Inverting the Large Lecture Class:
Active Learning and Diversity in an Introductory IR Course

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Abstract:

The inverted classroom model (ICM) has been successfully used in many disciplines. ICM is an active learning approach that reserves class meetings for hands-on exercises while shifting content learning to the preparatory stage. Multiple studies report better student learning, engagement and satisfaction in ICM classes. ICM is also alleged to better address the diversity of students with different learning styles and levels of preparedness. The technique has been used in IR but there have been few systematic evaluations of ICM's efficacy in large lecture classes in the discipline. Larger class size is a challenge for ICM but it allows the pursuit of higher-order learning objectives than the passive reception of content that characterizes traditional lectures. This paper reports results from an application of the inverted classroom to an introductory IR course during the winter semester 2014/15 at the University of Duisburg-Essen. It first reviews the literature on inverting large lecture classes and then presents our approach for this particular class. We then present preliminary results on ICM's effects on student learning, measured in terms of students' self-assessment, and on student attitudes about the ICM as a teaching method compared to a traditional lecture format.

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1. Introduction

Lectures are a long-established format in university teaching in almost all scientific disciplines, with the social sciences being no exception. In the era of mass enrollment, lectures are a resource-efficient teaching format. If we understand learning in terms of input and the learner as a vessel to be filled with the teacher's wisdom, only a single lecturer is necessary to teach hundreds or even thousands of students. Some early assumptions about the efficacy of *Massive Open Online Courses* were clearly driven by such a vision of hyperefficient content delivery via electronically transmitted lectures.

The scholarship of teaching and learning (SoTL), on the other hand, has consistently demonstrated the limited effectiveness of lecture for a majority of learning objectives. According to Cooper and Robinson (2000a: 9) lectures are appropriate to complement and organize reading, demonstrate exemplary paths of problem-solving, motivate students to engage with the subject matter, and to exemplify and contextualize complex relationships discussed in the literature. Bligh (2000) argues even more forcefully that lectures are only useful for relatively basic cognitive learning objectives. Referring to Bloom's revised taxonomy (Anderson/Krathwohl 2001: 67-68; Bloom/Engelhart 1974: 29-33), Bligh concludes that lectures may assist the accumulation of knowledge and information but are ineffective when it comes to affective and psychomotor learning objectives. Higher-level analytical skills such as application, analysis, evaluation and creation are insufficiently trained in traditional lectures: "if students are to learn to think, they must be placed in situations where they have to do so" (Bligh 2000: 10). In addition, the lecture's effectiveness for imparting cognitive skills is limited. If the material is not practiced independently, a week after the lecture the audience retains only to 42 percent of lecture content. Two weeks after the lecture students remember 20 percent of the material, after three weeks this figure drops to 10 percent (Bligh 2000: 40; Cooper/Robinson 2000a: 8-9).

Sams (2012: 14) also notes that students often have comprehension problems. During the lecture the students transcribe the lecture but they are often overburdened during the follow-up phase when they are supposed to apply and deepen their knowledge on their own. Many studies have shown that in comparison to other teaching formats students are less attentive in classical lectures due to the missing activation of students and a lack of interaction between lecturer and students as well as between students (Cooper/Robinson 2000a: 9; Möller 2013: 23). After 10 to 20 minutes of straight lecture, students' attention wanes and decreases until the end of the lecture (Burns 1990). In short, classic lectures are strong in presenting content but weak in providing incentives and a usable framework to students for deeper learning processes and objectives.

Despite these shortcomings, the classic lecture is still a widely used format due to limited teaching capacities and tradition. Very often there are few alternatives, e.g. if available personnel resources do not allow formats with smaller groups of students. In this regard, political science teaching in Germany is no exception – programs are characterized by high enrollment rates and therefore need to utilize their teaching capacities as efficiently as possible. Therefore the traditional lecture format is widely used as it can be used almost unchanged even as the audience continues to grow.

According to the study and examination regulations (*Prüfungsordnung*) of the Bachelor program in political science at the University of Duisburg-Essen – which is fairly typical in this regard – the program has the aim of conveying scientific foundations, professional and methodological competencies as well as qualifications related to professional fields. Consequently this requires *all* teaching formats, including lectures, to enable students to work methodologically, to systematize knowledge and to transfer knowledge to new practical issues and spheres of activity, aims which are once again reminiscent of the higher levels of Bloom's revised taxonomy.

How can these ambitious objectives be pursued despite the widespread prevalence and the pedagogical limitations of the classic lecture format? We propose that the *Inverted Classroom Model* (ICM) offers a possibility to convert conventional lectures from passive learning into a more activating and interactive format. The central principle of ICM is to swap the two central activities of teaching and learning. In inverted teaching, the students first study a topic by themselves, typically using reading, videos and assignments provided online by the teacher. In class, students apply their knowledge by solving problems, holding debates and discussions and doing practical work, either alone, in pairs or in larger groups. In contrast, in the traditional lecture model, students first passively listen to lectures and are then tasked to expand and extend their knowledge through out-of-class activities like homework. Therefore, ICM "inverts" or "flips" the classroom.

The paper first presents ICM in greater detail, providing an overview of the idea, its development, objectives, and expectations and the typical design of a ICM lecture session. After that, the paper investigates the previous application of ICM in different scientific disciplines to situate political science teaching within these findings. We then present information about the environment and framework of our application of ICM in an introductory undergraduate International Relations (IR) course. We then analyze the experiences, preliminary results, effects, strengths, weaknesses and challenges of our application of ICM. We do not provide definite solutions for all the challenges linked with the traditional lecture format. Rather we present and reflect on some of our observations, ideas, hypotheses and our conclusions. Finally the paper summarizes our findings and formulates theses and open questions about the application of ICM in political science teaching.

2. What is the Inverted Classroom Model?

"Inverting the classroom" means that students are first exposed to new material *outside* of class (see Fig. 1). This is usually in the form of texts, videos, podcasts and assignments prepared by the teacher and organized via a website or course management software like Moodle or Blackboard. The time in class is used for higher-value learning objectives and competences through problem-solving, discussions, debates and hands-on practical work. "The two central activities, content acquisition and content delivery in-class, on the one hand, and practicing and deepening at home, on the other hand, are swapped" (Handke 2013: 15; see also Lage, et al. 2000: 32; Schäfer 2012: 3).

Figure 1: Traditional and inverted lecture format in comparison

Traditional Lecture		**Inverted Lecture**	
Phase	**Activity**	**Phase**	**Activity**
1. In-class time/attendance phase 	Knowledge delivery and comprehension	1. Individual Phase 	Knowledge delivery and comprehension
2. Individual Phase 	Consolidation and deepening of knowledge (application, discussion, etc.)	2. In-class time/attendance phase 	Consolidation and deepening of knowledge (application, discussion, etc.)

In terms of Bloom's revised taxonomy (Anderson/Krathwohl 2001: 67-68; Bloom/Engelhart 1974: 29-33), students pursue lower-level cognitive learning objectives (accumulating and comprehending knowledge and information) outside of class, whereas in class they focus on higher-level cognitive learning objectives (analytical skills such as application, analysis, evaluation and creation) with the help of peers and the lecturer (Loviscach 2012: 35). One of ICM's central objectives is to use class time, where students can seek help from peers and teachers, more effectively and for more challenging tasks.

ICM was first described in 2000 by Lage, Platt and Treglia.[1] It is related to the concept of *Peer Instruction* which was developed for teaching physics by Mazur in the 1990s (Crouch 1998; Crouch/Mazur 2001; Mazur 1997). It is central for both student-centered approaches that they move

[1] "Flipped classroom" and "inverted classroom" are synonymous expressions (Sams 2012: 13). In the United States and Canada it is more common to speak of "flipped classrooms" whereas in Germany and other European countries the "inverted classroom" seems to be more popular.

the passive reception of learning content from the lesson to the preparatory phase. The attendance phase is used to clarify questions, deepen particular aspects of the topic and apply the knowledge students gained during preparation. The teacher's main role is no longer to impart knowledge *ex cathedra* – although brief lectures can still be employed to add new information and clarify muddled thinking – but to support students' individual learning processes. The teacher is no longer the "sage on the stage" but the "guide on the side" (Talbert 2012: 1).

