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# Vocational Education During School Shutdown - a Danish Case on Emergency Remote Teaching

Bent B. Andresen <sup>[0000-0002-6448-955X]</sup>

Aarhus University, Danish School of Education (DPU)  
Tuborgvej 164, 2400 Copenhagen NV, Denmark  
bba@edu.au.dk

**Abstract.** This paper focuses on the emergency remote teaching during the temporary shutdown of physical learning environments in the spring of 2020. It presents findings from a survey among about 14,000 Danish teachers and students at vocational colleges and upper secondary schools regarding their experiences with online education. The analysis and interpretations of the survey data provide evidence suggesting that the teachers generally need professional development regarding online education and blended learning events. Most often, they did not succeed in their attempts to realise the potentials of online education: First, they did not manage to coordinate their expectations regarding the students' daily workload and meet their individual need for teacher support. Second, they did not provide clear announcements and formative feedback. Third, they had difficulty supporting students experiencing learning difficulties and they did not support students with motivational challenges due to social isolation.

To overcome these challenges, teachers need to be more informed by data and research than they were during the emergency remote teaching. This includes information derived from analysis of local data on students' independent and collaborative work, learning challenges, and perceived self-efficacy. Moreover, it includes information about the main findings in research about the benefits of blended learning compared to online teaching and f2f teaching.

**Keywords:** Blended learning, online education, vocational education, emergency remote teaching, case study

## 1 Introduction

The Danish vocational colleges and upper-secondary schools, like many schools around the world, had to introduce emergency remote teaching in the spring of 2020. Faced with the risk of spreading COVID-19 virus, the purpose was to maintain ongoing education during the school shutdown. The teachers at all the schools made an extraordinary effort to reorganise teaching and learning activities. The paper analyses the main experiences of the teachers and students in the spring of 2020.

Teachers usually obtain knowledge about teaching methods by reflecting on their experiences in previous teaching situations. Their individual reflections often begin

while the teaching is in progress and continue afterwards [1]. These reflections regarding previous teaching and learning events may increase their ability to choose effective teaching methods. However, these reflections relate to previous experiences, so they are less useful when teachers need to carry out their work in completely new ways. Faced with an immediate need to reorganise educational events, most teachers lacked experience of and routines for carrying out online education.

Over recent years, all vocational colleges and upper-secondary schools implemented 1:1 environments where each student has a laptop or tablet with internet access and all students are digitally literate. The Danish schools were among the first in the world to implement such 1:1 learning environments [2]. For years, the level of digital literacy among students in Denmark has been among the highest in the world [3]. Moreover, the need of Danish teachers for professional development regarding ICT skills for teaching has been among the lowest in the world. Before the shutdown of classrooms, just 8% of upper-secondary teachers reported a high level of need for professional development in this area [4, Table 1.5.23]. However, they had no experience with emergency remote teaching and it was a challenge for them to adjust to it.

Accordingly, the paper addresses these two research questions:

1. What were the main challenges regarding emergency remote teaching at vocational colleges and upper-secondary schools in the spring of 2020, and
2. How can teachers overcome these challenges in future?

The paper addresses these questions by analysing data from a survey conducted shortly after the closure of the physical learning environments in the spring of 2020. The respondents included about 14,000 Danish teachers and students. Based on an analysis of data about their challenges and experiences, the paper examines how the teachers organised their online teaching by adopting a trial-and-error strategy.

Furthermore, it explores an alternative approach in which the teachers adopt a research-informed strategy. In particular, it explores how teachers can handle future disruptive events if they are informed by research findings on technology-enhanced teaching and learning activities.

## 2 Theoretical Framework

The theoretical framework includes theory on basic forms of teaching. This notion refers to constructions suitable for analysing and understanding different types of teaching [5]. The paper explores two basic forms of teaching in digital learning environments: 1) teacher-centered and 2) student-centered teaching respectively. There is research evidence suggesting that a synthesis of these forms of teaching generally has a greater impact on student learning outcomes than traditional f2f education [6].

Essentially, the former involves communication between a teacher and students (oral teaching, guidance, written dialogue and oral and written feedback). In general, such teacher-centered activities influence students' learning outcomes positively [7]. When teachers and students are not allowed to meet in a classroom, teachers can either organise one-way communication via the school's digital learning platform or apply a more

dialogical approach and communicate with individual students or groups of students via online media.

