Towards a Work Task Simulation Supporting Training of Work Design Skills during Qualification-based Learning

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Abstract: This paper describes a novel approach towards integrating work task simulation-based training of skills related to configuring relevant features for work design with the Qualifications-Based Learning Model (QBLM) approach. To achieve this, nine psychologically relevant work design characteristics from work content, workflow/organization, and social relations can be manipulated in the simulated work training tasks and their training context. The concretization of these work design characteristics requires extensive psychological testing and fine-tuning of the parameters for simulating the respective working conditions. For this purpose, Kirkpatrick's evaluation model from 1998 will be used. Therefore, the existing approach of QBLM will be used to develop an Applied Game for a simulation of work tasks. The existing tools and systems for QBLM will be extended by a QBLM-oriented gaming and learning analytics framework and the approach of QBLM-based Structural Didactical Templates. Besides the relevant state of the art, the conceptual modelling for the approach as well as a first set of initial visual prototypes of the system image will be presented following a user centered design methodology. Furthermore, a cognitive walkthrough of the visual prototype will be performed to support a first formative evaluation. The paper concludes with a summary and the remaining challenges of the approach.

1 INTRODUCTION

A central content focus of the study module "Work and Organizational Psychology," in the bachelor's degree program in Psychology at the University of Hagen (FeU) is job design (LG AuO, 2021), which deals with the effect of work on the working person.

The critical teaching of a theoretical basics of psychological work design, which is mainly done by reading and discussing relevant theories and research results, is unfortunately mostly lacking in the experience of practical job design training during these studies. This can only be achieved by experiencing a simulated training situation and trying out job design skills as well as experiening the effects of different forms of job design. Nevertheless, direct confrontation, one's own experience and trying out ones own job design skills on the one hand, as well as intensive reflection on what is experienced during such a work design simulation is an essential prerequisite for the acquisition of action competencies (Kolb, 1984), i.e. job design skills as they are also demanded within the framework of the recommendations of the German Psychological Society for the design of psychology studies (cf. Erdfelder et al., 2021; Spinath et al., 2018).

According to (Ulich, 2005), the main tasks of work psychology consist of analysis, evaluation, and design of work activities and systems according to defined human criteria. Accordingly, theories and models are taught in the study of work psychology that explain and predict the effect of specific characteristics of work (characteristics of work content, work processes, or social interactions, (GDA, 2018)) on people, their work performance, their motivation, and their health (e.g., action regulation theory, job demand-control model, JDR model, effort-reward imbalance, (cf. Lehrbrief Modul

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AF A Grundlagen und Arbeitspsychologie: p.66, p.126f, p.132ff.)). The topic has gained relevance due to an increased social focus on psychological stress at work, which has also been reflected in consideration of the subject in the Occupational Health and Safety Act. In addition, a growing field of work for (work) psychologists has emerged in this area.

The primary learning and training objective of the planned didactic innovation is acquiring qualifications based on competencies and skills in work psychology in the sense of analyzing, evaluating, and designing work tasks according to defined human criteria (Ulich, 2005). In addition, going through the corresponding job design simulation task and the subsequent reflection should lead to a deeper and better understanding of the differentiation between structural and behavioral prevention, which is central in occupational health psychology, as well as condition-related and person-related interventions (Lohman-Haislah, 2012). Through minor adjustments, other learning objectives can also be focused on (e.g., employees' leadership, communication organization, and information flow). Methodological qualifications based on corresponding competencies and skills are also developed through a systematic work analysis, which the students have to carry out following a work task they have experienced themselves. For example, the development of digital technologies in the form of so-called Serious/Applied Gaming (SG/AG) (Marr, 2010) allows the use of computer-based simulations to enable experiences to complete work task trainings quasi-virtually, which are typically only possible in actual practical real-word training activities. These simulated, i.e., virtual experiences are at least similar to those in real life and allow the reflection of unexpected or surprising results.

