

CREPS AND THE STREBER-APP AN INTERACTIVE METHOD FOR COMPETENCE-ORIENTED ASSESSMENT AND ITS DIGITAL IMPLEMENTATION

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Abstract

Competence orientation and individualization are paradigms that are becoming increasingly important in modern education. However, especially in courses with many participants the implementation of competence-oriented teaching and assessing quickly exceeds the limits of the lecturer's time resources. Peer evaluation is generally suitable for giving students individual and comprehensive feedback, at least if the quality of the feedback is high enough. Unfortunately, sometimes it's hard to motivate students to give high-quality feedback.

The CREPS (Create, Review, Enhance, Practice and Score) method was created by the authors in early 2020. It offers an organizational framework that can be used regardless of the size of the student group without significantly increasing the effort for the lecturers. The focus is placed on the skills of self-evaluation and peer assessment, which are both important for competence orientation. The basic idea includes an iterating process in which students generate and enhance test questions based on the given learning content that are assessed and evaluated by their colleagues for quality, correctness, and complexity level. In addition, the best questions are selected for further practicing. Students are rewarded with points for each step in this process; highly appreciated work (good questions and valued feedback) will result in higher scores.

This method and the Streber-App, a mobile application supporting the method, were originally developed for a media technology related university course and since then have been used in six courses in 2020, 2021 and 2022. To evaluate the method CREPS and the supporting app as well as to find out the students' views on and experiences with both method and application, more than 500 students were invited to participate in a quantitative survey.

This paper presents the method CREPS, its underlying didactic considerations, the implementation with the mobile app and the most interesting results from the survey. The participants reflected these concepts and their acceptance in the learning setting. The students' feedback on the use of the method, the support by the lecturers and the concrete implementation using our app, allows us to draw conclusions about the functioning of the previous application and possible improvement for further use.

The self-assessment of the students on their individual learning success gives an indication of the benefits of the method in the university environment.

Keywords: CREPS, didactic method, competence-oriented assessments, peer evaluation, mobile learning.

1. Introduction

Nowadays the goals and methods of teaching and learning have been changed dramatically. While the pure transfer of knowledge more and more takes a back seat the student's ability to acquire knowledge themselves is gaining momentum. Self- and external reflection as well as competence-oriented assessments are concepts that are expected to be part of every teaching concept for every university course.

Yet in recent years new developments have not only posed major challenges for the education system but also provided opportunities previously not been considered possible. These possibilities were opened up by rapid technical progress but also by far-reaching user acceptance. Numerous digitalization initiatives in education experienced a major boost, which can now be used to further enhance modern teaching and learning.

The educational method *CREPS* and our implementation, the *Streber App*, were developed to implement innovative teaching, learning and examination scenarios in an environment of competence-oriented work. The method and especially the *Streber App* focus on large groups of students. Peer evaluation and assessment (Nicol 2014) is used to promote learning impulses and formative performance assessment (Stern 2010). In terms of the constructive alignment (Biggs 2011), the method for achieving competence-oriented learning goals was also used in the context of summative performance assessment for finding the student's grades for the lectures. A more detailed discussion of the underlying pedagogical theories can be found (Schmiedl 2020), where the concept of *CREPS* was introduced for the first time.

Since its first use in Spring 2020 feedback from the students has been gathered to optimize the *Streber app* and the underlying method. As of April 2022, a total of 6 university courses at the UAS St. Pölten have been organized using the method and app not only as the dominant teaching and learning method but also for finding the student's grades. 460 participating students created 8,937 questions and a total of 83,031 peer reviews/ratings, 17,359 of which including also verbal feedback.