The second basic form of teaching and learning is defined as “teaching with a high degree of individual work or group work” [5]. When teachers organise such activities, they make a number of choices regarding for instance small-group interaction and learning content and tasks. The students work individually, in pairs or in groups, and they can adjust the time they spend on each task according to their prior knowledge and current abilities.

The teachers need to evaluate these activities with virtual attendance. In particular, the teachers need to evaluate the student-centered learning processes systematically in relation to academic and other expectations, which can be defined in terms of the students’ zone of proximal development [8]. Whenever expectations fall outside this zone, students risk being demotivated by tasks that are too difficult, or, conversely, do not learn anything at all because the tasks are too easy for them. In consequence, the teachers have to:

- Identify the students’ zone of proximal development
- Select appropriate student tasks
- Provide feedback on the students’ work in progress
- Evaluate their final results

Sometimes, teachers use a retrospective and summative approach to determine the students’ current knowledge and skills or to grade student work. This approach is less suitable than a formative approach when it comes to determining the students’ developmental potentials. Additionally, the students’ belief in their own ability may suffer when their assignments and other products are returned with comments regarding their flaws and shortcomings.

There is also research evidence suggesting that summative evaluations in the longer term demotivate many students [9]. Although they may learn from their shortcomings and mistakes in the short term, the use of summative evaluation may decrease their motivation and momentum in the end.

Frequently used complementary approaches include formative feedback and process-oriented evaluation. About twenty years ago, researchers provided evidence suggesting that formative feedback has a relatively large influence on students’ motivation and learning outcomes [10]. In addition, there is research evidence suggesting that formative evaluation fosters these factors a great deal [7]. When reflecting on their formative feedback, the students are encouraged to complete and present the results of their self-directed activities. In general, the benefits of such approaches are twofold: strengthening the teachers’ insight into the students’ learning processes, and fostering these processes.

In general, the teachers use various approaches to provide feedback on the students’ work, but there has been a shift in focus from result-oriented to process-oriented evaluation in the Danish educational system. More and more frequently, teachers provide feedback on work in progress tailored to the students’ educational needs and challenges and applied to strengthen their continued learning processes.

### 3 Methodology

As mentioned above, the paper analyses data from a survey among teachers and students at vocational colleges and upper-secondary schools. This survey was conducted in close collaboration between a Danish knowledge center and a Danish think-tank [11]. The author of this paper provided research guidance.

The survey was conducted in 2020 from April 27 to May 8 at schools offering upper-secondary education after the compulsory ten years of education at primary and lower-secondary schools. The total number of schools was 55. The forms of upper-secondary education involved are shown in Table 1.

**Table 1.** Overview of schools and forms of education involved in the survey (some schools offer more than one form of education)

Form of education	Explanation	Number of schools
VET	Vocational Training	25
EUX	Vocational Student Exam	22
HF	Higher Preparatory Exam	20
STX	General Student Exam	25
HHX	Mercantile Student Exam	9
HTX	Technical Student Exam	8

1,886 teachers and 12,352 students responded to the survey. The main theme in the teachers' questionnaire is their work experiences. The questionnaire focuses on the teachers' experiences when organising teaching and learning activities in which physical attendance was not possible. They were asked to relate to statements about their work experiences with online teaching in the last two full teaching weeks in April 2020. The main theme of the students' questionnaire was their experiences of online teacher-centered and student-centered activities during the same weeks.

### 4 Results

In the spring of 2020, the majority of teachers obtained insight into online teaching, which they expect to make use of in the future to develop and improve online teaching [11]. In particular, teachers who already had some experience in this area obtained insight that they plan to use in the future.

The transition to pure online teaching due to the closure of the physical learning environments was a top-down decision. When this decision was announced, there were no clear guidelines for the necessary reorganisation of teaching at the vocational schools and colleges [11]. Although some school leaders inspired the teachers and provided feedback on their online teaching, a number of teachers were given inadequate guidelines:

- One in every eight teachers “received useful and sufficient guidelines for distance learning from the school” either very little or not at all.
- One in every four teachers “received useful and sufficient support and guidance from the school in relation to the choice and use of digital technologies” either very little or not at all.
- One in every four teachers said that their school “organised sharing of knowledge about and experience with distance learning between colleagues” either very little or not at all.
- About half of the teachers said that their school “organised sharing of materials and/or teaching courses between colleagues” either very little or not at all.

