

INTERNATIONALIZING “METHODOLOGY OF SCIENCE”

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Abstract

The objective of this paper is twofold. On the one hand, it reports on a set of teaching innovations proposed for an undergraduate course in the “Methodology of Science” aimed at students in an international Central European Studies program. These are motivated by the perceived need to increase student participation and to address the needs of a diverse audience, chiefly by introducing peer learning and redesigning the course with an emphasis on student-centeredness. On the other hand, the paper outlines an empirical research project intended to study the impact of these innovations as they are implemented in the forthcoming academic year (2021/22) by drawing on a range of different data sources. The first two sections discuss the main considerations involved in reimagining the course. Section 3 describes the project’s hypotheses and the methodology of data collection and analysis. Finally, in Section 4, I discuss the difficulties that may arise while implementing the innovations and studying their outcomes.

Keywords: internationalization, peer learning, group work, research proposal, constructive alignment

Abstrakt

INTERNACIONALIZACIÓN „METODOLÓGIE VEDY“

Tento príspevok sleduje dva súvisiace zámery. Na jednej strane opisuje pripravovanú inováciu kurzu „Metodológia vedy“, ktorý je určený študentom bakalárskeho stupňa štúdia v medzinárodnom programe Stredoeurópske štúdiá. Navrhované zmeny sú motivované potrebou posilniť participáciu študentov a prispôsobiť predmet nárokom rôznorodého medzinárodného publika, a to najmä prostredníctvom využitia prvkov vzájomného učenia (*peer learning*) a prebudovania kurzu tak, aby bral väčší ohľad na potreby študentov (*student-centeredness*). Na druhej strane príspevok predstavuje projekt empirického výskumu, ktorý sa bude realizovať v akademickom roku 2021/22, a ktorého cieľom bude preskúmať účinok spomínanej inovácie. Prvé dve časti článku zhŕňajú úvahy, ktoré viedli k novej koncepcii kurzu. Druhá časť opisuje hypotézy projektu, ako aj metodológiu zberu a interpretácie dát. V poslednej časti príspevku sa zaoberám potenciálnymi prekážkami, ktoré sú spojené s implementáciou novej podoby kurzu a s realizáciou výskumu.

Klíčová slova: internacionalizace, vzájemné učení, skupinová práce, výzkumní projekt, konstruktivní soulad

INTRODUCTION

Introductory courses in the methodology of (social) science and research have long been a staple of universities' class rosters, and for good reason (Grüne-Yanoff, 2013). Such has also been the case at Comenius University in Bratislava, Faculty of Arts, where students in various social science and humanities (SSH) programs have been taking methodology courses for decades. Some of these specialize in the problems of a particular discipline (e.g., psychology or sociology), while others have a more general focus. The latter have mostly been taught by members of the Department of Logic and the Methodology of Science, including the author of this paper.

A relatively recent addition (2018) is a course aimed at students in Central European Studies (CES), an English-only program. The “Methodology of Science” course was modelled on existing courses taught in Slovak whose purpose is to introduce students to a range of fundamental methodological concepts and to the essentials of formulating a research proposal. For most CES students, it is the only course they will take where methodology is the exclusive focus.

The majority of CES students come from Slovakia (including a substantial share of students from the Hungarian minority), but there is always a good number of international students, mostly from non-EU Eastern European countries. This makes for a diverse course audience. Class composition in the “Methodology of Science” course is usually also enriched by the presence of visiting Erasmus+ students. Coming mostly from other EU countries, they pick the course out of a relatively small number of courses available in English. While CES students typically take the course in their first or second year, visiting students are often already in their third or fourth year of studying a variety of SSH programs.

Teaching the course since its inception, I have been confronted with two major challenges. For one, participation rates in various in-class activities, as well as overall student engagement, have been less than optimal. In a group of 10 to 20 students, only about a quarter seem to have genuinely engaged with the course. Secondly, due to differences between the more advanced (and often visiting or international) students and those less advanced in terms of their English language

skills and pre-existing knowledge, there has been persistent variation in learning outcomes between these two groups, as measured by the quality of submitted work and ultimately student grades. To put it bluntly, the course seems to be doing little by way of closing the gaps in skills and knowledge between these two groups.

To sum up, I was faced with the following problem: How to keep the course challenging enough for the more advanced students who seem to be interested in the material, while also encouraging the less advanced students to engage with the course and helping them attain the course's learning objectives? In the following section, I discuss the challenge in more detail and describe the innovations proposed to tackle it, contrasting the original and the new course design. In Section 3, I outline a research project designed to study the impact of these innovations. Section 4 deals with issues that may arise in implementation and in research.

