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Self and Society in the Corona Crisis

Perspectives from the Humanities and Social Sciences

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Reflections on our teaching activities in the initial teacher training during the COVID-19 crisis

From "onsite classes" to "schooling at home"

Yves Kreis, Ben Haas, Robert Reuter, Christian Meyers & Gilbert Busana

The COVID-19 public health crisis and the subsequent confinement induced a series of profound changes to teaching and learning in education all over the world (Lancker/Parolin 2020). Mid-March 2020, the University of Luxembourg also switched from on-campus classes to "schooling at home" for all courses. This transition was more or less smooth for the teaching staff and the students. In this paper, we present our reflections, as lecturers in the "Bachelor en Sciences de l'Éducation", on how we adapted three courses and the internships, which could not happen as usual. We describe and discuss which aspects of our teaching approaches and the settings within which we have been working so far, might have contributed to a rather successful response to the current health crisis. The insights gained via these forced changes are discussed in terms of lessons learned for future instructional design decisions.

Introduction

The COVID-19 public health crisis and the subsequent confinement induced a series of profound changes to teaching and learning in education all over the world (Lancker/Parolin 2020). With the rector's communication (Pallage 2020) on 12 March, the University of Luxembourg switched from onsite classes to remote teaching for most courses. The rector later extended this period of remote teaching to the end of the summer semester. Hence, the teaching staff had to adapt at short notice their teaching methods and change to this new setting. For some lecturers, this meant rethinking their methodologies and getting to know how to use different technologies. Teaching students through remote teaching demands different scaffoldings, establishing a learning relationship with the students and different preparation of the tasks. There was not only one possible solution, as there are numerous existing possibilities to establish a teaching and learning relationship, even in remote teaching. Each study program came up with different challenges in remote teaching, and lecturers came up with questions about their courses: How could students realise their internships? How will the courses be

evaluated at the end of the academic year? What can be learned in remote teaching, and how?

In this article, we will establish the term "schooling at home", analyse and discuss how our courses evolved from onsite classes to "remote teaching" in the "Bachelor en Sciences de l'Éducation" (BScE) as well as possible effects on the teaching practices of the future teachers. In the course "Didaktik der Mathematik", students learned through a flipped-classroom approach over the last four years; a course structure which gradually arose out of many innovations. The courses "education in the digital age" and "scientific reading and writing" were based on mixed settings for their teachings and as such, somehow prepared for remote teaching. However, the internship of the students was, at first sight, unthinkable without the possibility for students to do classroom-based instruction.

Generally speaking, for some courses, the switch to remote teaching was more comfortable to perform than for others. Courses which had already been using a blended learning approach, and had thus previously relied on Information and Communication Technologies (ICT), were more likely to adapt to this new situation. The methodologies of these courses, using a blended approach, influenced the teaching skills of the future teachers in the study programme, hence we assume that this is preparation for remote teaching and blended learning approaches in the field. Furthermore, the use of technology by the lecturers and the students allows them to experiment with a range of communication technologies and educational software tools during their initial training.

Schooling at home ("Schoul doheem")

During the confinement, the government and its institutions requested to close schools, high schools and universities to prevent further infections by SARS-CoV-2. As of 21 May 2020, 1 725 million learners (98.6 % of the world student population) affected by school closures (UNESCO 2020b) continued learning.

In this paper, we refer to this entirely new learning and teaching setting as *schooling at home* (inspired by "Schoul doheem" of the Luxembourgish Ministry of Education) and will first discuss to what extent it differs from previously known concepts and why we prefer not to use those.

In many countries, including Luxembourg, the concept of *homeschooling* (North America) or *home education* (Europe) exists, which consists of educating children at home or any place other than school (Kunzman/Gaither 2013; Basham/Merrifield/Hepburn 2007). A parent, a tutor, or an online teacher generally conducts home education. In this educational movement, parents choose not to enrol their children in a (public or private) school for political reasons (e.g. alternative views or educational freedom), because of religious beliefs (e.g. refusal of sexual education) or for personal reasons (e.g. disabled or gifted children). In Luxembourg, parents are free to educate their children (four to twelve years old) at home. Currently, they must obtain authorisation from the regional director by explaining their motives, and then inform the commune

of their intent. No specific law regulates the situation for students (twelve years or older). However, education is only compulsory until the age of 16.

Distance education or *distance learning* seems to be a potentially appropriate concept here, at first sight, because it refers to the education of children who are not always physically present in school and involves online education (Cleveland-Innes/Garrison 2010; Holmberg 2005). Most scientific publications on this concept, which existed for a long time, were written in the first decade of this century. The concept of *blended learning* describes the combination of distance learning with in-class learning (Bonk/Graham 2006; Kennedy/Ferdig 2018). The courses analysed in this article were initially mostly planned as blended learning. They all contained at least some traditional classroom instruction. Thus, the courses required changes due to confinement restrictions. Strictly speaking, the concept of distance education best applies to open universities or online language learning, as these two settings are ultimately distance education without any in-class learning.