Several Problem Statements (PS) can be derived from the objectives and motivation mentioned above. PS1 is that currently, the Qualifications-Based Learning Model (QBLM) (Then, 2020; Wallenborn, 2018) cannot support the assessment, i.e., measurement and mapping of the learning objectives and learning successes of the game/simulation sequences within an integrated Applied Learning Game (ALG). The Learning Management System (LMS) used at the FeU is Moodle (Moodle.org, 2021). This LMS already offers digital learning content at the FUH. Therefore, the already existing LMS will be used in this work (Srbecky, 2021b). A didactical structural template supporting QBLM can used as a starting point to measure the success of achieving learning objectives regarding competencies together with the success of training skills on different proficiency levels in a game-based simulation and training activity. PS2 is that professionally relevant action competencies, i.e. skills at certain professionally relevant proficiency levels can so far only be acquired in the context of practical experiences after the theoretical studies. Still, at this point, there is a lack of appropriate supervision to reflect on the experiences adequately and to classify them in the scientific state of knowledge correctly. Especially the distance study programme at the FeU (FuH, 2021) is confronted with special challenges regarding Competence/ Qualification (CQ) orientation (cf. Erdfelder et al., 2021). In this context, a CQ is a synonym for competence and qualifications (Then, 2020). Accordingly, didactic methods must be found and created here in particular, which allow students to a) gain experience of different ways of working, b) enable the independent design of work characteristics, and c) reflect on these experiences and their classification in theoretical models already during their (distance) studies. PS3 is that currently, it is impossible to assess the gained factual knowledge, i.e., competencies, and action knowledge, i.e., professional skills at certain proficiency levels in a work task simulation regarding the achievement of a relevant professional action CQ in the sense of a QBLM-based CQ (Wallenborn, 2018; Then, 2019). The CQs gained through digital innovation will be recorded and attested, thus obtaining study evidence. PS4 is that there is currently no possibility to determine the users' free text input regarding the fulfilment of the task and the achievement of a CQ. In the simulation context, the users have to complete various tasks and orders. For this purpose, the players in the work task simulation have to answer messages from potential fellow players. When answering the messages, it is to be determined to what extent the answer fulfils the tasks and orders of the message. PS5 is that the tasks given in the applied game are static and hardcoded into the game. To adapt certain tasks, an authoring tool for the simulation and training tasks for applied games is needed. Previous publications (Srbecky, Frangenberg, et al., 2021a, 2021b) stated that in-game tasks are currently impossible to be modified and assigned to game scenes and CQs without significant effort. The PSs mentioned above result in the following Research Questions (RQs). RQ1: "How can QBLM-based structural course-patterns be extended with didactical structural patterns to support measuring learning objectives and success within the work simulation?", RQ2: "How can professionally relevant action competencies be gained during studies using SG/AG technologies to simulate practical training and work experience?", RQ3: "How can the factual domain knowledge and action-oriented professional skills on different proficiency levels be measured during the simulation, based on the learners' behaviour during the theoretical learning and practical training, to assess whether the learners have achieved certain CQs?", RQ4: "Can an algorithm be implemented which automatically analyses the free texts entered from the players during reflection of their experience regarding the fulfilment of orders and the corresponding tasks?", and RQ5: "Can an authoring environment for tasks in a applied game be developed with which it is possible to create, edit, and map training tasks to certain task simulation game scenes and corresponding CQs?"

Based on the research methodology of [Ncp90], the following Research Objectives (ROs) were derived from the RQs. RO1 is assigned to the Observation Phase (OP). This phase identifies a suitable CQ model to map the learning outcomes to QBLM CQs. Also, suitable systems and tools are identified. RO2 is assigned to the Theory Building Phase (TBP). A concept is designed that shows what system components and interfaces are needed. The System Development Phase (SDP) moves the concept into a prototype and is assigned to RO3. The result of the SDP is evaluated in the Evaluation Phase (EP) in the context of a Cognitive Walkthrough (CW) (Wilson, 2013). Finally, the EP is assigned to RO4. In this phase, all RQs are evaluated.

The remainder of this paper is structured according to the ROs. This means that in the State-of-the-Art section, the OP is described. In the Conceptual Design section, the TBP is described, and the SDP phase is presented in this paper in the Proof-of-Concept implementation section. Finally, in the Evaluation section, the EP is presented. Finally, the paper concludes with a summary and indications of future developments.

