Towards an Evaluation Concept for Business Simulation Games: Preliminary Work and Piloting in SAP ERP Teaching

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Abstract: Business Simulation Games (BSGs) aim to simulate reality and impart knowledge as well as skills in a playful way. To be able to verify the goal attainment, the first steps towards an evaluation concept were taken in this paper. With the exemplary evaluation of Global Bike Go, a series of mini BSGs for SAP ERP teaching, initial indications could be generated about what they (can) achieve. One certain finding is that the games are suitable for beginners whereas the participants' knowledge gain only shows tendencies. From the overall results, development potentials for the BSGs as well as for the evaluation concept used could be identified. However, due to the small sample and the limiting circumstances, further investigations have to be conducted. In this context, the self-performed actions as well as interactions with other players as significant game elements should be focused more, and especially the interdependency between the BSGs and other teaching materials seems promising. Therefore, an interdisciplinary approach is desirable.

1 INTRODUCTION

Publications on gamification have been accumulating in recent years (Fischer et al., 2017). Related concepts such as serious games, especially business simulation games (BSG), are also being researched in this context (Faisal et al., 2022). Today, more than 600 business games and serious games are offered in German-speaking countries alone (Blötz, 2015).

Although forms of case studies were the prevailing method in the field of Enterprise Resource Planning (ERP) teaching to impart application knowledge at German universities, business games are comparatively rarely used (Leyh, 2017). Possible explanations for this could be, on the one hand, the lack of availability of suitable BSGs and, on the other hand, the controversial benefits of such tools. However, there are already a few institutions that have been drivers of past developments, also meeting the current and expected demand. Among others, the SAP University Competence Centers (UCC) in Magdeburg and Munich are Education Service Providers (ESP) focusing on SAP software (Prifti et al., 2017; Häusler and Bosse, 2018), and serve as

exemplary providers for such BSGs. In particular, they offer so-called teaching and learning environments (TLEs) "which represent a broad selection of teaching materials with a high practical relevance in the field of enterprise software" (Reich and Häusler, 2019).

Those TLEs usually consist of three elements: (IT) system, teaching material, and model organization (Häusler et al., 2019). In this context, the UCCs emphasize the use of case studies as the preferred method for teaching system-supported (business) processes practically as well as realistically and supplement them with slide sets and hands-on exercises on the teaching material side. As part of the portfolio expansion, the UCC Magdeburg has started to offer three beta-version (mini) BSG called "Global Bike Go" (GBGo). These are intended to complement the existing materials in the "Introduction to SAP S/4HANA" TLE, thus offering learners methodological variety and contributing to learning success. Their requirement profile is diverse: They serve as an introduction to the respective modules such as purchasing, production planning, and sales, present an exemplary part of the respective

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(business) process, and enable participants to gain their first experiences with the system's user interface. The BSGs have been implemented, tested, and made available to the community, but to date, they have not been used or evaluated by the UCC itself in a teaching context.

In general, the evaluation of teaching materials, especially of BSGs, is challenging due to their diversity, and the measurability of learning progress is complex and effortful because of its subjective nature. Consequently, the following research question (RQ) is addressed.

RQ: Which Aspects need to be Considered in a Possible Evaluation Concept For BSGs?

The exemplary use of GBGo in a university course generates initial indications about what the single games (can) achieve. From the overall results of this study, development potentials for the BSGs as well as for the evaluation concept will be identified.

The paper at hand aims to do the preliminary work while achieving the first findings within a pilot project in ERP teaching. First, the state of the art is shortly presented, before the basic concept for the pilot (including subject, goals, and model) is explained. The following sections describe the exemplary study and discuss its results. In the end, the further proceeding is depicted.

2 STATE OF THE ART

Views on whether and how simulation games influence learning behavior and in which learning environments they should be used have been undergoing changes in recent years. It is presently assumed that playful elements can increase the motivation of participants (Jacob and Teuteberg, 2017). BSGs as a subset of serious games (Unger et al., 2015) are understood as tools and used in the educational context to utilize these effects and thus impart knowledge (Leyh, 2017; Jacob and Teuteberg, 2017; Rubart and Hartweg, 2019; Matute and Melero, 2016; McGonigal, 2011; Weppel et al., 2012) but also could enhance engagement, learning achievement, and higher-order thinking skills (Huang et al., 2022).