The development of ICM and Peer Instruction was made possible through advances in educational technology (Lage, et al. 2000: 30, 34) and motivated by the weaknesses of conventional lectures. A multitude of studies has demonstrated the efficacy of ICM and peer instruction in comparison with classic lecturing (Carlisle 2010b; Crouch/Mazur 2001; Fagen, et al. 2002; Hake 1998; Smith, et al. 2009; Talbert 2012). Knowledge delivery during the preparatory phase becomes a much more individualized process and is better able to accommodate different learning styles, as students can set their own pace and use the materials provided in ways that work best for them. The in-class phase benefits from the interaction among students and between students and the instructor who assists the students in an advisory capacity. Studies have even found improved learning effects in large classes with more than 100 participants (Bates/Galloway 2012; Moravec, et al. 2010).

These studies put forward various explanations for their findings. First, ICM solves the "attention problem" of conventional lectures because students are not only listeners but also participants. Second, the emphasis on active learning allows the pursuit of higher-level learning objectives. In dealing with training questions and tests students have to apply and transfer abstract knowledge. Students also receive constant formative feedback about their level of mastery (Cooper/Robinson 2000a: 11). Third, applied knowledge lasts longer and is qualitatively deeper than knowledge gained through listening passively to a lecture. Fourth, using *Just-in-Time Teaching* (Simkins/Maier 2010) teachers can focus on those issues and questions with which students are struggling the most.

In post-class evaluations, a majority of students indicates that they prefer ICM to conventional lectures (Bates/Galloway 2012; Lage, et al. 2000; Moravec, et al. 2010), even though individual accounts of teachers frequently report initial resistance from students who are unused to this model. This is reflected in greater motivation among students – Carlisle (2010b) reports that in ICM courses students spend more time in preparation for the attendance phase than participants of classic lectures (similar Bates/Galloway 2012; Moravec, et al. 2010).

In an ICM, a typical learning unit is comprised of a preparatory phase, an attendance phase and (potentially) a follow-up phase. The length of a learning unit can vary and is usually mapped to organizational culture. For instance, classes in German universities usually meet once a week for

two hours, so we created weekly learning units. A learning unit may also encompass multiple attendance phases, e.g. a discussion section and a lab or tutorial.

These phases pursue different learning objectives which become more challenging as students progress through a unit. For our course, we assigned learning objectives to the three phases as depicted in Table 1.

Table 1: Assigning learning objectives to the phases of the learning unit

	Preparatory phase	Attendance phase	Follow-up phase
Knowledge/Remember	X	(X)	
Comprehension/Understand	X	(X)	
Application/Apply	(X)	X	(X)
Analysis/Analyze	(X)	X	X
Synthesis/Evaluate	(X)	X	X
Evaluation/Create		X	X

Source: The learning objectives categories are based on (Anderson/Krathwohl 2001: 67-68; Bloom/Engelhart 1974: 29-33)

In the preparatory phase, students are supposed to gain basic knowledge and comprehension of an issue. The phase normally uses a course management system to provide videos, texts, assignments, quizzes and other sources. Students start the out-of-class phase with the instructed reception of the different materials (watching videos, listening to podcasts, reading texts). Passive reception should be broken up into chunks of no more than 15 minutes to keep students attentive and engaged (Szpunar, et al. 2013). Between each step, students complete quizzes and other exercises (multiple-choice or single-choice questions, matching and classification exercises, short-answer essay prompts). At the end of this phase, students can be requested to indicate their "muddiest point", i.e. which aspect of the material they found the most difficult.

The attendance phase serves a) to preserve the knowledge gained during the preparatory phase, b) to complement the material with additional information, and c) to apply the knowledge gained in the preparatory phase and d) to develop other high-level competences. This phase is best divided into two sections whose length can be adjusted from session to session. The first part addresses the objectives of a) and b) and covers those issues which have provoked questions and criticism during the preparatory phase (Just-in-Time Teaching, see Watkins/Mazur 2010). Students answer additional questions using classroom response systems (CRS) and peer instruction: If more than 70 percent answer the question correctly, the answer will be explained only briefly before moving on

to the next topic. If less than 30 percent answer the question correctly, the issue will be explained in detail in a mini-lecture. If 30 to 70 percent answer the question correctly, the students will first discuss their answer with each other and then answer the question a second time. Discussing the answers is quite important because students can compare and adjust their individual understandings with their peers (Watkins/Mazur 2010). It is also possible to initiate discussion through short group work assignments or open questions where interaction is started, replaced or complemented by *Think-Pair-Share* (Cooper/Robinson 2000b; Lyman 1981). If there are few or no problems in understanding and working with the preparatory material this part of the attendance phase can be shortened or dropped altogether. The first part can also be used to make topical additions that were not covered in the preparatory material.

In the second part students apply their competences by working on concrete examples and problems. Depending on the subject, these can be problem sets, case studies, simulations or other exercises. In the context of an IR classroom, we frequently discussed historical or current cases of more abstract concepts (e.g. the regulation of the Internet as an example of global governance). These were usually initiated with a brief lecture to provide background information and/or a handout. Students then worked, either individually, in pairs or in groups to answer several brief questions about the topic. Their answers were then collected either via the CRS, brief presentations or through a plenary debate. It is also possible to ask students to form a reasoned opinion or to provide policy advice on a particular issue. Such open-ended tasks engage higher-level competences of transfer, synthesis and critique. On the other hand, they require more detailed feedback than a simple "true/false" which is difficult to administer in a large enrollment class.

To follow-up the attendance phase students get more practice questions and tasks which are similar to later exam questions and tasks. These questions and tasks are focused on the competences to synthesize, develop and represent an independent opinion and to formulate critical statements. Over the short term, these tasks are supposed train and improve the competences students gained in the previous two phases. Over the long term, these tasks have the additional value of helping students prepare for exams. The follow-up phase is usually undertaken individually, but collaboration is also an option, either in person or electronically.

The alignment of learning objectives/results, assessment formats and teaching/learning methods/content for the lecture as a whole and for each individual learning unit is of crucial importance. Students tend to "learn to the test", so assessment formats and grading standards are a vital extrinsic form of motivation. By that, we do not wish to imply that assigning credit to every little task is necessarily the best option – some teachers have found that not making certain assignments compulsory actually increased student participation and retention of knowledge.

Nevertheless, methods of assessment must be planned carefully. To use a blunt example, if a teacher, after a semester of ICM teaching, uses the same old multiple choice exam that measures recall of facts and basic definitions, students will have little incentive to adjust their learning strategies, preferring the tried-and-true method of last-minute cramming. If we wish students to develop higher-level cognitive competences, we need to use appropriate forms of assessment, via e.g. oral exams, research papers or projects, learning portfolios etc.

If ICM is carefully implemented, it offers several advantages over the conventional lecture format. First, the students have more autonomy about their learning processes because they get to decide about their pace for the delivery and comprehension of knowledge. Second, the students gain deeper knowledge when they work on challenging tasks in collaboration with their peers and teachers, getting immediate feedback on their level of mastery. Third, by freeing up class time instructors can be more creative in their course design which also tends to increase teacher satisfaction. Fourth, by observing their students working on problems, instructors can provide assistance where it is most needed which especially benefits students struggling with the material and students from disadvantaged backgrounds.

