

INTEGRATIVE LEARNING: EXPLORING OPPORTUNITIES IN BUSINESS SIMULATIONS

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ABSTRACT

This paper describes the design and the implementation of an academic semester course based on an integrative teaching / learning approach within a Master's Program in Construction Management and Economics at the University of Duisburg-Essen. Herein, two newly developed business simulations represent the core of the course. It is supplemented by additional teaching methods which are oriented toward the teaching-/ learning targets affiliated to the core element "business simulation". These methods are selected by using a handy tool, with which the user is able to select appropriate teaching / learning methods, tied to the intended competency profile which defines the goal of the course. Findings indicate that an integrative teaching / learning approach seems to improve participant's competency acquisition indeed. Therefore the aim of this paper is to give suggestions for the practical implementation of integrative teaching / learning concepts involving business simulations and future research in general as well. The development and the implementation are described as universally as possible to allow the transferability to other domains. In addition, this paper should contribute to a lively discussion on integrative teaching / learning approaches involving business simulations at large.

MOTIVATION

Integrative teaching and learning concepts have not only become an important part of education in schools, but also in further and academic education. Such approaches enable the participants to combine skills and talents as well as experience and attitudes from numerous sources to one comprehensive overall context. Thus, the efficiency of teaching and learning processes and the targeted learning results can be improved substantially.

The special value of an integrative teaching and learning approach becomes obvious upon close inspection of the relationship between the information offer and processing, the teaching and learning methods based on these and the resulting acquisition of competency. Especially the initiation of the participant's independent activities, i.e. acting or reacting, explaining to others, hands-on practice and the discussion of it results already in a significant increase of the teaching and learning success.

As a consequence, business simulations can play an important, potentially even central role in the courses based on practical acquisition of experience. Therefore, business simulations as a learning and teaching method are highly relevant in the context of the current discussion on

competencies and their acquisition. It has to be considered, however, that the sole use of the business simulation method does not have to be a guarantee for a positive learning result.

Irrespective of the fact whether an already existing, often rather general type of business simulation or a simulation developed and tailored specifically for this purpose is employed within a course, the concept of the course can be improved with the carefully planned integration of further teaching and learning methods, based on previously located competency development targets.

BACKGROUND

The learning goal of a lecture or seminar comprises a variety of competencies. These are a dynamic combination of attributes, skills and attitudes (ECTS Users' Guide 2004).

Independent of different subjects and taking into account the areas highly relevant for business simulations, i.e. psychology, pedagogy, as well as organization theory, a competent individual is furthermore described as follows:

"A motivated and experienced individual is seen as competent if, first of all, he or she has a social or legal authorization and/or obligation at his or her disposal. Then, the individual needs to possess the skill to transfer facts into know-how with the aim to apply it appropriately to tasks as a dedicated skill in a competitive environment. Finally, the aforementioned has to be deployed responsibly and successfully for a specific aim." (Karl 2012, p. 37)

In view of this, business simulations as a method for further training and education achieve high relevance in the context of integrative learning approaches.

If the scope of observation is more focused on the information transported in a teaching and learning scenario, the four requirements postulated by Arnold and Siebert (2006) should be fulfilled to allow the transformation of information into knowledge. For this, the offered information has to appear as 1) important and meaningful, 2) practical, helpful and useful, 3) new, 4) quotable and integrable.

It is especially the last of these aspects which can be promoted very well with the help of integrative teaching and learning approaches utilizing the business simulation method. In how far the transferred information supports the development of specific competencies depends, among other factors, on the half-life of the information in the

receiver's memory. David Fritzsche (1974) already referred to this problem in an early stage of ABSEL:

„[...] much of the information we present is never received by the student, or if it is received, the information is stored in temporary memory rather than in permanent memory.“ (David Fritzsche 1974, p. 41)

This problem has also been identified by other authors in the past, especially upon examination of the retention or recall rate of information (cf. Dale 1946, Rohn 1964, Däumler 1982, Werneck, Heidack 1986, Moker 1987, Bales 1996). Although the individual retention rates differ depending on the type of information uptake and the author (and even the validity is a controversial issue in the subject discipline), the different authors agree at least on the fact that one's own activities, i.e. actions and decisions, imply the highest rates of retention and recall of the information. This, in turn, supports the special relevance of business simulations.

All of these aspects, however, do not guarantee that competencies are developed by the participants just because a business simulation is employed.