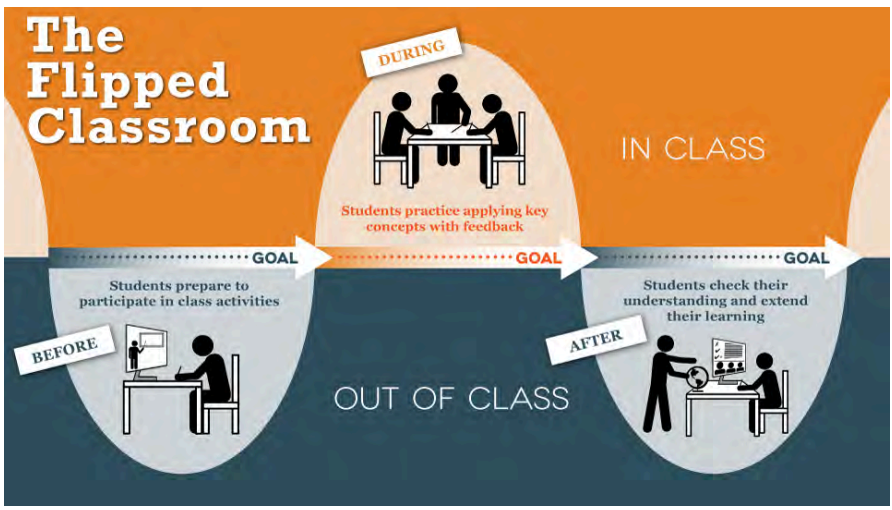
A less frequently used, but related concept is *remote teaching* (Dorman/Kennedy/2015; Chilton/McCracken 2017). It somehow coincides with distance education, but is used in a different context. For remote teaching, the distance from school is dominant: the child cannot go to school because it is living too far away in a rural setting. In the scientific literature, this term describes situations mainly found in Australia and China, while the term distance learning outlines the same situation in the USA. Giving students from one university access to specialised or costly facilities from another university that is far away is also called remote teaching. While the University of Luxembourg often uses this term, we prefer not to use it here because remotely participating in a course does not imply that the student does so from their home. Moreover, remote teaching is often well organised and planned.

Schooling at home, however, better reflects the current crisis, where teachers were obliged to change their methodology at short notice, and both teachers and students needed to work from their homes. We were in situations which had never occurred before on such a scale. However, detailed recommendations to plan distance learning situations were published very early on 6 March by UNESCO (2020a). The teacher remained in control of the education and imposed the rhythm on the student. There was no intention for students to be in a situation of self-regulated learning or self-directed learning. The teacher continued to organise and to regulate the learning activities of the students.

In the following sections, we will use *schooling at home* to refer to all teaching and learning activities in the current context of school closures, where the learners are required to work on tasks issued by their teachers. This also applies to our university courses, even if we suppose that university students should be and are more autonomous and responsible for their own learning than younger students.

An inverted classroom approach to develop didactical skills and knowledge about education in mathematics

Didactical principles in mathematics for future elementary school teachers consist, on the one hand, of pure basic mathematical knowledge, and, on the other hand, of methodologies used to teach these contents to pupils. The transmission of mathematical knowledge and methodologies has been done for many years in the Bachelor's Degree through onsite lectures and seminars. However, output during the students' practice sessions was not as promising as expected and, as a consequence, some of the students did not correctly master the mathematical knowledge, nor the methodologies to teach it accordingly. These shortcomings were observable during the internships and, unfortunately, even in the professional teaching activity. Hence the courses in didactics of mathematics needed restructuring to tackle these challenges. In 2016 we completely rethought the two first-year courses "Didaktik der Mathematik 1" and "Didaktik der Mathematik 2" from a student-centred point of view. After a meta-review of innovative and promising higher education teaching methods, the final choice was a hybrid learning setting combining an inverted classroom approach with onsite hands-on activities. The term *inverted classroom* is predominant in university contexts (Lage/Platt/Treglia 2000; Handke/Sperl 2012; Handke/Kiesler/Wiemeyer 2013; Großkurth/Handke 2014), while the term *flipped classroom* is prevalent in school contexts (Bergmann/Sams 2012; Roch 2016). Both refer to the fact that the lecture is available beforehand and during the onsite learning, the students practice applying key concepts and get immediate feedback.



"Flipped Classroom" by Faculty Innovation Center of The University of Texas at Austin (2020) is licensed under CC BY-NC-SA (2020b)

The flipped classroom is no new philosophy. However, it gained popularity due to the easy availability of videos. During the first lecture we needed to do the so-called onboarding (Werner et al. 2018: 68) by introducing the new concept. In our first lecture, we simulate the whole process by first showing the students a recorded lesson (regarding numbers in different bases), answering their questions and then applying the learned concepts (transferring numbers to different bases and calculations in different bases).