3. ICM in Political Science Teaching

ICM is being utilized in different fields, particularly in the natural sciences and economics (Love, et al. 2013; McGivney-Burelle/Xue 2013; Moravec, et al. 2010; Sams 2012: 13; Schullery, et al. 2011; Talbert 2014). ICM seems to be most widely applied in fields like computer science (Foertsch, et al. 2002; Gehringer/Peddycord 2013; Keyes 2013; Loviscach 2012) and physics (Bates/Galloway 2012; Hake 1998; Loviscach 2013), but it has also been used for instance in medicine (Prober/Heath 2012), music (Keyes 2013) and linguistics (Handke 2013). These fields share a few common traits: First, they are not typical "book fields" like the humanities and parts of the social sciences which have a strong tradition of out-of-class reading. Second, these fields place a stronger emphasis on application, practical skills and experimentation in labs. For instance, in a field like software engineering students learn the most by actually writing code (Gannod, et al. 2007). Third, these fields tend to share a binary epistemology: either an answer is correct or it is wrong, there is a correct way to perform a procedure and numerous incorrect ones. This is in contrast to humanities and the "soft social sciences" where answers are usually not as black and white. Fourth, these fields, especially the natural sciences, have established a core of knowledge that all beginning students are required to master and that is comparatively stable over time (i.e. unlikely to be upset by new discoveries or scientific paradigms), allowing for substantial standardization of courses over time.

In contrast, there are very few documented applications of ICM in the social sciences outside of economics (like political science, sociology or anthropology) and the humanities, in Germany as well as in other countries. One example is Jen Ebbeler's survey course on Roman History which she has held multiple times.[2] Another example is a flipped sociology class at the University of Western Australia (Forsey, et al. 2013). There may be more instances of ICM use in political science and related disciplines, but if they are, instructors are not writing about it. As a result, ICM is much less visible in these fields than it is in science education.

There is no field-intrinsic reason why ICM should not be an effective pedagogical method in political science. Yet what can explain this lack of diffusion? First, political scientists simply might be unaware of it. Despite frequent calls for interdisciplinarity, scientific disciplines remain relatively isolated from each other. Hence, teaching innovations do not easily move from one discipline to another. Furthermore, the few institutions that foster the spread of ICM, like the Khan Academy, focus on the natural sciences.

Second, political scientists may decline to adopt ICM out of inertia and traditionalism, or because they do not see it as innovative. When explaining the concept to colleagues, a frequent reaction was: "But that's pretty much what I am already doing!" Given our field's tradition of preparatory reading, it is easy to come to this conclusion. But simply assigning readings to students to prepare for class is not sufficient for ICM because a) it provides no feedback to students about the level of mastery they have achieved, b) it perpetuates the classic attention problem of passive learning and c) class time has to be structured in such a way that it systematically builds upon competences that students developed in the preparatory phase (Schäfer 2012: 6).

Third, given different disciplinary standards of what counts as "truth", higher-level social science teaching needs other kinds of assessment and feedback than a comparable course in the sciences. To be sure, part of learning the political science canon, inasmuch such a thing exists at all, entails learning definitions, basic historical facts and research methods, all of which have clear standards of what is correct and what is not. However, higher-level tasks that require analysis, comparison, evaluation and critique are more difficult to assess. In many instances, the structure, persuasiveness and originality of an argument and the adherence to accepted research methodology are more important than correctness of individual facts. This is why assessment cannot limit itself to evaluating factual correctness, but needs to examine the quality of an answer in more complex ways.

[2] Ebbeler has documented her experiences in her blog at http://teachingwithoutpants.blogspot.com/.

It should be clear that the inverted classroom is not a one-size-fits-all model but has to be adapted to an instructor's needs according to the course objectives. Barnett (Barnett 2014) makes the same point when she warns against an overly rigid interpretation of the flipped classroom as "all active learning, all the time". She goes on to argue for a "scrambled classroom" that utilizes a mixture of direct instruction and facilitated practice both in the preparatory phase and the in-class phase. For political science teachers, this means that adopting ICM requires time and effort – to fully invert or "scramble" a classroom, one needs to define learning objectives and to carefully map them to activities across the entire semester.

Finally, the social sciences have an organizational disadvantage. One minor, but nonetheless important aspect of the popularity of ICM is the possibility to share materials, typically videos, with other practitioners for use in their courses. Whether this is in a proprietary format (as the Khan Academy videos) or as an Open Educational Resource, being able to "borrow" third-party materials for at least parts of their course makes it easier for teachers to flip their classes. To a degree, this is a network effect, i.e. the more people participate in this kind of exchange, the more attractive participation becomes. But in part, this is also due to the much greater agreement about disciplinary canons in the sciences. For many subjects in the sciences, there is a fairly clear set of tasks that students have to be able to complete or a set of problems they have to be able to solve. In some areas, "concept inventories" have been developed that measure student mastery of these crucial skills. In political science, we lack this kind of disciplinary core. Of course, within the field we have some agreement that a well-rounded political scientist needs an understanding of political theory, research methods, policy analysis, comparative politics, international relations and potentially some other areas. Within these subjects, we could also come up with informal rankings which topics are the most important for students to know, although disagreements are bound to arise – do students of IR still need to know about deterrence theory? And even if we could agree on a set of issues that students need to learn about, no two instructors would present them in the same way. A neo-realist instructor will teach transnational governance in a very different way than a constructivist teacher. In many areas, this pluralism is an important asset of our discipline, but in this instance it is a downside because it obstructs a wider exchange of teaching concepts and materials beyond small networks of like-minded teachers.

4. Using ICM in an Introductory IR Course

The Institute of Political Science at the University of Duisburg-Essen is among the largest of its kind in Germany. Its students are mainly drawn from the region and go on to pursue a wide variety of careers in the public sector, in non-profit organizations and in the corporate world. Every year, some 200 students are enrolled into the B.A. program in political science. Except for the size of the

faculty, which allows the Institute to cover all major subfields, it is a fairly typical B.A. program and is comparable to many others in the country.

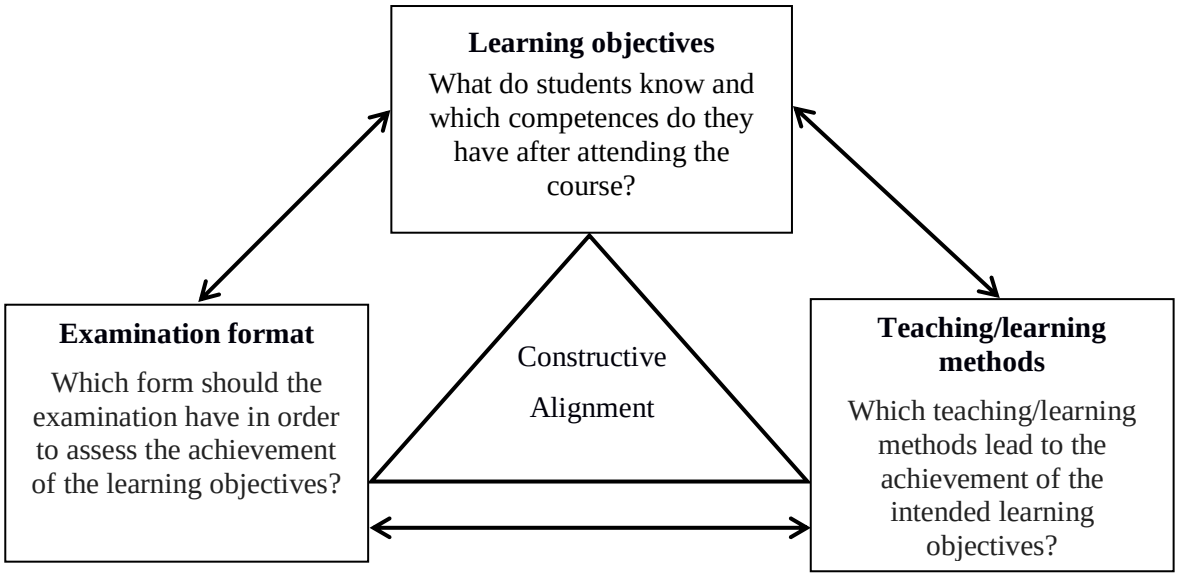
Given the size of each year's cohort, students are frequently taught via lectures. Out of the "core" courses (i.e. not counting electives) that aspiring political scientists have to complete, more than 50 percent are lectures, usually taught in a traditional format. This is at odds with the stated aims of the B.A. program which is supposed to convey scientific foundations, methodological competences as well as qualifications related to the specific field of professional activity.

