own interests into a well-balanced network of compromise. A more detailed consideration of the didactic and pedagogical background of SGC, along with comparisons with other current digital games and comparisons of SGC with criteria from recent gaming literature, may be found in Ahamer (2004a).

When designing SGC, a decision was made for process-oriented, transdisciplinary didactics (Crookall, 2000; Klabbers, 2000, 2001, 2003), systems dynamics and constructionist pedagogy (Gierlinger-Czerny & Peuerböck, 2002), as well as problem-based learning (Ronteltap & Eurelings, 2002). This frame-based version takes place in a classroom, whereas the Web-supported version (Ahamer, 2004b) employs "blended learning," which is made up of on-site and online methods (Kirk, 2004). Irrespective of the version decided on, insights and practical aid had also been included from recent developments in Digital Game-Based Learning (Prensky, 2001).

- SGC combines methods both of negotiation-oriented gaming in Levels 2 through 4 (Reilly, 2003) and of model-oriented gaming in Level 5 (Chadwick, 2000; Meadows, 2001).
- SGC's game play leads participants step-by-step from mastering facts (Fisher, 2001) to applying their social abilities (Schwartz & Teach, 2002).
- SGC aims to promote an ecologically, economically, and socially sustainable future (Rauch & Strigl, 2005), mediated by consensus building.
- SGC tries to achieve a flow-state in participants' activities (Csikszentmihalyi, 1990).
- Pleasure playing SGC might arise from social cooperation, marked by both creativity (paideia—as free children play) and effort (ludus—as in sports; Caillois, 1958, cited in Corbeil, 1999). It might eventually expand to playing with the rules, instead of merely playing within the rules—as sometimes observed when children approach the saturation point of a game.
- SGC relies on the educational validity of simulations rather than their algorithmic validity (Feinstein & Cannon, 2002).
- SGC goes beyond a predetermined set of options for decisions and assessments during gaming (Reilly, 2003) and provides an open-ended scenario for the participants' own definitions and for the directions their negotiations should take (Shellman & Turan, 2003).
- It is essential to note that SGC functions without a set of case-oriented rules formulated to guarantee success if followed closely (as ironically captured in Corbeil, 2002). On the contrary, in SGC, the guide to success is ignored from the outset.
- Truth is not conceived as "correct content" that is arrived at "using explicit algorithms" (Devine, Habig, Martin, Bott, & Grayson, 2004) but rather as a negotiated result that proves useful for arriving at an acceptable solution; hence, SGC is process-oriented (Corbeil, 2003) and trains for "discursive democracy" (Dryzek, 1990).
- SGC has no omnipotent judge (Smythe, 2002) at its disposal—certainly not in the person of the facilitator—but allows participants to develop their judgments as a function of their own role profiles without predefined role definitions being imposed (Kamimura & Tije, 2002).
- SGC includes activities outside of the regular meetings (Crookall, Jacobs, Hussein, & Ismail, 2001). These activities are guided by altering the team structures level by level (Ho & Crookall, 1995).
- SGC lives on a frequent change of roles: participants act, assess, and reflect.
- SGC allows both for "reflection in action" as well as for "Spielraum"—room to maneuver (Roth, Lawless, & Masciotra, 2001)—by changing phases of activity and reflection.
- Participants take on both participating and observing roles (Gaw, 2002), by playing two case studies with different members.
- In SGC, "the entire system is fluctuating in indeterminacy" (Baudrillard, 1984, cited in Myers, 1999), thus truly mirroring our real lives and can be called "simulative."

This game is original and was invented by the author, but after its invention a literature review was performed and showed that certain aspects of SGC might also be found in other concepts.

