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Development and alignment of undergraduate medical curricula in a web-based, dynamic Learning Opportunities, Objectives and Outcome Platform (LOOOP)

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Abstract

Introduction: This study presents a web-based method and its interface ensuring alignment of all parts of a curriculum map including competencies, objectives, teaching and assessment methods, workload and patient availability. Needs, acceptance and effectiveness are shown through a nine-year study.

Methods: After a comprehensive needs assessment, the curriculum map and a web-based interface “Learning Opportunities, Objectives and Outcome Platform” (LOOOP) were developed according to Harden’s conceptual framework of 10-steps for curriculum mapping. The outcome was measured by surveys and results of interdisciplinary MCQ-assessments. The usage rates and functionalities were analysed.

Results: The implementation of LOOOP was significantly associated with improved perception of the curriculum structure by teachers and students, quality of defined objectives and their alignment with teaching and assessment, usage by students to prepare examinations and their scores in interdisciplinary MCQ-assessment. Additionally, LOOOP improved the curriculum coordination by faculty, and assisted departments for identifying patient availability for clinical training.

Conclusion: LOOOP is well accepted among students and teachers, has positive effect on curriculum development, facilitates effective utilisation of educational resources and improves student’s outcomes. Currently, LOOOP is used in five undergraduate medical curricula including 85,000 mapped learning opportunities (lectures, seminars), 5000 registered users (students, teachers) and 380,000 yearly page-visits.

Introduction

One of the challenges in curriculum deliberations is to make sure that a curriculum is up-to-date; the content is well-spelled out with clear objectives for knowledge, skills and attitudes (KSA) and responds to the needs of the community. When outcome competencies are pre-defined and attainable, individualised learning becomes easier. Additionally, learning opportunities and assessment methods have to be realistic in an interdisciplinary setting, leading to improved abilities of clinical reasoning and decision making (Frenk et al. 2010; Hays 2014) as well as professionalism (Jameel et al. 2013; Birden et al. 2014). However, implementation of these interdisciplinary principles into existing curricula is a great challenge as competencies, objectives and assessment are often uncoordinated and unaligned with learning opportunities (e.g. lectures, courses, clinical ward units) – both within and...
between different medical faculties. Therefore, great effort is exerted to coordinate and align medical curricula and to structure the vast amount of available information in a transparent way. This transparency is an essential precondition for all accreditation processes (Ellaway et al. 2014). Especially in countries where curriculum designers, students and teachers have to coordinate and align curricula over long distances, appropriate platforms for curriculum mapping and management become effective.

Behavioural objectives can be a good basis to align teaching, learning and assessment, because accurately defined objectives are lucid and self-explanatory (Bloch & Bürgli 2001). For this reason, both for students and for the teachers who have decreasing time to prepare their teaching units (Albanese et al. 2008; Crawshaw 2010). In addition, well-articulated objectives are a necessity in order to be assessed with established, valid and reliable methods (Lurie 2012). However, objective-based curricula often result in massive amounts of data, making it impossible to see the whole picture and potentially fostering misalignment, which is sometimes ignored (Harden 2002; Pangaro & Ten Cate 2013).

Competency-based medical education (CBME) takes a different approach, placing the student in the centre of the curriculum (Frank et al. 2010; Harris et al. 2010; Pangaro & Ten Cate 2013). Different outcome frameworks have been specified to serve as guideposts in CBME (e.g. ACGME 2006; Pangaro 1999, Frank 2005; Carraccio et al. 2008; Cumming & Ross 2008). However, CBME requires careful and intensive coordination between all faculty members (Albanese et al. 2010), because it may end up in a “logistic chaos” (Frank et al. 2010), especially in times, where time for preparing teaching activities and engagement in curriculum development decreases due to increasing workload (Albanese et al. 2008; Crawshaw 2010; Foster & Laurent 2013). Furthermore, assessment of competencies is elaborate (Lurie 2012; Hauer et al. 2013; Morcke et al. 2013; van Loon et al. 2014). Thus, transition of existing curricula (e.g. a traditional curriculum) to CBME is a great challenge and is nearly impossible without technical support which prevents the mentioned “logistic chaos”.

Increasing work load of patient care and administration as well as increasing patient shortage also require consideration of total weekly workload of each department already during curriculum development to avoid a “teaching duty overload” and to ensure that the planned curriculum can be taught and is feasible (Albanese et al. 2008; Foster & Laurent 2013; Balzer et al. 2014).