One of the core modules that students have to complete is "Policy-Making and Conflict Transformation in a Globalized World". It consists of a lecture "Introduction to International Relations and Global Governance" and a seminar "Introduction to Peace and Conflict Research". The lecture represents a fairly standard IR survey course, covering major theories of international relations, concepts of global and transnational governance, and focusing on major issues like war, peace and globalization as well as current affairs like transnational terrorism and Russian-Western relations. There are eight seminars that look at different aspects of peace and conflict from an international or transnational perspective. Sample topics include military intervention and UN peacekeeping, transnational conflicts in the Middle East and conflicts over maritime boundaries. Every year, some 200 students, most of them in their third or fifth semester, attend the lecture and one of the seminars. The lecture has four credit points (= 120 hours total workload), the seminars have five credit points each (= 150 hours total workload). Students complete the module by passing an oral exam that covers both courses.

Having taught the module for several years, we were acutely aware of the limitations of a traditional lecture in teaching our students how to critically analyze international relations. In the past, oral exams were little more than students repeating what they memorized from the instructor's PowerPoint slides. We saw very little evidence of the competences our B.A. program was supposed to teach.

Thanks to financial support from the *Stifterverband für die deutsche Wissenschaft*, we were able to invert the lecture in the winter semester 2014/15. For each learning unit, the class continued to meet for two hours each week but this was augmented by a preparatory phase that was also designed to take two hours and a one-hour follow-up phase. In planning the lecture we used *Constructive Alignment* (Biggs/Tang 2011). Constructive Alignment is a method for student-centered, competence- and outcome-oriented lessons planning that goes beyond the mere reproduction of knowledge, to align learning objectives, examination formats and teaching/learning methods (see Fig. 2): "In constructive alignment, we start with the outcomes we intend students to learn, and align teaching and assessment to those outcomes" (Biggs 2014).

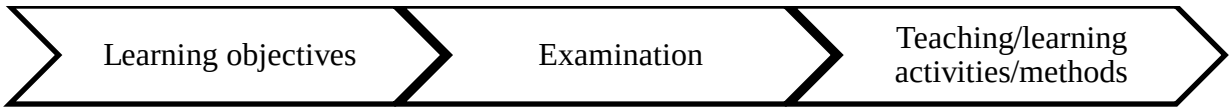
Figure 2: Structure and Elements of Constructive Aligment



Source: Based on (ProLehre Technische Universität München 2014).

Formulating learning objectives is an elementary step for the alignment with the examination format and the teaching/learning methods. The theory of learning objectives was first developed by Bloom (Bloom/Engelhart 1974: 38 f.) who proposed a system which classifies learning objectives due to their complexity and their requirements. Anderson and Krathwohl revised and expanded Bloom's taxonomy by adding three levels of knowledge (Anderson/Krathwohl 2001). Biggs criticized both taxonomies for their neglect of the procedural nature of learning. He developed the learning-outcome oriented *SOLO-taxonomy (Structure of the Observed Learning Outcomes)* which is also strongly oriented towards the development of competences (Biggs/Collis 1982; Biggs/Tang 2011).[3] Our implementation of constructive alignment takes into account all three taxonomies. From the first step – the formulation of learning outcomes – it is possible to deduce which teaching/learning methods are necessary to achieve the objectives and which examination format follows (see Fig. 3).

Figure 3: Alignment of learning objectives, teaching/learning activities/methods and the examination



We followed these steps for the design of the overall course but we also took them into account for the individual learning units. Caused by the requirements of the examination regulations

[3] Bloom, Krathwohl and Anderson assume an increasing complexity of the objectives and dimensions. But in contrast to Bloom, Anderson and Krathwohl do not assume a cumulative hierarchy. Empirical findings could not confirm the linearity of learning processes. The accomplishment of a higher cognitive process does not presuppose the accomplishment of lower cognitive processes (Kreitzer/Madaus 1994; Müller, et al. 2007).

(*Prüfungsordnung*) the learning objectives of the IR lecture are strongly oriented towards the development of competences. We understand competence as a holistic concept including the development of knowledge, skills, capabilities, motivations, emotions, activities and metacognition (Bundesministerium für Bildung und Forschung 2014b, a; European Union 2008; Weinert 2014: 27 f.). Using the model of Heinisch and Romeike (2013) we defined the following learning objectives for our inverted lecture:

1. Students employ key terms of IR to reflect and connect them as parts of broader theoretical approaches, multifaceted analytical perspectives, epistemologies and ontologies.
2. Students refer to IR theories when analysing and considering key questions and problems in IR, such as war, peace or cooperation.
3. Students differentiate the various mechanisms, logics of action and roles of actors to contrast these findings and apply them to various policy fields.
4. Students characterize and distinguish processes of change in IR and elucidate interrelations of different processes to draw conclusions regarding their implications and consequences.
5. Students evaluate and critique solutions to problems and challenges in IR in order to systematically assess their potentials, possibilities and limitations.

Our application of ICM is based on the *Universal Design for Learning (UDL)* (Meyer, et al. 2014). UDL is based on three premises:

1) Provide multiple means of presentation
2) Provide multiple means of action and expression
3) Provide multiple means of engagement

The implementation of the first premise requires amongst other things proving information in different formats, e.g. by customizing the display of information and providing alternatives for auditory and visual information. For that reason we provide and work with different learning materials during/for the preparatory and attendance phases. Learning videos are a helpful tool for teaching, especially in the ICM model (Handke 2012: 41-45; Sams 2012: 19). With the help of videos during the preparatory phase the students were supposed to learn basic facts about an issue. For each preparatory phase, we provided short videos which were supported by instructions and tasks. The videos had been recorded during a previous semester where the lecture was held in a traditional format. For each preparatory phase we typically prepared two videos, each one approximately ten to fifteen minutes long, and hosted them in a Moodle workspace.[4] Each video was supplemented by one or two questions and assignments covering the material presented in the video lecture. The videos help to fulfill the needs of different learning types. Students can determine their own learning tempo as well as temporal and spatial preferences. Furthermore videos address

[4] *Moodle* is a learning management system used by many educational institutions and companies in Germany.

visual and auditory learning types. In addition, we provided further material like academic articles, newspaper articles, charts and figures which were also linked to specific learning tasks and questions. During the lectures we sometimes also used videos and other materials to initiate and inform working groups or plenary discussions.

The second premise focuses on the provision of options for expression and communication (use multiple tools for construction and composition, etc.). During the preparatory phase the students get different tasks and questions. They range from comprehensive questions based on single-choice/multiple-choice (e.g. what is an international organization, what is a regime?) via matching/drag and drop (e.g. categorizing different scenarios according to definitions of war, armed conflict and peace), analysis and application tasks (e.g. why is global democracy desirable and possible? Please outline a short draft of a marketing strategy for a NGO which wants to promote the implementation of global democracy.) to brief essays (e.g. are the Paris terrorist attacks of January 2015 part of a cultural conflict or a "clash of civilizations"? Please give a brief reasoned statement.) that require students to synthesize and evaluate information. During the lecture the students can express themselves and communicate in different ways – for example through the participation in plenary discussions (e.g. does Global Governance undermine state sovereignty?) or by taking up different roles in group work. We also employed *Pingo* (*Peer Instruction for Very Large Groups*)[5], a web-based CRS to activate and involve students, especially in larger groups. During the lecture students can answer the lecturer's questions using internet-enabled devices (smartphone, tablet PC, laptop).

The communication of the students with each other and with the lecturer plays a significant role during the time in class (Bergmann/Sams 2012: 11). During the in-class time we used different activities to engage students. After the warm-up phase we frequently used *Peer Instruction* (Crouch/Mazur 2001; Mazur 1997, 2006), an effective simple method, to initiate the students' communication and to address comprehension problems during the preparatory phase. The method engages the students and gives the lecturer an indication of what had already been understood and which aspects need additional explanation. The method can be easily modified, e.g. by dividing the class into two or more groups tallying correct answers for each group. Social skills, analytical and evaluative competencies could be emphasized further and discussions sparked by demanding that each group decides and argues on one answer.