To increase the efficiency of a business simulation course, the integration of further teaching and learning methods offers the possibility to further advance competencies targeted by the business simulation method, e.g. analytic skills of combination and coordination, problem-solving skills, flexibility in thinking and decision-taking, the acceptance of responsibility as well as team-working or communication skills and assertiveness. Beyond this, additional competencies can be incorporated, usually defined by the equivalent business domain.

CONCEPTUAL DESIGN OF THE MODULE

The conceptual design of the module *Construction Management Simulation* will be introduced in the following. This one-term course is developed and conducted by the author and takes place as mandatory elective module in the second term (spring) of the masters program *Construction Management and Economics* (here, illustrated with 35 participants).

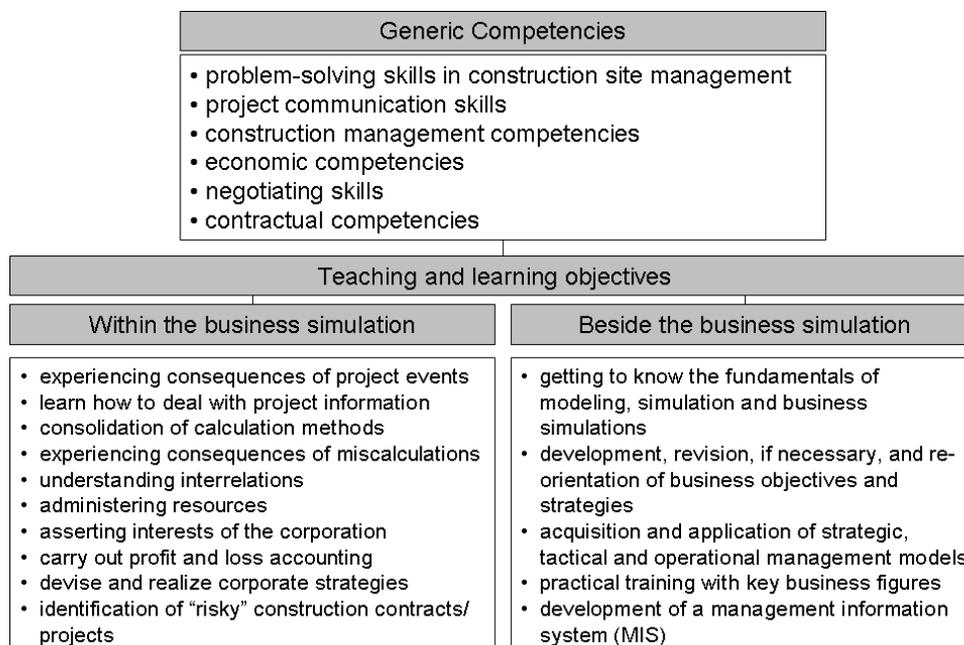
To measure the state of previously acquired knowledge and developed skills at the beginning of the module concept, the previous modules are analyzed. This results in reasonable and professionally applicable cross-links which the participants can easily relate to. Therefore, the described module *Construction Management Simulation* takes content of the following compulsory modules into consideration: Building Contract Law, Project Management, Investment and Financing, Operations Management, Corporate Management.

To further the skill of inter-cultural cooperation of the participants, the business simulations were intentionally developed with an international focus and in English language only. Thus, the acquisition of application-oriented English became an integral part of the simulations.

MACRO LEVEL

On this level, the teaching and learning goals of the module *Construction Management Simulation* were laid down in detail. These are dependent on the competency development objectives targeted in the module. These interdisciplinary competency development objectives offer

FIGURE 1 INTERDISCIPLINARY COMPETENCIES AND DERIVED TEACHING AND LEARNING OBJECTIVES



the basis for the developed business simulations (cf. Karl 2012, p. 41). To select additional content and, furthermore, to prepare it for the practical application in the business simulation, further teaching and learning objectives have to be defined and juxtaposed to the business simulation concept. An overview of these definitions is shown in figure 1.

MICRO LEVEL

In order to efficiently support the development of the competency to act, especially in the realization of the teaching and learning objectives aside from the business simulation, further teaching and learning methods are involved with the help of an instrument developed by the author, the method disk (in German: Methodenscheibe) as well as the belonging "Guideline for competency-oriented course development" (cf. Karl 2010, p. 220).

On the one hand, the dimensions listed on the method disk are general competencies like, e.g., social competence, working independently, conflict solving skill etc., and, on the other hand, a selection of teaching and learning methods. Furthermore, two additional dimensions (number of participants and the context/ setting) are integrated as extra parameters.