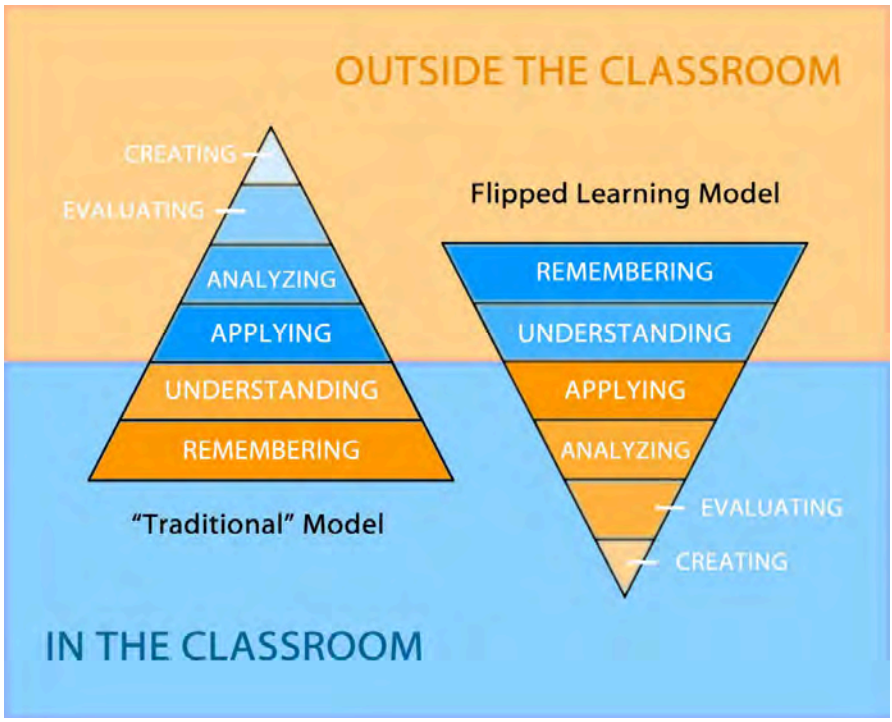
Normal Course

Instead of demanding a physical presence of the students for long lecturing hours, extending the attention span widely, we offered to let the students learn the same topics in mathematics at their own pace. They received readings (e.g. articles, book chapters, webpages), visual support (e.g. recorded lectures, explanation videos) and educational technology tools (e.g. GeoGebra, TinkerCAD®) to prepare a topic. Hence, they were allowed to study in an asynchronous setting, which we assume strengthened the overall learning performance in the mathematics course. Accompanying the preparation, the students filled in a worksheet (important aspects, questions, conflicts, notes) to prevent the risk of superficial processing. Regarding Bloom's Taxonomy, we are covering the first two levels "Remembering" and "Understanding".

During the following onsite learning phase, the physical presence of the students was optional. However, the active participation of the ones present was mandatory. We did not give a time-consuming classical lecture. Instead, we start with a question round where the students consult their worksheets and may ask questions which get clustered and then answered by the fellow students or the lecturer. Then a Kahoot! quiz is played to prepare the students for their upcoming exam, which consists of multiple-choice multiple-response questions. If the quiz reveals further weaknesses, then these are addressed. Afterwards, tasks matching the topic are solved together instead of being left as unattended exercises for homework. A significant advantage of this collaborative problem solving is that the solving process (including error and aberration) becomes visible to the students. Regarding Bloom's Taxonomy, we are covering the top four levels, which are the most interesting ones, while working onsite.

Nevertheless, we are solving exercises in an auditorium with potentially over 100 students. Thus, we need to use methods for large groups. Lyman (1981) introduced "Think-Pair-Share" (TPS) initially as Listen-Think-Pair-Share. TPS is a method of cooperative learning and is usable with large groups. The idea is that the students first think about the problem on their own (Think), then they share their findings with their neighbours (Pair), and finally, they share the joint answer with the whole audience (Share). Spannagel (2011) developed the "Active Auditorium" based on inspiration in a class of Erich Hammer using the method Learning by Teaching originally defined by Jean-Pol Martin. The idea is to foster discussions among students. Generally, one student moderates the sessions while another student records the suggestions by the fellow students in the auditorium. The lecturer does his best to try and stay out of the students' discussion. A beneficial side effect is that the two students at the front learn class

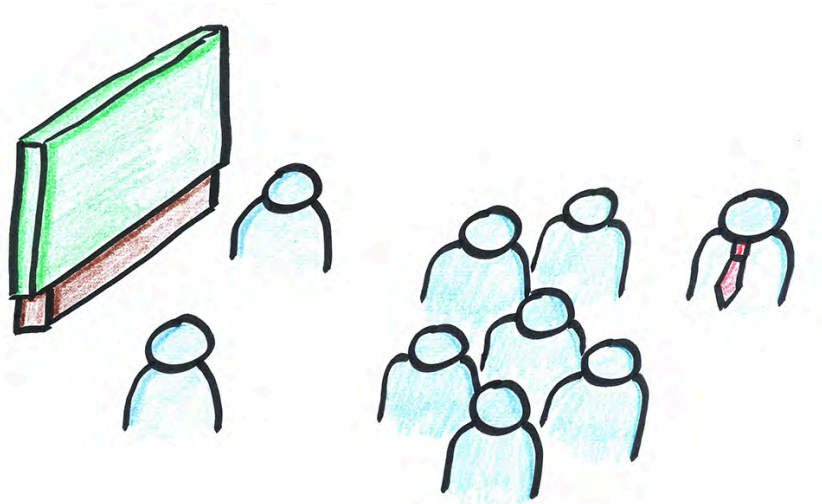
management skills which will contribute to their professional development. Of course, the Share phase of the TPS method is conceivable as Active Auditorium. Spannagel and Spannagel (2013) describe "Lecture Games" (*Divide and Fight*, *Row Rotation*, *Ring the Bell*), which are interesting to alternate the methods and keep the students motivated.