Another simple method we frequently used was *Think-Paire-Share (TPS).* It is collaborative learning strategy in which students work together to solve a problem or answer a question

[5] For more information see: http://wiwi.uni-paderborn.de/en/dep3/winfo2/research/projects/peer-instruction-for-very-large-groups/. For using Pingo see: https://pingo.upb.de/.

(Cooper/Robinson 2000b: 18-19; Lyman 1981). The method requires students to think individually about a problem, to apply their gained knowledge and to share ideas with their classmates. First the students work on the task on their own, brainstorming ideas and making notes. Then, the students form pairs to discuss their ideas. After a few minutes of dialogue, the lecturer solicits responses from the whole group. The method involves and activates every student, it trains students to communicate their thoughts to each other and to the entire group, it reduces thresholds to participate in the plenary because of the previous pairwise discussion, and it stimulates the development of analytical, evaluative, synthesizing and creative competences.

The implementation of the third premise demands for the provision of options for sustaining effort and persistence (heighten salience of goals and objectives, etc.). Therefore the tasks, questions, discussions and learning materials are oriented to achieve learning objectives. Receiving feedback and evaluating their level of mastery is very important for the student's performance (Deepwell/Malik 2008; Hattie 2009; Möller 2013: 23). Each self-guided preparatory phase is linked to non-graded tests where students answer questions and complete tasks to demonstrate their knowledge and skills. These tests can be repeated as often as students need to. At the end of each preparatory phase the students are requested to self-assess if they have achieved the learning objectives defined in advance by the lecturer. Furthermore they can formulate open questions, criticism, misunderstandings and things they would like to repeat during the in-class meeting. The attendance phase similarly starts with the explanation of the learning objectives which should be achieved during the lecturing section and links it with the preparatory phase. The lecturer responds to the student's results of the preparatory phase (Simkins/Maier 2010; Watkins/Mazur 2010). In this way, the students' level of understanding has an impact on the organization, tasks and debates of the in-class phase. At the end of the face-to-face phase the students are requested again to reflect whether they have achieved the learning goals.

5. Evaluating our Inverted Classroom

Much of the existing literature is made up of anecdotal reports of ICM application in single courses. Some evaluations focus on the effectiveness of ICM (and related techniques like Peer Instruction), comparing test scores with those of similar, non-inverted classes. Others assess student reactions and perceptions of the method. Some focus on learning styles and learning strategies within the context of an ICM. These various studies arrive at similar findings: First, students tend to achieve higher test scores in inverted classes as compared to traditional lecture classes (Carlisle 2010a; Hake 1998; Talbert 2012). Second, students tend to prefer ICM to traditional lecture once they have finished the course (Bates/Galloway 2012). Third, students tend to be more engaged in ICM courses than in traditional lecture classes, i.e. they spend more time on them, attend them more frequently

and complete a higher number of exercises (Bates/Galloway 2012; Lage, et al. 2000; Moravec, et al. 2010). These findings are consistent with other research on educational techniques such as active learning, learning objectives or the use of videos (Agarwal/Day 1998; Loviscach 2012; Simkins 1999; Sosin 1997).

SoTL has yet to synthesize these findings in a broader review. Of course, for a number of reasons, this is a challenging task. The measurement of teaching input and learning outcomes is difficult. Frequently, experimental controls are not possible. And finally, the applications vary widely in their scope and context. Many variables cannot be held constant, e.g. the teaching experience of the instructor, the institutional setting, disciplinary and national cultures of assessment, the size and composition of the student body as well as students' prior skills and previous experiences with ICM and active learning. Thus, "[…] evaluating teaching results is an extremely challenging task, and each possible endpoint for evaluations can be easily (and also unintentionally) distorted" (Möller 2013).

With this is mind, the evaluation of our ICM represents a modest addition to the literature, showing data from another single-class setting without a control group. We were particularly interested in student perceptions, attitudes and learning strategies in an ICM setting. We administered three survey to the students: a pre-class survey in the very first session as well as an evaluation form and a post-class survey in the last session. The surveys and the evaluation were paper-based questionnaires containing multiple choice questions and open questions. The pre-class survey was completed by 87 (N=87) participants; the post-class-survey/evaluation had 42 (N=42) participants. Due to the up-to-dateness of our ICM application – the lecture period ended at 6 February 2015 which was also the date of the post-class survey and evaluation – at this point we can only provide first data and some very preliminary interpretations.

In addition to the written, we also conducted a Teaching Analysis Poll (TAP) at the midpoint of the semester. The TAP is a qualitative method for course evaluation where students provided feedback to an external moderator, in order to enable an objective discussion and feedback-process as well as a summary of the students' opinion. The students explained their benefits as well as their concerns about the course and its concept. The moderator documented the responses and forwarded the collected information to the lecturer in an anonymized form.

Our students were well acquainted with the traditional lecture format. More than 75 percent had completed eight or more lecture classes in previous semesters and they were reasonably content with the traditional lecture as a pedagogical format. Table 2 shows that students' attitudes to their previous lecture classes were essentially unchanged after being exposed to a semester of ICM.

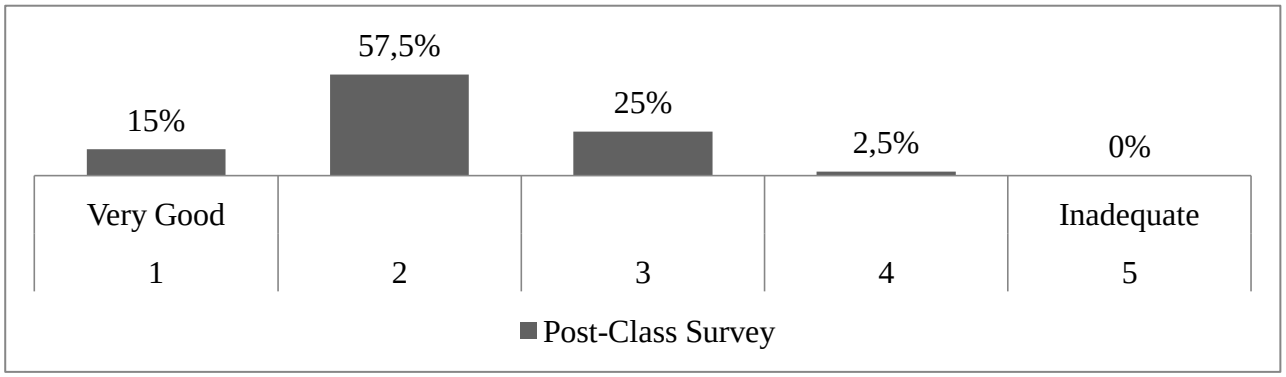
Table 2: All in all: How do you evaluate your previous lectures (excepting the current IR lecture)?

	1 Very Good	2	3	4	5 Inadequate	Arithmetic Mean
Pre-Class Survey	0 %	46.3 %	40.2 %	12.2 %	1.2 %	2.68
Post-Class Survey	0 %	41 %	53.8%	5.1 %	0 %	2.64

In contrast, our class was rated somewhat higher in the post-class survey, with an arithmetic mean score of 2.15, as compared to 2.64 for previous lecture classes (see Table 3).

Table 3: All in all: How do you evaluate the current lecture "Introduction to International Relations and Global Governance"?