This tool resembles the principle of the parking disk. On the front of the disk, the user can find the targeted competence in the upper area and three corresponding recommended methods are shown in the lower area. On the back, the optimum number of participants and the setting that corresponds to the methods selected on the front can be found.

In this manner it is possible, e.g. using the setting, to filter and identify methods that suit the available room or location very well. Likewise, a method can be chosen which properly corresponds to the number of participants of the event (The method disk as well as the guideline have been included as good practice examples in the expert report about competence orientation in teaching and learning of the Conference of University Presidents).

Even though the business simulations employed in this module are already oriented towards the general

competency objectives, the method disk lends itself to be used in cases where already existing business simulations are supposed to be complemented in an uncomplicated manner with additional teaching and learning methods to include specific competency development objectives without changing the business simulation itself. Nevertheless it is necessary to take into account that the selected business simulation is generally suitable for the intended purpose and the target group alike, as the limited learning effects of an inadequate business simulation can be compensated only insufficiently with the integration of additional teaching and learning methods.

Depending on the teaching and learning objectives apart from the business simulation, using the method disk helps to develop the relationships illustrated in table 1.

A further component of the module is the didactically reasonable linking of traditional course formats with modern forms of e-learning. In the module *Construction Management Simulation*, the internet-based learning environment Moodle is employed.

Moodle, an open-source online learning platform, is offered by the Center for Information and Media Services (CIM) at the University of Duisburg-Essen to all university employees free of charge. The software supports cooperative teaching and learning methods by serving as a platform for up- and downloading texts and files, offering possibilities to carry out online tests and communicate in forums. For the preparation and, later, the consolidation of the module's content, the online learning platform is used to supply the students with scripts (Powerpoint presentations and the like), lists of reference literature, excerpts from relevant works and current professional articles of the corresponding subject.

COMPETENCY ASSESSMENT AND INCREMENT MEASUREMENT

As business simulations and the courses realized with their help are conceptually to be seen as multidimensional teaching and learning scenarios (refer to figure 2), further considerations have to be taken into account regarding the

**TABLE 1
RELATIONSHIP TEACHING/LEARNING OBJECTIVES AND METHODS**

Teaching and learning objectives apart from the business simulation	Chosen method
getting to know the fundamentals of modeling, simulation and business simulations (professional expertise, methodological competency)	lecture/presentation
acquisition and application of strategic, tactical and operational management models (professional expertise, methodological competency, working independently)	presentation, partner work, group work
development, revision, if necessary, and re-orientation of business objectives and strategies (professional expertise, working independently, structured and systematic thinking)	presentation, case study, group work
practical training with key business figures (professional expertise)	presentation, group work
development of a management information system (MIS) (professional expertise, methodological competency, team-working skills)	partner work

competency assessment and evaluation - independent of technical or content-related models or the competency models.

Two primary methods for the assessment of competencies are employed in the presented course: a) self-assessment of the participants and b) evaluation of results / data in the course / business simulation by the tutor

As an online platform is integrated in the module, a very suitable tool for the self-assessment is a standardized online assessment, questioning the participants at different points of time to record the development of competencies and make them measurable (nevertheless the self-assessment could be done with a paper-based questionnaire, too). Aim is to verify the realization of teaching and learning objectives as well as the recording and measurement of competencies by monitoring and analyzing the progress of competency developments over time. As an example an excerpt from the survey form is shown in figure 3.

The change was determined at each time step using a *competency development ratio* (equation 1).

EQUATION 1
COMPETENCY DEVELOPMENT RATIO (CDR)

$$cdr = \frac{v_1 - v_2}{v_1} = \begin{cases} > 0 \rightarrow \text{increase of competence} \\ = 0 \rightarrow \text{stagnation of competence} \\ < 0 \rightarrow \text{decrease of competence} \end{cases} ; v_1 \wedge v_2 \in [1,5]$$

v_1 : assessment value at time t_1 , v_2 : assessment value at time t_2 , $t_1 < t_2$

Values v_1 and v_2 depend on the evaluation scale :

very good (1), good (2), acceptable (3), satisfactory (4), unsatisfactory (5).

The additional method of evaluating data and results in the course respective the business simulation is reasonable and helpful to prove or, where necessary, disprove the self-assessment of the participants.