In this situation, the teachers increased their knowledge sharing about: 1) the use of digital technology and materials, and 2) the reorganisation of teacher-centered and student-centered learning events.

Teachers primarily shared knowledge about and reorganised their oral communication using interactive video methods. In general, the influence of interactive video methods is above the average for all the methods used (Table 2).

**Table 2.** The effect of using digital technology [12]

Type of method	Influence (effect size)
Interactive video methods	0.54
Average of all types of methods	0.40
Programmed instruction	0.23
Web-based learning activities	0.18

The teachers often scheduled lessons on the screen for an audience of students lying in their beds with their cameras and microphones turned off. The teachers could easily be seen and heard, but it was obviously much more difficult to ensure that the students were paying attention. Some students were distracted by, for example, social media updates [11].

When they perceive academic instruction and web-based learning as homework, their industriousness and self-discipline varies as with other types of homework. Consequently, not all students managed to prepare for scheduled lessons by watching video-based homework.

The influence of interactive video methods on student learning may also decrease if the students regard them as elements of programmed instruction or web-based learning activities. This is in line with general research findings. As indicated in Table 2, programmed or web-based instructional activities have relatively little influence on students’ learning outcomes.

Although the online teaching was never referred to as ‘programmed instruction’, it did resemble programmed instruction to some extent. For example, this form of instruction is often monotonous because it involves sequences of repeated activities such as introduction of new material, assignments, tests, repetitions and additional tests. In the spring of 2020, the teachers and students experienced increased uniformity: “Both

teachers and students felt that the teaching became more monotonous in the way it was approached during the COVID-19 virus shutdown” [13, p. 7].

Due to inadequate coordination between the teachers, they provided plenty of assignments: “The first period of teaching was characterised by the students being given tasks that they had to perform individually or in groups and hand in for assessment. In other words, the teachers provided plenty of tasks to ensure that the students had enough to do during the allocated teaching time” [13, p. 5]. The increased amount of homework affected the students’ motivation and learning outcomes negatively. Students were generally less motivated and learned less [13, p. 5].

Moreover, many students called for clear announcements regarding their self-directed learning activities. The teachers generally: “Had difficulty expressing their expectations to the students. Teachers are used to expressing and explaining their expectations during face-to-face contact with students. When this possibility disappears, it is much more difficult to ensure that individual students understand the presentation” [13, p. 6].

In addition, many students wanted formative feedback and guidance when working independently or in pairs or small groups. As previously mentioned, the students may learn a lot from this kind of feedback. Ideally, they can resubmit some of their work to obtain summative feedback. However, most students wanted feedback that was more comprehensive in the spring of 2020.

Regarding the amount of feedback, the teachers were more positive than the students were. [11]. However, the teachers provided so many tasks that they did not have “the opportunity to give feedback on all the tasks” [13, p. 6].

In the regular classrooms, most teachers continually consider the students’ need for support related to individual tasks and collaborative work. After the school shutdown, they were not able to develop alternative methods to cater for this need. Therefore, it was more difficult to assess students’ motivation, working efforts and learning outcomes during the school shutdown [11, p. 5].

During face-to-face teaching, the teachers circulate among student groups, answer questions and provide ongoing feedback to the students regarding their self-directed activities. When this is no longer possible, the teachers tend to decrease their observations. In consequence, they knew less than usual about the students’ motivation and the extent to which the students actually met the given learning objectives. Many teachers failed to support their students adequately during the shutdown of the classrooms in the spring of 2020.

In other words, the teachers did not have time to develop alternative methods to observe and support the individual students. Consequently, the students found it harder to work with the educational materials. This included students who felt they were academically weak. It is significant that students at the lower end of the achievement scale felt a lack of support from their teachers more than students at the other end of the same scale did [11].



## 5 Discussion

In general, feedback for teachers provided by an external research-informed certifier improves technology-enhanced education and e-learning [14]. In particular, it promotes consistency between expected learning outcomes, preconditions as regards content, duration, flexibility, use of digital platform etc., and design in terms of the organisation and evaluation of learning activities. Therefore, the vocational colleges and upper-secondary schools might consider implementing a system of certification of e-learning concepts in future.

Furthermore, the teachers could apply more research-informed practice. This does not mean that they regard research findings as a recipe for action, but research does provide useful information whenever they plan educational events in 1:1 learning environments. For example, there is research evidence suggesting that clear announcements influence students' learning outcomes to a considerable extent. In the first weeks after the sudden shutdown of the classrooms, it is quite understandable that not all announcements and learning objectives were completely clear. Afterwards, however, there was a need for clearer announcements and objectives to ensure that control of the learning activities was not transferred in its entirety to the students.