1. The first level debriefs and trains the necessary fact-oriented basis for later Piagetian adult playing (Fthenakis & Textor, 2000; Knallerbse, 2005; Kocher, 2005; Kovalik & Kovalik, 2002).
2. The second level embodies peer review (Sivan, 2000) as a means of improving the quality of individual argumentation (Kern, Saraiva, & Pacheco, 2003).
3. The third level puts teams into negotiation structures (Starkey & Blake, 2001) known from Technology Assessment, but under noncontrollable boundary conditions (Brozik & Zapalska, 2002).
4. The fourth level attempts to match partial views coined by partial cultures of understanding (Fowler, 2003) and calls for hiring new team members to complement own viewpoints (Thiagarajan, 2000, 2001).
5. The fifth level includes contemplation and reflection of global scenarios in the light of the chosen project (England, 2001).

The game idea, the didactic foundations (Ahamer, 2004a), and the game rules (Ahamer, 2004b) were developed by the author and holder of the game copyright during 9 years of practical interdisciplinary university lecturing, more than a decade of global modeling for E3 (environment, energy, economy; Ahamer, 1994), the experiencing of the hurdles involved in implementing national climate targets (Ahamer et al., 1998), and the recent adventure of overcoming day-to-day difficulties in the procedure of the enlargement of the European Union (Ahamer, 2003).

The following sections explain the game play from both the facilitator's and the participants' perspective.

Facilitator's guide

SGC is a game based on the dynamics of communication and debate. The participants progress from level to level. At each level, they must learn to manage information and marshall arguments. Each level requires actions and intellectual efforts that build on those of the preceding level but are more complex as the participants advance from level to level. The levels are briefly described as follows:

- Level 1: to acquire knowledge and achieve the best possible results in a quiz.
- Level 2: to provide a well-founded argument and to comment on the points of view of other participants.
- Level 3: to win a confrontational discussion, as assessed by peer participants.
- Level 4: to achieve consensus with the same or similar discussion partners.
- Level 5: to place the case study within a broader context of long-term global trends.

You must at all times remember that as a facilitator, you are on a metalevel and should carefully avoid becoming a participant yourself. Trust in participants' own capacities (Rogers, 1961, 1969)! Your tasks as facilitator are to

1. introduce the game and guide the participants.
2. monitor and manage the procedures at each level of the game.
3. provide data and evaluation at each level of the game.

As an overview, Table 1 shows a survey of actions in all levels. The detailed rules for all procedures follow.

Procedure

Level 0

This is the introduction to the game. At this level, you will do the following:

1. Explain the rules of the game and answer procedural questions.
2. Explain or introduce the concepts of self-organized learning.
3. Emphasize, possibly by referring to your own experience, the importance of mastering the art of communication and of consensus building in professional success.
4. Introduce the subject or field that provides the content for the run of the game.
5. Require from the participants a description of their expectations. For this purpose, you might use an anonymous survey.

Each participant who provides a response, by survey or otherwise, immediately receives one point toward his or her final score.

Level 1

This level delivers the cognitive basis for the game. You will do the following:

1. Provide participants with fairly detailed fact-based knowledge.
2. Present a written quiz to monitor participants' mastery and evaluate it.

Grant up to about 70 points to each participant as a function of the quiz result.

Afterward, use the 8-4-2-WORDS GAME (Thiagarajan, 2002), in which participants compete anonymously for the best concise definition of a key notion (e.g., *sustainability*), as follows:

1. Have each participant write his or her definition using eight words on a small sheet of paper, which you collect in a pot.
2. Read out loud one paper after the other.
3. Have all participants hum; the loudness will indicate their level of consent with the single definition on the paper.
4. Listen to all humming voices and identify the definition having received most appraisal, reread it, and (if suitable) conduct a short discussion, in which some participants might wish to weigh pros and cons of the definitions heard.
5. Repeat the same procedure with 4 and 2 words, which takes roughly 1 hour altogether.

Grant 1 point for each contribution delivered or choice made, giving a maximum of 6 points per 8-4-2-WORDS GAME.