At German universities, there are still comparatively few BSGs used in the field of ERP teaching and the focus lies on imparting knowledge through lectures and case study-based hands-on exercises (Leyh, 2017). An exception is the ERPsim, which is used in the context of ERP teaching in higher education. In this BSG, the focus is on economic processes whereas ERP or SAP prior knowledge is

not necessary (Leyh, 2017; Rubart and Hartweg, 2019). However, ERPsim is fully system-integrated and also presumably provides practical knowledge on the use of SAP software. The execution of this BSG generally leads to a positive response from its participants (Leyh, 2017; Rubart and Hartweg, 2019; Utesch et al., 2016). In his publication, Leyh (2017) goes beyond this general assessment and examines the knowledge gained by the participants. This is compared with the knowledge gained from case studies, whereby in some cases better results are achieved with ERPsim.

GBGo as a BSG series is another example that can be considered as a UCC proprietary development in the context of ERP teaching. Although the universal research results on BSG can also be assumed for GBGo, it is unclear at this stage whether its targeted teaching goals are being achieved. In particular, there is a lack of systematically generated results with which the games can be evaluated and, if necessary, further developed on this basis.

3 CONCEPT

In the following concept section, GBGo is introduced as evaluation subject. Thereupon, five concrete questions to be investigated are derived from the games' objectives. Subsequently, the evaluation model is presented.

3.1 Evaluation Subject and Goals

GBGo currently consists of three mini-games – "Explore Procurement", "Explore Production" and "Explore Sales" – which address various operational (business) processes from the areas of procurement, production, and sales (Häusler, 2019). In this way, they complement the teaching materials of the corresponding modules Materials Management (MM), Production Planning (PP), and Sales and Distribution (SD). In Explore Procurement, the participants (players) compete indirectly with each other as purchasers of different companies. The goal is to optimize their procurement strategy based on offered product combinations, price, and delivery reliability (supplier selection). In Explore Production, the participants act as production planners and have to fulfill a given production target under certain conditions (working days, personnel, costs) in a cost-efficient way. In the Explore Sales scenario, parts of the sales process are simulated. The players have to maximize their profit through bicycle sales, taking

into account the shared market and seasonal influences.

In each scenario, a maximum of 25 companies compete with each other. The participants take business decisions for the company assigned to them. The division of the players can be done individually or in teams. Several rounds, determined by the lecturer, are played in sequence, with one round (period) always corresponding to one month. Before the game starts, the participants familiarize themselves with the respective scenario and discuss any comprehension questions with the lecturers. After the end of the game, the game leader moderates a joint debriefing in which the progress of the BSG is recapitulated and analyzed.

The BSGs may be used independently from each other and other teaching materials. As an extension option for lecturers, they link the module's slide set and case study by providing a gamified thematic introduction. The aim is to provide a basic understanding of simple market mechanisms and the fundamentals of business activities. The assumption is that especially learners from a distant business environment can be given a simplified introduction to the complex business context with these BSGs. Furthermore, active and game-based activities as well as the simulation of real processes are intended to lead to an increase in motivation among learners (Häusler, 2019).

Participants are offered didactic variety through the BSGs, which should also lead to increased motivation. It is further assumed that learners find it easier to work through the corresponding case studies if they have previously mastered the business games. These business games are highly simplified and consist of quickly understandable scenarios and game rules. Other features in this context are the flexible and independent use as well as the short game duration.

This exemplary study aims to investigate the concrete use of GBGo in teaching and learning arrangements. The evaluation concept lays the foundation for the improvement and further development of these business games, which can ideally be extended to other BSGs used in ERP teaching. The following central questions can be derived in summary from the (partly implicit) objectives of the GBGo series:

1. Are these BSGs suitable for beginners?
2. Are these BSGs suitable for imparting basic knowledge of the respective topics to the participants?

3. Do the (self-)performed actions of the participants contribute to knowledge acquisition?
4. Does the interaction (as a characteristic of BSGs) with other participants contribute to knowledge acquisition?
5. Do the participants find it easier to work on the thematically related case study after the BSGs have been executed?

This question set forms the frame of reference for the evaluation concept designed and executed in this work. From the state of the art, especially from the field of ERP teaching, there are numerous findings about the subject area that support the development and use of a standardized survey for BSG participants as the central evaluation method. This also enables the basis for the comparability of future surveys in the ERP teaching context.

