

Combining and Balancing Project-Based and Blended Learning in Education

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Abstract—This paper discusses evaluation findings from project-based and blended learning courses in the higher education sector and beyond. The multi-method studies focus on learners’ attitudes, practices and preferences towards project-based and blended learning. The evaluated courses were developed and taught in the context of teacher training programs at Ludwigsburg University of Education (LUE). They aim at the planning, execution and critical reflection of individual projects carried out by the participating students in blended learning contexts. This paper presents a discussion of the structure, the blended methodology and the outcomes of the courses, combining the methods of quantitative evaluation research and qualitative interviews. By doing so, the study assesses current practice and analyzes the above-mentioned courses closely and in detail. Thus, this paper discusses how students deal with a project-based and blended learning environment and how these results can be constructively implemented to improve future project-based and blended learning scenarios.

Keywords—project-based learning, blended learning, higher education sector, empirical evaluation

1 Background and context of the project-based and blended learning scenarios

The process of autonomous learning in blended learning settings has become increasingly important and has changed considerably in the face of new challenges [1]. Autonomous learning and working with the assistance of new information technologies in blended learning contexts have become integral features of societies and their educational systems all over the world. In this article, the term “blended learning” is understood as the integration of traditional teaching methods and eLearning, both using hybrid learning arrangements and encouraging collaboration and autonomous learning [2]. The world of learners and teachers has become more autonomous and, at the same time, more flexible and interconnected as a result of new challenges such as globalization and digitalization. This is discussed by many academics whose interests lie within the scope of project-based, autonomous, digital and blended learning scenarios.

In this regard, project-based and blended learning are discussed as some of the most constructive ways to cope with the new challenges of a globalized world and to develop and foster competencies in autonomous learning [3]. Project-based and blended learning scenarios seem to have proven particularly relevant in this context, since they can offer tools for communication, autonomous learning, collaboration and shared learning between students and teachers [4]. Consequently, there is a strong demand for courses using project-based and blended learning approaches [5]. Against this background, however, well-researched resources offering guidance on how to combine project-based and blended learning and how to design adequate courses for the higher education sector and others remain rare [6]. This study reports on the development, implementation and evaluation of courses in the programs “Teacher Education” and “Early Childhood Education” at LUE in Germany [7]. Participants were students enrolled in Teacher or Early Childhood Education programs.

The key question of the study is how students cope with project-based and blended learning courses. Therefore, students’ practices and preferences concerning project-based and blended learning, and factors such as motivation, autonomous learning and project implementation, play major roles in the design of the courses and their evaluation. Project-based and blended learning scenarios show the potential to help students foster autonomous learning skills and develop learning competence in individual learning contexts [8]. The courses discussed, therefore, show a mix of synchronous and asynchronous course sessions and use various digital and face-to-face learning scenarios [9]. Against this backdrop, the focus of this paper is to discuss the structure and the evaluation of the courses to present results on the possible impacts of project-based and blended learning approaches. Therefore, the paper discusses project-based and blended learning scenarios that support learners in a two-fold way. On the one hand, learners should develop their learning skills in project-based contexts and become aware of their capabilities concerning autonomous learning. On the other hand, learners should become capable of blended learning skills that could transfer to their future work.

To facilitate insights into these topics, the paper discusses quantitative and qualitative evaluations focusing on the attitudes and preferences of students to project-based and blended learning scenarios.

2 Project-based and blended learning: description of the course designs

Several project-based and blended learning courses, conducted at LUE between 2019 and 2021, serve as the basis of the study. The main foci of these courses are (a) the autonomous implementation of a small-scale empirical study or project in the field of education and (b) the use of various learning scenarios in blended learning contexts. Thus, the project-based and blended character of the course aims for the interconnection of students with their future work area, their future colleagues and their future students through a project in the field of education and the development of autonomous learning skills through the individual use of different methods. Thus, the combination of project-based and blended learning scenarios has a special focus

on the development and fostering of autonomous learning [10]. Approximately 50% of the course sessions were carried out in digital synchronous and asynchronous ways, whereas the other 50% of the course sessions were conducted in face-to-face settings. The asynchronous sessions offered a mix of learning arrangements, such as readings, videos, podcasts, audio presentations, interactive forums and chats.

To these ends,

- (a) pertinent presentations with audio commentary were created;
- (b) a podcast with experts was made available;
- (c) common issues were presented through a selection of pertinent literature;
- (d) student collaboration was established;
- (e) videos about project-based learning were provided; and
- (f) forums were established, offering an ongoing interactive exchange of ideas.