1. COURSE DESIGN: OLD AND NEW

In part, the challenges described above can be viewed as stemming from the ongoing process of internationalization of higher education. The CES program aims – rather successfully – at attracting students from a wide variety of countries. Combined with visiting students, they form a diverse audience of “Methodology of Science”, with different levels of experience. For example,

- core CES students are mostly freshmen or sophomores, while Erasmus+ students are often more mature,
- international students (both those enrolled in CES and visiting students) are often already fluent in English, while some local students view the program, in part, as an opportunity to improve their language skills,
- some students had been exposed to courses in logic or methodology prior to taking the course, while others had not.

These differences lead to a different set of expectations and needs (e.g., students who have defended a BA thesis, as many visiting students already have, are familiar with much of the fundamentals), different levels of engagement (or, in the case of English skills, the very *ability* to engage), and ultimately to a varied learning experience with dissimilar outcomes, both in terms

of what students have learned and in terms of their grade.

In this way, teaching the course in an international setting uncovered weaknesses in the course design that had not been as apparent in a more localized setting.¹ In the following subsection, I briefly describe the original course design and discuss its problems.

1.1 The original design

The course assumes that students have little to no pre-existing knowledge of methodology. Hence, its aim has been to provide students with an understanding of the essential methodological concepts (e.g., *hypothesis, theory, measurement, experiment etc.*) and problems (e.g., the demarcation problem). Armed with such understanding, students should have an easier time in their future studies, when reading existing research (e.g., assigned readings in other courses) or designing their own research (such as a BA or MA thesis). A major objective of the course is that students learn how to formulate a research proposal – a document of 2–3 pages describing a (fictional) research project of their own. Since this requires systematic thinking and planning, not unlike project management, the knowledge and skills students develop stretch beyond academia.

The course consists of 11–12 weekly 90-minute sessions. In the original design, each class was based around a lecture on a specific topic framed as a set of interrelated concepts. Typically, the lecture would introduce a new concept as a means of describing or solving a particular problem, discuss its applicability and illustrate its use with a few examples. Every week, students would complete an obligatory or bonus assignment that would either involve the application of material covered previously, or “prime” students for thinking about next week’s topic. One such assignment, in the final weeks of the semester, was writing a research proposal.

Assessment was based on a 60-point scale, with 30 points being the minimum required to pass the course and grades A to F distributed evenly along the remainder of the scale. Throughout the semester, students would collect points for obligatory take-home written assignments (5 points each; a total of 30 points) as well as bonus points for extra work (such as voluntary written assignments or above-average participation in

class). In the examination period, students would take a final written test – consisting of both open-ended and closed questions – for another 30 points. The final grade would be calculated simply by summing the points.

All in all, the original course design followed a “teacher-centered” model of learning that emphasizes lectures and summative assessment (cf. Hoidn & Reusser, 2021). Students were tested on their practical knowledge by means of obligatory written assignments, while conceptual knowledge was assessed on the final exam. As such, the course favored students who had already been exposed to methodology and thus did not get overwhelmed by the rather complex material, and/or highly motivated students willing to continuously prepare for the exam. Importantly, the significance of a key objective was not reflected in the structure of assessment. The research proposal was merely one of relatively many assignments, representing about 8% of the final grade, and students only had two weeks to complete it.

The course design also did little to entice student interaction. While students usually did engage during lectures, this would mostly involve the more advanced or more motivated students. Moreover, interactions in the course were centered around the teacher. In other words, I would provide detailed written feedback on every assignment, as well as the final test, and, of course, I would answer any queries and try to stimulate debate in class, but there was little reason for students to interact *with each other*. An unfortunate consequence of this was that unless there was some initiative from the students themselves, the intercultural composition of the class played no significant role in the course – to the detriment of the students’ learning experience.

1.2 The innovation: student-centeredness and peer-learning

Teaching “Methodology” to a more diverse group of home and international students highlighted some issues with my course design. To address them, I propose a new design that focuses on two interrelated areas.

The *first* area concerns (the lack of) correspondence between, on the one hand, the course’s learning objectives and, on the other hand, assessment methods and class activities.

¹ In a similar context, Ryan and Carroll (2005) suggest viewing international students metaphorically as “canaries in the coalmine”.

