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Preliminary Communication

Balanced Learning Design Planning: Concept and Tool

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Abstract

We present a comprehensive learning design (LD) concept and tool, motivated by the needs identified by higher education (HE) practitioners. The concept and tool aim at implementing contemporary research findings and theory to support balanced LD planning (BDP). The student-centered BDP concept and tool provide innovation to LD planning by strongly focusing on learning outcomes (LOs) and student workload, aligning study program and course level LOs, ensuring constructive alignment and assessment validity, enhancing LD by using learning analytics, and enabling flexible use in different contexts and pedagogical approaches. The ongoing work has been done according to design science methodology, with positive first feedback from HE practitioners. We identify areas for further research and improvement, including testing the BDP tool in real-world HE contexts and its integration with learning management systems. This could help close the gap between intended (often innovative) LDs and their implementation in real teaching and learning environments.

Keywords: learning design, learning design tool, balanced learning design, learning analytics, innovative pedagogies

1. Introduction

Even before the COVID-19 pandemic, the use of digital technologies in education had already been widespread and growing. However, digital technologies had not always been used in a way that optimally supported effective learning. In higher education (HE), teachers frequently lacked time and support to innovate and enhance teaching

and merely reflected existing practices in digital environments. [14] However, in the fast-changing world, with altering objectives of education and changing learners, teacher-centric pedagogical approaches can no longer meet the needs of learners, and there is a need to use technology in education as efficiently as possible [23]. The COVID-19 pandemic has clearly accelerated and intensified the use of digital technologies in HE, including, inter alia, course design, instruction, assessment and learning analytics (LA), but there is still a gap between the potential and actual use of technology [22].

This paradoxical gap has been central to the emergence of a new area of research focused on making a better understanding of that mismatch: learning design (LD) research [7]. As a field, LD appeared at the beginning of 2000s, when the potential of the Internet in documenting and sharing examples of good practices in education was recognized [19].

Engaging in the process of LD is beneficial in both online and face-to-face (F2F) modes of delivery, but is especially relevant when it comes to e-learning, often focused on "content and services at the expense of learning (inter)actions" [1]. The LD approach greatly depends on technologies and tools enabling the development of "a participatory culture of design", supporting sharing and reusing [23]. In 2016 it was noted that, in the past decade, as educational institutions dealt with shifting to blended learning, implementing Web 2.0 technologies and online programs, LD had received increasing attention [17]. As digital technologies continued progressing and the world has been faced with the pandemic, putting a stronger focus on digital education and sharing of resources, LD remains a highly relevant topic.

To support the process of LD and the planning of learning and teaching, a range of LD tools have been developed [1]. In this context, possibilities of LA are being explored and discussed (e.g., [19]). The aim of this paper is to present a concept of balanced LD that takes into consideration student-centered approaches to teaching and learning, as well as practical issues related to the institutional use of an LD concept and an accompanying tool.

2. Literature review

LD has been defined in various ways. In the early 2000s, Koper and Olivier [13] defined LD as "an application of a pedagogical model for a specific learning objective, target group and a specific context or knowledge domain" (p. 98). They pointed out that LD determines which activities, and in which conditions, teachers and learners need to undertake, so that learners would achieve the intended learning objectives. Later on, Lockyer et al. [19] defined LD as "the documented design and sequencing of teaching practice", describing the order of learning tasks, resources and support developed by teachers for their students, capturing the "pedagogical intent of a unit of study" (pp. 1439 – 1442). Conole [7] presented it as a methodology that assists teachers and designers in more informed decision-making related to the design of learning activities, that is "pedagogically informed" and effectively uses relevant resources and technologies (p. 7). Bennet et al. [2] stressed that LD also deals with

how teachers adapt designs according to students' reactions, reflect on improvements and share ideas.

LD can be seen as having two aspects: conceptual and technological [6][23]. On a related note, Pishtari et al. [24] stressed that LD gives both conceptual and technological tools that can aid teachers in creating learning environments. According to Bennet et al. [2], LD puts an emphasis on technology-based tools and technical specifications, supporting design and setting up online repositories for sharing good practices. On a similar note, Conole [7] pointed out that LD deals with creating tools, design methods and approaches which can support teachers in developing pedagogically effective learning activities and curricula, while using technologies effectively.