"Bloom's Taxonomy" by Wagoner et al. 2016: 3 is licensed under CC BY 2020a

Students, especially in the first year, need to learn practical skills besides the content skills. The students are not yet familiar in-depth with theoretical and practical approaches in mathematics didactics for elementary school. Therefore, after an inverted classroom week, the students experience hands-on activities while being guided by a team composed of two lecturers with different disciplinary backgrounds (mathematics, computer science, educational technology, educational science, in-service teacher). In these working sessions, we offered to let the students invest their theoretical knowledge further in a didactical material experience. Students had to gain a deeper understanding of the methodology used for the topic, and experience a variety of differentiation methods. In these moments, in class, we were able to connect theoretical work to a practitioner's every-day teaching in elementary school. In medium-size groups the students analysed didactical material and activities based on given theoretical frameworks (e.g. process-related skills in mathematical thinking).

Thus, with the two consecutive phases, which were repeated iteratively with each new topic, students were likely to create a holistic understanding of teaching and learning mathematics. Indeed, the students readily accepted this approach on teaching and learning mathematical theoretical knowledge, and we were able to observe a broader understanding of the specific topics.



"Active Auditorium"

Schooling at home

As the lockdown occurred quite late in the semester, no significant changes to the course were necessary to cover the learning outcomes. Of course, the students could not participate in onsite activities, but as they were used to the inverted classroom concept, they continued learning at their own pace from home. A Cisco Webex conference replaced the onsite learning phase and allowed us to collect questions and play Kahoot! together with the students. However, the students could no longer solve the tasks together in the same way as they did before. Besides, an inverted classroom lecture replaced the hands-on activities.

The substantial change required was involving the evaluation. An onsite evaluation was unthinkable and remote evaluation using multiple-choice multiple-response items would not be fair as several probable frauds are imaginable. Thus the evaluation was based on the tremendous work performance of the students during their remote internship (see the section on remote internship) and was replaced by the conception of digital content as examination work. The students will elaborate a mathematical trail using the free educational software MathCityMap (Ludwig et al. 2020), developed by the working group MATIS I from the Goethe University Frankfurt in cooperation with

Stiftung Rechnen. They work in groups of two to three students, create five tasks per student (including one-third as innovative activities) and ideally realise the trail in the proximity of a school. After submission, the trails will be assigned randomly for peer-review. The students will evaluate three other trails based on the predefined questions. Excellent trails can be made public and become available for everyone.

Discussion

Although our primary goal consisted in offering a new approach, more suitable to the students, in studying didactical principles in mathematics, we were able to work on digital competencies with the students, similar to Sosa Díaz and Palau Martin (2018). The methodology used during our teaching allowed the students to see the advantages and disadvantages of onsite and remote teaching activities. Hence, the students could reuse the teaching and learning setting they experienced in their future teachings. The structure and the educational technologies (e.g. Moodle™ or video) of the course "Didaktik der Mathematik 2" were visible to the students, and thus this experience could be reproduced by them in a different teaching setting. Hence, similar to the findings of Hao and Lee (2016) we should consider further investigations in the students' technical knowledge, self-concern and management concerns, to get a broader understanding on how they would employ this methodology in a *schooling at home* setting.

The change in evaluation modalities was perceived exceptionally positively by students. They thanked the lecturers after the presentation for the assigned "nice task". The creation process is still ongoing, and the peer-review process will only start afterwards. We will, of course, analyse both processes in detail and publish the results at a later date.

A project-based approach to develop scientific reading and writing competencies

When novice students start their studies at the university, they are often faced with the challenges of reading scientific texts that differ from the types of texts they were used to reading; and writing scientific texts, which they probably never did before entering university. They need to learn to understand and use technical terms that they are not familiar with, develop their reading and writing skills (Pyerin 2019), and learn to understand and use certain conventions and norms (e.g. formatting styles) of scientific writing.

Developing scientific reading and writing competencies is indeed helpful in order to become a successful student at the university in general, where they have to read scientific literature for various courses, write essays and a bachelor's or, eventually later on, a master's thesis. It is more specifically relevant for future teacher students because it allows them

1. to ground their thinking about learning and teaching in solid scientific knowledge,
2. to develop an informed, nuanced, critical and reflected stance about learning and teaching, without having to blindly rely on authority figures,
3. to design learning and teaching activities based on scientifically valid knowledge,
4. to document, describe and reflect their own pedagogical and didactic actions as well as the associated learning processes and outcomes in a scientific way, and
5. to evaluate learning and teaching processes better. Overall it contributes to them becoming reflective practitioners (Schön 1983) of learning and teaching, which is the *leitmotiv* of the entire study programme.