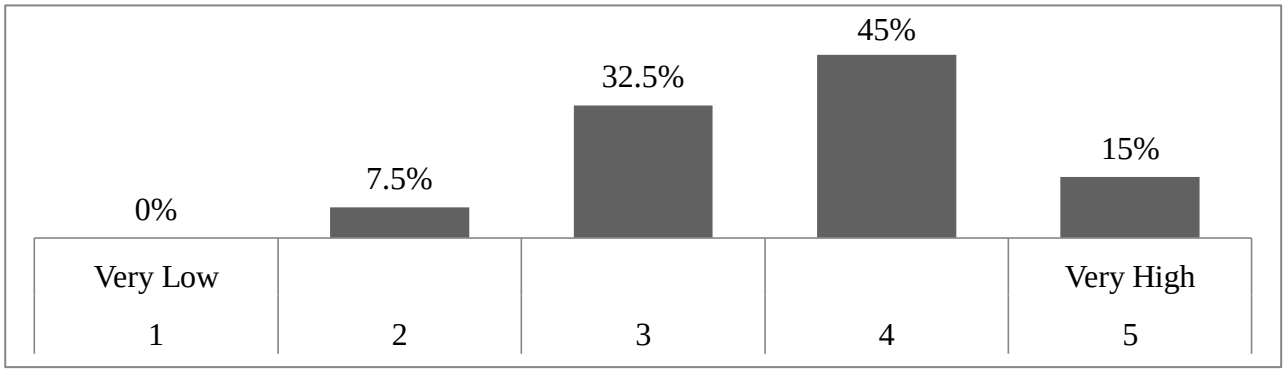
1 Very Good	2	3	4	5 Inadequate	Arithmetic Mean
15 %	57.5 %	25 %	2.5 %	0 %	2.15



A majority of students also indicated that the class had a high or very high learning effect (see Table 4).

Table 4: How do you evaluate the learning effect of the lecture "Introduction to International Relations and Global Governance"?

1 Very Low	2	3	4	5 Very High	Arithmetic Mean
0 %	7.5 %	32.5 %	45 %	15 %	3.68



However, students are divided in their opinion about ICM when directly compared to a traditional lecture-based class. When asked whether they prefer ICM to traditional lectures, the answers are widely distributed with some students fully agreeing and others strongly disagreeing (see Table 5). We get similar results when asking students whether they would prefer future classes to use ICM or traditional lectures (see Table 6).

Table 5: Compared with a traditional lecture I believe in the Inverted Classroom I have learned more about International Relations...

Answer	Chosen by
I fully agree.	18.4 %
I agree.	23.7 %
I neither agree nor disagree.	15.8 %
I disagree.	31.6 %
I fully disagree.	10.5 %

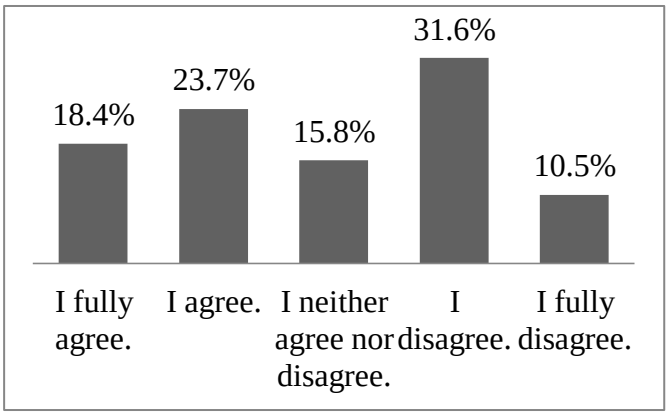
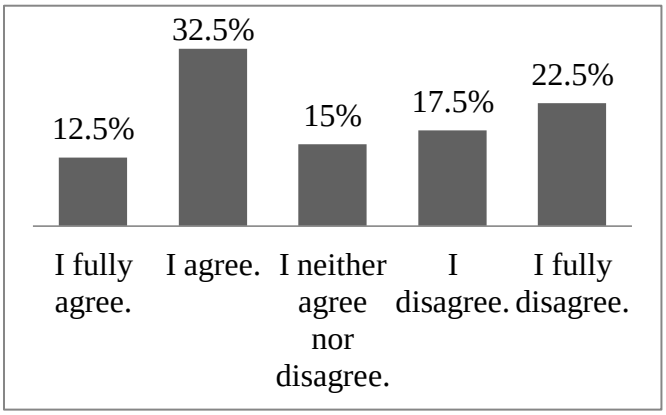


Table 1: For future lectures I would prefer the Inverted Classroom rather than a traditional format…

Answer	Chosen by
I fully agree.	12.5 %
I agree.	32.5 %
I neither agree nor disagree.	15.0 %
I disagree.	17.5 %
I fully disagree.	22.5 %



Clearly, only a minority of students prefers the inverted classroom model. Of course it was not our aim to persuade all students of the ICM and as Jürgen Handke points out, "(j)ust like in traditional teaching and learning scenario, we will always have students who ignore even the most carefully designed content and will constitute a group that will remain almost unaffected by all our efforts of content delivery" (Handke 2013) and "[…] who lack motivation and desire to master the content […]" (Handke 2013). But who are those students who prefer ICM to the traditional lecture format? One interpretation could be that ICM is more attractive to independent learners and to those who

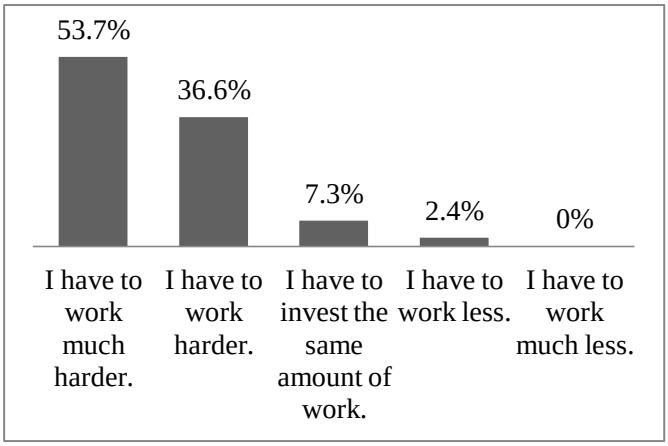
prefer active participation in class. It might also correlate with the analytical aptitude of the student, i.e. that better students prefer the autonomy that ICM allows them.

Furthermore, it is possible that the students' extensive experience with the traditional lecture format has socialized them into a learning culture that is characterized by memorization and cramming and highly focused on succeeding in written exams. Students seek to acquire factual knowledge and may be unaccustomed to the high priority we accorded to higher-level competences and active learning. This assumption is consistent with the findings of other ICM applications who describe changing students from a passive, receptive studying attitude towards active and autonomous learners as a long-term challenge (Möller 2013). Clearly, making students assume responsibility for their own academic success cannot be effected in a single class.

Another possible explanation is that students found our class to be much more work-intensive than a traditional lecture (see Table 7). This is completely understandable as we demanded about two to three hours of preparatory work before coming to class. In a typical lecture, the preparation would usually not exceed an hour and consist mainly of reading without any form of homework or test.

Table 7: Compared with a traditional lecture format, in the Inverted Classroom...

Answer	Chosen by
I have to work much harder.	53.7 %
I have to work harder.	36.6 %
I have to invest the same amount of work.	7.3 %
I have to work less.	2.4 %
I have to work much less.	0 %



Unfortunately, we are not able to measure the effectiveness of our ICM application in terms of learning outcomes. First, there is no control group that is exposed to the same material in a traditional format. Second, students are assessed in an oral exam that covers the inverted IR lecture as well as the seminar on peace and conflict research. Therefore, any variation in exam grades cannot solely be attributed to the pedagogical approach of the lecture. One possibility would be to compare results from the winter semester 2014/15 with the previous year's, when the lecture was conducted in the traditional format. However, while we have a grading rubric with clear, competence-based criteria, we cannot rule out the possibility that standards have shifted.

Therefore, we asked students for a self-assessment of their IR-related competences in the pre- and post-class surveys. We used a five-point Likert scale, with a value of five indicating a high

competence; a value of one indicates a non-existent competence. Table 8 shows that students report higher subjective assessments across all competences.

Table 8: Students' self-assessment of competences in the field of IR prior to and after the lecture

Competence	Pre-Class Survey: Arithmetic Mean	Post-Class Survey: Arithmetic Mean
I know many facts from IR and I am able to recall them.	2.65	3.56
I understand information about IR and I am able to explain key terms and concepts.	2.79	3.73
I am able to apply already known issues/tasks of IR to new issues/tasks.	2.89	3.68
I am able to analyze, diagnose and draw conclusions to questions, tasks and problems of IR.	2.48	3.51
I am able to formulate alternative solutions and draw connections between issues.	2.65	3.43
I am able to evaluate information and to express my opinion to questions, tasks and problems of IR.	3.26	3.66

6. Conclusion

ICM is an innovative and – as many studies show – an effective tool for addressing the limitations of the traditional lecture format. Nevertheless it cannot be reproduced rigidly but needs to be focused carefully to its audience and the learning objectives (Sams 2012). ICM is not a doctrine or a pedagogy but rather a tool or resource that instructors can apply according to their needs. When deciding on whether to use ICM, the essential factors to consider are its compatibility with the course content, forms of assessment and learning objectives, the skills and teaching philosophy of the instructor and the available resources (time, classroom, educational technology, personal capacities).