Web-based curriculum mapping may be a feasible approach to solve the above-mentioned problems as it enables alignment of complex, student-centred competencies with course specific, well-defined behavioural objectives (Grossley 2014). In addition, it may ensure sufficient learning conditions, particularly by considering available teachers and suitable patients during curriculum development.

Thus, the purpose of this study was to address all the above-mentioned aspects and to design and evaluate an efficient and effective web-based method for curriculum development which considers all aspects of a curriculum map according to Harden’s conceptual framework (Harden 2001). Besides alignment of the key areas (competencies, objectives, learning opportunities and assessment), special emphasis was put on feasibility of the curriculum, on promotion of collaboration of up to hundreds of faculty members during the planning process, and on the possibility of documentation of teaching activities for later financial calculations. The method should be usable for both development of new as well as transformation of existing curricula, with the possibility of measuring and analysing the resulting effects, functionalities and usage rates as indicators for usability and acceptance of LOOOP.

Methods

The web-based, dynamic Learning Opportunities, Objectives andOutcome Platform (LOOOP) was the result of a nine-year process of development, implementation and evaluation that was undertaken from 2004 to 2013.

The following steps were executed:

(I) Needs assessment, development of the curriculum map and implementation of the web-based interface:

(a) Exemplary needs assessment for curriculum mapping.
(b) Development of an appropriate structure for a curriculum map which is suitable for most universities.
(c) Implementation of LOOOP as an interface, which makes the curriculum map usable for all stakeholders.

(II) Analysis of effects of implementation of the map on
(a) curriculum structure,
(b) usage and usefulness of objectives,
(c) interdisciplinary coordination,
(d) results of interdisciplinary MCQ-assessment.

(III) Evaluation of current usage statistics and used functionalities

Needs assessment, development of the curriculum map and implementation of the web-based interface

The process described below uses Arabic numbers following the 10 steps for curriculum mapping published in AMEE Guide No. 21 (Harden 2001).

1. ‘Assess needs”

2004: An exemplary needs analysis was performed among fourth-year students of an organ-based, interdisciplinary curriculum of human medicine, consisting of 13 disciplines, 52 departments, 261 lectures and 4896 clinical ward units (CWU) by using a paper-based questionnaire with a 3-point Likert scale (agree, undecided, disagree). This questionnaire consisted of questions concerning quality of objectives, alignment of CWUs and objectives, number of suitable patients/diagnoses in CWUs, coordination between disciplines and coordination within disciplines.

2. “Scope the task”, 3. “Establish the links”, 4. “Populate the windows” and 5. “Decide the format of the map”
The curriculum map was established sequentially according to the following timeline:

2004–2005: Structure of the map – including all windows described by Harden (Harden 2001, see Table 1) and links between these windows – was developed offline.

2005: LOOOP was designed, implementing four out of 10 of Harden’s windows. These four “key areas” contained outcomes/competencies, content, learning opportunities and assessment.

2005–2006: Six interdisciplinary focus groups discussed and decided upon the content of the “key area map” for the aforementioned exemplary organ-based fourth year curriculum. Special emphasis was given to the selection and definition of verbs, alignment of objectives, learning opportunities and MCQ-questions.

2009–2013: Structure of the map was modified in order to integrate the clusters described by Willet (Willet 2008, see Table 1) and was implemented accordingly into LOOOP. Use of LOOOP was extended to all five undergraduate curricula.

The whole LOOOP development process was performed according to the spiral model of Software Development (Boehm 1988).


A concept for tracking and visualising all changes of data represented in the map was developed to ensure gapless documentation of curriculum mapping. A hierarchical system of online users with specific responsibilities was implemented to structure access as well as respective rights to read or write in the designated sections of LOOOP. In addition, a system for evaluation and updating the map was established using a “ticket system” mentioned below.

10. “Familiarize staff and students with the map”.

Several symposia, lectures and workshops were organised to familiarise faculty and students with LOOOP and the underlying curriculum map. In addition, answers to “frequently asked questions” (FAQs) were made available online, and a support hotline was set up. An e-mail system (“ticket system software”) was implemented to allow tracking of all incoming support requests.