The concept of LD has been related to the notions of sharing and reusing. As a key principle of LD, Conole [7] emphasized helping to make the process of design "more explicit and shareable" (p. 8). Similarly, Lockyer et al. [19] stressed that the essential premise has been "reusability" in different educational contexts (p. 1442).

LD has been linked with enhancing the efficiency of teaching. Bennet et al. [2] stressed the rationale that improvements to learning experience design can contribute to environments more supportive of effective learning, and therefore to the improvement of student outcomes. In a similar vein, in their study, Rienties and Toetenel [25] concluded that LD significantly affects learning activities, satisfaction of learners, and academic retention. Further, Conole [7] argued that more explicit and shareable design processes enable higher effectiveness of learning environments and interventions developed by teachers, and help learners to better understand their learning paths.

LDs can implement various learning theories, pedagogical models and approaches, and often focus on innovative pedagogies. In this respect, Laurillard [8] reminded of the claim that LD aims at "pedagogical neutrality" and LDs can express various pedagogies. Lockyer et al. [19] linked the development of the LD field with the premise that constructivist approaches can foster quality designs and practices. They noted that, in LD, there is a focus on experiential, project and inquiry-based pedagogies, paying attention to communication and interaction of learners. Findings by Toetenel and Rienties [26], referring to the LD approach of the Open University UK (OU), suggested that, when visualizing the design in advance, educators put less focus on traditional teaching patterns and create more student-centered designs. Further, as emphasized by Lloyd and Bahr [17], rather than being based on established learning theory, LD evolves in line with the conditions. LD can support the process of change of study programs, meaningful introduction of new study programs or courses, as well as the change of the mode of delivery. For example, the ABC LD tool of the University College London (ABC LD) has been recognized as useful in this respect [29].

It is possible to distinguish several common elements of LDs. Lockyer et al. [19] pointed out that the key elements include teaching and learning tasks, necessary educational resources and support mechanisms. Additionally, Koper and Olivier [13] suggested combining the LD and the physical resources into a "unit of learning", which they see as a generic title of a course, lesson etc., which can be used in different

settings in an online environment. In their vision of an LD support environment, Laurillard et al. [15] emphasized the alignment of LOs, sequence of activities and assessment. This is in line with Biggs' [3] emphasis on the internal alignment of the elements of LD, that is, LOs, teaching and learning activities and assessment - namely, the constructive alignment. It is important to take account of the framework for the utility of assessment, as described by van der Vleuten [27]. The framework contains five elements: validity, reliability, educational impact, acceptability and the cost of assessment. Ensuring the validity of assessment should be done by connecting the assessment plan with the intended LOs. This has been emphasized by Divjak et al. [9], who proposed a two-step approach. First, they established four criteria for the evaluation of LOs and, second, they proposed the use of multicriteria decision-making (MCDM) methods in determining the weights of evaluation criteria and the relative importance of LOs.

There is a growing interest in coordinating LD with LA, as the two can mutually provide valuable input. According to Lockyer et al. [19], LDs can serve as a framework for the design of analytics supporting faculty's teaching and learning decisions, and LA can provide more holistic information on the impact of learning activities. Moreover, Pishtari et al. [24] pointed out that while, on the one hand, LD can provide guidance and context to analyses and contribute to their relevance for various stakeholders, LA, on the other hand, can inform design-related decisions and contribute to the evaluation of LDs [11]. Lockyer and Dawson [18] stated that the integration of LA and LD may support the understanding of student behavior and provide recommendations needed when learning behavior is not aligned with the pedagogical intention. However, it has been stressed [11] that, when it comes to linking the two areas, initiatives are sparse, and there is no holistic framework and guidelines that would support its full exploitation. A number of researchers have lately focused on different aspects of LA and LD. For instance, Rienties and Toetenel [25] addressed how data analytics can play a critical role in a new generation of tooling for evidence-based LD. Further, Mangaroska et al. [20] showed that the behavior captured by multimodal data provides additional understanding of learner performance.

