TrygFondens *Udeskole* Research Project 2013-2016 (TEACHOUT)
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Summary

_Udeskole_ is a broad term referring to curriculum-based teaching outside of school in natural as well as cultural settings on a regular basis. Teaching outside the classroom in _udeskole_ one day every week has been observed to influence children’s physical activity, learning, social relations and attitudes to school positively. However, these observations are based on a few case studies. From a few _udeskole_ classes in year 2000, the number has increased to more than 290 schools in Denmark involving this teaching method, which makes it both possible and important to obtain more reliable information and in-depth understanding of whether and how _udeskole_ impacts on school children’s development and learning. The aim of the proposed research project is to achieve reliable evidence about the strengths and areas in need of further attention in _udeskole_. The main question is: _Do the alternative teaching practices of _udeskole_ increase and improve children’s physical activity, academic learning, social interaction and attitudes to school? And if so how?_

Based on case studies and theory, it is hypothesised that learning processes taking place in the settings of _udeskole_ are motivating and effective while also increasing the intensity and duration of physical activity of the pupils. A specific focus in the present research project is whether children who are classified as overweight, or with special needs, or from minority groups will benefit from _udeskole_ in relation to health, social integration as well as academic success. This project will provide evidence about the potential benefits of _udeskole_ and will reveal if and how _udeskole_ is a relevant supplement to both health promotion and primary education in Denmark.

The study will take place as a joint project between the Department of Forest and Landscape, University of Copenhagen, the Department of Exercise and Sport Sciences, University of Copenhagen, and the Steno Health Promotion Center, Steno Diabetes Center A/S.
1. General Introduction

In Denmark, a growing number of schools practice *udeskole*\(^1\). *Udeskole* targets school children aged 7 to 16, and is characterised by educational activities outside the school buildings on a regular basis (i.e. one day weekly or fortnightly) in either natural or cultural settings (Bentsen, Jensen, Mygind, & Randrup, 2010; Jordet, 1998, 2003, 2007).

*Udeskole* has mainly been practiced in forests and green areas / spaces. The typical aim and function of *udeskole* is to make use of an environment to teach often abstract academic concepts and skills in a more concrete and illustrative way. For example, by measuring and calculating the volume of trees in Mathematics, writing poems in and about nature when teaching languages, or visiting historical significant places in History or religious education (Mygind, 2005; Bentsen, Mygind & Randrup, 2009). Thus, *udeskole* has been used as a way to facilitate learning and understanding processes in children and to provide a motivating school setting.

Since 2000, Danish policy-makers have shown increasing interest in *udeskole*, and today approximately 290 schools practice *udeskole* (Bentsen et al., 2010), however evidence and knowledge about how *udeskole* influences pupils is still lacking.

Danish research in *udeskole* is a rather new phenomenon. Research in this area is limited to the understanding of the pupils’ physical activity levels (Mygind, 2005, 2007), social relations (Mygind, 2009), use of language (Herholdt, 2003), the extent and dissemination of *udeskole* (Bentsen et al., 2010), and how teachers prefer and use the cultural or natural settings outside the classroom (Bentsen, Schipperijn & Jensen, 2012). However, some caution is required in the interpretation of the results of this emerging field of research. First of all, research in *udeskole* has mainly been limited to investigations into teaching and learning outcomes and has been based on small numbers of pupils and teachers. Secondly, only case studies and action research have been conducted. Therefore, larger quantitative studies about the impacts and outcomes of *udeskole* are needed, supplemented with qualitative studies, in order to provide the necessary basis of evidence and in-depth insight on which future policy decisions about teaching and learning can be based.