3.2 Evaluation Model

While in the evaluation of educational materials often different alternatives of the object of evaluation can be weighed against each other (Mayer, 2010) this is not the case for GBGo. In the complex ERP curricula of the UCC, a large number of teaching materials are not used as alternatives, but rather as supplements. Consequently, to be analyzed business games should be considered less as substitutes than as supplements (for case studies). Therefore, the BSGs have to be examined and evaluated concerning the achievement of their learning objectives. However, the interdependency with the case studies should also be included in the evaluation. To structure and classify the previous explanations and to extend them by further conceptual components, an evaluation model by Kirkpatrick is used, which is frequently used for the evaluation of BSGs (Mayer, 2010). The model distinguishes the four stages or levels of reaction, learning, behavior, and results, which are situated in the temporal course of an evaluation.

Level 1 focuses on the reactions of the participants. Here, subjective assessments and valuations are to be queried. Questionnaires or interviews are often used as tools for this purpose (Mayer, 2010). Both the immediate reaction of the participants and the subsequent feedback on organizational and technical content are taken into account (Birgmayer, 2011). In level 2, the acquisition of knowledge and skills from the respective intervention is to be investigated. It should be determined whether and how the participants' knowledge level has changed. In order to make the related change visible, the use of a pre-post-test

design can be beneficial (Birgmayer, 2011). Level 3 focuses on the evaluation of the transfer of previously reviewed knowledge and skills into practice. In the case of occupational topics, this transfer mostly takes place in the workplace (Birgmayer, 2011). Level 4 focuses on the consequences or expected benefits of the intervention or program for the implementing organization. Ideally, the interventions and programs are intended to achieve predefined goals, e.g., the evaluation of corporate goals (Birgmayer, 2011) by measuring key performance indicators and their change over time (Kriz, 2010).

Levels 1 and 2 are measurable during or directly after the execution of the BSGs under evaluation, whereas evaluation in terms of level 3 is only meaningful or possible after a certain time has elapsed. Not only will this increase the influence of confounding factors (Kriz, 2010), but also the measurement of the transfer itself is challenging and therefore not investigated in the given scope. Level 4 which is the KPI-oriented proof at the organizational level can also not be implemented in this study. Therefore, the evaluation of GBGo concentrates on the first two levels.

4 STUDY DESCRIPTION

Due to the Covid-19 pandemic, the BSGs to be evaluated were integrated into a remote course with a final examination. The framework from the UCC and the relevant faculty had to be considered when creating the course. As a result, the concrete implementation of the evaluation and the method used depended on these circumstances. A total of 16 participants took part in the study. All participants were matriculated students from different study programs and with different study progress.

4.1 Study Design

According to the underlying evaluation model, an online survey with standardized and open questions was used as the data collection method. In addition, the survey was set up as a pre-post design in order to be able to record knowledge gains in the context of the BSGs on individual prior knowledge. Furthermore, the interaction of the games with other teaching materials was investigated. For this purpose, the participants were randomly divided into two

groups. The groups conducted the three BSGs within the GBGo series and the associated case studies in reverse order. Group 1 (G1) first played the business game and then worked on the case study, and group 2 (G2) did vice versa. Both groups received the upstream pre-questionnaire (t_0) before playing the BSGs and the downstream post-questionnaire (t_1) afterward. As a result of the pre-post design, G1 had to answer a third questionnaire (t_2) after the case study was conducted. An overview of the investigation procedure can be seen in Figure 1.

This procedure was repeated, maintaining the subject group composition, for each of the three BSGs and their corresponding lectures and case studies. The order of conducting the BSG topic areas followed the run-through of value-added processes in companies: Explore Procurement (MM), Explore Production (PP), and Explore Sales (SD). Slide sets, case studies, and BSGs in version 3.3 were used (based on SAP S/4HANA 1809).

4.2 Survey Design

The central questions regarding the impact of GBGo formed the basis for structuring and operationalizing the surveys used. Firstly, in addition to general socio-demographic data, the participants were asked at the beginning whether they had already come into contact with BSGs. The data were collected using nominal scales.

In order to be able to record a possible transfer of basic knowledge through the respective BSG, examination questions on thematic basic knowledge with open answer options were used (e.g., "What is a bill of materials?", "What does the term production control mean?", "How do a supplier's bid prices typically affect the associated demand in the market?"). These questions were asked in the same wording both before (t_0) and after (t_1) the respective BSG.