Further, it may be useful to classify teaching and learning activities (TLA) according to types and investigate their links with other aspects of LD [15][25][29]. In the context of the Conversational Framework, Laurillard identified six types of TLA: acquisition, inquiry, practice, production, discussion, and collaboration [14]. In this respect, related to online and distance education, Nguyen et al. [21] found strong influence of assimilative activities on workload and on relations with other learning activities. To provide practical guidance in the implementation of LD and LA, a number of authors gave conceptual frameworks that connect LD and LA [4][11][16]. Within the LA, the sub-field of curriculum analytics has been developed, focused on using evidence to support and direct curriculum decision-making [12].

3. Research methodology, the LD concept and the tool

Our research has been conducted in line with the principles of design science, where "artifacts we study are designed to interact with a problem context in order to improve

something in that context" [28]. We investigated practitioners' needs, relevant literature and existing LD concepts and tools in HE, in order to examine the state of play and identify areas for improvement. Subsequently, we have developed an LD concept and a tool called Balanced LD Planning (BDP).

Our research has encompassed the three tasks of the design cycle, namely, problem investigation, treatment design and treatment validation, as presented in Figure 1 and described in more detail in the following sections.

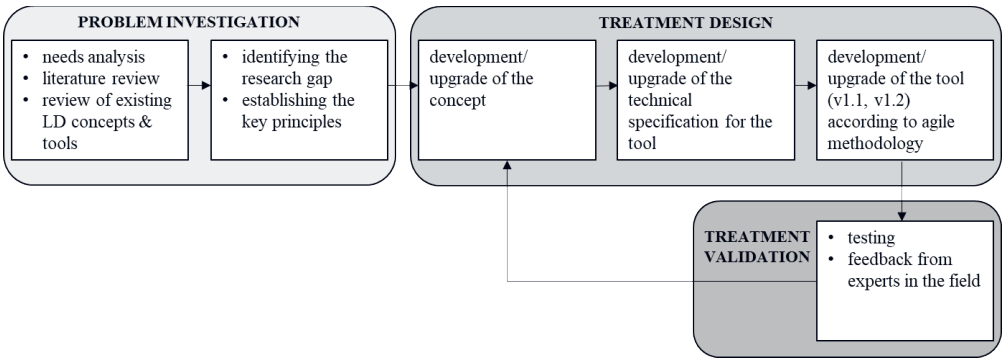

Figure 1. Flow diagram of the BDP concept and tool design process

3.1. Problem investigation

The motivation for the development of the BDP concept and tool has been twofold. First, at the level of our HE institution (HEI), a need has been identified by practitioners to develop an LD tool which would put a strong emphasis on LOs, not only at the level of a course , but also at the level of a study program, and their mutual vertical alignment. This is also in line with the requirements stemming from contemporary international and European Union (EU) policy initiatives, such as the Bologna Process [5] and the European Qualifications Framework for lifelong learning (EQF) [10]. Second, our HEI has been taking part in three separate international projects focusing on LA, which encompass a wide range of international practitioners and researchers. The implementation of the three projects has highlighted the need to develop a comprehensive tool which would support LD and its enhancement with the use of LA in an international context.

In order to respond to the identified needs, we first explored the relevant literature and the theoretical framework related to LD and LA. Then, we analyzed selected existing LD concepts and tools, particularly the ABC LD and the OU LD. The two concepts provided a valuable input for the development of some aspects of the BDP concept and tool, however, the new concept and tool also aim to introduce a certain level of innovation.

In this respect, we defined the key principles for the development of the BDP concept and tool, as follows:

- vertical alignment of LOs at the study program level with those at the course level, in line with the principles of the Bologna Process [5] and the EQF [10];

- horizontal alignment of intended LOs on the course level with TLAs and assessment, in line with Biggs' [3] idea of constructive alignment;
- workload planning including both student workload, which has also been recognized as an important element in other LD concepts (e.g., [26]), as well as teacher workload, which is related to institutional planning;
- resource planning, as one of the common elements within LDs [19], for all modes of delivery, including F2F, online, blended and hybrid, as there is a demand by students to increase the flexibility of study options [22];
- support to innovative pedagogies, prominent in LD [19], such as flipped classroom and work-based learning;
- feedback on the quality of course design, provided by LA [19].