2. Research questions

In this paper we focus on the student's learning success and their motivation as well as on the applicability of the method in university courses and the usability of the *Streber app*. The following set of research questions was used to guide the accompanying scientific considerations:

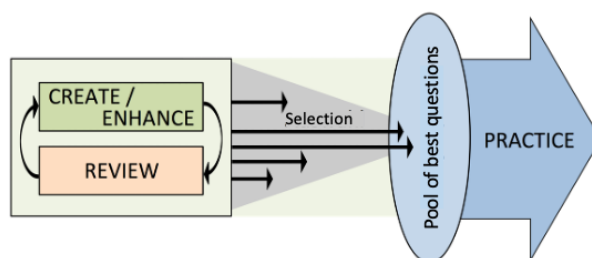
- How do students rate the learning process using the *CREPS* method compared to previous more traditional methods of learning/teaching/grading in comparable courses and how do they evaluate their personal learning success using the *Streber App*?
- How do students evaluate the peer assessment components in the concept of the *CREPS* method and in the *Streber app*?
- Do the students consider the *CREPS* method and the *Streber App* to be suitable means to be used in tertiary education? What are options for improvement?

The main research method used to evaluate these questions was the quantitative evaluation of a written survey (standardized questionnaire). Some of the findings were compared or supplemented with usage statistics based on the application's log files. These findings will be used for future enhancements of *CREPS* and the *Streber App*.

3. The *CREPS* method

CREPS is an acronym for the terms *create*, *review*, *enhance*, *practice* and *score* and describes a method for learning and testing that enables competence-oriented knowledge acquisition and testing even in large learning groups. Course content is normally split into several modules. Each module combines two phases of the *CREPS* method as shown in figure 1:

Figure 1. The *CREPS* method for one topic.



The *CRE*-phase includes three activities:

- Students *create* questions (including answer options) for a multiple-choice test on the subject matter of the current topic. Each of these questions consists of the question text, several answer options and an optional explanatory text explaining the correct answer.
- Each question is *reviewed* and rated for quality and understandability in a double-blind peer review by several other students (peer review).
- These reviews are presented to the original author who may then *enhance* / revise his question. Optionally authors may also respond to reviews or vote for the most helpful review they got.

The *CRE* phase can be carried out in several iterations, and this improves the quality of the questions.

After the CRE phase is over, the best questions are selected based on the student's average rating. The lecturer will normally not influence this selection of the best questions although quality-improving measures are an option. In the *Practice* phase the students can learn by continuously practicing these questions.

For every task in the method – creating questions, reviewing, practicing but also for achievements (question was selected for the pool of best questions, review was voted to be the most helpful review by the question's author) students get points (they *score*). If the course content was split into several modules, CREPS can be used for every module independently and the CRE- and P-phases of subsequent implementations may overlap. The course's lecturer is normally only providing the organizational framework implementing the CREPS method but does not interfere in the generation or reviewing of questions. The total number of scored points can be used for grading the students in the course.

4. Implementation of CREPS: The Streber App

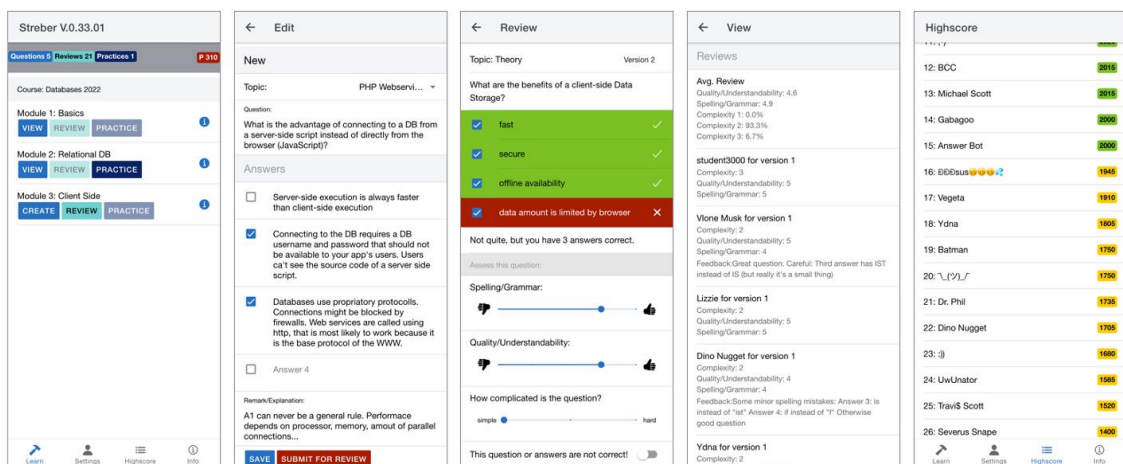
The Streber App is a web application which implements the CREPS method. Lecturers can split the course into several modules, define the start- and end-date for each module's CRE- and P-phase and define the number of points students can score for different actions like creating or reviewing questions. Although the app was optimized for Smartphones it can also be used with every up-to-date web browser on desktop computers.