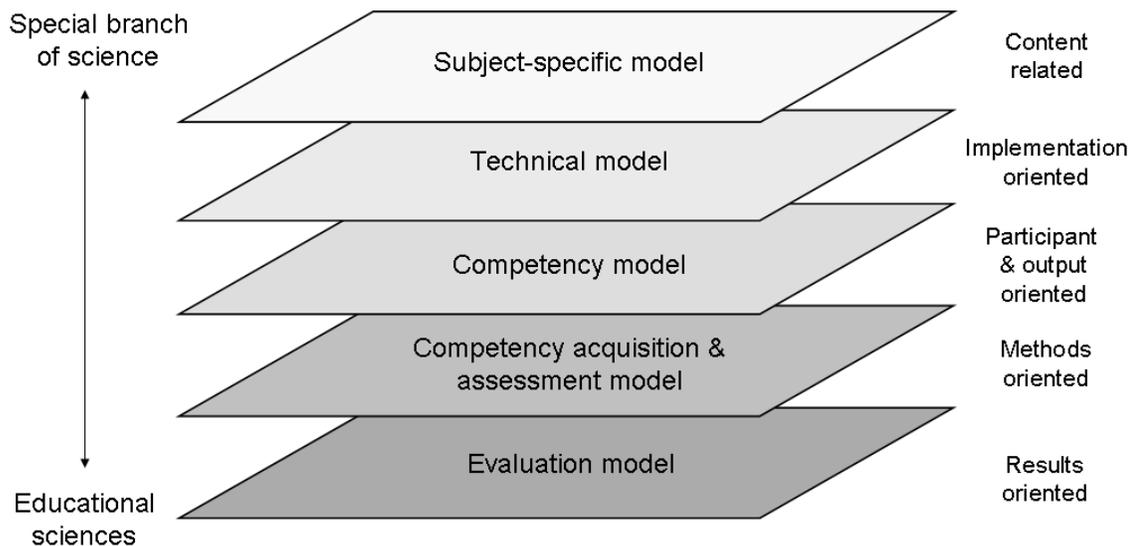
Lastly, an exam can be used at the end of the course as an additional element. When evaluating the results of this exam, however, it has to be taken into consideration that the exam situation itself may distort the results due to numerous mental effects on the candidates as, e.g., the pressure to perform or stress, and could consequently lead to wrong conclusions. Similarly, the duration of (serious) preparations and rehearsal for the exam can be a factor which significantly influences the results to be interpreted afterwards. Therefore the examination should only be carried out with all due care taken in its design and do no more than complement the above-mentioned conclusions. An exclusive interpretation of the exam results to assess the competency development is not recommended.

The evaluation of the course is carried out with the help of an anonymized standard evaluation procedure within the faculty of engineering science on the one hand, on the other hand a separate survey is devised specifically for the individual needs of the course (partly personalized).

STRUCTURE OF THE COURSE

Following the considerations on the macro and micro level, content and methods are arranged chronologically in the module *Construction Management Simulation*, resulting in the curriculum for the module (figure 4). Afterwards, the separate elements of the course are further developed in content and method by specifying each element (presentation/lecture, group work, case study etc.) in accordance to the teaching and learning objectives. In this more detailed view, the teaching and learning

FIGURE 2
THE MULTIPLE DIMENSIONS OF BUSINESS SIMULATIONS



objectives need to be differentiated even more in cognitive and activity-focused teaching objectives as well as affective learning objectives.

To encourage the acquisition and application of management models, the course was divided in three fundamental topics: a) strategic, b) tactical and c) operational models. Based on this definition, different teaching and learning methods were involved. Lectures were included to communicate the necessary fundamental knowledge (refer to table 2).

RESULTS / COMPETENCY INCREASE

The module *Construction Management Simulation* was evaluated regarding formal criteria in form of a course evaluation as well as in regard to a potential competency increase of the participants. As the latter is the main focus of this paper, only the competency increase will be illustrated in the following.

To make the development of competencies more tangible, online assessments were carried out at four

different points of time in which the participants were prompted to estimate their skills and capabilities in regard to the six competencies trained in the course. To ascertain the current status and thereby set reference values for the further evaluations, the first assessment was carried out right at the very beginning of the module.

The following section illustrates and discusses the increases which were measured in the subsequent assessments.