The face-to-face sessions mostly consisted of guided discourse offering the chance to reflect on the contents of the course and discussions of the various projects designed and carried out by the students. Thus, the blended learning scenarios were mainly based on the combination of individual eLearning, interactive face-to-face collaboration and autonomous project-based learning in various ways [11]. The classroom sessions mainly dealt with matters of organization, the discussion of key terminology and key concepts, and the presentation and discussion of project-based work.

3 Multi-method design of the study and evaluation of the courses

The study is focusing on the implications of project-based and blended learning scenarios on students' learning behavior. The complex research focus—students' behavior and preferences in project-based and blended learning contexts—asks for an innovative multi-method approach observing multiple perspectives. Against this backdrop, the study looks for both quantitative and individual data—subjective feedback that offers a more comprehensive view [12].

To achieve this, two evaluations, carried out through quantitative questionnaires, illustrate trends about attitudes towards and usage of project-based and blended learning scenarios. These quantitative tests produce first results and help to develop advanced structures and methods for further research. All participating students took part in the quantitative evaluations, completing two questionnaires about (a) project-based courses in general and (b) the blended learning approach of these courses in particular.

The subsequent series of semi-structured qualitative interviews identifies individual attitudes and preferences towards project-based and blended learning. The qualitative evaluations use a creative qualitative design [13], which is conducted digitally [14]. The interviews were carried out in an asynchronous digital way. This way of interviewing students is a rather new technique in qualitative research, which encourages respondents to reflect on their answers by allowing them to structure their ideas and responses beforehand [15]. In this particular study, students had the opportunity to record their answers as audio files independently. The completed audio files were then sent to the

research team via a digital transfer system. Drawbacks of this technique, such as a lack of face-to-face interaction and constructive dialogue, have been taken into account and play a role in the analysis of the data. Apart from the innovative way of data generation, the study follows established structures of qualitative research and analysis [16].

The semi-structured questionnaires show five categories [17]: (a) motivations for enrolment in a digital project-based course, (b) learning and working in project-based contexts, (c) blended learning scenarios, (d) project-based work in blended learning contexts, and (e) individual learning progress.

These deductive categories were built based on the discussion of the quantitative results, former research, and evaluations in the field of education and beyond [18]. The questionnaires mainly focus on the project-based and blended learning character of the courses. The questions are directed towards students' expectations, attitudes, preferences, possible development of competencies and perceptions of change within individual learning strategies and attitudes.

The experience of multi-method testing notably helped to identify strengths and weaknesses in the conducted courses by evaluating students' responses in different empirical settings.

4 Findings of the study

4.1 The quantitative perspective

The quantitative perspective consists of two surveys.¹ The surveys aim to (a) show trends in behavior and preferences of students concerning project-based and blended learning scenarios and (b) help develop items for the qualitative surveys. The surveys indicate that three factors are essential for the participating students when it comes to project-based and blended learning scenarios:

- (a) The balance between online and classroom learning
- (b) The balance between synchronous and asynchronous contents
- (c) The balance between autonomous and collaborative work

The results of the surveys also indicate that the participating students “learned new techniques of learning in the courses” (54% strongly agree/38% rather agree) and “developed their learning skills during the courses” (23% strongly agree/61% rather agree), due to the project-based and blended learning approach. The participants especially appreciate “the independent ways of learning” (61% strongly agree/31% rather agree) and the “flexibility of the blended design” (69% strongly agree/23% rather agree).

Altogether, the quantitative perspective indicates that learners can develop their learning skills and acquire new learning techniques in project-based and blended learning contexts. Autonomous learning through project-based work and the flexibility of blended learning designs seem to be the main reasons for this. The follow-up

¹Two courses at LUE were involved (n(1)=16/n(2)=13). cf. Knoblauch, C., Keßler, J., Jakobi, M. (2020): 866–876.

qualitative studies focus on these findings in detail. Furthermore, the questions arise as to what the students specifically appreciate and which improvements can be made—questions the following qualitative evaluation incorporates.

4.2 The qualitative perspective

The qualitative study focuses mainly on learners' behavior in (a) project-based contexts, (b) blended learning settings and (c) possible changes in learning. The analysis and discussion of the data show five combined categories, which are based on the analysis of the preceding quantitative tests, deductive categories and new inductive impulses found within the data. The findings are structured and discussed according to these categories. Answers and reflections, which show links to more than one category, are discussed in different categories.

a) Motivations for enrolment in a digital project-based course

For many students, project-based work in the field of education and the prospect of actual implementation of a small-scale project seems to be a strong motivation. The idea of autonomous working and learning also seems to be a motivation, as some students report that they miss working independently. Another factor seems to be the interdisciplinary opportunities that project-based work can offer. Some students report that they were looking for learning opportunities where different subjects and educational systems could be combined. Furthermore, students seem to appreciate the practical insights that project-based work can offer and the possibility to connect with future work fields.