The basic idea is that learning with the Streber App can take place anytime and anywhere. The application was conceptualized and implemented in parallel with the CREPS method by the authors in early 2020 to be used in a course about basic web technology at the UAS St. Pölten / Austria. By coincidence the introduction of the app was just one week before Austria went into the first Corona-Virus lockdown. Since then, the Streber App has been used (and currently is used) in six different courses.

Figure 2 shows five screenshots of the Streber App used in a course held in 2022. The picture on the left side shows the module screen. Three modules are available, where module 1 is already closed, module 2 is in the Practice phase and module 3 is in CRE phase. The second screen is used for creating new questions. Streber is currently limited to four multiple choice answers per question, although that might change in later versions of the software. The third screenshot is for doing the peer review. A reviewer is first shown the question and answer options and can try to solve the questions. The real work although is reviewing the question. Reviewers must rate for *Spelling/Grammar*, *Quality/Understandability* and *Complexity* of the question. In addition, reviewers are asked to leave written comments and explain their rating.

Screenshot 4 shows the ratings and remarks as the author can see them. Only anonymous nicknames (that can be changed by the users as often as they want) are displayed, so reviewing is done in a double blind manner.

Figure 2. Screenshots from the Streber App.



In the previous and current implementations all six courses varied only in the number of modules but used the same settings and the same points scheme for scoring.

Students were allowed to submit up to 5 questions per module – scoring 30 points for every submitted question. After waiting for reviews each question could be resubmitted for review once. For

every question created themselves students were allowed to review up to 10 questions of their colleagues, scoring 5 points for every review. Authors could later award the most useful review of each of their questions – which added 20 more points to that reviewer’s score.

After a module’s CRE-phase ended, the best questions were evaluated automatically using only the student’s ratings. The best questions (number depended on the total number of students/questions, about ¼ to ½ of the questions) were select for the module’s question pool. Practicing 10 random questions from the pool was rewarded with 10 points. The number of practices was not limited, so each student was essentially able to get full points by hard training.

5. The survey

To evaluate CREPS and the Streber app as well as to find out the students' views on and their experiences with both the method and the application, all students who ever enrolled in one of six courses where the Streber App was used were invited to participate in a quantitative survey. From more than 500 enrolled students we identified a total of $n = 460$ users that effectively used the app. 104 students (23%) finally participated in the survey.

In addition to demographic data, the questionnaire contained questions about personal learning behavior, perceived learning success, motivation through the elements integrated in the app, organizational use of the method and the app and technical implementation of the app. These are the most important findings:

If we compare the time spent with the perceived learning quality, the method comes off quite positively:

70% of all students participating in the survey stated that they believe to have dealt with the subject matter more intensively than in other comparable courses. 76% had the feeling that they had learned more sustainably using the CREPS method. If we compare the time estimated to be used for the Streber App with the time normally spent for traditional exams (preparation, administration), the difference is not very significant. 41% believe they spent less time (37% slightly less) using Streber, 59% spent more time (50% slightly more).