3.2. Treatment design

Based on the concept we have developed in line with the principles, we have been working on the technical specification and the software tool, supporting the implementation of the concept in practice and providing a platform for its testing in actual LD planning. Both the concept and the tool are subject to continuous improvement: they are developed in parallel and each upgrade to the concept is immediately implemented in the tool, in line with the principle of agile development.

On the macro (study program) level, as presented in Figure 2, our concept starts from study program LOs, and relates them to course LOs. These are mutually linked, ensuring vertical alignment. For a course LO, corresponding TLAs and assessment are defined, ensuring horizontal constructive alignment. Respectively, student workload is assigned.

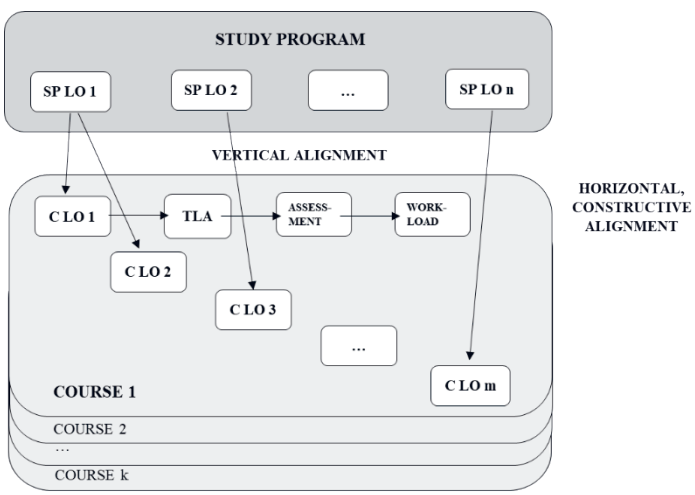

Figure 2. BDP concept: macro level. (SP LO - study program LO; C LO - course LO)

On the micro (course) level, as presented in Figure 3, the concept links course LOs with specific topics. Every topic is linked with units, each divided into activities, which are assigned with descriptors, including the TLA type.

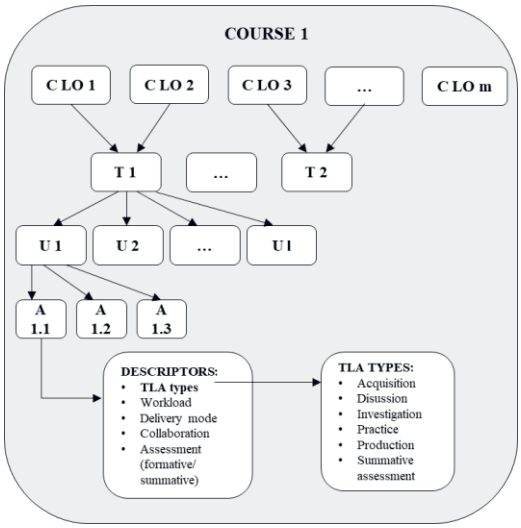

Figure 3. BDP concept: micro level. (C LO - course LO; T - topic; U - unit; A – activity)

Considering the descriptors assigned to particular activities, an important one refers to TLA types. When defining TLA types, we reflected on the six learning types as described by Laurillard [15] and the two selected LD concepts, the mentioned ABC LD and the OU LD. We mapped and compared them to identify common elements, as well as areas for possible improvement, and found a high level of similarity in the included TLA types, with certain differences in terminology. Particularly, all of these concepts included acquisition, discussion, investigation, practice and production. In terms of the major differences, we found that only the Conversational Framework and the ABC LD included collaboration, whereas only the OU LD included assessment. Taking into account the practical application as well as the relevant research and the theoretical framework, we defined the TLA types to be included in the BDP concept and tool, as presented in Table 1.

Although we found the TLA types of the analyzed LD concepts to be highly relevant, we perceived assessment and collaboration as - at least to some extent - horizontal elements that can be attached to activities of other TLA types. Therefore, in the BDP concept and tool summative assessment is always marked as a specific TLA type, while formative assessment can also be incorporated into activities of other types. Moreover, as the majority of activities can be done either collaboratively or individually, collaboration is not included as a separate TLA type, but is assigned to activities of various types.