ICM is an interesting method "most probably suitable for deep rather than surface learning […]" (Möller 2013). It can be used selectively, i.e. in individual units within an otherwise traditional course, without compromising its efficacy. Thus some units can be inverted and other units can taught using the traditional lecture format. This can be a sensible intermediate step before fully inverting the classroom since a full transition entails technological challenges and requires additional effort (Handke 2012; Weidmann 2012) which can be overwhelming especially for less experienced lecturers.

However, when using ICM instructors should reflect on their role and functions within the classroom. In contrast to traditional approaches, ICM is clearly learner-centered. It provides the students with a certain degree of flexibility allowing them to organize themselves and make learning more time- and place-independent. The instructor needs to flexibly support students in their individual learning processes while maintaining control over the content and the learning objectives. Nonetheless ICM does not transform students who are unwilling and less motivated to learn into phenomenal students. Examination results do not improve miraculously but incrementally (Loviscach 2012).

As yet, very little is known about how to apply ICM to courses in political science and related social sciences. Based on our experience, we think that ICM needs to be adapted to political science classrooms. For instance, we believe that ICM in most political science courses should focus on discussion and argument rather than on problem-solving.[6] There is a wealth of technological options which can facilitate collaboration and feedback in class, such as "twitter walls", etherpads and next-generation classroom response systems which offer more complex response options, e.g. highlighting areas on maps or drawing figures or curves. We also believe that brief lectures still serve a purpose in this approach, for example to introduce case studies, highlight marginalized positions and summarize discussions.

There is no reason to doubt that ICM can be just as effective for teaching political science as it is in other disciplines. Unfortunately, we can only offer some very indirect evidence in support of this claim. According to our students, the course had a substantial learning effect and they reported a higher self-assessment of various competences. But it is clear that further research about the ICM's impact on student learning is necessary, particularly in comparison with other teaching modes. The same is true for other aspects of our evaluation. Evidently, students are split about whether they prefer the ICM over a traditional lecture. We will have to analyze our data more deeply, and possibly conduct additional evaluations over the next few years to better understand how students respond to this method. Another line of inquiry is how students adapt their learning strategies to an inverted classroom and how this impacts their learning and assessment scores. Clearly, a longer-term perspective that compares different cohorts of students can provide depth to this investigation and put our findings on a sounder empirical footing.

Despite some persistent challenges and unanswered questions an inverted classroom promises several benefits. The format is more transparent than a traditional teaching and learning scenario, it can combine content delivery with opportunities for autonomous and active learning. It makes

[6] One exception would be courses in areas like research methods which are clearly oriented towards developing practical skills.

possible the pursuit of higher-level learning objectives and competences. Not least, it is much more engaging for the instructor. Instead of being at the center, trying to keep everyone's attention for a 90-minute show, the instructor becomes a facilitator who sets the stage, decides on the program and provides brief input and feedback to stimulate learning among students. After a semester's worth of experiences, we are both convinced that inverting the classroom is not just good for the students, but also for their instructors.

Bibliography

Agarwal, Rajshree and A. Edward Day (1998): The Impact of the Internet on Economic Education; *The Journal of Economic Education* 29 (2), 99-110.

Anderson, Lorin W. and David R. Krathwohl (2001): *A Taxonomy for Learning, Teaching, and Assessing. A Revision of Bloom's Taxonomy of Educational Objectives*, New York: Longman.

Barnett, Pamela (2014): Let's Scramble, Not Flip, the Classroom, *Inside Higher Ed*, 14 February 2014, https://www.insidehighered.com/views/2014/02/14/flipping-classroom-isnt-answer-lets-scramble-it-essay [05.01.2015].

Bates, Simon and Ross Galloway (2012): The Inverted Classroom in a Large Enrolment Introductory Physics Course: A Case Study, Edinburgh. http://www.heacademy.ac.uk/assets/documents/stem-conference/Physical%20Sciences/Simon_Bates_Ross_Galloway.pdf [15.01.2015].

Bergmann, Jonathan and Aaron Sams (2012): *Flip Your Classroom. Reach Every Student in Every Class Every Day*, Eugene: International Society for Technology in Education.

Biggs, John B. and Kevin F. Collis (1982): *Evaluating the Quality of Learning: the SOLO Taxonomy*, New York: Academic Press.

Biggs, John B. and Catherine Tang (2011): *Teaching for Quality Learning at University. What the Student Does*, Maidenhead: Open University Press.

Biggs, John B. (2014): Constructive Alignment; *http://www.johnbiggs.com.au/academic/constructive-alignment/* [13.08.2014].

Bligh, Donald A. (2000): *What's the Use of Lectures?*, San Francisco: Jossey-Bass.

Bloom, Benjamin S. and Max D. Engelhart (1974): *Taxonomie von Lernzielen im kognitiven Bereich.*, Weinheim: Beltz.

Bundesministerium für Bildung und Forschung (2014a): Glossar; *http://www.dqr.de/content/2325.php* [19.08.2014].

Bundesministerium für Bildung und Forschung (2014b): Der DQR; *http://www.dqr.de/content/60.php* [18.08.2014].

Burns, Ralph A. (1990): The Two-Year College. Designing Presentations to Help Students Remember; *Journal of College Science Teaching* 19 (5), 301-305.

Carlisle, C. Martin (2010a): Using YouTube to Enhance Student Class Preparation in an Introductory Java Course, in *41st ACM technical symposium on Computer science education* edited by Carlisle, C. Martin; New York.

Carlisle, Martin C. (2010b): Using YouTube to Enhance Student Class Preparation in an Introductory Java Course; *41st ACM Technical Symposium on Computer Science Education (SIGCSE' 10)* 10.-13.03.2010.

Cooper, James L. and Pamela Robinson (2000a): The Argument for Making Large Classes Seem Small; *New Directions for Teaching and Learning* 2000 (81), 5-16.

Cooper, James L. and Pamela Robinson (2000b): Getting Started: Informal Small-Group Strategies in Large Classes; *New Directions for Teaching and Learning* 2000 (81), 17-24.

Crouch, Catherine H. (1998): Peer Instruction: An Interactive Approach for Large Lecture Classes; *Opt. Photon. News* 9 (9), 37-41.

Crouch, Catherine H. and Eric Mazur (2001): Peer Instruction: Ten Years of Experience and Results; *American Journal of Physics* 69 (9), 970-977.

Deepwell, Frances and Samina Malik (2008): On Campus, but out of Class: An Investigation into Students' Experiences of Learning Technologies in Their Self-Directed Study; *Research in Learning Technology* 16 (1), 5-14.

European Union (2008): Empfehlungen des Europäischen Parlaments und des Rates vom 23. April 2008 zur Einrichtung des Europäischen Qualifikationsrahmens für lebenslanges Lernen (2008/C 111/01); *http://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:32008H0506(01)&from=EN* [19.08.2014].

Fagen, Adam P., Catherine H. Crouch and Eric Mazur (2002): Peer Instruction: Results from a Range of Classrooms; *The Physics Teacher* 40 (4), 206-209.

Foertsch, Julie et al. (2002): Reversing the Lecture/Homework Paradigm Using eTEACH® Web-based Streaming Video Software; *Journal of Engineering Education* 91 (3), 267-274.

Forsey, Martin, Mitchell Low and David Glance (2013): Flipping the Sociology Classroom: Towards a Practice of Online Pedagogy; *Journal of Sociology* 49 (4), 471-485.

Gannod, Gerald C., Janet E. Burge and Michaele T. Helmick (2007): Using the Inverted Classroom to Teach Software Engineering; *Technical Report MU-SEAS-CSA-2007-001*.