### Analysis of effects of implementation of the map

All students of three consecutive semesters of the above-mentioned exemplary organ-based, interdisciplinary fourth year curriculum who participated in the regular final interdisciplinary MCQ-test (70 questions) were included from 2006 to 2008. Group 0 (first semester) served as the control group. This group studied the original curriculum without any modification, i.e. without curriculum mapping and without use of LOOOP. Students of Group 1 (second consecutive semester) studied the modified curriculum after curriculum mapping and used LOOOP. In this semester, LOOOP was only promoted among students and not among teachers. Students of Group 2 (third consecutive semester) studied the same curriculum, received MCQ-questions from the same pool, used the same functions of LOOOP and all students received the same promotion for LOOOP as Group 1. The only difference between Group 1 and Group 2 was an intensive additional promotion of LOOOP among teachers.

Results of the MCQ-tests were analysed, and all students were asked to complete a 7-point Likert scale concerning the usage and usefulness of course objectives (KSA), assessment preparation and lecture/CWU cooperation. Differences between groups were analysed using the Kruskal–Wallis test. In case of significant differences, Mann–Whitney test between single groups was performed and was corrected for repeated measurements. Significant differences were assumed by $p<0.05$.

### Evaluation in regard to current usage statistics and used functionalities

Anonymised log files of the webserver were used to analyse usage of the curriculum map including number and type of visited pages. Additionally, the number of accounts to the

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**Table 1. Comparison of windows adapted from Harden (2001), the herein described curriculum map and clusters of features of such maps (adapted from Willet (2008)).**

<table>
<thead>
<tr>
<th>Windows (Harden)</th>
<th>Curriculum map/LOOOP</th>
<th>Clusters (Willet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning outcomes</td>
<td>(a) Competencies/outcomes, and learning spiral can be defined</td>
<td>Cluster 3: learning outcomes, specific learning objectives, learning opportunities</td>
</tr>
<tr>
<td>Content</td>
<td>(b) Objectives are strictly matched to a, c, d and g</td>
<td></td>
</tr>
<tr>
<td>Learning opportunities</td>
<td>(c) Learning opportunities refer to learning outcomes and are matched to objectives, disciplines and departments</td>
<td>Cluster 2: Assessments, assessment method descriptors, teaching or learning method descriptors</td>
</tr>
<tr>
<td>Student assessment</td>
<td>(d) Every objective is aligned with assessment methods. Teaching methods, resources and associated peer teaching are defined for every learning opportunity. In addition, all disciplines and departments are linked to learning opportunities</td>
<td></td>
</tr>
<tr>
<td>Learning resources</td>
<td>(e) Personalised views are available for faculty and students</td>
<td>Cluster 1: teachers, date, time, students, location</td>
</tr>
<tr>
<td>Timetables</td>
<td>(f) A hierarchical system allows use of different parts of the map with different rights to read or write</td>
<td>Cluster 4: freeform keywords, controlled vocabulary or ontology</td>
</tr>
<tr>
<td>Learning locations</td>
<td>(g) Structured vocabularies (e.g. verbs) and descriptors (e.g. MeSH) may be used</td>
<td></td>
</tr>
</tbody>
</table>

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**Notes:**
- Significant differences were assumed by $p<0.05$.
login-restricted parts of the interface served as a measure of usage. Due to data protection regulations, these data cannot be assigned to the respective users and therefore a voluntary, qualitative analysis of the LOOOP features used was performed in all fifth year students of an outcome-based reformed curriculum (2013). This curriculum is one of the above-mentioned five undergraduate curricula, which uses LOOOP. Based on the clustered results of the qualitative analysis, a questionnaire was developed and completed by fourth year students of the same curriculum one week afterwards.

The questionnaire consisted of
- used LOOOP-features (check boxes),
- one statement ("Implementation of LOOOP improved the processes") with a 7-point-Likert scale (1 = agree totally, 7 = disagree totally) and
- one commentary field for suggestions.

Results

Needs assessment, developed curriculum map and implementation of the web-based interface

Needs assessment

Two hundred and fifty-four out of 586 students (43%) completed the questionnaire for needs assessment. Only about one-third of the participants were satisfied with the quality of objectives (35.8% agreement), alignment of CWUs and objectives (33.1% agreement), number of suitable patients/diagnoses in CWUs (26.0% agreement) and coordination between disciplines (35.5% agreement). In contrast, coordination within disciplines was viewed more favourably (50.5% agreement).

Developed curriculum map and implementation of the web-based interface

Educational objectives (KSA) are the central part of the curriculum map and are directly aligned with all key areas (Figure 1), especially with competencies (learning outcomes), learning opportunities and assessment. These key areas are linked to several parts of the map (windows) which are described below.