b) Learning and working in project-based contexts

The possibility to pursue individual interests and thereby develop competencies within individually chosen fields of education are aspects that are highly valued by the interviewed learners. This goes hand in hand with the chance to design and carry out an individual project self-responsibly and the possibility of individual time management. In this context, the described balances seem to become important for many learners: Many students emphasize that individual time management has to be accompanied by a solid course structure, which sets a framework for the various projects. Additionally, strong support through the lecturer seems to be very important for the interviewed students, especially in the first stage of the course. A reliable structure and time frame, the development of a knowledge foundation through pertinent literature, the discussion of good practice projects and the close mentoring of the design of the individual projects are also emphasized as important moments for learning and working in project-based contexts. Learners value a fine balance of autonomous project-based learning, which is accompanied by individual support: *"...so I could learn and work at my own pace, within a sound course structure and with the option to receive individual support for my project."* To accomplish this balance, it is crucial to plan project-based learning beforehand and in close collaboration with the learners. If the described balances are established, learners report that they developed confidence throughout their project-based work: *"...the fact that I worked on my own project and I could actually see: I can do this!"* Additionally, some students appreciate the practical and immediate involvement: *"...we were able to reach certain goals by implementing our individual*

project. Therefore, the learning processes are more effective and bigger—on top of that, the learning is sustainable and interdisciplinary.”

c) Blended learning scenarios

In general, the interviewed learners show a high acceptance of blended learning environments and value project-based approaches. In this context, various factors seem to be important for the participating learners:

- The learning environment must offer different digital and face-to-face learning methods.
- A combination of self-regulated learning, interaction and diversified working options must be offered. This combination seems to be especially valuable as it offers special potential for reflection: *“...I liked the mix of both (...) so when I watched the videos it was more thinking by myself and making my own ideas, but it was also very important to be back in class (...) I got new ideas how they (other students) understood the tasks, how they answered the questions and how they think about this and this was really interesting.”*
- Learners must be involved in the development of the learning environment: *“...and (the) best part about it was that students were also taking the lead. It was not completely driven by the teacher.”*
- Learners must have the possibility to create content and share it with others online and in class.
- The online content and associated tasks have to be adjusted carefully to prepare for classroom interaction.
- A reliable learning platform is pivotal for ongoing and sustainable learning in blended learning contexts.

d) Project-based work in blended learning contexts

The interviewed learners not only worked in project-based and blended learning environments, but they also created and balanced their blended learning contexts by implementing their projects. To do so, the interviewed students used different strategies and processes. While some learners conducted their projects almost completely digitally, others used blended forms of online and face-to-face meetings, and some students conducted their projects face-to-face only.

Students who chose a digital way mostly report about positive effects such as (a) the possibility to record sessions via video conferencing software, (b) the distribution of digital materials before and during project sessions, (c) the opportunity to gather and share information online and simultaneously, (d) the chance to meet without using a car or public transport and (e) the time-saving aspects of digital communication.

In contrast, students who chose face-to-face project sessions emphasize the necessity of face-to-face interaction, especially with children in primary school or early childhood education, mostly because children in this age group cannot handle the required digital devices on their own. Additionally, some students report that they experienced an unobstructed flow of information and communication in their face-to-face sessions and that the use of some materials—i.e., pictures or items—may have a better effect.

The study indicates that the learners who experienced blended learning environments in the planning of projects can adapt and adjust blended learning scenarios to their

project-based work. This adoption and adjustment can lead to reflection and a better understanding for the development of further blended learning scenarios.

e) Individual learning progress. Project-based and blended learning environments encourage autonomous learning. All interviewed learners report that they developed new skills independently while working on their projects using blended learning methods: *“I think I really learned a lot in this course because I taught myself. I developed competencies on different levels independently.”* Some students value the factor of autonomous work as a special property of the courses: *“Autonomous working, the development of one’s own ideas and the responsibility that comes with the execution of the project. This was missing in my studies.”* Many learners also reported about changes in their learning processes and strategies. These changes can be traced back to the blended learning design and interactive tasks: *“...we had the chance to work on our own, completely independent of time and place, which was good. And afterward, we could share in class our solutions and our thoughts (...).”* All the interviewed students welcomed the fact that the online content served as a preparation for collaboration and could be used independently. The value of the combination of self-regulated learning and interactive collaboration was mentioned emphatically several times. Several students report that their methods of learning changed because of the use of online content and the connection between self-regulated learning and classroom discussion. In addition to this, the individual learning progress is strongly associated with the project-based character of the course, which seems to help students by the development of new competencies in various disciplines: *“...and in my opinion, you only learn things, when you actually do things. This is why I appreciated the projects so much.”*

As many students also appreciate the autonomous interaction via open forums and chats, an option for future courses could implement video forums in theme-centered groups without a teacher. In this context, the idea of closer collaboration between learners was mentioned several times; teams, which discuss common methods and projects or even work on the same project, are certainly a constructive and promising idea for future project-based and blended learning courses.