To get first indications about whether the knowledge acquisition is achieved or promoted by self-performed actions within the BSG as well as by interaction with other players, one question each was developed for the action and the interaction of the participants within the BSG. For these questions, 4-level rating scales were used as response options, in order not to give too fine-grained, difficult-to-delimit answer possibilities for this first investigation as well as to identify a direction.

	Week 0	Week 1	Week 2	Week 3
G1	Lecture	(1) t_0-Survey (2) BSG Case Study (3) t_1-Survey	Case Study	t_2-Survey
G2	Lecture Case Study	Case Study	(1) t_0-Survey (2) BSG (3) t_1-Survey	

Figure 1: Investigation procedure overview.

In a further question, the participants were asked to assess how well they managed the case studies after completing them (e.g., "Overall, how did you manage to work on the case study?", "Which problems did you have during processing?"). This was intended to gather initial circumstantial evidence about a possible connection between participation in the BSGs and subsequently successful (easier) mastery of the case studies. Possible answers were listed using a 5-point rating scale or created as free response options since neutral answers seem comprehensible for this question.

5 RESULTS AND DISCUSSION

In the following section, the study is evaluated. First, some preliminary remarks are made. Then the results are presented before possible causes and effects are discussed.

5.1 Preliminary Remarks

The surveys were created, distributed, and answered using LimeSurvey. The collected data were exported to Microsoft Excel and subsequently cleansed. Unfortunately, in the different executions, there were varying numbers of data sets excluded due to different causes:

- A participant did not complete at least one survey within a single pre-post setup.
- The connection parameter between pre and post-survey was inconsistent.
- There were conflicting responses to essential, interrelated questions.

The six execution groups and the respective number of usable response data sets can be seen in Figure 2.

5.2 Results

In all executions, most respondents stated that they had never taken part in a BSG before (MM n = 5/9; PP n = 9/12; SD n = 9/10). Thus, the majority of the participants are beginners. Previous experience in the respective module areas (MM, PP, and SD) was also denied by most people. Accordingly, the respondents rated their prior thematic knowledge as "poor" (MM n = 5/9; PP n = 6/12; SD n = 5/10) and "very poor" (MM n = 4/9; PP n = 5/12; SD n = 3/10).

5.2.1 Feedback Concerning GBGo

Almost all participants assessed the duration of the overall games as "appropriate". Similarly, the difficulty was mostly assessed as "appropriate" and in several cases as "(rather) too easy". Only one respondent rated Explore Procurement as "rather too difficult". The averaged values indicate that Explore Sales was the easiest game whereas Explore Procurement was the most difficult.

The majority of respondents enjoyed carrying out actions by themselves, especially in Explore Sales and Explore Procurement. Only one of the participants answered with "rather disagree" regarding Explore Production. The interaction with others is assessed lower than in the previous question but still positive. Regarding action and interaction, sorting the average values of action and interaction, the following order emerges: Explore Sales receives the most approval, followed by Explore Procurement and Explore Production.

5.2.2 Imparting Knowledge Through GBGo

The questions on specific prior knowledge and the associated knowledge gained during BSG execution were posed to the participants in a test-like manner.

	MM-G1	MM-G2	PP-G1	PP-G2	SD-G1	SD-G2
Usable Data Sets	5	4	6	6	5	5

Figure 2: Number of usable data sets.

	M Basic Knowledge (t_0)	# Participants with Knowledge Increase (t_1)	Total Responses
MM-Q1	0,33	3	9
MM-Q2	0,33	0	9
MM-Q3	0,17	0	9
PP-Q1	0,25	3	12
PP-Q2	0,29	4	12
PP-Q3	0,17	3	12
SD-Q1	0,75	1	10
SD-Q2	0,6	1	10

MM-Q1:   What does the term procurement mean?
MM-Q2:   What is a bill of materials?
MM-Q3:   What does the term procurement strategy mean?
PP-Q1:   What does the term production planning mean?
PP-Q2:   What does the term production control mean?
PP-Q3:   What is the difference between a planned order and a production order?
SD-Q1:   How do a supplier's asking prices typically affect the associated demand in the market?
SD-Q2:   How do asking prices of different suppliers in the same market influence each other?