FIRST CONSTRUCTION GIANT SESSION

After the first business simulation session was carried out with the board game *Construction Giant*, especially the operational and construction management competencies were noted to have increased (figure 5). Although the participants had learned the fundamentals of estimating and cost planning as well as construction management in their bachelor studies and have applied these successfully in a

FIGURE 3
EXAMPLE OF THE USED EVALUATION SHEET

Please evaluate yourself in terms of the following skills:

Nr.	Competence	My skills are ...				
		very good	good	acceptable	satisfactory	unsatisfactory
1	Problem-solving ability in construction management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Explanation:</i>		<i>Become aware of project risks, gain experience with the consequences of project events.</i>				
4	Business management skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Explanation:</i>		<i>Carry out planning, organizational and technical decisions (accounting, controlling), proper billing of projects, create statements of profit and loss, set up balance sheets for their own company, develop and implement business strategies.</i>				
5	Negotiation Skills	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Explanation:</i>		<i>Perform negotiations with subcontractors and consortium, enforce corporate interests.</i>				

number of courses and finally in the exam, it becomes obvious that it was notably the practical application within the business simulation which advanced the understanding of this subject area. Presumably this is also due to the fact that the participants had to carry out all necessary calculations regarding the required resources, project duration and all revenues and expenditures in this configuration of the business simulation.

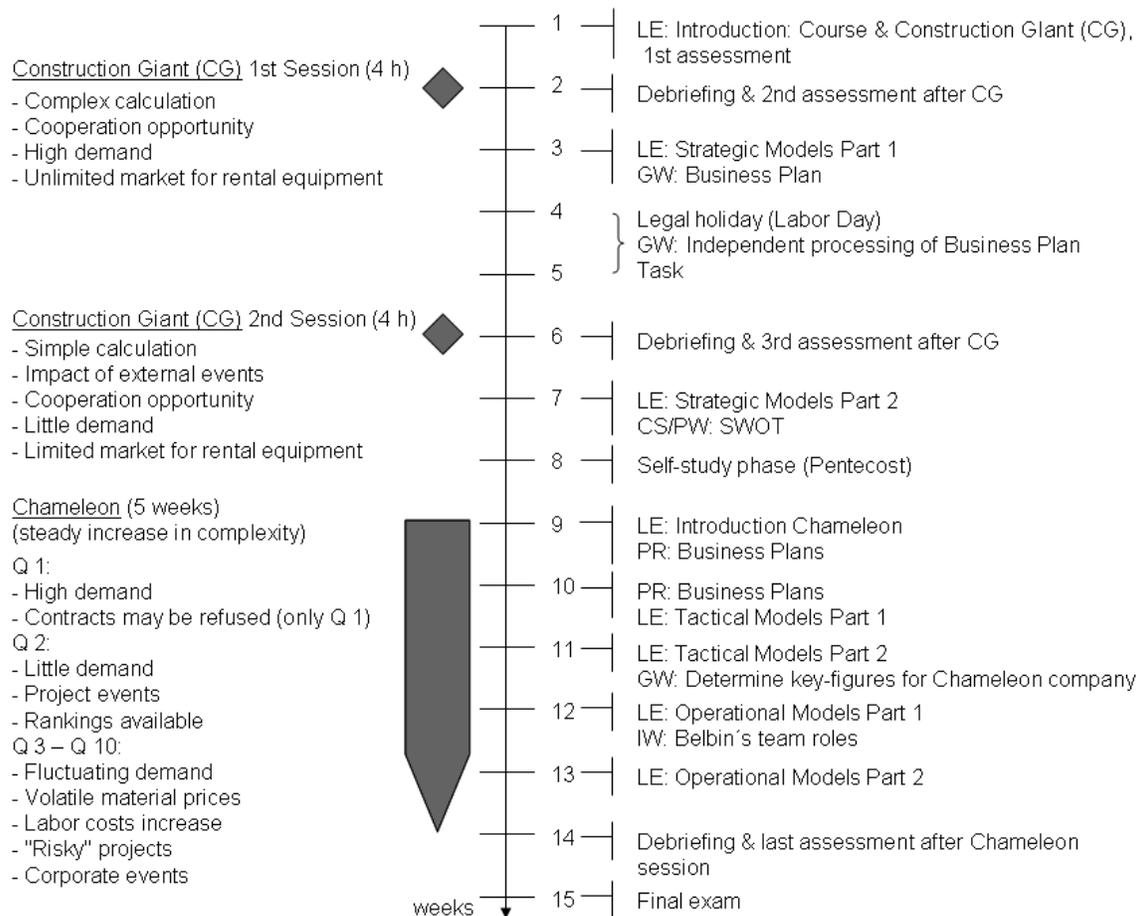
The second significant area is the negotiating skill. The increase in this area can be traced back to cooperation possibilities within the business simulation, opportunities the participants made use of. Here the cooperation partners can freely negotiate the resources of the project (machinery and personnel) and also the expenditure and profit participation. The ranking of increases displayed here corresponds to previously carried out instances of Construction Giant sessions with a similar configuration.