2 STATE OF THE ART

The previous section has already mentioned some research projects and software systems related to the research goals. In the following, the most important are described in more detail.

Different approaches to simulation work tasks exist in work psychological experimental studies. Here, isolated single work tasks are simulated (e.g., the simulation of a computer store with the task of assembling ordered hardware packages within a certain cost; Hertel et al., 2003). Building on the job demand-control model (Karasek, 1979), systematically defined task characteristics (time pressure, scope of action) are manipulated, and the effect is tested (Häusser et al. 2011). Although the described simulation works well in laboratory settings, more complex, lifelike work tasks are needed for (online) teaching, both to keep motivation high among students and to demonstrate more complex features of job design and at least to better reflect the central features of job design (GDA, 2018) at work.

Developing the planned digital teaching innovation can rely on extensive previous experience and pre-existing tools and methods of the department Multimedia and Internet Applications (MMIA) of the FeU (LG MMIA, 2021), both conceptually didactically and regarding the technical implementation. The department MMIA has already applied game environments and simulation and training environments, which have been developed in the projects Realising an Applied Gaming Eco-system (RAGE) (European Commission, 2020) and Immerse2Learn (Immerse2Learn, 2021). In the Immerse2Learn project (Immerse2Learn, 2021), the game environments were used to integrate simulation and training environments for vocational and industrial training applications into a Moodle LMS (Moodle.org, 2021). Tools were also developed in the project RAGE to integrate the planned applied game environment with the Moodle environment. In addition, the RAGE project created a course authoring environment (Course Authoring Toolkit, CAT) (Wallenborn, 2018). The CAT can be used to provide instruction to participants in the form of a course. This uses the QBLM approach (Wallenborn, 2018; Then, 2019), which allows learning environments to be designed dynamically so that learners' prior knowledge can be addressed, as it supports both a CQ-Profile (CQP) for the learners and a CQP for the instructional materials (Then, 2020). This would be used mainly in the instruction for task simulation. The participants are prepared and instructed individually for the task, e.g., by separately training and coaching the divergent working tools and contexts.

Furthermore, a pattern-based course-author support approach based on course patterns and Didactical Structural Templates was elaborated in Immerse2Learn. This means that basic patterns of courses or also basic patterns of didactical structures within courses and applied games can be offered to course authors and game developers (Winterhagen, Heutelbeck, et al., 2020; Winterhagen, Hoang, Lersch, et al., 2020; Winterhagen, Hoang, Wallenborn, et al., 2020; Winterhagen, Salman, et al., 2020; Hoang 2020; Lersch 2020). This mechanism will allow instructors to design and integrate the course environments and work simulation environments based on course patterns and Didactical Structural Templates within the present project.

In recent years the research interest in Learning Analytics has increased (Wagner, 2012). As shown in (Freire, 2016) one of the most widely used and precise descriptions of Learning Analytics is the definition from the first Learning and Knowledge (LAK) Conference in 2011: "Learning Analytics is the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs" (SoLAR, 2011). Based on the given definition and the recommended combination of Adaptive Control of Thought-Rational (ACT-R) theory (Anderson, 2000) and Competence-based Knowledge Space Theory (CbKST) (Albert, 1999) from (Albert, 2007) will build the foundation for the design of a framework (Greching, 2010) for Learning Analytics at the MMIA department. This framework will automate the measurement and mapping of learners' outcomes to CQs (Srbecky, Frangenberg, et al., 2021a, 2021b; Srbecky, Krapf, et al., 2021a, 2021b; Srbecky, Then, et al., 2021). Based on the definition of Learning Analytics from (SoLAR, 2011), the Learning Analytics mechanism will measure learners' follow-up/simulated training success and map it to training outcomes and corresponding qualifications in terms of factual knowledge (competencies) and action knowledge (skills and proficiency levels) on the topic area of job design. The factual knowledge and action knowledge refer to the definitions of declarative and procedural knowledge of the ACT-R theory (Anderson, 2000). Action knowledge refers to the procedural knowledge that indicates how something should be executed. This is the knowledge about the appropriate execution of an action (Schönpflug, 2008). The factual knowledge refers to the declarative knowledge of the ACT-R theory (Urhahne, 2019). To accomplish a task or problem, an interplay of both bits of knowledge is needed (Albert, 2007).