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\(^{1}\) *Udeskole* is a broad term referring to curriculum-based teaching on a regular basis in natural as well as cultural settings. It is hard to find a suitable equivalent word in English, but *udeskole* could be understood as ‘outdoor schooling’ or ‘out-of-school-teaching’. The concept of out-of-school-teaching originates from Norway where teachers and pupils also use natural surroundings or a cultural setting i.e. museums, companies, factories, churches etc. as ‘outdoor’ classrooms on a regular basis.
Udeskole is becoming a widely used form of teaching in both the Danish Folkeskole\(^2\) and in private/independent schools. A national survey of Danish schools shows that 28% of the responding schools (at least 14% of the Danish schools) practice udeskole at some extent with about 60 classes practising udeskole once a week all year round (Bentsen et al., 2010). This high number of udeskole classes makes it both possible and necessary to conduct a larger study on how this teaching method influences the pupils’ physical activity, social relations, attitude towards school and learning.

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\(^2\) Comprehensive information about the Danish Folkeskole – the municipal primary and lower secondary school - can be found at [http://eng.uvm.dk/Education/Primary-and-Lower-Secondary-Education/The-Folkeskole](http://eng.uvm.dk/Education/Primary-and-Lower-Secondary-Education/The-Folkeskole)
2. The Relevance of Udeskole

Udeskole is an illustrative area for further research on the interdependencies between physical activity, learning and social relations. Therefore, the research questions raised in the proposed research project are not independent from one another and the project group including the three work packages will work closely together in order to address questions such as: Does udeskole provide increased opportunities for inclusion and improve social relations? How might this improve children’s attitude to school and how is this related to learning? Is learning facilitated in the udeskole environment due to the subjects studied becoming more concrete and meaningful or due to improved social relations and inclusion? How is the physical activity level related to learning? How are the physical activities of udeskole related to social inclusion? And how does udeskole affect the health, physical activity, learning skills, attitude to school and social inclusion of children with different social backgrounds (e.g. ethnicity, gender and social class) and bodily conditions (e.g. obesity and sports participation)? In other words, we expect the project to produce a much needed elaborated understanding of the associations between the school setting, social relations, physical activity and attitude to school and learning.

A number of recent national and international studies has identified associations between physical activity and learning which supports the hypothesis that udeskole, through its combination of academic learning and physical activity, can bring new learning and teaching perspectives to the Danish Folkeskole. In a review paper, Biddle and co-workers concluded that increased time for daily physical activity and less time used for academic subjects at school does not lower school performance and there seems to be a positive correlation between physical activity and the students behaviour in the classroom, creativity, IQ and general school performance (i.e. grades) (Biddle & Asare, 2011). A Swedish study of 1.2 million 18 year old men called up for military service (1950-1976), examined the relationship between physical activity (i.e. fitness), intelligence (i.e. logical thinking, spatial perception, verbal and technical skills), and cognition (i.e. exam results at school) and found a clear positive association between cardiovascular fitness and cognitive performance (Åberg et al., 2009).\(^3\) Increasing physiological evidence points to a direct causal effect of physical activity on cognitive performance as research indicate that during physical activity a brain-derived neurotrophic factor is produced which affect neuronal growth in hippocampus, which may improve cognitive function (Zoladz & Pilec, 2010).

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\(^3\) Among the participants >3000 were twins and 1300 were monozygotic twins. A strong linear relationship was found between the difference in cognitive function and difference in fitness between monozygotic twins.
A review conducted by Rickinson et al. (2004), concluded that teaching in the field / outdoor settings has a positive impact on long-term memory and points to emotional and cognitive benefits that mutually help to create a bridge to increase the learning abilities. Meta-studies indicate that 'outdoor adventure programs' have a strong positive impact on the emotional and social dimensions, while evidence for the cognitive, behavioural and physical benefits is more moderate (Cason & Gillis, 1994; Hattie, Marsh, Neill, & Richards, 1997). Although outdoor adventure programs are not directly comparable with the udeskole concept, these studies indicate that there is a potential in the use of nature as a teaching and learning setting. In the Scandinavian countries, several studies emphasise the special role of nature in the education of children and adolescents (Bentsen et al., 2009; Dahlgren & Szczepanski, 1998; Mygind, 2005; O'Brien & Murray, 2007).