Figure 3: Average values for prior knowledge and absolute frequency for knowledge increase.

The answers to the open-ended questions from the first survey (t_0) on prior knowledge were scored as follows: Either "0" (incorrect), "0.5" (partially correct), or "1" (mostly correct) point(s). The answer to the same question in the second survey after executing the BSGs (t_1) was evaluated according to the identical scheme and compared to the first answer on a participant-specific level. The resulting change in knowledge was coded either "0" (not improved) or "1" (improved). The results on prior knowledge were averaged and presented in Figure 3 along with the absolute frequencies of participants who had an increase in knowledge.

Overall, it can be seen that the level of knowledge with regard to the posed questions is relatively limited. In addition, only some participants showed an increase in knowledge. The relatively high increase in knowledge in the PP module is remarkable.

5.2.3 Mastering the Case Studies

After completing the case studies, the simulation participants assessed how well they managed to work through them. Responses were coded as follows: Very good = 1; good = 2; partly good/partly poor = 3; poor = 4; very poor = 5.

Figure 4 compares the average values calculated from the two groups for each BSG.

The available results do not show a consistent overall picture. Thus, there is no evidence that the

participants coped better with the case studies if the thematically related BSG had been carried out beforehand.

5.3 Discussion

The following discussion of the results is structured according to the evaluation questions that were derived in the concept section.

5.3.1 Are These BSGs Suitable for Beginners?

The BSGs are suitable for beginners because the level of difficulty and the amount of required time were rated as appropriate by the participants, most of them inexperienced in BSGs. Only a few reported too little or too much processing time, which only emphasizes the heterogeneity of the students regarding learning requirements and learning behavior.

There were no comprehension problems regarding rules and scenarios during the execution of the BSGs. The reason for this could be the comprehensive support by the simulation instructors (e.g., introduction to the course of the game and answering comprehension questions). Support before and during the implementation, as well as a joint debriefing afterward, therefore, contribute to a successful application just as much as the quality of the teaching materials themselves. In order to specifically investigate the impact and importance of

	M Mastering the Case Studies (G1)	Total Responses G1	*M* Mastering the Case Studies (G2)	Total Responses G2
MM	2,6	5	2,5	4
PP	1,5	6	2,17	6
SD	1,6	5	1,4	5

Figure 4: Average values for mastering the case studies per group.

debriefing as part of the game plan implementation, the related objectives should be formulated and operationalized as evaluation questions. In this way, they can be integrated into future studies.

5.3.2 Are These BSGs Suitable for Imparting Basic Knowledge of the Respective Topics to the Participants?

The BSGs aim to impart basic knowledge of the respective topics to a heterogeneous target group, some of which is already known to the participants (e.g., through job experience). The games seem to be just partly suitable for this purpose because only a part of the participants shows a knowledge increase. As an example, Explore Sales showed the most correct answers regarding the level of prior knowledge, and at the same time the smallest increase in knowledge. Nevertheless, even participants with little or no prior knowledge showed only a partial improvement. The reason for this is unclear and could be due to the selection and formulation of the knowledge questions.

To counteract this "prior knowledge conflict", possibilities for experienced players can be created by alternative game mechanics and incentives. In this way, they can use their previous experience without endangering the experience of the other players. In this regard, possible ideas should be discussed and, if necessary, integrated. In this context, it should also be examined whether the BSG is the most suitable teaching method for the basic knowledge to be imparted in general.

In order to be able to better evaluate the acquisition of knowledge and competencies in the context of the considered BSGs, a profound reflection and discussion about this topic are needed. Especially the acquisition of specific competencies through BSGs and their measurability is challenging and may only be manageable with an interdisciplinary approach.

5.3.3 Do the (Self-)Performed Actions of the Participants Contribute to Knowledge Acquisition?

There are indications that the actions carried out by the participants contribute to knowledge acquisition.

Participants perceive that they carry out actions during the BSGs and thus influence the gameplay. Since results are directly visible, adjusting screws become comprehensible and cause-and-effect relationships observable. By analyzing and evaluating their own actions, future actions become plannable and calculable. Some participants even demand further, more extensive action options and information about their effects. It is unclear whether such an extension would make the mini-games too complex or complicated. This could possibly conflict to provide an easy entry into the respective module context because there are indications that an (overly) complex simulation leads to a lower learning success (Ulrich, 2002).

