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SoTL in Process

A Protocol for Minimalist Curriculum Mapping

ABSTRACT

Curriculum mapping is a powerful tool that teachers and pedagogical developers can use to improve courses. It can, however, be both costly and time-consuming. This article describes a protocol for minimalist curriculum mapping that is easy to implement, highly flexible, and requires no specialized software. The described method is paired with the use of supplemental instruction, allowing access to high-quality information without the need to conduct interviews or distribute questionnaires. In the case described, minimalist curriculum mapping was used to determine the optimal use of digital tools for online courses. The protocol described can easily be adapted to serve other purposes. It can also be used without reliance on supplemental instruction. It is argued that this makes the protocol a simple and flexible way to reap some of the benefits of curriculum mapping without incurring all of the costs.

KEYWORDS

curriculum mapping, pedagogical analysis, digital tools in teaching, blended learning, supplemental instruction

INTRODUCTION

In the Department of Philosophy at Stockholm University, we have implemented a protocol for minimalist curriculum mapping. We believe strongly in its versatility but encourage other researchers to test the protocol's effectiveness in other educational contexts.

University teaching has shifted from traditional face-to-face methods to digital formats, including the delivery of fully online courses. Online education facilitates access to high-quality learning at low cost, offers flexibility to students, enables personalized feedback, which aids learning (Mertens, Finn, and Linder 2022; Wisniewski, Zierer, and Hattie 2020). Yet, flexibility demands strong self-regulation from students (Easterbrook and Hadden 2021; Owston, York, and Murtha 2013). Digital formats may foster feelings of isolation and reduce motivation (Flanigan, Akcaoglu, and Ray 2022). Digital learning impacts students differently, as shown by Le Cunff, Giampietro, and Dommett (2024) and Getenet et al. (2024), and blended learning presents a promising middle ground. But what digital materials ought to be integrated into blended learning?

To answer that question, our department needed a thorough understanding of the content in the courses taught, with funding approved by the university president to investigate this. SoTL articles propose diverse methods for conducting content analysis in educational improvement efforts; see, for instance, Harrington 2023 and Lake et al. 2024. We opted for a curriculum mapping approach, and our minimalist protocol curriculum mapping is a result of this project.

Curriculum mapping is a method to evaluate how an existing curriculum supports skill and competency development, while also highlighting potential gaps and areas for enhancement (Sumsion and Goodfellow 2004). While there is no universally accepted understanding of this method, it is widely recognized as a powerful tool. Its typical application is often complex and time-consuming (Rawle et al. 2017), creating a barrier for some users. To help overcome that barrier, we present a curriculum mapping protocol that is minimalist. It only involves two maps, does not rely on specific software, requires no specialized training, is time-effective, but still delivers important insights. Next, we describe the context in which our protocol was developed. The protocol is then outlined in a table that describes its stages (Table 1). We then review each stage, incorporating methodological remarks. In the final section, we comment on how this protocol can be modified.

THE CONTEXT

With initial funding from the university president, we formed a task force of four faculty members experienced in designing and teaching the analyzed courses. These courses have a significant overlap in content since all introduce basic concepts and techniques from critical thinking and philosophy of science.

- Introduction to critical thinking 7.5 ECTS-credits
- Knowledge, science and methodology 7.5 ECTS-credits
- Critical thinking and philosophy of science 7.5 ECTS-credits
- Introduction to logic 7.5 ECTS-credits

With over 2,500 students participating annually across these courses, the insights gained from this project carry significant educational value. Our specific aim was to identify the optimal use of digital tools in blended teaching methods. However, the protocol for minimalist curriculum mapping has broader applicability. It offers a detailed, step-by-step methodology that can be used for various pedagogical improvement projects requiring course content analysis.

THE DEVELOPED PROTOCOL

A common purpose of curriculum mapping is to align different perspectives of course content, comparing the delivered curriculum with students' learning experience. This strategy aims to identify gaps, redundancies, and misalignments in order to enhance educational effectiveness (Harden 2001; Lam and Tsui 2014; Rawle et al. 2017).

Traditional curriculum mapping often includes multiple perspectives: declared (official content), taught (lecturer delivery), delivered (student perception), and assessed (tested content). We simplified this by comparing just two maps:

1. I-MAP: Describes intended course content and sequencing, based on the lecturer's interpretation of syllabi and course literature (making the I-MAP a combination of declared and taught perspectives).
2. R-MAP: Captures students' perception of course content. While gathering multiple student perspectives traditionally requires extensive resources, we developed a more efficient approach using supplemental instruction (SI) leaders.