Therefore a decade ago, in parallel with the fundamental school law reform (MENFP 2009), a course on scientific reading and writing was introduced into the first year of the curriculum of the BScE. More specifically, the aim was to teach students to develop a scientific research question, to perform strategic searches for primary sources of scientific knowledge, to gain access to those sources, to read and use them to write scientific texts themselves, following applicable standards.

Normal Course

This course has been co-organised by two lecturers using an active pedagogy implementing *project-based learning* (Bédard et al. 2012) and *learning by doing* (DuFour 2013) within a *community of practice* (Wenger 1999). We have indeed opted for a pedagogical approach that puts students at the centre of their learning process, and enables and forces them to be active, to explore, to experiment, to debate and be creative themselves (auto-socio-construction). We also wanted our approach to be as authentic as possible, i.e. as close as possible to the real-world process of scientific reading and writing, while remaining manageable by first-year students. In order to allow them to take responsibility for their learning and to make it as meaningful as possible for them, we allow them to work on a topic of their choice. They need to develop an empirical research question themselves, to collect peer-reviewed empirical research reports themselves, analyse and evaluate them, and develop a review of the scientific literature to answer their empirical research question. This bibliographic research process gives rise to the first product that they need to hand in and which contributes to their final grade, an annotated bibliography. We also give them the evaluation criteria which we apply to grade their works.

In-class sessions are generally used to tell students how we work in this course and what the deliverables are, to coach them, to guide them, to give them feedback on their works in progress, to model the iterative and complex process of scientific reading and writing, to let students work together on the two products—the annotated bibliography and the review of the literature—and to let them ask questions about the work process and the articles they were reading. Students also have access to various resources on Moodle™, which they should explore and use for their work. Importantly, they do

have access to online search engines and online library catalogues, which allows them to easily and effortlessly access primary sources from anywhere.

Schooling at home

When the authorities implemented lockdown measures, we had reached a phase of the learning process where students were supposed to take an active role in the co-construction of knowledge anyhow. They should have started to read self-chosen scientific papers, to extract knowledge from them and to write their first attempts at a review of the scientific literature, in order to find answers to a self-chosen research question in the field of education. During previous years, this had been the time where some students felt that coming to the on-campus sessions was not too helpful because they could not easily concentrate and focus on their reading. So we uploaded a short video message on Moodle™, where we explained that we wanted them to keep working towards their annotated bibliography and towards their review of the literature, and that further instructions would follow as soon as possible. During the following week, we did indeed organise a live video conference (via Cisco Webex) to keep in touch with them and to give them live feedback on their current work. The students needed to find digital means to communicate with each other and to collaborate on their group work, and we provided them with some links to useful tools to expand their collaborative learning environments. Over the weeks we held regular video conferences with the same objectives, and additionally to give them further instructions about the second product, the review of the literature, that they had to work towards. We did a special session where we explained to them what a review of the literature is about, how to write it, how they should proceed to make it a collaborative work (and not some loose patchwork), and how they could structure their review. We recorded this session and made it available to the students. We made some of the scheduled sessions optional, so that students would have specific time slots where they could contact us, but could also choose to spend their time to work on the required products.

Discussion

While we did not have as much insight into the students' work-in-progress, the distance imposed by the lockdown might have been more a blessing than a curse for the students, at least when it comes to this course. They were no longer obliged to come to campus and could avoid the disturbing presence of other students while reading and writing in their home setting. However, it might have been more difficult for them to co-write and to set up efficient personal learning environments that allow them to communicate and collaborate with their peers, which usually plays a crucial role in the learning process. These difficulties may have led to more jigsaw work strategies than normal, i.e. dividing up the work into separate work packages that are later more or less loosely stitched together. Some students might even have felt lost and disoriented, even if they did have the opportunity to ask questions, via online forum entries, via email or the live video conference sessions. In addition, we were no longer able to closely interact

with each student group to coach them by mediating their collaborative construction of knowledge processes.

The experience of the past weeks may have taught us that we can allow our students more autonomy towards the end of the process, but that we then also need to provide more scaffolding and guidance at the beginning of the semester than previously (which we had done this time for reasons unrelated to the COVID-19 pandemic). The recording that we made during this extraordinary situation might become a valuable resource for future iterations of this course, because it will allow us to give students more explicit instruction about the review of the literature that we want them to produce, right from the start of the process.

Overall, we were able to continue our course using the same teaching approach because it was set up in a resilient way. Right from the start, we had defined which learning products students were supposed to generate. We had provided all the necessary resources that students could and should use to do their work. We had clearly and explicitly instructed them how they should work, in oral and written form. We had replaced the live in-class tutoring sessions with online video conference sessions and had created more flexibility for our students to manage their own time and their work process. Last but not least, our assessment modalities were in place: students were supposed to hand in their work online, and we would collaboratively assess them at a distance using video conferencing and shared screen services.