TABLE 1: Collection of Main Actions Along the Five Levels on the Sides of the Facilitator and the Participants

Level	*Action of Facilitator*	*Action of Participants*
0	Explain the rules Introduce the concepts	Describe your initial expectations and at the end, give final feedback
1	Provide participants with facts	Pass a written quiz
	Conduct the 8-4-2-WORDS GAME	Play the 8-4-2-WORDS GAME
2	Announce a general thematic frame	Write up a personal point of view Read, reflect, and review others' points of view
	Compute points for all participants	Update own point of view
3	Repeat rules for Level 3 clearly	Agree on two case study themes (a), (b) Define four to five roles for each theme Join one role (= team)
	Coach the preparation of a thematic matrix in three steps	Design an individual, then a team's, and finally an entire theme's matrix
	On the day of the discussion, set up tables facing each other in a square	Prepare a team's point of view (a) All teams of one theme sit down in a square arena for discussion (b) All teams of the other theme sit around this central arena and watch (a) All discussing teams place a total of 60 chips onto the grid elements
	Select one grid element after the other at random Announce the discussing teams and measure discussion time Compute and document the points won in this grid element	(a) Argue for your standpoint and try to win over the other teams (b) Vote for which team won the discussion (b) Write reasons for voting decisions
	Repeat above procedures for all grid elements, then exchange a⇔b	
4	Repeat rules for Level 4 in detail Announce that each team must hire at least one external expert Document all bids on a board	Remain in roles and themes of Level 3 All team speakers formulate the team's need for support Select experts from offers
	Again, set up tables in a square Document the points won Exchange a⇔b	(a) All teams discuss and accept a proposal for a fact-based consensus (b) All other teams vote on quality of consensus built Publish a copy of the consensus text
5	Present material on global trends to participants	Write an analysis of the case study in the context of global trends

Level 2

This level trains first elements of mutuality. Here, you will do the following:

1. Let participants freely choose a subject from a general thematic frame (e.g., "How will we use energy resources in 20 years?" or "The European Union in 20 years").
2. Have each participant write up a personal point of view backed by arguments and by citations of sources in the fine academic tradition.
3. Pose a deadline of, say, one week, after which all participants are to have fixed the document to the classroom wall, one beside the other, thereby creating an individual column of discussion for each author.
4. Announce that a period of several weeks begins now in which all participants are called on to read, reflect, and review their colleagues' points of view and to attach the comments below the initial document at any time they wish, but exactly dated.
5. Announce that any author is entitled to improve one's own document at any time and to post such an update, again dated and below the reviews.
6. Instruct participants that, when in the role of reviewer, they may grant the author up to 5 points (n) for the overall quality of the point of view.
7. Offer well-targeted criteria for assessing quality by points (e.g., plausibility and balance of well-documented arguments).
8. Point out that the difference between this award and the maximum (5-n) is the potential award for the reviewer, which is granted only if the author posts at a later time an updated version of the original document based on the critique contained in the review. (This criterion is a practical means of evaluating whether the review was useful enough to trigger quality improvement.)
9. Explain that everyone may choose freely and strategically (a) how many reviews they perform (experience says, 2 to 5) and (b) how severe they are when giving points (experience says, 3 to 5).

Compute points for all participants by adding the following components together: the average of the assessments received from peers (average of the n), plus the sum of any earnings received as reviewer (sum of the 5-n). From experience to date, participants might earn a dozen points as a result of these Level 2 rules.

After the end of the review period, read and assess the papers yourself and optionally grant up to 10 points if you think it increases the level of justice in your world. Be proud of the papers you have managed to receive.

Level 3

Tension increases and social confrontation begins to occur as you come to the dramatic climax of SGC: confrontational discussion. Level 3 is made up of well-prepared discussion rounds using a matrix-like structuring of the themes of debate and involves mutual assessment by the participants. For leading into vivid but structured discussion, you will do the following:

1. Emphasize in detail the rules for this Level 3.
2. Give participants enough time (several hours or a few days, to allow participants to identify thoroughly with the matter) to agree on two themes or case studies they consider relevant, pertinent to their field, and of common interest (e.g., a large technological or building project).