Therefore, in the new design, learning to formulate a research proposal takes center stage. Instead of being one of many written assignments, the proposal will be turned into an activity covering almost the entire semester. In this way, a higher-order activity becomes central, and the rest of the course is reorganized to support it, in the spirit of the principle of *constructive alignment* (Biggs, 1996). By week 3, students will be introduced to a template and begin working on their own proposal step by step, as we cover the material. Each lecture will be recast to emphasize the points relevant to a particular element of the proposal's structure. For example, when discussing types of hypotheses, attention will be drawn to the particular section of the research proposal where this typology is pertinent. Students will submit their work for preliminary feedback (including peer feedback) by the 12th week. Finally, during the examination period, they will present (or "defend") their proposals in small colloquia. All in all, time spent working on proposals, in one way or another, is extended from no more than two weeks to about nine weeks.

The structure of this new assignment relates closely to the *second* area, that of *peer learning*. The latter has a long-established credence as a means of engaging students more deeply than individual learning and foster the learning of skills which are "not as readily pursued by other means" (Boud, Cohen, & Sampson, 1999, p. 415). From the third week of the semester, students will be divided into groups of 4–5. The purpose of this setting is to provide support for students' work on their research proposals. The proposal will remain an individual product, in the sense that each student will be graded based exclusively on their own paper. However, they will be encouraged to exchange ideas and discuss their proposals throughout the semester outside class, within their respective groups. The latter will also play a role in more formalized peer feedback (ca. 12th week), when proposals will be redistributed among group members for comments, so that each student reviews at least one proposal from their group. Besides encouraging interaction and debate, this task also serves an educational purpose, as every student will have to review a proposal apart from composing one themselves. Finally, the colloquia in which research proposals and their authors' responses to feedback will be discussed will also be organized based on the groups formed at the beginning of semester. Besides being an established method of inquiry-based learning (Richmond, Boysen, & Gurung, 2016, p. 57), student

presentations add a background learning objective to the course, namely, honing the students' communication and argumentation skills.

The ultimate purpose of introducing group work, however, is to make use of the diverse skills and knowledge of home and international students and create opportunities for them to learn from each other. To this end, students will not be assigned to groups randomly but based on an estimate of their skill levels. In my courses, I have long used an ungraded quiz to measure the progress individual students have made. At the beginning of the semester, usually at our very first meeting, I would have students take a short, written test consisting of five open-ended questions. Some of the same questions would then also appear on the final test. In the new design, this initial quiz will serve to collect data on students' pre-existing knowledge of methodology as well as their level of English. Peer groups will then be established – based on this data and my observations from the first two classes – to match less advanced students with their more advanced colleagues, while also ensuring that students of different cultural backgrounds are mixed to stimulate intercultural communication (De Vita, 2005).

This redesign of the course emphasizes a practical skill – the craft of composing research proposals. But what of conceptual knowledge? In the original design, students' theoretical prowess was assessed by the final exam. However, this was long after we had covered much of the material, including some notoriously more difficult topics in the first half of the semester. Therefore, in the new design, the exam is replaced by a shorter midterm quiz.

The overall change in the character of the course is perhaps best illustrated by comparing the original and the new assessment model. While in the old design, the final exam represented 30 points and written assignments were reflected in the other 30 points (with only 5 pt assigned to the research proposal), the new design emphasizes the research proposal (30 pt) and assigns 20 and 10 pt to assignments and the midterm exam, respectively. Whereas previously, students were only graded on the written form of their research proposal, in the new design, the composition of proposals becomes a more structured activity, in line with the introduction of colloquia. The proposal's written part will account for 15 pt, while presentation and peer feedback (in the sense of feedback provided on other students' work) will represent 10 and 5 pt, respectively (see also Figure 1).

The changes described above will be first implemented in the 2021/22 academic year.

At the same time, I will collect data to assess the impact of the new design. The following section discusses this research project.

2. RESEARCH DESIGN

In tackling the challenges described in Section 1, the new course design should not only lead to an overall improvement in students' grades and in the quality of their submitted work, but also increased student engagement and satisfaction with the course. Hence, I am interested in testing the following hypotheses:

- (H1) Making the research proposal a central activity will increase the quality of the (final drafts of) students' research proposals.
- (H2) Introducing peer learning will reduce differences in assessment results (and, by proxy, in learning outcomes) between students.
- (H3) Making the course more student-centered and creating a peer learning experience for local and international students will:
 - a) increase student participation rates,
 - b) increase student satisfaction with the course, with an emphasis on intercultural interaction,
 - c) improve overall assessment results,

2.1 Methods of data collection

The hypotheses will be tested by confronting them with both quantitative and qualitative data. I plan on drawing on the following data sources:

- graded student work (proposals, assignments, final grades),
- student feedback,
- visiting colleagues' observations,
- a teaching diary.