The differences between male and female students are not very significant, but visible. While 83% of female students had the feeling that they had learned more sustainably using Streber, only 56% spent more time than with a conventional exam.

96% of the students who already received a grade on their course agreed fully or at least partially that the grade corresponded well with their self-assessment.

Our survey demonstrated well the importance of a well-established feedback culture for the successful application of a peer assessment-oriented method such as CREPS. 75% of the students believe that getting feedback is generally important for their learning. 85% indicated that in general even critical yet constructive feedback is still motivating, and the majority of the students said that they could learn also from critical feedback they got in the Streber app.

But there is room for improvement! 67% stated that negative and derogatory feedback has a demotivating effect on them. Therefore developing the student’s feedback skills is essential for the method. However, 58% said they do not feel comfortable giving peer feedback or even rating the performance of others. On the other hand, when receiving feedback, 81% liked to reward their reviewers for giving helpful feedback. In comparison with *creating questions* or *practicing questions* reviewing their colleagues’ questions is not only an unpopular task, but also believed to be least effective. 14% of the participants state that reviewing is the best way to learn while 59% believe it is the least effective task.

While rating the question’s quality was mandatory in Streber’s review phase, writing a feedback message was an option that was used in only 21% of all reviews. However, while well rated questions got written feedback rarely the rate of feedback messages explaining the rating increased to 35% for critical reviews and even to 44% for the worst rated 1% of questions. The poorer the rating the more likely was a message explaining the problems or even suggesting improvements.

An amazing 87% said they would like to use the Streber app again in another course, 44% even as often as possible (whenever the method makes sense in a course). Only 3% were dissatisfied with the method and app used in their course. Female students are even more satisfied with the app - 50% would opt to use Streber for every reasonable opportunity.

86% of the participants (students from IT related study programs) think that they are the right target group for the app and the learning method. 80% believe that CREPS and the Streber app are suitable especially for theoretical lectures and that the method is a good alternative to a traditional test. For courses of practical content (projects) 24% believe that it would make sense to use Streber at least as a supplement to other possibilities of performance assessment.

6. Conclusions

The concept of structured continuous learning applied in CREPS as well as the idea to deal with learning content in several ways (creating and revising questions, reviewing and rating questions and practicing by repeatedly answering questions) met with broad approval from the students. There is a very high level of satisfaction, both in terms of comparing the learning time spent with the learning results and in terms of the correspondence between the grade and the self-assessed learning success. Students appreciate the flexibility, the chance to learn "more sustainably", the motivating aspects of dealing with the subject matter in more detail and also the novelty compared to more traditional teaching and assessment methods. "The concept is a lot more fun than normal studying and makes every train journey meaningful!" as one student put it.

The students proposed a lot of ideas for new features in the Streber App like the possibility to integrate hyperlinks and graphics into questions in order to create more complex questions or to provide additional information. The Practice Modul could be enhanced by mixing the answer options of all questions instead of displaying them in the original order. We also appreciated the idea that critically reviewed questions created with the Streber App could be reused in the attendance part of the course for substantive discussions.

A culture of constructive and qualified feedback is a key success factor and should be encouraged by the lecturer. It is important that students learn to provide and accept critical but fair, constructive, and appreciative feedback to avoid the otherwise possible demotivating effects of feedback. Some students suggested that a feedback message explaining the rating should always be mandatory however mandatory feedback messages could also result in lower quality. The option to let the author of a question rate his reviews (instead of just promoting the most helpful review as it is implemented currently) was discussed but it would also increase the method's complexity. All in all, we are convinced that there is still potential for technical and organizational optimizations in the peer review process.

Although our observations during the courses had already made clear that our students liked the Streber App, the overwhelmingly high level of approval for the CREPS method and the app as well as the often-expressed desire for repeated use came as a bit of a surprise. It encourages us to continue optimizing the app and to integrate the CREPS method and the Streber app into further course concepts, especially for knowledge-based courses.

The Streber App is currently in closed beta state - fully functional but still work in progress.

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