3. Coach participants to define roles with concise names. Best are four to five roles (= teams), which should cover all existing patterns of interest (e.g., state administration, investor, lobbyist for industry, or lobbyist for environmental protection).
4. Ask teams to choose a speaker.
5. Allow all participants to join a team, while informing them that points won by teams will be equally divided among team members (this rule is designed to encourage teams of similar size).
6. Guide the preparation of a matrix in three steps:

    a. First, instruct all participants to design an individual matrix (best 3×3 or 3×4 grid elements as a function of the anticipated duration of discussion) and to define concise headings for spreadsheet rows and columns representing suitable topics of the theme (e.g., economy, ecology, land use or neighbors, consumers, partner firms, etc.). Let them label the resulting 9 to 12 grid elements with concrete descriptions of the topic's aspect (e.g., economic effects on users or ecologic effects on neighbors). The total of all grid elements must cover the essentials of the case study.
    b. Second, ask each team to mold their individual matrices into one (which triggers reflection on the entirety of aspects included).
    c. Third, one matrix for all teams in each theme must be created. All such communication incites deliberation of the matter in stepwise enlarging social entities and produces a common game field for future interplay of arguments.

7. Instruct each team to prepare a common point of view (typically one or two pages per team member) and set a deadline for affixing this document to the classroom wall (e.g., permit a period of approximately 1 week ending 2 days before the scheduled discussion to allow for studying opposing teams' points of view).
8. On the day of the discussion, schedule at least 2 hours each for two themes, and set up tables for the teams facing each other in a square.
9. Invite all teams involved with the first theme to sit at these tables and give them a paper copy of their matrix.
10. Invite all teams of the other theme to sit around this central arena and watch the performance.
11. Give the teams 20 minutes for (a) placing a total of 60 chips (representing the potential points to be won) freely on the grid elements by writing numbers on the printouts of the matrix and for (b) developing a common strategy for negotiation. (You might adjust the total of 60 according to the planned overall duration.)
12. Collect all the matrices, which have been identified with the team role name and all team members' names.
13. Select one grid element after the other at random. To achieve randomness, if possible, ask an assistant or a local movie star to do the choosing, or use a sophisticated computer program or any other technical gadget—or you may just roll dice (as I did). For each of the 9 to 12 grid elements, do the following:

    a. Identify and announce the teams taking part in the discussion of the selected grid's topic according to the following rule: Any team having set at least one chip takes part in the discussion.
    b. Compute the points to be won for this grid element: Points at stake are equal to the sum of the chips set.
    c. Compute the time limit of the discussion for this grid element: Discussion time is equal to the sum of chips set divided by the number of teams having set chips on this grid element (this formula has proved helpful in practice).
    d. Insert this information into the spreadsheet and display it for everyone to see (e.g., by LCD projector) to publicly structure the discussion.

e. Measure the duration using highly sophisticated software, some gadget, or just a kitchen alarm clock (as I used).
f. Just announce the start. Now, the discussion goes on in a self-organized way. This means that you do not name a discussion leader. As usual in SGC, any question of internal organization is left to the teams.
g. Your only role as a facilitator might be to indicate at appropriate moments how many minutes are left; experience has shown that this suffices.
h. At the end of the discussion, let all team members of the other theme vote plus (!) all teams of the current theme that did not take part in the current discussion (because they had set no chips, in other words, all participants not involved in the current discussion).
i. Announce the options for the voting procedure: Either a single team has won, or no team has won (e.g., in case of low quality of discussion). This means either team 1 or team 2—or team 3, if applicable—or none.
j. Collect the votes, announce which team(s) has/have won and document in writing (most helpful via LCD projector).
k. Each of the voters may note reasons for their voting decisions and give you this sheet of paper at the end of the discussion; you grant them 1 point for each explanation (which increases the degree of reflection in voting behavior).
l. Proceed to the next grid element unless you feel atmospheric tension that needs to be uttered.