Our method simplifies this process by introducing "elements"—the smallest units of course content. The elements vary based on mapping aims; in our case, they include topics, themes, lecture activities, definitions, theories, methodological descriptions, and skill-development opportunities. We constructed the I-MAP by collecting these elements from lecture plans, exercises, and exams, organizing them in their intended presentation order. The final map reflects the lecturer's interpretation of syllabi and course literature. The task force spent three meetings, totaling approximately six hours, for the construction of the I-MAP.

The R-MAP corresponds to the course content as perceived by students. Creating this map poses a significant challenge since the perspectives of a possibly large group of students must be collected and organized in a way that is meaningful and feasible to compare to the I-MAP. We opted to use SI-leaders for this, which offered many benefits which we will discuss in our subsequent commentary.

Comparison of the two maps provides educators with insight into the effectiveness of their curriculum design and delivery. This comparison may reveal differences in the sequence of elements between the I-MAP and R-MAP or highlight elements present in only one of the maps, leading to improved student learning outcomes.

We describe our approach in Table 1 below, outlining the key stages of our protocol and detailing the components and actions involved at each stage. Next, we provide an in-depth commentary on each stage, offering additional context and suggestions for alternatives and improvements.

Table 1. Protocol for minimalist curriculum mapping

Stages	Components	Actions
1	The I-MAP and list of elements	1. Collect material describing the teacher's lecture-plan 2. Create a list of elements available for I-MAP. 3. Create I-MAP by placing elements in the order in which the lecturer believes they are delivered.
2	The R-map	1. Instruct SI-leaders about the purpose and design of the project. 2. Present list of elements in the I-MAP to SI-leaders. 3. SI-leaders have recurring meetings with the students. 4. Comparing the I-MAP with the students' perception of the content of the course.SI-leaders write a short report after every meeting. The reports are based on the elements from the list. 5. Collection of all reports during the course is SI-leaders' R-MAP.
3	Comparison and analysis	The task force compares the I-MAP and R-MAP(s).
4	Further action	Does the analysis of the differences between the maps suggest any changes?

Comments stage 1

We first identified what we called course elements. The mapped courses had both theoretical and practical learning outcomes. Therefore, we chose to divide the elements into two classes: knowledge-elements and skill-elements. An example of a knowledge-element is "the definition of deductively valid argument." A related skill-element is "the ability to use truth-tables to determine validity." Although imprecise, this categorization displays the ordering and interplay between elements.

The task force collected lecture plans, exercises, lecture notes, slides, and readings used in the courses (Action A). From these the task force extracted the elements and categorized them. For ease of use, all elements were added as tags in a database (Action B). We used the database of elements to create I-MAPs for every course included (Action C).

Comments stage 2

We made use of SI as an indirect way to gather the information needed to extract the R-MAP. This was cost-effective since the SI-leaders were already tasked with weekly SI-meetings. Creating R-MAPs replaced their standard task of writing weekly SI-meeting reports. A 7.5 ECTS course corresponds to five weeks of work. Each course was assigned one SI-leader, who held a one-hour meeting per week. The SI leaders spent approximately 20 minutes per week creating the R-map.

SI is an academic support model that offers a structured form of peer learning. Advanced students are recruited as SI-leaders. They are given specific pedagogical training and continuous support from a member of staff. The SI-leaders then lead regular, usually weekly, meetings for students. These meetings are aimed at helping students focus on the most important parts of the course content, as well as identifying any problematic parts. The meetings are open to all students, and attendance is high. (For more information about SI see Dawson et al. 2014 and Malm, Bryngfors, and Fredriksson 2018.)

Utilizing SI-leaders for creating R-MAPs offers several advantages. These leaders, being current students who have completed the relevant courses, offer a perspective closer to that of the student body, a viewpoint often challenging for seasoned educators to fully comprehend. SI-meetings are student-driven, focusing on their queries and issues, thus providing deep insights into their understanding of the course material. Furthermore, SI-meetings provide a low-risk environment, encouraging students to share experiences, free from fear of assessment. SI-leaders do not solicit direct feedback on R-MAPs or distribute surveys; instead, they infer and construct the R-MAP based on observations of student activities. Trained in the project's goals and design, they document these insights after meetings, linking activities to elements and identifying or adding new elements to the database produced at action 1C. This iterative process refines the R-MAP and aligns it with the foundational structure of the I-MAP.

The SI-leaders used the provided I-MAP as a starting point for creating the R-MAP. Allowing for the possibility that students perceive the course differently from the I-MAP, we enabled SI-leader to add new elements to the database when formulating the R-MAP. By the end of the courses, every SI-leader had created an R-MAP. (Actions B–D) and handed them over to the task force for further analysis. (Action E).