Collaborative inquiry-based learning with big questions to develop knowledge and understanding about education in the digital age

In a digital age, preparing pre-service teacher students for their jobs not only means helping them develop the skills to use a well-defined set of software tools, but it also means helping them to develop solid theoretical foundations for their future strategic use of information and communication technologies in school settings. Altogether this includes knowledge and understanding of a variety of educational software tools and their instructional functions, as well as multimedia authoring tools. And it also includes knowledge and understanding of the broader societal context within which schools operate and the curricular requirements imposed on schools by society at large. Education in the digital age is not just about using digital media and tools for educational purposes (digitisation of education). It is about developing new approaches to learning and teaching, and about rethinking educational goals (Selwyn 2011), given the social, cultural and technological changes induced by the digital revolution (education for a digital age). Education in the digital age is about becoming knowledgeable more than it is about being knowledgeable (Wesch 2009), it is a question of learning how to learn, learning how to ask big questions and how to address them in bold ways (Mitra 2013), rather than merely memorising old answers developed for a different context. When the world is continuously changing, then it is no longer sufficient to know what was valid in the past, but we need to develop a forward-looking eagerness to develop new answers. Of course, this does not mean that we can disregard the knowledge and

wisdom from the past. Looking back at past events and how they were shaped by social, cultural and technological forces is quite revealing and helps us understand current events.

The topic "education in the digital age" was introduced into the first study year of the BScE over a decade ago. Over the years, it had been organised either as a seminar or as a lecture, often depending on structural reasons rather than pedagogical ones.

Normal Course

After having organised the course "education in the digital age" as a lecture and a written exam for years and observing a few issues with that approach, we decided, in 2017-2018, to implement it as a seminar and to change, rather radically, our teaching approach as well as the assessment modalities.

We had indeed seen that many students failed to pass the written exam, where they were supposed to show knowledge and understanding of the various topics addressed during our lectures, namely: (1) the impact of the digital revolution on how we live together, how we communicate with each other, how we create and share culture, how we produce and share knowledge, how we learn, how we teach and what schooling is about; (2) the need to develop new literacies for the digital age; and (3) digital-age teaching methods and digital media and technologies for teaching. Moreover, even if they passed the exam, a few semesters later many of them had forgotten most of the theoretical foundations or did not mobilise them when asked to do so in a subsequent project-based course on developing a scenario for the strategic integration of ICT into education. We also felt that lecturing students about the need to rethink education in the digital age was not isomorphic with the conveyed content of the course. These considerations had driven us to rethink and redesign our teaching approach and our assessment method.

Since 2017/18, we have thus been implementing and continuously reflecting (Reuter/Busana 2018; Busana/Reuter 2019) a pedagogical approach that combines various learning and teaching methods that require students to *actively and collaboratively construct meaningful knowledge* and to *share it in a community of learners*. The entire cohort of students is divided into two groups of approximately 50 students and co-taught by two lecturers. Compared to the previous lecture approach, we doubled the required human resources. However, it allows us to coach students much better and gives them access to two expert perspectives with different disciplinary backgrounds (educational technology, educational sciences, cognitive psychology and learning sciences). In general, students are given "big questions" (i.e., questions where there are no simple and easy-to-lookup answers), and we instruct them to develop meaningful answers, based on resources that we have curated for them and made available on our learning management system (Moodle™), and resources they have looked up themselves. These answers are shared with their colleagues (and us) in an online forum ahead of the seminar and discussed in class to collaboratively produce meaningful and shared answers to the big questions. Finally, each student is required to leave an entry in a personal digital portfolio by which they can demonstrate their knowledge and understand-

ing of the topic worked on during the week. Currently, we do not provide a centralised digital portfolio solution, but let students choose the authoring tools they wish to use to create these portfolio entries and how and where they collect them. We try to guide their inquiry-learning process more at the beginning of the semester (by requiring them to read or watch learning material that we provide and which we know to contain useful information to address the big questions we are working on). We do that less towards the end of the semester (by inviting them to search for relevant resources online themselves with which they can gain a better understanding of the topics, or with which they can illustrate their understanding of theories and models).

We have seen them struggle with our approach. This might be due to the fact that many students do not have extensive experience with *auto-socio-construction* before studying at the university. They are more used to dealing with "small questions" (questions for which you can look up answers, in your memory or external storage devices of all sorts), or with reproducing answers to questions (both provided by their teachers). They do indeed often expect us to validate their answer and to provide the information to put into their portfolio. Moreover, some entries in their portfolios merely quote information that they discovered in the provided resources, while we expect them to demonstrate their understanding and to produce their own informed answers. However, since we have partially used previous exam questions, we have observed that their answers have largely been better than those developed by their predecessors, probably because they had access to documents. We also see that many students deeply engage with the proposed content and try to understand it and make sense of it. Given our (more or less) guided inquiry-learning approach, combined with the fact that students share their productions in class and online with the rest of the community of learners, over the semester we have had quite useful insights into their learning processes, and we were able to provide formative feedback when necessary. Our students' learning (processes and outcomes) has become much more visible than it was previously in the lecture hall, where it only became visible when grading the final written exams, but then it is too late to scaffold their learning processes.