Data on *student work* will be produced, collected and, to a degree, evaluated as part of teaching the course. Data on *students' views* will be collected by means of four brief online surveys at different points in time throughout the semester. A *visiting colleague* will observe at least two classes and record their observations in electronic form. Another external source of data will be a standardized classroom observation protocol from at least one visit by one colleague (if possible, this will be a different person and a different occasion than mentioned previously). My own observations will be recorded in a reflective journal on a weekly basis throughout the semester. Electronic data collection methods (online forms)

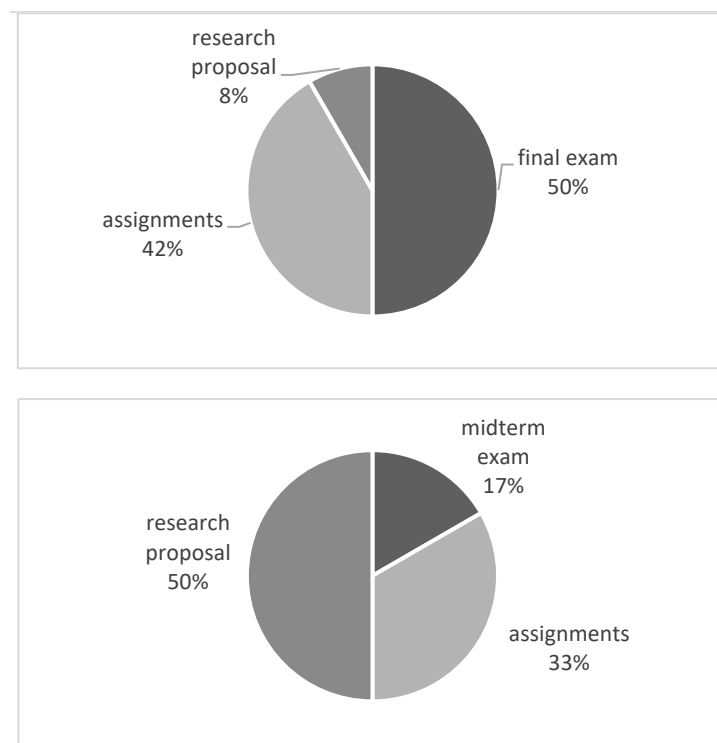


Figure 1: Components of the final grade in the old (top) and new (bottom) course design.

Source: (Own calculations.)

will be used to make data processing easier and enable anonymity where relevant.

Additionally, as a contrast, I intend to use examples of student work (from previous academic years 2020/21 and 2019/20) and student feedback (from 2020/21, where an identical end-of-semester survey to the one planned for the forthcoming year was used).

The data sources are related to my hypotheses in a rather straightforward way. For example, analysis of student work will be central to assessing hypotheses H1, H2 and H3a. Similarly, students' views will be important in terms of hypotheses H3b and H3c. Data from previous iterations of the course will be used for testing the comparative component of the hypotheses ("...increased...", "...improved...").

As mentioned above, the research project relies on both qualitative and quantitative data. The latter will be collected in surveys and in a reflective journal (Likert scale questions), as well as in the form of points and grades for student work (assignments, proposals, final grades). Qualitative data will be collected by means of surveys (open-ended questions), in the journal (my notes and comments) and in assessing research proposals (my comments on students' work).

2.2 Methods of data analysis

Quantitative data will consist of both ordinal scale data (answers to Likert scale questions from surveys and teaching diary, values ranging from 1 to 5) and metric scale data (number of points collected/grades, number of assignments completed, including partial historical data). Both sets of quantitative data will be analyzed using simple descriptive statistics.

For example, to quantitatively test hypothesis H1, I will compare the mean, median and mode values of points for research proposals in 2019/20, 2020/21 and 2021/22. Increased averages in 2021/22 will be interpreted as confirming H1 (and vice versa).