SECOND CONSTRUCTION GIANT SESSION

The configuration for the second session was more complex. Especially the placement of incidents and events which influence projects, companies and the market alike, furthermore the implied discussions within the business simulation groups provide evidence for the conclusion that the increase in the problem-solving skill in construction site management (figure 6) occurred due to these circumstances.

Interestingly enough, the detected increases in operational competencies and economic competencies are in clear contrast to the results of the previously collected input. This fact can be traced back to the replacement of the complex calculation with a simplified calculation in this session (manufacturing costs are given, surcharges for general business expenses, risk and profit have to be selected yourself); therefore the participants had to focus more on the economic aspects of their businesses.

FIGURE 4
STRUCTURE AND COURSE OF EVENTS OF THE MODULE
CONSTRUCTION MANAGEMENT SIMULATION



LE: Lecture, GW: Group work, CS: Case study, PW: Partner work, PR: Presentation, IW: Individual work

The monitored behavior and the decisions taken can be interpreted in this way, that the participants attached greater importance to observation of the market and aspects of corporate strategy.

Consequently, the content of courses offered in parallel to the business simulations has been integrated into the decision-making of the latter and were tried out in practice by the participants.

This configuration was also characterized by a decreased demand for construction projects and a limited market for rental devices, resulting in more occurrences of cooperation and potentially leading to the marked increase in the areas of negotiating skills and contractual competencies.

CHAMELEON SESSION

In contrast to the previous business simulations, this session of the online business simulation lasted five weeks. The configuration of the business simulation was gradually adapted in this time (the name of this business simulation is due to this flexibility). As another contrast to Construction Giant, the employed version of Chameleon offers three

different types of devices instead of one and three types of construction material instead of just one.

Beyond this, the projects generated by the system now contain additional variables, e.g. prices of material, labor costs, costs of operating supply items, on-site overhead costs and general business expenditures based on the activities of the own business. All these aspects have to be taken into account when establishing an individual management information system (MIS). Some participants even put up their own MIS, some of them even build prediction models (mostly based on MS Excel® spreadsheets) to simulate future market changes on the one hand as well as the prospective activities of the other companies on the other hand, too. The development of such decision support systems (DSS) requires operational and economic competencies, probably explaining the substantial increase in these areas (figure 7).

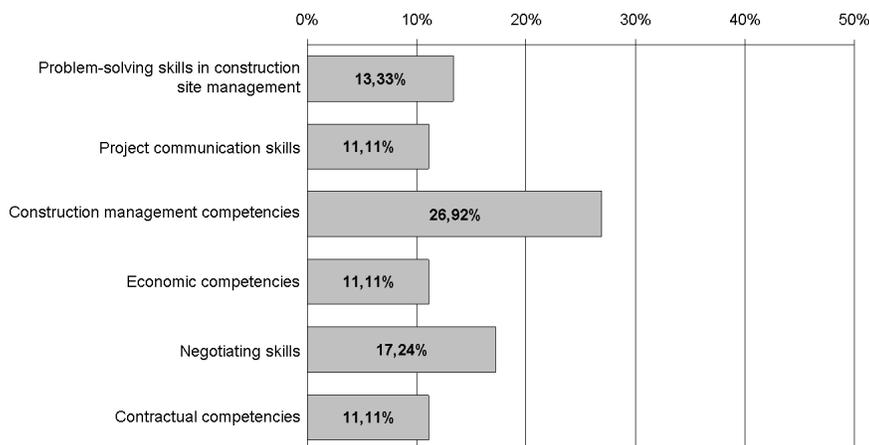
A further increase in construction site management can result from the handling of specific project incidents and events.