An important methodological issue concerns the number of students who are contributing to the creation of the R-MAP. The R-MAP was created by eight SI-leaders synthesizing input from approximately 650 students. This is a significant sample size, which adds considerable weight to our findings. However, our indirect method of creating the R-MAP may be viable even in cases when a smaller number of students participate in SI-meetings—provided that the students are both representative of the larger group and actively engaged during the SI-meetings.

Although attendance is high, it is not complete, and there is some risk of selection bias. One obvious alternative to using SI-leaders for the creation of the R-MAP is to send out questionnaires to or conduct interviews with students. This, however, is costly and time-consuming. High quality answers require a level of pedagogical self-reflection that might be an unrealistic demand of students. Therefore, we concluded that such methods have no place in a truly minimalist curriculum mapping. A key feature of using SI-leaders is that they can observe the students in a setting where the lecturer is not present and where the students' own activity is in focus. Instead of asking the students directly what their R-MAP is, we draw the R-MAP indirectly via the SI-leaders. One drawback of our approach is that it only captures the perspectives of students who attend SI-meetings. Other methods of identifying the R-map might fare better but will be more costly and time consuming. Alternative methods could use similarly indirect ways of creating the R-MAP. Teaching assistants could be tasked with creating the R-MAP based on their observations during exercise-sessions or question and answer-sessions.

Comments stage 3

What results the comparison and analysis can yield depends on how elements are selected and which maps are compared. Our analysis showed that some elements occur several times in either R-MAP or I-MAP. Some instances of repetition are intended by the lecturer since the content is central and worth repeating. In other cases, the repetition is not part of the teacher's planning, but a response to questions raised during the lecture. Additionally, we identified some elements that recur across multiple courses. We also noted the utility of some digital tools, such as films explaining the hypothetico-deductive model and truth-tables. Moreover, references in some digital tools employed during the pandemic now appear outdated to some students. Importantly, we also found that many students struggled with mastering specific elements, such as constructing proofs in natural deduction (a central skill-element in one of our mapped logic courses) and the concept of knowledge defined as true, justified belief (a central knowledge-element in all mapped courses).

Comments stage 4

As a response to the aforementioned repetitions, and taking effectiveness into account, we concluded that these elements could benefit from digitization. In response to the outdated digital material, we identified specific digital tools in need of revision to ensure the material remains effective and relevant.

The analysis of the maps gave valuable and precise information about what students were struggling with and helped us design digital tools specifically tailored to the challenges identified. To assist students facing difficulties with the mentioned logic-skill, we have created an app for practicing natural deduction proofs. To help students struggling with crucial definitions we have created a series of auto-checked quizzes aimed at assessing fundamental conceptual understanding. From an educational view, the conceptual knowledge elements that occurred across several courses were particularly interesting and, due to their reach, worth investing more in.

CONCLUDING REMARKS

The application of the protocol requires no specific software and gives a useful map even with a small time investment. While experienced, the creators of the elements and maps had no advanced training in curriculum mapping. It is important to recognize that what is actually delivered in a course is the result of a joint collaboration between teacher and students. It would therefore be inaccurate to say that the I-MAP is a definitive description of what is actually delivered. To get a more complete description of this, one could include the perspectives of other faculty members or pedagogical developers, in that way triangulating three perspectives in order to determine a more fine-grained description of what was actually covered. In this paper, we focused on comparing I-MAP with R-MAP, but the same protocol could be used to compare other kinds of maps.

Our specific aim was to identify the optimal use of digital tools in blended teaching methods. We implemented the protocol across four distinct courses that shared substantial similarities. However, the protocol has broader applicability. It offers a detailed, step-by-step methodology that can be used for any pedagogical improvement projects requiring course content analysis. It can be adjusted readily to suit smaller endeavors centered on individual courses or broader initiatives covering entire degree programs. Since the user determines what elements are used and how they are defined, the protocol is flexible. As an illustration of its effectiveness, users of this protocol may, with only a small investment, discover that:

- Lecturers and students share the same idea about the elements that have been brought up during teaching, but they haven't understood them in the same way.
- Lecturers perceive it as addressing a single element, but for the students, it involves several elements.
- Lecturers perceive one element as elementary, but for (many) students it is difficult.
- The order in which the elements appear differs between the R-map and the I-map.
- There are elements that exist on only one map.

A final note on the cost of using this protocol: based on our estimation, applying the protocol to a 7.5 ECTS credit course with one SI-leader will require approximately 10 hours: six hours for the task-force creation of the I-MAP, two hours for SI-leader protocol training, and approximately two hours per SI leader for the creation of R-MAPs.

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DISCLOSURE

Generative AI (ChatGPT and Claude) was used to correct grammar and spelling.

ETHICS

According to the Swedish Ethical Review Act (2003: 460), the research described in this article does not require a permit (from the Swedish Ethical Review Authority).

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