Overall, we have been quite satisfied with our teaching approach, and our students have appreciated the approach as well as the content of the course (as seen in the increasing scores of the official course evaluation). However, we are still working on how we can improve our ongoing formative assessment practices, and on how we can provide a shared digital portfolio environment that would help establish and extend the community of learners beyond the in-class moments.

Schooling at home

As this course had been functioning as a blended learning course for the third time (i.e. there are online and offline phases of the learning process) the changes required to continue the learning process during the lockdown were relatively small. Of course, we had to make some small adaptations to continue organising this course as a collaborative inquiry-based learning process. We had to replace the shared physical space (classroom on campus) with an online shared space (a Cisco Webex video conference room) where we

could discuss their individual and collaborative constructions of knowledge. We also had to replace the instructions that we usually gave to students orally in-class (what they should do as preparation work ahead of the next session, or what they should do as a collaborative work during the session) with written instructions that needed to be very precise (in order to prevent that students would send emails asking for clarifications). While we might usually have used paper-and-pencil methods for collaborative productions or resorted to online collaboration tools, during the lockdown we were forced to use online collaboration tools. The live video sessions were recorded and made available to students afterwards.

We organised some sessions differently since we were not able to set up different stations with tools for our students to explore and experiment themselves. Online guided tours of different media and tools replaced the session about instructional software tools and their instructional functions, as well as the session about teaching with multimedia and hypermedia. The hands-on exploration and experimentation session about computational thinking was substituted by an instruction to explore, consume and digest a variety of online resources about computational thinking (*what*, *why* and *how*?). A video conference session with the usual external guest speakers replaced the in-class session about digital game-based learning.

Discussion

Overall we were able to deliver our course in a relatively similar way to before the lockdown, even if some adaptations were necessary. Moreover, the experiences our students went through, as learners during the lockdown, represent an excellent opportunity for them to experience learning activities that are entirely online, digitally mediated yet socially powered, and self-directed yet teacher scaffolded.

Of course, the synchronous live sessions in the virtual video conferencing spaces were quite different from the in-class sessions, especially for us as teachers, since all students had their video cameras off and microphones muted, and they only unmuted their microphones to speak (to ask a question or react to our prompt). We do not know what the students were doing, thinking and feeling during these sessions, and we will only see to what degree they were able to construct valid knowledge when we review their portfolio entries.

At least, at the beginning of the lockdown phase some of our students raised concerns over the workload. They did indeed get a lot of written instructions, to individually prepare themselves ahead of the live sessions and the associated group work activities, and on how to collaborate with their peers. Given that these activities would usually have taken place during a live in-class session, they would have had to do them anyhow, and the workload would have been the same. However, the instructions would mostly have been given orally and might not have been as tangible and visible.

We will surely keep using the now more explicit and precise written instructions (about preparation and co-construction learning activities) for future iterations of our course. Even if we might not need to rely on written instructions, students can consult them at anytime.

Instructional design in online teaching for an unplanned remote internship

The internship is the backbone of the BScE as it links with all other courses. It is essential for the future teachers to try and adapt the knowledge and skills learned. However, the internship is far more than a testing ground for the students. It is a central learning place, as well. Based on their experiences, they can (re-)discuss didactical and methodological concepts in the subsequent courses at the university.

Normal Internship

The students would assist the teacher of an elementary class for several weeks and plan and perform a series of regular teaching activities (MENJE 2011). An elementary school teacher and university tutor would have guided and evaluated each student. In the regular internship, the students would have touched ground with their future working environment. They would have tried to collaborate with their field mentors in all of their activities (e.g. administrative tasks, exchange with parents, excursions).

Remote Internship

Elementary schools were closed, and the teachers were teaching their pupils under the above-mentioned and very diverse *schooling at home* conditions. Thus, the internship that our students were about to start in different elementary schools could not happen as planned. A completely new concept was needed in a very short time. Hence, the students created *instructional videos* on "essential" topics from the curriculum as defined by a joint task force from the Ministry of Education (MENJE 2020). These videos will be publically available and can thus support the teachers in their daily work.

Similar to the duration of the planned internship, students should produce, generally in cooperation with another student, one instructional video per week following consecutive phases. The students wrote a scenario laying out the theoretical foundations and describing the content of their video. They presented this scenario to their tutor and optionally to a group of experts. With the approval of their tutor and potential recommendations from the didactical experts, the students engaged with a wide variety of educational technologies, categorised into four categories according to Means (1994): communicate, explore, tool and design. However, although most students seemed to use communication technologies and tutoring systems online, few engaged in technologies which foster design and exploration by the student. Similar to the observation which could be made generally in *schooling at home* in the educational system, there was a strong tendency to (often implicitly) base their instructional design decisions on objectivist theories of learning (Roblyer/Doering 2013). However, we assume that this tendency was related to their little teaching experience, and that students based their scaffoldings on their scholastic experiences (Crook 1997). The novice experience level of the students in instructional design made the revision of the videos by a group of experts (media experts, mathematics didactical experts, language didactical experts) and

the members of the "Bureau Temps de Terrain" (BTT) quite essential to ensure the needed quality and the linking to the curriculum before their publication.