Acquisition	Discussion	Investigation	Practice	Production	Assessment
Reading materials, listening to lectures and presentations, watching demonstrations.	Expressing ideas and questions in communication with peers and teachers (or other people).	Collecting, exploring, analyzing, interpreting and evaluating information.	Learning from experience, whether in a simulated or real-world environment.	Producing concrete outputs in written, audio, video or other formats, consolidating what has been learnt.	Evaluating the acquisition of LOs by forms of summative assessment.

Table 1. TLA types in the BDP concept

As for other descriptors, already the first version (v1.1) of the BDP concept and tool included the corresponding students' workload, delivery modes, as well as an indication if the activity is collaborative and it includes assessment. However, as the concept and the tool are further developed based on the feedback from users, these descriptors have been additionally elaborated. Importantly, in the second version (v1.2), the activity delivery model has been extended in order to include a wider range of data, with a strong emphasis on assessment, as well as data on the form of feedback provided to students. The current version of the overall conceptual and data model (v1.2) is presented in Figure 4.

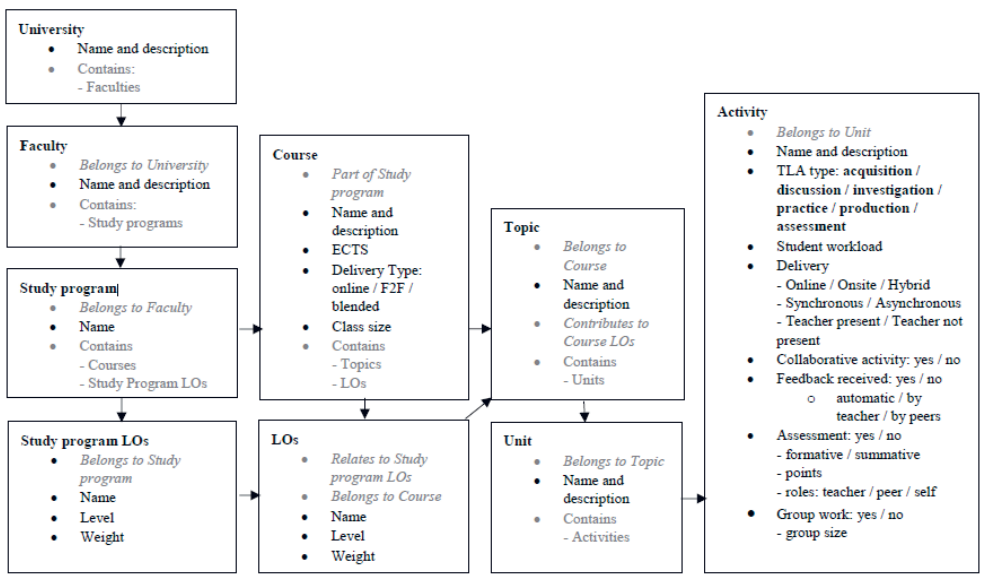

Figure 4. The overall conceptual and data model of the BDP tool

Furthermore, one of the essential elements in the overall BDP concept refers to determining the relative weights of LOs at both the study program and course level. The use of methodology proposed by Divjak et al. [9] is foreseen. This methodology

originally refers to course LOs, but can be used to calculate the weights of study program LOs. At the course level, the relative weights of LOs can be distributed among chosen assessment methods and tasks.

The BDP tool also provides possibilities for analysis of a planned LD, focusing on curriculum analytics. The LA dashboard gives a big picture of the entire study program with attached courses and provides support to practitioners in reflecting on their LD planning. The BDP tool enables to establish whether study program LOs are covered by course LOs. It also provides analyses of modes of delivery, TLA types, and horizontal descriptors such as collaboration and assessment. This is valuable in determining whether a practitioner's LD is aligned with the intended pedagogical concept. Further, it provides student workload analytics, related to a study program, a course and a topic, supporting more meaningful workload planning. It supports practitioners in the planning of credits (e.g. European Credit Transfer System - ECTS) assigned to particular courses, ensuring their alignment with the workload. Importantly, the BDP tool provides an overview of intended LOs' evaluation through assessment activities. This type of analytics is not foreseen by other related LD concepts, and it presents an important aspect of innovation provided by the BDP concept.