As shown in (Freire, 2016), an extension of Gaming Analytics with Learning Analytics leads to a better understanding of the actual learning of the players (Freire, 2016). In this context, Gaming Analytics refers to the definition of (Seif El-Nasr et al. 2013). "Gaming analytics is the application of analytics to game development and research. The goal of game analytics is to support decision making, at operational, tactical and strategic levels and within all levels of organization - design, art, programming, marketing, user research, etc." (Seif El-Nasr et al. 2013). Various data can be collected in the context of gaming analytics. According to (Freire, 2016), this data can be divided into the two categories of technical data of a game and user and experience data of a game. The technical data (Freire, 2016) mentions data as the code itself, or the bugs reported. Also, data about the memory usage or system performance are covered by the term of technical data according to (Freire, 2016). The user and experience data can be more preciously described as the game metrics (Freire, 2016). According to (Seif El-Nasr et al. 2013), game metrics "are quantitative measures of attributes of objects." (Seif El-Nasr et al. 2013) according to (Seif El-Nasr et al. 2013), the raw players' behavior data tracked in the game can be transformed into the game metrics such as "total playtime or daily active users" (Seif El-Nasr et al. 2013).

For the combination of Gaming Analytics and Learning Analytics, the so-called Game Learning Analytics (Freire, 2016) therefore suggests that "the educational goals of Learning Analytics and the tools and technologies from Game Analytics should be combined" (Freire, 2016). In terms of this paper, the procedural knowledge should be measured and evaluated using Gaming Analytics. Learning Analytics should be combined with the outcomes and results of Gaming Analytics to analyze declarative knowledge.

This is exactly where the planned digital teaching innovation comes in. Building on existing task simulations, a complex, generalizable work task context that is relevant to many domains of work is to be simulated. This is to be achieved digitally within an AG environment that enables students to experience and reflect on content-related, organization-related, workflow-related, and social features of job design. They should be enabled to reflect their experiences for themselves after completing the simulated training tasks in a playful manner. This reflection should also enable them to develop work new design configuration proposals, to test their own design variants and to analyze the respective effects. The digital task simulation will be based on the idea of the pre-existing "computer store task" (Hertel et al., 2003) but integrated into a social context and extended to include interaction with colleagues and later superiors. Furthermore, the task simulation is to be supplemented by additional tasks like research tasks, processing of colleague inquiries, and made more realistic through additional complexity. In addition to the processing of customer orders, inquiries from supposedly cooperating colleagues are to be considered, and thus a complex structure of target work context criteria is to be achieved.