Gehringer, Edward F. and III Barry W. Peddycord (2013): The Inverted-Lecture Model: A Case-Study in Computer Architecture; *Proceedings of the 44th ACM Technical Symposium on Computer Science Education SIGCSE 2013*, 489-494.

Hake, Richard R. (1998): Interactive-Engagement Versus Traditional Methods: A Six-Thousand-Student Survey of Mechanics Test Data for Introductory Physics Courses; *American Journal of Physics* 66 (1), 64-74.

Handke, Jürgen (2012): Voraussetzungen für das ICM, in: Handke, Jürgen and Alexander Sperl (ed.): *Das Inverted Classroom Model. Begleitband zur ersten deutschen ICM-Konferenz*, München: Oldenbourg Verlag, 39-52.

Handke, Jürgen (2013): Beyond a Simple ICM, in: Handke, Jürgen, Natalie Kiesler and Leonie Wiemeyer (ed.): *The Inverted Classroom Model. The 2nd German ICM-Conference Proceedings*, München: Oldenbourg Verlag, 15-21.

Hattie, John (2009): *Visible Learning. A Synthesis of Over 800 Meta-Analyses Relating to Achievement*, London: Routledge.

Heinisch, Isabelle and Ralf Romeike (2013): Qutcome-orientierte Neuausrichtung in der Hochschullehre Informatik - Konzeption, Umsetzung und Erfahrungen, in: Forbrig, Peter, Detlef Rick and Axel Schmolitzky (ed.): *HDI 2012 – Informatik für eine nachhaltige Zukunft. 5. Fachtagung Hochschuldidaktik der Informatik. 06.–07. November 2012 Universität Hamburg*, Potsdam: Universitäts-Verlag Potsdam, 9-20.

Keyes, Christopher J. (2013): Alternate Sofware and Pedagogical Strategies for Teaching Audio Technology to Classicaly Trained Music Students; *Proceedings of the 134th Convention of Audio Engineering Society* Paper 8809.

Kreitzer, A. and M. Madaus (1994): Empirical Investigations of the Hierarchical Structure of the Taxonomy, in: Anderson, Lorin, W. and L. Sosniak (ed.): *Bloom's Taxonomy. A Forty Year Retrospective*, Chicago: University of Chicago Press, 64-81.

Lage, Maureen J., Glenn J. Platt and Michael Treglia (2000): Inverting the Classroom: A Gateway to Creating an Inclusive Learning Environment; *Journal of Economic Education* 31 (1), 30-43.

Love, Betty et al. (2013): Student Learning and Perceptions in a Flipped Linear Algebra Course; *International Journal of Mathematical Education in Science and Technology* 45 (3), 317-324.

Loviscach, Jörn (2012): Videoerstellung für und Erfahrungen mit dem ICM, in: Handke, Jürgen and Alexander Sperl (ed.): *Das Inverted Classroom Model. Begleitband zur ersten deutschen ICM-Konferenz*, München: Oldenbourg Verlag, 25-37.

Loviscach, Jörn (2013): The Inverted Classroom: Where to Go from Here, in: Handke, Jürgen, Natalie Kiesler and Leonie Wiemeyer (ed.): *The Inverted Classroom Model. The 2nd German ICM-Conference Proceedings*, München: Oldenbourg Verlag, 3-14.

Lyman, Frank T. (1981): The Responsive Classroom Discussion: The Inclusion of all Students., in: Anderson, Audrey (ed.): *Mainstreaming Digest*, College Park: University of Maryland Press, 109-113.

Mazur, Eric (1997): *Peer Instruction. A User's Manual*, Upper Saddle River: Prentice Hall.

Mazur, Eric (2006): Peer Instruction: Wie man es schafft Studenten zum Nachdenken zu bringen; *Praxis der Naturwissenschaften - Physik in der Schule* 4 (55), 11-15.

McGivney-Burelle, Jean and Fei Xue (2013): Flipping Calculus; *Primus* 23 (5), 477-486.

Meyer, Anne, David H. Rose and David Gordon (2014): *Universal Design for Learning: Theory and Practice*, Wakefield: CAST Professional Publications.

Möller, Clemens (2013): Activating Students by Inverting and Shuffling the Classroom - Experiences from Employing ICM and I²CM, in: Handke, Jürgen, Natalie Kiesler and Leonie Wiemeyer (ed.): *The Inverted Classroom Model. The 2nd German ICM-Conference Proceedings*, München: Oldenbourg Verlag, 23-33.

Moravec, Marin et al. (2010): Learn Before Lecture: A Strategy That Improves Learning Outcomes in a Large Introductory Biology Class; *CBE-Life Sciences Education* 9 (4), 473-481.

Müller, Kirstin, Bärbel Fürstenau and Ralf Witt (2007): Ökonomische Kompetenz sächsischer Mittelschüler und Gymnasiasten; *Zeitschrift für Berufs- und Wirtschaftspädagogik* 103 (2), 227-247.

Prober, Charles G. and Chip Heath (2012): Lecture Halls without Lectures - A Proposal for Medical Education; *New England Journal of Medicine* 366 (18), 1657-1659.

ProLehre Technische Universität München (2014): Constructive Alignment. Bringing Learning Outcomes, Courses, and Examinations into Optimal Agreement; *https://www.lehren.tum.de/en/topics/effective-teaching/success-factors-in-effective-teaching/constructive-alignment/* [13.08.2014].

Sams, Aaaron (2012): Der "Flipped" Classroom, in: Handke, Jürgen and Alexander Sperl (ed.): *Das Inverted Classroom Model. Begleitband zur ersten deutschen ICM-Konferenz*, München: Oldenbourg Verlag, 13-23.

Schäfer, Anna Maria (2012): Das Inverted Classroom Model, in: Handke, Jürgen and Alexander Sperl (ed.): *Das Inverted Classroom Model. Begleitband zur ersten deutschen ICM-Konferenz*, München: Oldenbourg Verlag, 3-11.

Schullery, Nancy M., Robert F. Reck and Stephen E. Schullery (2011): Toward Solving the High Enrollment, Low Engagement Dilemma: A Case Study in Introductory Business; *International Journal of Business, Humanities and Technology* 1 (2), 1-9.

Simkins, Scott P. (1999): Promoting Active-Student Learning Using the World Wide Web in Economics Courses; *The Journal of Economic Education* 30 (3), 278-287.

Simkins, Scott P. and Mark Maier (2010): *Just-In-Time Teaching: Across the Disciplines, Across the Academy*, Sterling: Stylus Publishing.

Smith, M. K. et al. (2009): Why Peer Discussion Improves Student Performance On In-Class Concept Questions; *Science* 323 (5910), 122-124.

Sosin, K. (1997): Impact of the Web on Economics Pedagogy; *Working paper*, University of Nebraska at Omaha.

Szpunar, Karl K., Novall Y. Khan and Daniel L. Schacter (2013): Interpolated Memory Tests Reduce Mind Wandering and Improve Learning of Online Lectures; *Proceedings of the National Academy of Sciences of the United States of America* 110 (16), 6313-6317.

Talbert, Robert (2012): Inverted Classroom; *Colleagues* 9 (1), 1-3.

Talbert, Robert (2014): Inverting the Linear Algebra Classroom; *PRIMUS* 24 (5), 361-374.

Watkins, Jessica and Eric Mazur (2010): Just-in-Time Teaching and Peer Instruction, in: Simkins, Scott P. and Mark Maier (ed.): *Just-In-Time Teaching: Across the Disciplines, Across the Academy*, Sterling: Stylus Publishing, 39-62.

Weidmann, Dirk (2012): Das ICM als Chance für die individuelle Förderung von Schülern?, in: Handke, Jürgen and Alexander Sperl (ed.): *Das Inverted Classroom Model. Begleitband zur ersten deutschen ICM-Konferenz*, München: Oldenbourg Verlag, 53-70.

Weinert, Franz E. (2014): *Leistungsmessungen in Schulen*, Weinheim [u.a.]: Beltz.