In this area, it must also be generally ensured that there are no irregularities between input parameters, simulation mechanics, and output. The respective BSG has to react appropriately (close to reality) to the actions of the participants in order to avoid misunderstandings and false assumptions among the players. Since this can also be caused by hard-to-find bugs, which may become apparent during real use, extensive and periodic tests are necessary.

5.3.4 Does the Interaction with Other Participants Contribute to Knowledge Acquisition?

The interaction with other players within the game setup is mostly perceived positively, especially in Explore Sales. There is an obvious explanation: The scenario of this BSG involves direct competition between the companies, which increases the motivating effect. In the other two scenarios (Explore Procurement and Explore Production), the companies interact indirectly with each other, which is why competition presumably is rarely perceived by the participants.

It should be noted that especially interactions and their effects are perceived by the participants, as this increases realism and motivation. Specifically for Explore Procurement and Explore Production, it should be examined if and how an increased (more direct) interaction between the players can be realized.

The self-performed actions as well as interactions with others must be included as significant elements of BSGs appropriately and extensively in further investigations. This should be done in future evaluations by adding answer options to the need for extended action and interaction possibilities, or by using different data acquisition methods, e.g., interviews. This will allow concrete suggestions from players to be systematically taken up and included in the further development of the games. In this way, the players and their intentions become the focus of attention.

5.3.5 Do the Participants Find it Easier to Work on the Thematically Related Case Study after the BSGs Have Been Executed?

The presumed interdependencies on other teaching materials, in particular on the processing of the case studies, could not be proven in this work. Only in the PP module, the participants find it easier to complete the case study after completing the BSG. In the MM and SD modules, a slightly opposite trend can be discerned. The reasons for this cannot be determined from the survey. It is possible that the knowledge gained from the BSGs does not have a positive effect on facilitating the processing of the case studies, or that there is no direct interrelation. Nevertheless, it should be noted that the content of the BSGs only covers a small part of the business processes considered in the case studies.

The expansion of existing teaching materials is in the nature of these BSGs and is therefore of great interest in this context. Consequently, a suitable research design for a more in-depth analysis of the relationship between BSGs and easier mastering of the case studies needs to be developed and tested. Possibly, it may not be possible to prove causal interactions since the overall scenario is too complex.

5.4 Limitations

The following points limit the results of this study, first and foremost the extremely small number of participants. Since this was a regular course including the awarding of ECTS credits, the design of the study structure had to ensure equal conditions for all students, i.e., the same content and also a comparable amount of time for performance. Therefore, no control groups could be integrated. In addition, the execution of the BSGs had to be embedded in weekly, 90-minute lectures. This limited the scope of the study and led to a restriction of the time needed to conduct the round-based simulations as well as the extent of the survey.

With regard to the possible execution variants (online vs. offline, single player vs. group game), only one was tested, in which the participants completed the BSGs online as single players. Thus, there is a lack of comparison possibilities with other variants, which presumably produce different results.

However, since the present study represents the first evaluation of GBGo with pilot character, the previously described circumstances were accepted. In this way, it is possible to further develop the evaluation design including the method as well as the BSGs themselves based on the results of the pilot phase.

6 CONCLUSION AND FUTURE WORK

With the evaluation of GBGo, initial indications could be generated about what the games (can) achieve in the concrete application context of ERP teaching and which potentials exist. Together with the first steps towards an evaluation concept required for this purpose, this has created the basis for knowledge-based further developments. In their continuation – i.e., in the enhancement of the interdependency between BSG and other materials – is the opportunity to exploit the hitherto unused potential. Through continuous evaluation and further development, not only the BSGs themselves as well as their use can be improved, but also scientific knowledge about the subject area can be gained, which is especially essential for a future "BSG as a Service" approach (Häusler et al., 2021).

A first step has already been taken by handing over the BSG documentation including the evaluation questionnaires to customers (e.g., universities and vocational schools) of the UCC Magdeburg for testing. With these and other evaluation results, the existing data basis can be enlarged and thus made more solid. An additional gain could be to include the expertise of disciplines that have not been involved so far or only marginally, such as didactics and learning psychology. Thus, the subject area could be considered and understood even more comprehensively in order to enrich the further development of the BSGs with problem-solving ideas beyond their own disciplines.

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