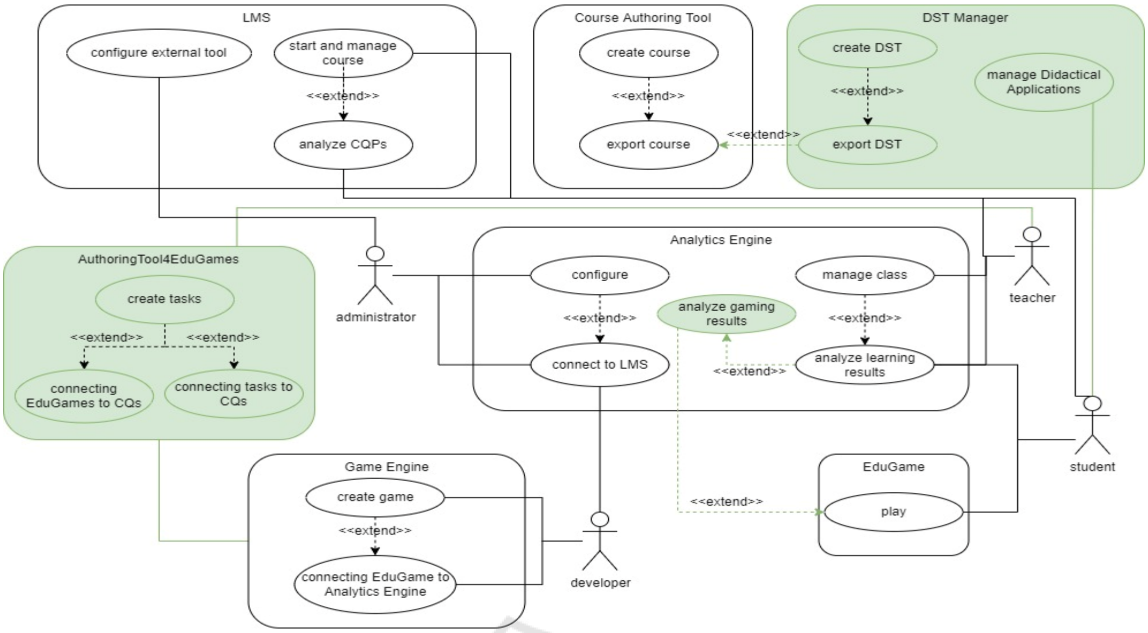

Figure 1: Use cases for the system.

3 CONCEPTUAL DESIGN

In the following section, the technical and didactical concepts of our approach will be derived.

3.1 Overall Technical Concept and Use Cases

In the following section, the use cases for the system (see figure 1) will be described and explained. To create the course, at first, a so-called Didactical Structural Template (DST) has to be created. This new DST will be implemented by means of a course or a course template, which can be edited with the CAT. To support this approach in a QBLM-based way, a QBLM-capable course pattern is used, which first converts the learning contents into course units. Within the corresponding Moodle course checks to what extent the learning contents have been understood, i.e., to what extent the prerequisites for participation in the actual work simulation have been met. This can, e.g., be achieved through self-testing tasks in the form of automated QBLM assessment functions (pre-testing). These initial basic QBLM CQs can then already be stored in the students' QBLM CQP with the help of the QBLM approach and the initial CQs can afterwards be used for later progress evaluation. Classically, the assessments could also be carried out through a Moodle learning quiz (Moodle docs, 2021).

Before playing the applied game, the teachers, as shown in figure 1, need to create the work simulation tasks and their specific job design parameter configuration in an authoring tool for applied games. Here the teachers need to be enabled to create the tasks for the applied game and map the tasks to the game scenes including the respective job design parameter configuration. Also, the CQs from the CQ framework should be mapped to the tasks. Finally, an export function for exporting the tasks and the corresponding mapping should be created. This functionality will be needed to analyze the achievement of the CQs. Finally, the game scenes files' import and export functionality are needed to map the tasks to the applied game scenes.

Once the students have acquired the relevant theoretical knowledge with the study manuals, they can start playing the work task simulation to experience the effects of their work design and corresponding parameter configuration by themselves. Afterwards, students can re-start the actual ALG at any time in the sense of an additional training "exercise" or training task "submission". Within this automated ALG, a QBLM-based Didactical Structural Template needs to be used, which extends the QBLM course pattern of the Moodle course by measuring the learning objectives and learning successes of the game/simulation sequences within the ALG. In particular, the active parts of the ALG (reflection of the professional job design, systematic work analyses, and generation of alternative work design configuration solutions) can be used as the "exercise outcome". This result is automatically reported back to the Moodle system so that it can automatically decide whether the "exercise/final task" has been passed and can be continued in the course, or the "exercise/final task" needs to be repeated to achieve a different/better outcome. As a prerequisite for the analysis of the data, a CQ framework has to be defined and maintained in the CAT. After this, appropriate measurement values for the game metrics have to be defined and implemented for the game. The gained factual knowledge should be evaluated with the help of the game metrics and gaming analytics. Potential metrics can be the number of processed customer requests, duration of processing a request, number of words, etc. The metrics will be defined and explained in more detail in later publications. The analytics components from the RAGE project (European Commission, 2020) will be used and further evaluated to measure the game metrics. To measure the game metrics for the fulfillment of customer requests, an algorithm needs to be implemented that can analyze the free text answers based on sample solutions. After the game is played, players have to reflect on the measured game metrics. Here, the action knowledge is measured using learning analytics. The players need to explain how their results came about by applying the theoretical knowledge they gained before playing the applied game. Those answers are free-text answers. Those answers should be analyzed automatically regarding the achievement of CQs. If the CQ has been achieved, it should then be transferred to the CQP and entered.