It can be concluded, from the findings mentioned above, that there is support for the value of out-of-classroom teaching that combines physical activity and academic learning. Recently, a Danish consensus conference summarised the existing knowledge about the relationship between physical activity and learning:

"New knowledge and insights has been gained, but there is a need for further documentation on a number of areas. In particular, research should investigate different types of activities, extent and temporal distribution, what pedagogy and which settings give the best learning results and how activities are organised."

(Ministry of Culture, 2011, p. 13; own translation from Danish).

2.1 Project overview and work packages

The research project studies how udeskole influences three overall outcomes; physical activity, learning and social relations, which, as described above, will be considered as interrelated. However, in order to give an overview we have divided these outcomes into three thematic work packages (WP) which are to be carried out as PhD projects:

- **WP 1 aims to generate an understanding of the potential impact of udeskole on physical activity among pupils in primary and lower secondary school. The question is whether udeskole has specific benefits for boys and girls, children with an immigrant background, children who are not participating in sports and children with special needs, e.g. overweight problems or hyperactivity syndrome (ADHD).**

- **WP 2 aims to gain knowledge about potential impact of udeskole on the pupils’ learning processes and outcomes. This WP also focus on the particular effects on different subgroups of children such as gender, children with learning difficulties and children with classroom behaviour problems.**

• **WP 3 aims to generate an understanding of the potential impact of udeskole on social relations, inclusion, attitude to school and well-being among children in primary and lower secondary school with a specific focus on benefits for boys and girls, children from an immigrant background and children with special needs, e.g. overweight problems and learning difficulties.**

### 2.2 Overall study design

School classes that practice *udeskole* at least one day every week which have a parallel class that does not practice *udeskole* will be asked to take part in the study and so will their non-*udeskole* parallel classes. As the aim is to study the effects and processes of the current *udeskole* practice or movement in Denmark which is mainly a teacher (i.e. grassroots, bottom-up) initiative (Bentsen et al., 2009) the children will not be randomly assigned to *udeskole* and control groups. In other words, the study does not apply a Randomized Control Trail design but a quasi-experimental design where children, who are participating in *udeskole*, are compared to children in their parallel non-*udeskole* classes. These two groups are comparable regarding confounding variables such as parental background, local area and overall school resources. They differ regarding whether their teachers have chosen to include *udeskole* teaching as a supplement to their normal teaching. It is the results of teachers applying this alternative teaching method we are aiming to evaluate. We do not find it relevant or feasible to evaluate the effects of implementing *udeskole* as a top-down process where teachers with no wish or competence to practice *udeskole* are randomly designated to implement this method in their teaching as we do not see this scenario as very realistic or beneficial.

As mentioned, about 290 schools involve *udeskole* to some extent. Of these approximately 60 teachers and classes practiced *udeskole* once a week all year round in 2007 (Bentsen et al., 2010) and it is our impression that the numbers are increasing. With a mean of 20 pupils in each class approximately 1200 pupils from 60 classes are practising *udeskole* one day every week in Denmark and are potential participants in the study. Based on our study design where we compare pairs of *udeskole* and control classes at the same class level at the same schools (parallel-classes), we estimate that 50% of the current weekly *udeskole* classes fulfil the criteria of having a non-udeskole parallel class and being willing to participate in the study. Therefore, the aim is to include at least 600 children (30 classes) practising *udeskole* and 600 children in their parallel non-*udeskole* classes (30 classes) as control classes in the study.

We have conducted statistical power calculations based on the means, standard deviations (SD) and intra-class cluster effects on accelerometer measured physical activity and on overweight among 10 and 13 year old children in the COSCIS study (Hansen et al., 2005). These two
parameters are considered to be the most critical in relation to power. Based on these calculations, two sided test on differences in physical activity with 600 children in each group will detect a significant difference if *udeskole* classes have an average activity level over 756 counts/min (mean 700 counts/min in control classes, SD = 200, cluster effect rho = 0.05, 30 schools with 40 children, power = 0.8, level of significance = 0.05). In other words, we will be able to detect a difference in physical activity of around 8%.