4.3 Analysis and interpretation through triangulation

The multi-method approach of this study is looking for reliable quantitative feedback about the implemented courses, as well as individual, subjective perspectives about learners’ behavior and preferences in project-based and blended learning contexts. The quantitative perspectives (see section 4.1) generate general feedback about the courses to show trends in learners’ behavior and preferences and to help develop items for the following qualitative evaluations. The qualitative perspectives were implemented to gain deeper knowledge about the attitudes of the participating students and to learn about the demands of a project-based and blended learning environment in general (see section 4.2). The methods employed largely focus on the same phenomena and are discussed in this final analysis, using the method of triangulation [19].

Three main foci could be established during the analysis process: (I) behavior in and attitudes towards project-based and blended learning environments, (II) development of learning skills in learners, and (III) impulses for the improvement of future combinations of project-based and blended learning scenarios.

(I) Overall, the interviewed learners show mostly positive attitudes towards the project-based and blended learning design of the courses.

Within the blended learning settings, the students mostly valued the manifold opportunities for self-regulated learning and the flexible mix of digital learning and classroom sessions. Many learners discuss that they enjoy the blending of individual reflection online, the digital interaction with other students and, finally, the collaboration—online and in class—in groups. Against this backdrop, the blended learning settings seem to encourage independent learning, as the online content can be retrieved and reused self responsibly; online interaction can take place anytime, and collaboration can be established with chosen partners outside the classroom.

Concerning the project-based approach, many of the interviewed learners emphasized the importance of autonomous working and learning within a solid course structure. The motivation to plan individual projects of interest, to connect with different partners and to implement one's ideas seem to be important to many students.

These factors are discussed many times in the conducted interviews and seem to lead to the development of various learning skills. In these contexts, project-based and blended learning scenarios seem to go together, as they support both autonomous learning and collaboration. These findings correlate with the positive attitudes students show towards the project-based and blended learning structure of the courses in general.

(II) The findings indicate that the project-based and blended learning settings of the courses enable learners to develop their learning skills and acquire new learning techniques. Many students report that they use the provided online contents and tasks in a flexible and largely independent manner—a way of learning that is new to many of them. Furthermore, the self-responsible planning and implementation of individual projects are discussed as highly motivating and educative as it challenges learners to connect with others and reflect the connected topics in depth. Many students also emphasize the fact that the (digital) interaction with others, in the project-based settings, is a means of collaboration, which changed their learning habits. Finally, self-regulated and autonomous learning combined with collaborative elements seems to embody a challenge that offers learning potential via a project-based and blended learning design.

(III) Project-based and blended learning settings require a structure that enables learners (a) to find themes and develop projects individually through chosen (online) content and multiple perspectives; (b) to share and discuss their ideas collaboratively; (c) to develop shared knowledge individually and through collaboration; (d) to present their work; and (e) to develop new content and tasks for themselves and others. To meet these requirements, the course designers must present a solid course structure that describes the balance between autonomous work and collaborative learning as well as digital and classroom learning.

5 Outlook

Project-based and blended learning scenarios in the field of education can generate a high level of motivation in learners and encourage them to work more autonomously. The implementation of individual projects and the use of blended learning scenarios

can lead to the development of interdisciplinary competencies, a deeper insight into chosen topics and many-sided connections to future work fields. Against this backdrop, project-based and blended learning settings have to offer a fine balance of autonomous and collaborative work, which is accompanied by a reliable course structure and individual support. The designers of the course should present a flexible yet clear outline, which describes the balance between digital and classroom learning, and between individual learning and interaction.

In this study, many students comment on the process of autonomous work as being a crucial factor in their learning experiences. By following individual interests and ideas, especially in a project-based and blended learning setting, students can develop and foster competencies through active and project-based learning processes. Learners can gain from these processes as they can (a) set appropriate goals autonomously, (b) work and learn within a reliable structure, (c) have frequent opportunities for individual and collaborative revision and (d) connect with (work) fields of personal interest. These processes support one another as they aim at the development and fostering of competencies and can help students become more aware of their learning activities and (work) fields of interest [20].

These encounters, which are made possible by the project-based and blended learning designs of the courses, might be regarded as transformative as they meet the challenges of the time constructively and support students in their ways of becoming autonomous experts in their chosen fields.

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