3.2 Didactical Elements

A central element of the planned learning game is the students' own experience of well and poorly designed work tasks in terms of the specific manifestation of psychologically relevant work characteristics (e.g., psychological stress). For this purpose, the students will process one or more specifically designed work tasks which are digitally simulated. Psychological stresses, such as interruptions, time pressure, variability, or social support, are systematically varied, and their effects are thus made tangible. Furthermore, the reflection of the own experience and the effect of the processed work tasks, the reflection of causes (person-related and condition-related), and the independent generation and testing of design solutions are promoted by targeted open questions. These questions are to be answered utilizing the previously gained theoretical knowledge. For this purpose, the measured values are to be explained based on theoretical knowledge. Finally, the students can experience the exact effect of the different design solutions regarding work performance, motivation, and stress based on their own work example and receive processed feedback.

In the end, an explanation of the overall process is provided for all simulation elements. It explains how specific psychological stresses manifested themselves in concrete terms in the simulated work situation and what alternative concrete designs would have been possible. In this way, the understanding is sharpened that the design of working conditions is not unchangeable, but that there is almost always scope for design, which must be found in the practice of job design (e.g., in risk assessment). In addition to the pure recording of the characteristics of specific work features, the students also have to reflect and evaluate the results and independently develop suggestions for improvement. Psychologically relevant task features (e.g., time pressure, work interruptions, information overload, social support, feedback, task variability) can be systematically manipulated from the outside. After the processing, the feedback of the results, the own reflection of individual and condition causes for specific results, and the debriefing with a systematic analysis of the work situation and the independent derivation of solution suggestions for a better work design takes place.

4 IMPLEMENTATION

The previously mentioned software components and systems are used and extended to realize the conceptual design. The basic gameplay and the corresponding mock-ups for the graphical user interfaces are shown below. Future publications will describe the detailed realization of the software components and interfaces in more detail.

The simulated task is a typical processing task in which customer inquiries are fulfilled to the fullest possible satisfaction by transforming the requirements described in the customer's inquiry into concrete offers. The inquiry, e.g., requests for a hardware package, consists of content like a computer, monitor, printer with specific requirements, price ideas, and time specifications for delivery times. To process the request and create a suitable offer, the players must research certain information. For this purpose, first research relevant information in a file directory with lists and descriptions for an offer, and second ask specialized colleagues for specific information.

In addition to creating their own offer, the players have to answer parallel inquiries from colleagues who are supposed teammates with the same tasks about information only available to the players. The supposed colleagues need to process their customer orders. The goal is to process as many orders as possible, to achieve a high level of customer satisfaction by fulfilling the requirements as best as possible, and to achieve a high level of colleague satisfaction by processing the corresponding requests quickly. For processing, the players have a desktop with the following basic tools at their disposal. An Email program for receiving customer inquiries and sending offers. A Messenger/Chat tool for communication with colleagues. Further, a File Explorer/virtual library with information on various products will be implemented and an editor to create offers.