3.3. Treatment validation

To validate if the BDP concept responds to the established requirements, we have started the process of validation. In the first validation cycle, the first version of the BDP concept and the tool (v1.1) was presented at an international workshop organized within an EU Erasmus+ project dealing with relevant assessment and pedagogies for inclusive digital education, held at the beginning of September 2021. The workshop was attended by 30 practitioners (HE teachers) from five universities in four countries (Croatia, Germany, the Netherlands, the UK). Practitioners designed a course using the BDP tool, applying innovative pedagogies, namely, the flipped classroom and work-based learning.

Practitioners reported a highly positive feedback in terms of the usefulness of the tool and its applicability in their contexts. However, they also provided valuable feedback in terms of further improvements. Most importantly, they suggested to enable more detailed options related to the modes of delivery of activities, as well as to introduce a more refined division related to types of assessment. They also suggested to clarify definitions and enable flexibility, and introduce the possibility to use only particular segments, without referring to a comprehensive study program. Based on the received feedback, both the concept and the tool have been updated and the second version (v1.2) developed.

In the second cycle, version v1.2 was validated at an international workshop within another EU Erasmus+ project aiming at accelerating the transition to education 4.0 in HEIs, held later in September 2021. The workshop was attended by 22 practitioners from seven universities in seven countries (Croatia, Estonia, Italy, Serbia, Slovakia, Spain, the UK). Here, the BDP tool is used to build courses to be implemented in collaboration between the participating universities.

The feedback received was also highly positive, but included suggestions for further development. It was suggested to introduce an overarching level of vertical alignment, linking LOs with national or international qualifications frameworks (e.g., the EQF). The value of integrating the LD tool with a learning management system (LMS) was stressed, especially in tracking students' progress. Participants were highly appreciative of the constructive alignment between LOs and assessment activities, stressing the importance of clearly linking LOs with concrete assessment tasks in LMSs.

The received feedback is being taken into consideration in the further process of continuous improvement of the BDP concept and tool.

4. Discussion and further research

Our practice has motivated us to conduct research based on design science, look beyond the common elements of LDs and investigate areas for innovation, to develop an LD concept and a tool which would answer more comprehensively to the current needs in HE. These are related to the quality of teaching and learning, life and work in the world of industry 4.0, as well as the rapid changes in delivery modes following the COVID-19 pandemic. Lead by the principles we defined based on the existing research, the constructivist theoretical framework and selected LD concepts, we started the process of designing a novel concept and a tool which provide a balanced approach to LD. The novelty of the BDP approach lies on four pillars.

First, the concept puts a strong emphasis on LOs. This is reflected, first, in the principle of vertical alignment, ensuring that course LOs are aligned with study program LOs, bringing an institutional dimension to LD. Considering the contemporary educational developments and lifelong learning, vertical alignment is not introduced as a rigid category. The BDP concept also allows for flexibility, supporting LD planning regardless of formal study program delivery. Second, the emphasis on LOs is also reflected in the principle of horizontal alignment. Namely, the BDP concept and tool are centered around the idea of constructive alignment between LOs, TLAs and the corresponding assessment. Third, the BDP concept and tool introduce the possibility to ensure assessment validity by determining relative weights of LOs. Both the second and the third pillar present the foundation for the acceptability of HE credentials. Fourth, the BDP concept puts a strong emphasis on the use of LA in balanced LD planning, in line with intended pedagogical approaches.

Moreover, even though the BDP concept and tool can support the implementation of various pedagogical models and approaches, as they are based on LOs and student workload, they are envisaged as student-centered with the constructivist theoretical approach, and therefore not completely pedagogically neutral.