Table 1 compares the developed curriculum map in LOOOP with windows adapted from Harden (2001) and with clusters of features of such maps described by Willet (2008). The following section focuses on some specific aspects.

Figure 1. Structure of developed curriculum map. Bold boxes represent key areas adapted from Harden (2001), italic boxes are only available for teachers and curriculum planners. Objectives, self-studies and peer-teaching are grey framed to visualize that they all contribute to the intended outcomes/competencies. Since “Curriculum management”, “staff” and “students” present the main stakeholders and thus users of the map, they are not part of the map itself. MeSH: Medical Subject Headings.

Competencies, objectives and visualisation of learning spirals (“key areas”). Each objective is defined by standardised verbs according to a modification of Bloom’s taxonomy (Anderson 2005). These verbs properly describe and progressively increase in depth, critical thinking and problem solving. Selection of verbs can be made intuitively by curriculum planners, teachers and students without prior knowledge about the implemented taxonomy. A designated feature of LOOOP analyses text input of learning objectives and assists in selecting the appropriate verb. LOOOP visualizes learning objectives according to the respective category of Anderson’s 24-square-table (Anderson 2005) and to respective Reporter–Interpreter–Manager–Educator (RIME) roles (Pangaro 1999). Consequently, only those objectives that accurately correspond to the knowledge, skills and attitudes required for a
course or a curriculum are selected, edited and matched to the acceptable list of competencies. In addition, all objectives are strongly aligned with their respective method of assessment.

By usage of combinable filters, for example, descriptors (diagnoses, symptoms), departments, associated peer-teaching or national catalogues, LOOOP allows a comprehensive overview over the distribution of all competencies and associated objectives of the curriculum. Thus, larger or smaller parts of the learning spirals can be visualized and exported. Students have the option to comment on parts of the curriculum anonymously. Links to additional resources (i.e. e-books, web links, etc.) are made available for respective topics and study guides for daily use or for accreditation processes can be generated automatically.

Considering department capacities and patient availability during curriculum development. Department teaching capacities can be defined during the planning process, and LOOOP calculates the respective number of teachers needed during each week of the semester. Remaining teaching capacities of a given department can be displayed and exported.

Statistical patient availability is taken into account during curriculum development as previously described elsewhere (Balzer et al. 2014). Each objective is aligned with standardised descriptors adapted from MeSH which in turn are aligned to ICD-10 coded diagnoses. These ICD-10 codes are mapped with anonymised patient data of each department in order to calculate the number of available patients presenting the required diagnoses. When there are not enough patients for a given learning opportunity available in the selected department, LOOOP suggests alternative wards where patients presenting the respective diagnoses might be available.

Teacher and assessor assignment, personal timetable and teaching activity record. Each department is responsible for the assignment of suitable and available teachers. Qualifications of each teacher (e.g. training for problem-based learning) are documented, and LOOOP ensures that only qualified teachers are assigned to respective learning opportunities or will be trained in advance. When a teacher is assigned to two different lessons that take place at the same time, LOOOP issues a warning message and requires correction. Personal schedules can be exported by teachers and students in different formats (e.g. iCal, PDF), and all teachers are automatically reminded of their teaching responsibilities by email once a week. Everyone’s teaching and assessment activities can be viewed retrospectively for past semesters. Starting in 2014, the final state examination is also planned by using a sophisticated hierarchic system of rights which allows users to manage subordinated processes. Therefore, both construction and maintenance of the map can be performed online from any computer with internet access. All changes of data in the map are logged, tracking what was changed, when and by whom. This data can be used for detailed, anonymous visualisation of changes during curriculum development using a sophisticated versioning system especially for changes in assessment-relevant objectives.

Free online access for visualisation of LOOOP. We have established an exemplary LOOOP version with a fictional curriculum under "https://looop-demo.charite.de" to visualize the core functions of the platform. This freely available demo version may be explored manually or through a guided tour.

Analysis of effects of implementation of the map

Of the three semesters included, 778 students participated in interdisciplinary MCQ-test, 544 (44%) of these students also completed the questionnaire with additional questions on LOOOP. The implementation of LOOOP was significantly associated with improved perception of curriculum structure, amount of defined objectives, usage of objectives by students for preparation of lessons and assessment, usefulness for preparation of lessons and assessment, interdisciplinary coordination and scores of interdisciplinary MCQ-assessment. All effects were only detectable in Group 2 (LOOOP promoted among students and among teachers), but not in Group 1 (LOOOP promoted among students but not among teachers). For details, see Figure 2.