The increase of perceived competence in project communication management may have the following reason: just alone the fact that Chameleon is an online simulation and the participants can access the system

TABLE 2
INTRODUCED MANAGEMENT MODELS WITHIN THE COURSE

Lecture	Introduced management models
Strategic Models Part 1 & 2	Porters Five Forces, Core Competencies, Business Plan, SWOT-Analysis, Value Chain combined with M&A, BCG Matrix
Tactical Models Part 1 & 2	Core Quadrants, Covey's seven habits, 7-S framework, Benchmarking, Du Pont Analysis
Operational Models Part 1 & 2	BSC, Belbin's team roles, Mintzberger's Management Roles, de Bono's Six Thinking Hats

FIGURE 5
INCREASE AFTER FIRST CONSTRUCTION GIANT SESSION



without any restrictions of room or time demands additional means of communication. Apart from the classic face-to-face communication, participants discuss decisions and strategies by mail, using social networks or send messages using the integrated message system of the Chameleon system. Here, participants can not only contact each other, but also send messages to the administrator (Following the Web 2.0 approach, the author would suggest to categorize online business simulations like Chameleon as *Competitive Learning 2.0* concepts).

The very limited and non-existent increase in the areas of negotiating skills respectively contractual competencies may have been hampered by the lack of chances to cooperate; the employed version of the online business simulation does not yet have implemented functions of this type.

SELF-ASSESSMENT OF THE PARTICIPANTS BEFORE AND AFTER THE COURSE

Based on the self-assessment of the participants it can be stated that in generally all areas a subjective competency increase has been monitored (figure 8).

It can be concluded that the previously defined competency development target respectively the derived teaching and learning objectives were reached. Apart from the self-assessment of the participants, the analysis of further data shows that e.g. the participants, who managed the group work of the business plan quite well, also performed well in the business simulations.

Further examination displayed the tendency that participants who reported higher competency increases in the assessments had managed their business venture with more success than others.

Despite different starting conditions, adversities like a decreasing demand, volatile market prices or competitors

offering their services at prices below manufacturing costs (intentionally and unintentionally alike), a carefully planned business strategy, close observation of the market, flexibility and discretion finally led to success.

As no data regarding previous experience (studies, practical professional experience etc.) was collected for the establishment of the initial state, it cannot be determined whether individual participants displayed notions of modesty in the competency assessment of their own skills and abilities.

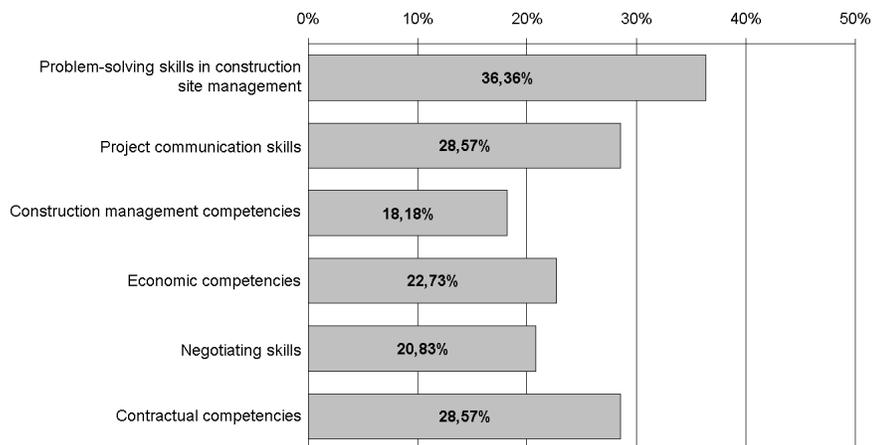
However, the difference between the initial state and the final state can be used to derive that a subjective increase is perceived. The inclusion of further data leads to the suggestion that these increases have less to do with a growth of self-perception only (in the sense of self-confidence), but more with a real development of competencies. This conclusion correlates with the results of the examination carried out after the course: failure rate 3 %; overall average grade 2.3; best grade 1.3; worst grade 4.0 (best possible grade 1.0, failed 5.0).

CONCLUSION AND OUTLOOK

The extraordinary value of the integrative teaching and learning concept was introduced and described with the help of a course in which the business simulation method was successfully combined with further teaching and learning methods. Here the term “integrative” is to be seen from two perspectives: a) integration of previous knowledge and skills and b) utilization of additional teaching and learning methods taking into account the competency to be trained.

With the help of a method developed by the author, it was relatively easy to identify and select additional teaching and learning methods to complement the business simulation method – corresponding to the interdisciplinary competencies and the teaching and learning objectives derived from these.

**FIGURE 6
INCREASE AFTER SECOND CONSTRUCTION GIANT SESSION**



Here, the integrated elements of the business simulation form an open space in which the participants can try out previously acquired content as well as new competencies without later consequences. It is especially the latter aspect which is highlighted in this module, as the experimenting with maybe unconventional business strategies or unusual individual modes of behavior and decision-making should neither be rewarded nor penalized in the final grading. With this, it was to be avoided at all costs to create a situation in which the participants display more an adapted, from their point of view expected behavior rather than develop their own decisions and judgments, realize their ideas and justify them – independent of the fact whether these will turn out as success or failure in the end.