The BDP tool has so far undergone two cycles of validation, which was done by HE teachers in modeled contexts which can be classified as non-formal HE. In the next phase, further feedback should be collected, relating also to the use of the BDP concept and tool in different contexts. In this respect, the BDP tool is currently being validated within another international Erasmus+ project (with partners from Spain, Portugal, Finland and Croatia), focused on enhancing the competences of HE

teachers, where it is used in the development of a concrete Massive Open Online Course (MOOC). The current feedback from this project has shown that users from different countries and contexts appreciate the theoretical guidance and practical usefulness of the BDP concept and tool in development of a MOOC, and pointed to further possibilities for technical upgrades, including interoperability and different formats of data export, as well as availability in various languages. This process can be seen as another step in validation research, as action research in which the BDP concept and tool are used to solve an actual problem, but they are still in the process of development and are not used independently of the research context.

In the next step, to determine how the BDP concept acts in the real-world and the original HE institutional problem context, the process should be extended beyond the design cycle and towards the next two phases of the engineering cycle: treatment implementation and implementation evaluation [28]. This means, first, the application of the BDP concept by practitioners in the planning of teaching of formal study programs (leading to qualifications) and courses at HEIs. Second, it presumes the evaluation by practitioners after having used the BDP tool in their everyday work.

In future, it would be worth exploring the possibility to introduce LOs also at the level of particular units within a course. This may enable even more refined analyses, but also opens up the question if additional granularity would make the tool too complicated and less practical for curriculum planning. Further research questions may refer to whether LOs weights need to be proportional to students' workload, as well as proportional to the share of a particular LO assessment in total assessment. It could also be explored which TLA types most significantly affect student workload.

Furthermore, as one of the important dimensions of LD refers to co-creating, sharing and reusing, further tool development could focus on the possibilities for building repositories of LDs, at least at institutional level, developed in line with innovative pedagogies and approaches, such as the flipped classroom. Special focus should also be put on the issues related to ethics, privacy and intellectual property rights. In addition, the BDP concept and tool could be further adapted to respond more meaningfully to the needs of pre-tertiary education and lifelong learning.

Possibilities for the use of LA are to be further examined and developed. One of the possible directions may be related to the link between planning LDs and actual implementation. Not many studies have, on a larger scale, linked LDs with learning behavior and students' performance [25]. The BDP tool can currently be used for benchmarking and comparison among various courses in LD planning, but it would be worth exploring the possibilities for analytics which would consider implementation data from LMSs. This would enable verifying if the realization of an LD corresponds with the plan. It could also provide an insight in the effectiveness of a particular LD, in terms of LOs acquisition, as well as the possibility to better understand the links between LD and learning activities, learner satisfaction and academic retention.

Limitations of our research may be linked to the validation of the BDP concept and tool in a limited context. Moreover, the BDP concept has been based on the experience of practitioners in the European HE area and, to some extent, inspired by EU instruments and policies. Therefore, in the next stages, non-European perspectives

could contribute to more invariant applicability. Finally, the development of the BDP concept and tool has so far been based predominantly on practitioners' perspective, and students' reactions have not been collected. As student-centeredness is an important pillar of this concept, students' perspectives should also be addressed in further research.

5. Conclusions

In this paper, we presented a novel LD concept and a corresponding tool aiming to provide support to balanced LD planning. We started with a needs analysis at a HE institution level, as well as course development needs in the scope of international cooperation projects in the field of HE. Then we reviewed relevant literature and similar concepts and tools. Based on that, we have developed the BDP concept and tool. The concept and the tool have been validated by two groups of international HE practitioners. The received feedback has been implemented in order to upgrade the concept and the tool. The foundation of the BDP concept and tool are LOs, which should be aligned at the study programme and course level. An important requirement refers to constructive alignment between course LOs, TLAs and assessment. Further, the BDP concept emphasizes the need for ensuring validity of assessment, which can be put to practice by calculating LOs' relative weights. Finally, the BDP concept opens possibilities to use LA in enhancing LD planning, supporting the implementation of innovative pedagogies. In terms of further development, we envisage and integration of the BDP with an LMS, the use of LA to identify the gap between the intended LD and practical implementation, as well as exploring the possibilities for co-creation, sharing and reusing LDs in supporting innovative pedagogies.

6. Data availability statement

Data sharing is not applicable to this article as no datasets were generated or analyzed during the current study.

7. Declaration of interest statement

The authors declare that there is no conflict of interest.

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