Evaluation of current usage statistics and used functionalities

About 85,000 lessons in all five undergraduate medical programs at Charité have been created or modified with LOOOP in 2013. About 60,000 of these lessons were part of our main module-based, interdisciplinary curriculum. All lessons have been “filled” with content (e.g., description of learning events, outcomes, objectives) by the responsible curriculum planners and could be assigned to dates, locations and teachers. The number of registered users including both faculty and students is currently about 5000 and increasing. The number of visits and visited pages analysed from the server log files are shown in Table 2. About 40% of the visited pages were related to content and about 60% of the visited pages were related to content.

Qualitative analysis of LOOOP features used by fifth year students (58 out of 60) of an outcome-based reformed curriculum identified four main topics: (1) content, (2) objectives, (3) timetables and (4) locations. To design the resulting questionnaire, topics 1 and 2 as well as 3 and 4 were combined, respectively. Table 3 presents the results of the subsequently performed evaluation among fourth year students of the same curriculum (55 out of 60 students).

Discourse

Development of a curriculum map and implementation of LOOOP into different curricula is feasible and well-accepted among students and faculty. Usage of LOOOP improved
curriculum structure, usage and utility of objectives (KSA) for preparation of lessons and assessment, coordination between disciplines and student’s MCQ-results. This indicates that the integration and use of competencies and objectives provide a promising method when defined by standardised verbs and embedded into a well-defined curriculum. As all lessons – including the interdisciplinary ones – have been “filled” with content and were able to be assigned to dates, locations and teachers, the feared “logistic chaos” was prevented.

Willett identified three frequently encountered challenges in mapping curricula and called for more reports on successful approaches to these issues (Willett 2008). These three challenges have been successfully addressed through LOOOP and discussed in the following section.

**Facing challenge 1 (implementation of controlled vocabularies, taxonomies or ontologies to facilitate searching of the curriculum for specific topics, themes or concepts)**

A structured custom vocabulary was used to annotate objectives (Anderson 2005) and to align them with descriptors. In this study, we used MeSH as a descriptor, other possible taxonomies are described elsewhere (Blaum et al. 2013). This, together with an annotated list of outcomes, teaching formats and assessment items ensures that the chosen format, as well as the assessment blueprint, matches the objectives. It also leads to a spiral curriculum design in which objectives are self-explanatory parts of defined competencies. Such structured vocabularies and specific learning objectives have been shown to be beneficial for the learner both in theoretical contexts and in ward round teaching (Crawshaw 2010; Scheffer et al. 2010; Surapaneni & Tekian 2013).

**Figure 2.** Effects of LOOOP. (A) Group A (before mapping, without usage of LOOOP), (B) Group B (after mapping and promotion of LOOOP among students but not among teachers, (C) Group C (after mapping and promotion of LOOOP among students and among teachers. Data are shown as median (quartiles). A, B, C represent three consecutive semesters of the same curriculum. (Questionnaires: 1 = agree totally, 7 = disagree totally; MCQ-results: 1 = very good, 5 = very bad). Numbers of students are shown below X-axis.

**Table 2.** Number of visits and visited pages from 2011 to 2013.

<table>
<thead>
<tr>
<th>Year</th>
<th>Visits</th>
<th>Visited pages</th>
<th>Yearly visit increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>180,000</td>
<td>3,180,000</td>
<td>–</td>
</tr>
<tr>
<td>2012</td>
<td>258,000</td>
<td>3,515,000</td>
<td>43%</td>
</tr>
<tr>
<td>2013</td>
<td>380,000</td>
<td>5,500,000</td>
<td>56%</td>
</tr>
</tbody>
</table>

Numbers are rounded to the nearest thousand.
The combination of self-explanatory objectives with all described interface functions for searching and visualisation of smaller or bigger parts of the curriculum may ease establishment of CBME as it reduces the effort of each teacher to get an overview of the “whole picture” both during curriculum development and in daily teaching activity. This is a crucial aspect, as time requirement for “living” CBME in undergraduate medical education is extensive and may be one important obstacle for a widespread implementation of CBME in times of teacher shortage and work intensification (Albanese et al. 2008; Frank et al. 2010; Harris et al. 2010).