To ensure sufficient qualification and the same starting point of the players for the actual task simulation, the players are first familiarized with the operation of the basic tools and then trained in the processing of the actual work tasks of the work simulation environment in a more comprehensive tutorial. This is followed by a pre-testing, in which the skills in the operation of the basic tools and the actual processing of the task are tested. In addition, the current stress level, fatigue, is recorded to determine the starting point for determining the stress level. The start screen of the applied game environment of the work simulation, contains the virtual desktop with the basic tools email program, messenger, virtual library, and editor, as well as a clock combined with info panel (number of processed orders, number of waiting customer orders, colleague requests, etc.). New customer requests can be read by opening the email program, and their processing can be started. For processing, information searches in the virtual library and inquiries to colleagues via messenger are necessary. Based on all the information obtained in this way, an offer as suitable as possible can then be created in the editor and sent to the customer. At the same time as the players are processing their own customer orders, inquiries from colleagues who need information for processing their customer inquiries are sent via messenger. The player has to answer these requests by obtaining the desired information in the virtual library and sending it to colleagues. During the game phase of about 45 minutes, customer orders and requests from colleagues arrive at different times and must be processed as quickly as possible and by the requirements. The actual work task should basically be feasible without any stress. Nevertheless, task performance is influenced by several systematically variable work characteristics like psychological stresses, which thus determine either positively or negatively the effect of the work task on the players. Finally, the characteristics of the tasks presented here are initially set at random and can later be systematically varied by the players.

After completing the task simulation, the players have to fill out a short questionnaire on misuse (fatigue) and motivation (work engagement). This is followed by feedback on the results regarding work performance (number of orders processed, customer satisfaction, colleague satisfaction) as bar charts with comparison bars (norm values) and regarding stress (comparison to the baseline before the task) and motivation. Reflection on one's own results, one's own experience, the effects of the work task, and reflection on the causes for certain results (person-related and condition-related) is done by answering specific open questions in a text field.

5 EVALUATIONS

Before implementing the system, an evaluation in the form of a CW of the visual mock-ups will be performed.

In the form of a CW (Wilson, 2013), an initial evaluation of the Proof-of-Concept implementation will be accomplished by domain experts in the field of education in Computer Science. The evaluation's primary goal is to estimate the productive capacity of the implementation and orientate future development. In addition, nine psychologically relevant work characteristics from work content, workflow/ organization, and social relations can be manipulated in the task. The concretization of these changes requires extensive psychological testing and fine-tuning of the parameters for simulating the working conditions, e.g., feature "work interruptions": How many work interruptions must there be for the agents to speak of "high intensity of work interruptions". This requires some testing with subsequent evaluation and adjustments of the task simulation regarding the effect of the task features.

Nevertheless, even more critical are the tests of the actual effectiveness of the task simulation regarding the learning objectives. For this purpose, following the evaluation model of (Kirkpatrick, 1998), an evaluation is carried out on 3 of 4 levels:

The participants' reactions will be evaluated with a short questionnaire about the simulation experience at the first level. The students should answer the following questions: How do students experience the task? Was the simulation interesting and stimulating? Do you think you learned something important? In the second level, the so-called learning level, a knowledge test on job design with a randomized wait-control group will be designed. Therefore, students will be randomly selected as participants of the control group and later compared against the other students. At the third level, the behaviour level, a transfer test will assess typically applied job design and job analysis problems and assess work analysis tools. The 4th level in Kirkpatrick's evaluation scheme (outcomes), e.g., better grades in the final exam or later career success, is not possible for both ethical and practical reasons (no control group, no access to students after the end of the study, as well as contamination of the target criteria by numerous other factors). In addition to the effectiveness evaluation, a formative evaluation will take place via a qualitative approach (guideline-based interviews with participants) to optimize individual elements of the task simulation.

6 CONCLUSIONS

This paper introduces a novel approach to a work task simulation considering relevant features for job design and the QBLM approach. Future work includes the implementation and evaluation of the described systems. Also, algorithms and concepts for assessing the CQs based on the learning game outcomes and the behaviour of the learners in the game will be designed, implemented, and evaluated. Furthermore, a literature review and evaluations for RQ5 need to be performed. Also, further evaluations regarding the usage of RAGE Analytics as the Analytics Engine will be performed. This involves checking whether RAGE Analytics provides all the necessary functionalities for the tasks required. The remaining challenges are the development, integration, and evaluation of the components and systems into the tool landscape of FeU for productive usage. Since today QBLM-based approaches are only integrated into a development and research environment. In addition, the analytics framework and tools need to be developed and integrated. Finally, the approach of the didactical structural templates needs to be integrated and evaluated. Therefore, the Applied Game needs to be implemented and evaluated.

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