Two sided tests on differences in overweight (control group overweight prevalence = 12.57%, cluster effect rho = 0.003, 30 schools with 40 children, power = 0.8, level of significance = 0.05) will detect a significant difference if children in *udeskole* develop a prevalence of overweight of 7.8%.

2.3 Overall plan of the data collection

The data collection will take place over a two year period where approximately 15 new *udeskole* and 15 control/parallel classes are followed each year. In total, this will enable an analysis of the effects of having *udeskole* for one year among 600 *udeskole* pupils (compared to 600 control pupils). Quantitative measures of physical activity, overweight, social relations, attitude to school and wellbeing as well as school performance tests will be collected each year.

Measures of physical activity will be collected from different schools in a way where each child is measured for a 7 day period twice on two different times of the year. The children’s engagement in physical activity will be measured for 7 days including school days with and without school PE, and days with and without *udeskole*. This will enable a comparison of weekly amounts and patterns of physical activity among children who participate in *udeskole* with children who do not, as well as a comparison of days with and without *udeskole* for the *udeskole* pupils. In this way, children who participate in *udeskole* can function as their own control but can also be compared to a non-*udeskole* control group, regarding the effects of *udeskole* on physical activity in total and in different contexts (school, school breaks, leisure etc.).

The survey on social relations, attitude to school and general well-being will be collected three times from the classes involved in the study each year. In order to track the improvements that *udeskole* may cause, the survey will be collected at the start of the school year, midway, and at the end of the year. The development among the *udeskole* children will be compared to the development that has taken place among their parallel classes that do not participate in *udeskole*.

The analysis of the effects of *udeskole* on school performance will be based on results of the national test in Danish and Mathematics as well as memory tests. The effects of *udeskole* on children’s development and learning in Danish and Mathematics are analysed by testing children’s’
abilities in Danish and Mathematics before the *udeskole* year starts and at the end of the school year and comparing the test scores at the end of the year among *udeskole* classes with their parallel non-*udeskole* classes adjusting for their test results at the beginning of the year (baseline result from the beginning of the year). Differences in children’s memory and understanding of what has been taught and learned in the *udeskole* environment compared to the traditional classroom teaching is assessed by comparing the results of memory and understanding tests shortly after and 6 months after a teaching session in *udeskole* for the *udeskole* children and in the classroom for their parallel non-*udeskole* class peers.

In order to be able to describe and understand the processes that have influenced the quantitative outcomes described above, various qualitative data about the children’s practices, learning, meaning-making, and interaction in *udeskole* and classroom teaching is collected during the two year study period.
3. Outcomes, Publications and Dissemination of the Project

The extensive amount and the high quality of data collected in the project is expected to give evidence and a more solid knowledge on which to base future decisions on whether and how udeskole should be an integrated part of the Danish Folkeskole. In the ongoing debate about physical activity and about the problems of inactive and overweight children, it is of relevance to know whether udeskole would be an effective supplement to PE and if it can make a significant contribution to health promotion of children. Furthermore, with the increasing numbers of children receiving teaching support (children with special needs), it is important to know whether udeskole can improve learning and remembering for children in general and not the least children who do not do well in the traditional classroom based teaching setting. Do all or only some children benefit from learning in the udeskole setting? Do they learn different skills than in ‘normal’ school? Are they more motivated for school as a result of udeskole one day every week? The results of the project will provide answers to these and other important questions, which school boards and politicians need in order to develop and improve the everyday conditions for children’s learning, as well as their social and physical health development.

The results of the project will be presented in international peer reviewed journals, through seminars and at conferences. Furthermore, the knowledge gained will be used in the education of future udeskole teachers and other professionals in outdoor education such as park managers, nature interpreters and outdoor guides.
4. References