To test H2 quantitatively, I will compare the relative variance in grades (points). Decreased variance in 2021/22 will be viewed as confirming H2. As further evidence, averages of answers to Likert scale questions from the colleague survey and teaching diary will be calculated and reported. Similar procedures will be applied when testing the quantitative aspects of other hypotheses. For example, in the quantitative testing of H3b, descriptive statistics will be applied to answers to Likert scale questions from student surveys, from

a visiting colleague survey and from the teaching diary. Survey data will be compared to results obtained from a single iteration of an identical survey administered in 2020/2021.

In qualitative testing, I plan on using content analysis. My comments on research proposals, answers to open-ended questions from surveys (students, visiting colleague) as well as my comments from the teaching diary will be analyzed to serve as confirming or disconfirming evidence for all the relevant hypotheses. Textual data will first be analyzed into units of meaning. The latter will be coded and subsumed under a range of predetermined central themes corresponding to the content of hypotheses H1–H3. Finally, coded pieces of text will be assessed as to their relevance as confirming or disconfirming evidence. In part, qualitative analysis will be comparative, as it will also rely on data from an end-of-semester student survey conducted in 2020/21.

3. PROBLEMS OF RESEARCH AND IMPLEMENTATION

In the 2020/2021 academic year, I have trialed certain aspects of the innovation on a small scale and collected data in a survey for future comparison. This "pilot study" revealed some potential problems. Before discussing these, I want to highlight some more general issues.

Admittedly, the research design outlined above is rather rudimentary, especially in terms of data analysis. I have decided against using more robust statistical tools due to the small *N* (historically, ranging from 9 to 20 students) and the high likelihood of outliers in the data set (e.g., students who excel anyway or those who drop out for reasons unrelated to the course). It should be emphasized, though, that the project's methodological simplicity precludes any stronger, generalizable conclusions about the causal role of the innovation. This caveat is underlined by the quasi-experimental nature of the research design as a whole: there is no control group and no real blinding. Moreover, a significant share of the data (i.e., grades and teaching diary observations) will be produced by the researcher himself, to be then evaluated as evidence confirming or disconfirming the hypotheses. To some extent, this lack of objectivity may be mitigated by the other data sources (i.e., observations by visiting colleagues and input from the students themselves), but it remains an obvious limitation of the project – and something that I would point out as problematic in my students' research proposals.

On the other hand, although the project might not qualify for serious research in the field of education science, I do think it may prove to be useful as a supplement to the more causal and subjective observations that usually guide teachers – including myself – in deciding the future direction of their courses. This situates the project halfway between an instructor’s intuitive reflections and more rigorous scholarship of teaching and learning (SOTL).

3.1 Potential obstacles

While trialing some elements of the new design in the Summer semester of 2020/21 ($N = 9$), I was confronted by some issues arising from the innovations.

The COVID-19 pandemic necessitated online-only teaching, which made student interaction both in and outside class more difficult. For discussions outside class in groups of four, students were provided with separate “rooms” in MS Teams, but there was little spontaneous activity. This may suggest a problem with the design itself. Simply dividing the students into groups and encouraging them to cooperate may not be enough to stimulate interaction. The more advanced students will not go looking for assistance they do not need, while their less fortunate colleagues may be too shy to do

so. Perhaps the new model could be improved by introducing some form of incentive for cooperation (e.g., bonus assignments that require cooperation and are related to research proposals), while retaining the research proposal as an individual student’s product.

Secondly, in some instances, the peer feedback mechanism was too forgiving. Some research proposals that deserved constructive criticism were instead praised by their reviewers. While such solidarity is commendable, it did complicate assessment: should well-meaning students who otherwise did very well in the course be punished for not being critical enough of their peers? Perhaps a way of mitigating this issue would be to turn the peer feedback process into double-blind review.

Finally, I have also encountered the notorious problem of a low response rate, with only a third of students completing the survey. The latter was only introduced at the very end of the semester, after final grades were known. This may have made the survey seem unimportant in students’ eyes. However, making the survey obligatory or incentivizing participation in some way could skew the results. Therefore, next time, I plan on introducing it earlier on, while keeping participation voluntary.

CONCLUSION

In this paper, I have described how teaching an undergraduate course in an internationalized context revealed certain problems with its design – namely, lack of involvement by students and too big a variation in learning outcomes between more and less advanced students. To tackle this twofold challenge, I have proposed a new “backward design”, starting from learning objectives (Richmond, Boysen, & Gurung, 2016, p. 21), that incorporates group work and elements of a more student-centered approach. The innovations described will be put into practice in the forthcoming academic year. Their impact will be studied by drawing on a range of data sources, using both quantitative and qualitative methods. The results of this inquiry will be the subject of a future report.

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