Facing challenge 2 (implementation of effective and efficient strategies for the construction and maintenance of the map as well as for improvement of faculty participation)

As curriculum mapping in LOOOP is an easy way to participate in curriculum development and to place topics into the curriculum, acceptance and usage in the faculty are very high and increasing. Combined with a comprehensive handbook, a personal telephone hotline and the easy web-based access, teachers and students value the benefits of the map. One reason for this acceptance may be that teachers and students can quickly and easily gain an understanding of what should be taught, when and why, and this decreases the time for lesson preparation dramatically (Albanese et al. 2008). In addition, maintenance of LOOOP as well as further curriculum development are eased by a sophisticated versioning and change-tracking system. These advantages appear to induce a kind of intrinsic motivation to participate in further development and maintenance of the map.

However, the whole process could be implemented rather easily if a core group of faculty have some formal training in medical education, or possess a Master of Health Professions Education degree (Tekian & Harris 2012), as the structure of the map eases curriculum development and maintenance but does not replace professional “human” coordination of the process.

Facing challenge 3 (appearance and usability of the interface have a significant impact on the use and success of systems)

Interface design may have a significant impact on the use and success of general software and thus also on mapping software. LOOOP is integrated into normal web sites and may be used intuitively. Therefore, the number of registered students and teachers as well as the number of page visits increased dramatically during the last few years, indicating a pronounced usability of the interface. Ninety-five percent of the students used LOOOP to get access to their schedules and 84% of the students used LOOOP to get information about content and objectives. This rate is much higher than what the authors anticipated and may be explained by the so-called “Generation Y”, or “Net Generation” students, which are characterised as being technologically savvy and demanding (Junco & Mastrodicasa 2007). Interestingly, PDF exports are used by many students, indicating that both online use and exports for “take away” into learning groups and courses are necessary for acceptance of a web-based curriculum map. The relation between downloaded technical information (e.g. schedules) and content information was 2 to 3. This means, that, even if the schedules (as mandatory information) may have triggered student’s visits to LOOOP, the “content part” of the map is also of high relevance to them.

Limitations and perspectives

There are a few limitations in this study. (a) Due to the structure of the tested fourth year organ-based curriculum, assessment was only performed as an MCQ-test. Therefore, only knowledge could be assessed. Data concerning practical skills and/or workplace-based assessments would be helpful to confirm MCQ-results. Therefore, this aspect will be studied soon. (b) As the students in the reformed curriculum are the only ones who know a curriculum with and without LOOOP, sample size of these intra-individual data concerning user behaviour is not as large as in the other parts of the study. (c) Direct evaluation of effects was only performed by student-questionnaires. Acceptance by faculty and satisfaction of curriculum planners and teachers with LOOOP and with the resulting interdisciplinary curriculum and its feasibility were only analysed indirectly by analyses of usage rates and by fully assigned content, schedules and teachers. Direct measurement of these factors as well as of reduced workload and improved patient availability will be necessary to confirm our indirect results.

In conclusion, the presented curriculum map and the associated interface LOOOP appear to be successful methods for curriculum development and alignment in undergraduate medical education. Investment in conducting a needs assessment for curriculum mapping, analysing and utilizing the results demonstrated a significant improvement in the attitude of the faculty and the outcome of the students. Quantitative and qualitative data indicated that the usage of this interface substantially increased, to the extent that all undergraduate
curricula at our faculty decided to adopt the system. This system could facilitate the challenge at most institutions to develop, modify or optimise their curriculum and at the same time motivate faculty to participate in such a process.

Next steps of development will include tools to measure, document and visualize the intra-individual improvement of each student. Part of this will be formative feedback from peer-teachers, students’ self-assessment and our “ASCLIRE” test for computer-based assessment of clinical reasoning (Kunina-Habenicht et al. 2015). Demands for quality improvement and audits for accreditation purposes require medical schools to provide structured information on their curriculum (Ellaway 2014). Currently, the Association of American Medical Colleges oversees the creation of a “Curriculum Inventory Standard” in order to establish a standard for exchanging curriculum data. Standardisation of curricular data, however, starts where curriculum mapping ends: Both processes should be closely linked, and LOOOP might be extended with this functionality in the near future.

**Glossary**

**Competency-based medical education:** An educational process built upon the ability to define and describe the competencies that physicians must acquire upon graduation.

**Note**

1. Charité currently runs five different undergraduate and 12 postgraduate curricula for a total of 6000 students.

**References**


F. Balzer et al.