14. As facilitator, never take sides.
15. After the last grid element is discussed, ask the participants for feedback and for their opinions. Accept critique and convert potential impressions of mistreatment and injustice caused by the voting procedure into a search for solutions with the participants. They might figure out adaptation of rules.

In Level 3, participants are likely to have earned 30 to 50 points, as experience has shown. If you feel it is warranted, you may always complement each score by "instructor's points" for academic quality of written points of view.

Level 4

This level of consensus equilibrates the foregoing level of collision of interests. It is preferable to use a different day to allow for different "social energy" among the participants. Here, you will do the following:

1. Repeat the rules in detail and inform the teams that they will remain in their roles and themes of Level 3 and use the same seats and tables.
2. Ask the teams to prepare and affix to the wall a proposal for a fact-based compromise in light of any differing points of view that have become apparent. For the consensus-oriented discussion, place the same teams at the same tables.
3. The following procedure is designed to model a "marketplace of expertise":

   a. You announce that each team must hire at least one external expert from the pool of participants not taking part in the discussion of the current theme.
   b. Make one team speaker after the other formulate a brief question describing the team's need for support and define the amount of points the team is willing to pay for this service.
   c. You write all bids and prices on the board, and then call on potential participants (i.e., from the other theme) to present themselves as candidates for the job as an external expert if they feel capable.

   d. Make the calling team select in case of multiple offers for being an expert.
   e. Make each team hire at least one expert, who then sits with the team.
4. Announce a period of 30 minutes for general discussion for elaborating a compromise. Such a compromise must be written down in suitable detail, read out loud at the end of the 30 minutes, and must be accepted by a vote of all team speakers.
5. Again, you make the nonparticipating public (i.e., all members of the other theme) vote their agreement, or not, to the consensus. In this level, you allow only two choices: yes, consensus reached (thumbs up) or no, consensus not reached (thumbs down as in the ancient Roman circus). As mentioned above and as a function of the final vote, the previously negotiated rewards for the experts are paid by all members of the hiring team together but received by the expert(s) personally.
6. Exchange the two themes and perform the same procedure starting with item 2.
7. Demand that for each of the two themes, a copy of the consensus text is affixed to the wall as a documentation.

In Level 4, again a total of 60 points for each team is at stake, which in case of a consensus is divided among the team members plus their hired expert(s) and lost in the case of no consensus. These experts are paid their points personally in case the final vote yields "consensus" (remember, normally points are divided between all members of a team).

Level 5

This level links up with global trends. Here, you will do the following:

1. Present to participants new material on global trends, best chosen from the specially designed "Global Change Data Base" (GCDB; Ahamer, 1997).
2. Explain the possibilities of receiving aggregated graphical representations of global long-term trends that are targeted to the case study and explain such long-term global trends using examples from the field of economy, energy economics, land use change, and agriculture. Alternatively, you may also use publicly available material.
3. Tell participants to draw up 2 to 5 pages per person (formation of teams is allowed if desired—these may or should differ from previous teams) describing their view of the case study within the framework of global trends such as population growth, improvements in energy efficiency, resource scarcity, changes in economic patterns, and so on.
4. Affix the resulting analysis to the classroom wall. You may allocate some 10 to 30 points as is traditionally done for academic paper quality and thereby adjust the relative success of participants if ever necessary (e.g., for "serious" course marks).
5. Ask participants for a final feedback (compare with Level 0).

Social energy phases out in this last level, and the scene cools down.

Participants' guide

Do you want to be a self-guided actor? Do you want to participate in looking further? Is your goal to combine clear argumentation with practical implementation? Game for your success and play SURFING GLOBAL CHANGE!

In Level 0, you will hear the background: Develop both your social and intellectual abilities when gaming with the set of rules presented to you. These rules allow you to win by being both stronger *and* more compromising! Leave behind what is called "traditional learning."

In Level 1, you are provided with orientation and basic knowledge in the field. It is best if you start digging into facts and collect your first bunch of points by passing a quiz.