The self-assessments of competencies in longitudinal temporal section aided in demonstrating that the introduced approach clearly constitutes an additional benefit for the course participants. Integrating the results of the course evaluation, the sometimes significant increases are likely to be seen as results of the high level of motivation of the participants as well. As the results of the evaluation were collected anonymously, no direct connection between the motivation of individual participants and their competency increases can be pointed out. Therefore it appears reasonable to shift specific aspects of the course evaluation to the personalized questionnaire in order to locate potential influences of previous experience, motivation and self-perception on the learning success.

As all participants had taken part both in the business simulations as well as in the individual sessions apart from the business simulations, it cannot be clearly allocated which element of the integrative teaching and learning concepts contributed most to the competency development. The evaluation of further courses with separate groups of participants could offer valuable insights into this detail.

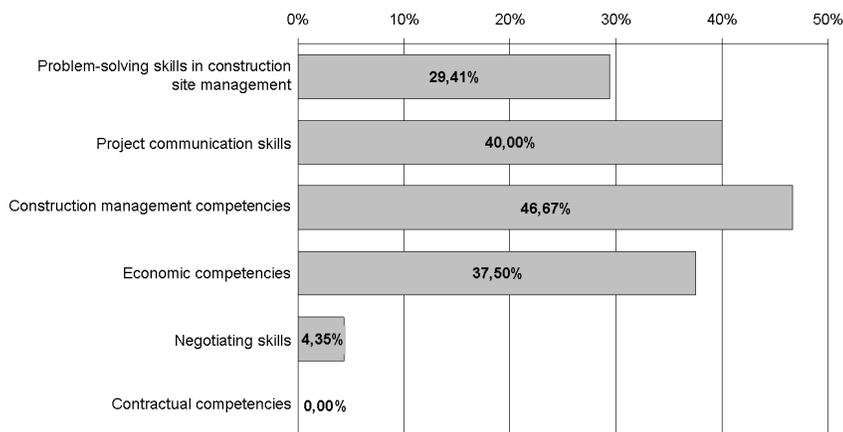
However, it does not seem too relevant for this course to isolate which element is responsible for which contribution. Much more important for the overall result is the fact that the participants achieved a learning success

which would probably not have been possible without the integrative approach.

Besides the professional perspective, a further particular objective of introducing the different management models was to show the participants the usefulness of some of the models for their own personal development. To support this aim, the participants were given the opportunity to apply models like Covey's seven habits or Belbin's team roles for themselves, too. It was not mandatory to communicate their findings within the course; a discussion of the personal application was voluntary in this context. This positive personal impact increased the understanding of the relevance of such models for individuals, teams and whole companies. Although the participants (all being engineers) were initially reluctant to display parts of their own personality, most of them communicated to the end of the course how much the personal application of the models had enhanced their understanding (topic as well as themselves) and their own development, too.

This course has also clearly shown that the integration of additional tools especially in online business simulations could offer an excellent possibility to record both the behavior of the participants and the communication among them (e.g. stored in a database). Software agents developed specifically for this purpose could assist in the analysis of the accumulated data, e.g. within the triangle 1) the development of the markets and 2) the businesses as well as 3) the decisions taken. These analyses would help the trainer to draw conclusions about the learning success which can be discussed with the participants during or at the end of the course. Therefore, online-based and agent-supported business simulations could be a prospective way to realize the diverse possibilities of competency assessment and competency increase without being too time-consuming for the trainer. Beside the mentioned opportunities, online business simulations (particularly in the form of apps on mobile devices) could be furthermore helpful to examine the learning behavior of the participants. Such observations could provide the basis for a learning

**FIGURE 7
INCREASE AFTER CHAMELEON SESSION**



approach that the author would name *commuter-learning theory*. In this way it would be possible to investigate what, when, where and how participants learn in the digital mobile age. Besides teaching, online business simulations could be a serious research tool to study organizations especially focused on the integration of social tools, social media, and social networks within companies and particularly the aspect of acceptance by the future users.

Finally, the author wishes to express his gratitude to the participants of the investigated course for their willingness to take part in the evaluation, the assessments as well as in the additional questionnaires within the course.

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FIGURE 8
SUBJECTIVE SELF-ASSESSMENT BEFORE AND AFTER THE MODULE