In general, students' control over learning has low influence on their performance compared to actions like formative evaluation and feedback, and clear announcements and learning objectives (Table 3).

**Table 3.** Selected effect sizes [12]

Type of method	Influence (effect size)
Students' perceived self-efficacy	0.92
Formative evaluation	0.90
Formative feedback	0.75
Clear announcements	0.75
Clear learning objectives	0.50
Average of all types of methods	0.40
Students' control over learning	0.04

Usually, students' learning processes are assisted whenever they receive formative feedback and have sufficient time to learn from this feedback and possibly resubmit some of their work (Table 4). This includes feedback on activities requiring them to work alone or in groups, but as mentioned above, many students experienced little motivating feedback from their teachers in the spring of 2020.

The students' motivation relates to their perceived self-efficacy, which correlates with their learning outcomes [15]. When they feel that they cannot perform an increasing number of tasks on their own, their perceived self-efficacy may decrease. Consequently, the teachers need to develop methods to replace the methods they use in the classroom to identify students with relatively low self-efficacy, and provide tasks which

all the students are able to master individually or in groups with proper support. Otherwise, the dropout rate at vocational schools and colleges could increase. This may be a serious problem, since just one out of twelve Danish municipalities complies with the current requirements relating to student dropout rates [16].

This problem was intensified by the fact that students also, in their own opinion, lose motivation as time goes on [13, p. 6]. For obvious reasons, many students reported increased needs for social contact during the closure of the physical learning environments. They generally missed social interaction with other students during the period of pure online teaching and learning events. [11]. From day to day, they actually became less happy with their situation, which affected their motivation and industriousness.

Under these circumstances, teachers should consider more dialogical approaches allowing the students to ask questions and present their academic understanding and major results of their self-directed learning activities. Moreover, they should consider collaborative learning activities and peer feedback. There is research evidence suggesting that collaborative learning generally leads to a greater learning outcome than individualised approaches (Table 4).

**Table 4.** The effect of student collaboration [12]

Type of method	Influence (effect size)
Collaborative vs. individual learning	0.59
Average of all types of methods	0.40
Individualised teaching	0.22

In some situations, it is most appropriate for students to develop specific skills individually, but in many other cases, students may benefit from working together for three major reasons. First, collaborative learning can help reduce feelings of social isolation. Second, it can cause subject terms to become part of students' active vocabulary. Third, it can strengthen students' commitment and serious work because they feel obligated by their agreements with other students.

Accordingly, it is crucial that the teachers foster collaboration in student-centered activities. For example, the teachers could promote co-creation, dialogue and other kinds of collaboration by allowing the students to use digital learning platforms, social media platforms, Google Docs, Skype, Zoom, etc. Additionally, the students could prepare for lessons, perform tasks, and receive feedback in pairs or in larger groups. Moreover, they could exchange and comment on each other's draft assignments and the like.

## 6 Conclusion and Perspectives

The paper addresses two research questions: What were the main challenges of emergency remote teaching after the closure of classrooms at vocational colleges and upper-secondary schools in the spring of 2020, and how can teachers overcome these challenges in future?

The research findings provide evidence suggesting that the schools did not succeed in utilising the potentials of online learning during these circumstances. From a student perspective, there were shortcomings regarding announcements of learning activities, feedback, professional support, differentiation in teaching, and social contact.

Consequently, both teachers and students experienced reduced student motivation and increased monotony in their teaching and learning experiences. In particular, the students became mentally distracted and demotivated, or lost their sense of self-efficacy, due to an increased number of assignments, which they generally regard as more difficult than before the emergency remote teaching was introduced.

Therefore, the teachers need to coordinate their expectations regarding the students' daily workload and individual need for teacher support. In addition, the teachers need to provide clearer announcements and more formative feedback and support. This includes supporting students who experience learning difficulties and social isolation during emergency remote teaching.

Generally, the teachers need to be informed by data generated by their formative evaluation of students' perceived self-efficacy, learning challenges, collaborative work and social isolation if they wish to practice blended learning in future. Additionally, they need to be informed by important findings in school research. This includes information about the strengths of blended learning synthesising teacher-centered and student-centered activities, which has a greater positive influence on students' learning processes than pure online and pure classroom education.

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