In Level 2, you train "democratic and academic review culture." You will do the following:

1. Write a well-founded personal point of view as an individual author and publish it on the classroom wall.
2. Slip into the role of a reviewer and assess other participants' work, giving marks to your co-players (1 to 5 points), as traditional teachers do.
3. Be the one who freely comments on inconsistencies and "mistakes" in your colleagues' papers; you display your comments openly.
4. Decide freely how severe you are and choose strategically if you assess many or few of the other participants' papers and which ones you assess.
5. Collect additional points if your written reviews prove helpful and the authors rework their text: Such "reviewer's reward" amounts to "5 minus given points."
6. Incorporate others' reviews into your own text to improve it, if ever you as an author discover something useful in received comments. Future reviewers may improve your score during subsequent reviews of your text.

In Level 3, you go for a fight. You will do the following:

1. Join with whichever participants you want to battle.
2. Choose a theme.
3. Select activities that you would like to contribute to the team's preparation for the case study.
4. Dissect the entire theme in a way that is advantageous for your argumentative situation by designing a matrix with the theme's aspects.
5. Co-develop the proposed matrices in a three-step procedure (individually, one per team, one per theme). The final matrix defines the detailed discussion topics.
6. Prepare your point of view together with your team colleagues by using any sources of information you like, while defining by yourself what your point of view in debate is.
7. Read your adversaries' viewpoints 2 days before the confrontational discussion so that you can re-adapt and alter your team's strategy early enough.
8. Together with your team, initially distribute 60 chips on the most promising topics (i.e., grid cells) to increase your chances in this "roulette of arguments." You may simply avoid the aspects where you feel inadequately prepared! For winning, it suffices to make use of your strengths, and it is possible to avoid your weaknesses.
9. Follow the grid elements of the matrix as randomly selected by the facilitator during the "showdown" of the discussion.
10. Discuss on thematic aspects defined by the grid elements with the other teams who have set chips on the same grid elements.
11. Be assessed not by the facilitator but by the other participants in the game—and you assess them in turn.
12. Possibly experience Machiavellian temptations and feel how things turn out if you follow them.
13. Win if you have better arguments, or if you can make yourself better understood.

14. Document and discuss reasons that a team was voted for or against.
15. At the end of this discussion process, speak up publicly about what worked well and what went wrong in this battle of interests.

In Level 4, you will calm the scene when reuniting on a different day. You will do the following:

1. Settle down with your previous sparring partners and experience "sitting in the same boat" (i.e., all teams will win, or no team wins).
2. Have prepared a proposal for a consensus as a preparation.
3. Be obliged to produce a compromise satisfying all roles' needs and all views as unfolded until now.
4. Make use of the additional feature in Level 4: If your team seems to lack competence in some area, hire an expert for that area from among the rest of the players.
5. Together with your team, define the price in points your team will pay for this argumentative service.
6. After half an hour of consensus-oriented discussion, together with all teams, arrive at balancing your needs with the others' needs and you will ultimately write down a consensus solution to your case study that has to be approved by all teams.
7. Let others vote on whether your consensus appears to be substantial.
8. You will vote on the quality of their consensus as well.

In Level 5, you put your nose out in the winds of global megatrends. Merge the different views you have acquired by having started from different points of view and mirror them with long-term trends. You will be provided with graphic and quantitative material by the facilitator from the GCDB or from similar sources. Immerse your case study into the context of evolutionary trends and become aware that your actions are embedded in such trends.

In conclusion, you have gone through all stages of learning, arguing, convincing, winning, compromising, and rounding out a vision. You have surfed on the waves of global change. And you have felt in your own legs how you encountered such waves. Quite sportive!

Formula for the total score

How is the final score computed for each participant? The following list condenses all formulae in all levels stemming from the rules enumerated above. All following items add up as shown in Table 2.

The total score equals the sum of all above lines, which combine various academic and social abilities. It should be noted here that the main interest of the rewarding system lies in inspiring and inciting students to increase their abilities for their future and not purely to assess their existing knowledge they have learned to date.