Discussion

Comparing both internship settings, we see that they both generate outcomes that are relevant to becoming a teacher. However, the remote internship made possible what was impossible so far, as it was a massive step towards the digitalisation of the pre-service teacher training. Students used acquired skills and knowledge under the supervision of tutors and specialists. Their learning was scaffolded, and highly motivated students and teachers drove the remote internship. The students created their productions in a collaborative approach. This innovative learning experience was challenging at some points, as all innovations combined for a level of uncertainty, but showed overall a positive impact on the students' professional development. The students did engage in a self-regulated learning process which probably had a positive effect on self-perception.

Nonetheless, the production of one video per week diminished the quality of the learning material. Thus after one week, the rule was abolished, and no exact number imposed. As a consequence, the students could invest more time to implement the feedback received, which primarily improved the quality of the produced videos. Eventually, they could be peer-reviewed in the next semesters and improved accordingly in an iterative process.

Another small glitch was the fact that many students regularly chose the same subjects (e.g. properties of shapes, perimeter and area). Again the BTT reacted quickly and published the list of treated topics each week, to try and avoid the multiplication of videos regarding the same subject. The main idea remained to cover as many "essential" topics of the curriculum as possible.

However, it was a very enriching learning setting for both students and teaching staff. It has been the first internship in years where students had systematic exchanges with a didactical specialist during their internship, which became possible as they treated a small number of subjects in detail. Hence, the students got first-hand formative feedback on didactical principles. Moreover, compared to normal internships, tutors and students had more intense discussions about the scenarios they were developing because time pressures were different. During a normal internship, school teachers might, rightly, give preference to their need for learning activities to happen, even if the planned lessons are far from perfect. In the remote internship setting, this urge to perform immediately was much less present. It can also seem fitting to have students improvise more and let them experience the effects of a less well-planned lesson. Instructional videos that are supposed to be published must, however, live up to much higher standards.

Students should always have the possibility to exchange with a didactical specialist in an internship to get formative feedback. A classroom visit combined with the production of valuable instructional videos, usable in flipped classrooms, would give the university the chance to get a complete picture of the students' performances and ensure the hands-on training of educational technology skills. Besides, we assume that it would

be beneficial for the student to dedicate one part of the internship to online teaching methodologies.

Conclusions

Schooling at home, with its abrupt and imposed changes in teaching and learning, were entirely new experiences for the teachers and students at the University of Luxembourg. In the described courses of the "Bachelor en Sciences de l'Éducation", a switch to *schooling at home* came very comfortably. Having resources, instructions and assignments online made the transition quick, with everything in place and part of the usual routines. Of course, the synchronous live sessions in the virtual video conferencing spaces were quite different from the in-class sessions, especially for us as teachers, since all students had their video cameras off and microphones muted, and they only unmuted their microphones to speak (to ask a question or the react to our prompt). Some students did use the chat functions to send in questions or affective approvals (e.g. "I like this assessment." or "Thank you for your explanations."). However, we do not know what most of the students were doing, thinking and feeling during these sessions.

Furthermore, pedagogical scenarios that rely on learning activities, with a lot of student responsibility and active learning, are more resilient when onsite learning and teaching becomes difficult or impossible. Nevertheless, it remains unclear in how far our students can cope with this increased responsibility and freedom. Our pre-service teachers had been more than ever in a situation, where they needed to organise their studying and create meaningful resources. We assume that the learning motivation is more significant when students produce resources which might be published and used in daily teaching sessions by their future colleagues. However, we will have to evaluate to what degree we can implement the design and production of instructional videos as learning contents and deliverables of various courses where students accomplish educational and pedagogical projects.

We are also considering using video conferencing more systematically in the future. On the one hand, it gives enormous flexibility for (very) short interactions like tutorials in the context of Bachelor theses, project work or even internships. On the other hand, it might also be useful for course sessions where physical co-presence is less critical, like the 7th semester course about the design and implementation of an educational technology scenario. All in all, we need to completely rethink the relevance of in-class attendance for learning and continue to work towards a digital university (Siemens/Gašević/Dawson 2015), knowing that especially scaffolding learning processes and establishing interpersonal relationships become crucial in this context.

The impact of the *schooling at home* on the professional development of the future elementary school teachers is manifold. They have experienced themselves *schooling at home* and seen multiple approaches by different lecturers which might ease the acceptance of this concept in their future professional environment. Besides their willingness for a consistent use of ICT (e.g. video conference, blog, mathematical trail) for learning and teaching in class, and especially beyond, should have increased.

Future empirical research is, however, needed to systematically investigate how pre-service teacher students experienced the *schooling at home* activities and what effects it will have had on them, their knowledge, their skills and their attitudes. The course evaluation available in July will provide the first answers to some of the raised questions.

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