Debriefing

Reviewing experiences, feedback, and reflection is integrated into the game procedure. If necessary, such step-by-step debriefing activities allow the course of the

TABLE 2: Composition of the Total Score (= sum of right column) as Result of Actions (center) in all Levels (left)

Level	*Action*	*Points*
0	Participation in initial survey	1 point
	Participation in final survey	1 point
1	Success in Web-based quiz	Points from quiz
	Each action in the 8-4-2-WORDS GAME	1 point
2	Author's reward granted by reviewer	Points [take average of all single reviews]
	Reviewer's potential reward	5 points minus (author's reward granted by reviewer) [take sum of all single reviews]
	Assessment by trainer	Points from trainer
3	Potential team's points, if won: (individual's points) = (team's points) / (number of team members)	Sum of chips set on this square
	Each posting of reason for a vote via the Web platform	1 point each
	Assessment by trainer	Points from trainer
4	Entire team pays as team points for expert aid	Successful expert personally receives same amount of points
	Potential team's points, if won: (individual's points) = (team's points) / (number of team members)	Sum of chips set on this square
	Each posting of reason for a vote via the Web platform	1 point each
	Assessment by trainer	Points from trainer
5	Team's points, again: (individual's points) = (team's points) / (number of team members)	Points from trainer

game to be adapted to the specific profile of the participants, the case studies, and the emerging social atmosphere.

Two cycles of anonymous feedback are installed in SGC and have been identical and constituting elements of all the author's teaching since 1997, namely,

1. the "initial survey" during the first lessons right after the presentation of the course concept and the range of selectable emphasis for content, and
2. the "final survey" after the end of the course to receive the overall feedback.

In addition, oral and less formalized but more personal debriefing procedures are scheduled in both directions between facilitator and students:

- after the quizzes (Level 1), primarily from facilitator to students,
- after the writing and review activities (Level 2), primarily to students,
- after the confrontational discussion in both directions (Level 3, often vivid),
- after the consensus-oriented discussion (Level 4, less vivid), and
- after the trend analysis (Level 5, directed to authors, but publicly readable).

As mentioned, final feedback is undertaken at the very end of the game SGC with a questionnaire. Experience has shown that this ranges from quite critical comments during the first implementation (involving students of civil engineering doing SGC in a compulsory course in a very experimental atmosphere) to often enthusiastic reactions (from students of environmental systems science having chosen such a course as an elective, using the latest implementation of SGC). Feedback received has been used for fine-tuning the set of rules during the past years. Analyses of social dynamics when playing SGC will be delivered to this journal in a future text.

Conclusion

The intent of this game is to train skills that are necessary to create suitable professional solutions given the intricacies of consensus building in real life. As of April 2005, seven implementations of the game have been offered in university courses of various specialties such as construction management/civil engineering, industrial electronics, economics, and environmental systems sciences.

S&G's guide for authors proposes speaking about the personal motivation for inventing such a game. In the case of SGC, it was years of affiliation with environmental administration in a country that for decades has been proud of its sound and eager ecologic motivation. When it became necessary (as a result of governmental commitments within the EU) to make plans on a national level for the measures necessary for the reduction of greenhouse gases, I felt that several scientifically or technologically oriented initiatives for assessing the potentials of measures for climate protection (be they commanded by superiors or developed from my own background of earlier international modeling affiliations) did not work or were even hindered on various administrative levels. In my mind's eye, I can still see my project folders with CO_2 reduction assessments using energy models being disposed of in completely empty office cupboards by administrators as well as my finished reports that are collecting dust in administrative temples. My conviction grew that successful implementation is not determined by scientific criteria but by the ability to create coalitions among actors on the basis of common views.

In the meantime, even the daily newspapers report that the legally binding climate reduction target of my country is increasingly more out of reach from year to year. But I hope that this proposed game will enable other professional actors to perform better than I did!

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