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What is the effect of block scheduling on academic achievement?

A systematic review

Report written by Kelly Dickson, Karen Bird, Mark Newman and Naira Kalra

EPPI-Centre
Social Science Research Unit
Institute of Education
University of London

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SSRU
Social Science
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REPORT

What is the effect of block scheduling on academic achievement?

A systematic review

TECHNICAL REPORT

Review conducted working with support staff

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The results of this systematic review are available in four formats. See over page for details.

The results of this systematic review are available in four formats:

SUMMARY	Explains the purpose of the review and the main messages from the research evidence
REPORT	**Describes the background and the findings of the review(s) but without full technical details of the methods used**
TECHNICAL REPORT	Includes the background, main findings, and full technical details of the review
DATABASES	Access to codings describing each research study included in the review

These can be downloaded or accessed at **http://eppi.ioe.ac.uk/reel/**

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List of abbreviations

DCSF	Department for Children, Schools and Families
DfES	Department for Education and Skills
EPPI-Centre	Evidence for Policy and Practice Information and Co-ordinating Centre
EYS	Extended Year Schedule
YRE	Year Round Education / Schooling

Abstract

What do we want to know?

Block scheduling is one approach to school scheduling. It typically means that students have fewer classes (4-5) per day, for a longer period of time (70-90 minutes). There are three main types of block schedule investigated in this review, comprising the following:

4 x 4: four blocks of 80-90 minute classes in one day, with students taking four subjects in one term

A/B: classes of 70-90 minutes each for 3/4 different subjects on every alternating day

hybrid: five classes per day, between 55 and 90 minutes in length

The in-depth review asks the following question:

Does block scheduling result in higher levels of student attainment than traditional scheduling?

Studies used different measures of academic achievement across different academic subjects. These included test results in Mathematics, English, Science, exam scores or average grade scores across different subjects.

Sub-questions were also asked in the in-depth review and investigated whether the effect of block scheduling varied by type of block schedule and type of subject(s) taught.

Who wants to know and why?

Those who want to know about block scheduling include policy-makers and schools interested in whether teaching subjects in extended 'blocks' of time will improve achievement at Key Stages 3 and 4 in the National Curriculum.

What did we find?

Only 12 of the 14 studies included in the in-depth review provided the data necessary for statistical meta-analysis to assess the effectiveness of different types of block scheduling on academic achievement. The 12 studies were considered to be of medium weight of evidence and two were considered to be of low weight of evidence, overall, for this review.

Where we were able to combine data to produce summary effect sizes, we found that 4 x 4 block scheduling resulted in higher cross subject achievement than traditional schedules. However, the outcome average cross-subject achievement could conceal worsening performance in some subjects and better performance in others.

For single subject outcomes:

- In Science, A/B block scheduling resulted in higher results than traditional schedules.

- In Mathematics and English, the evidence was unclear, with studies showing both better and worse results for block scheduling compared with traditional scheduling.

What are the implications?

There is not conclusive evidence in this review to support the introduction of policy guidance on the use of block scheduling in secondary schools. Findings do not indicate that participating in block schedules would produce negative outcomes for pupils across subjects, but the findings on positive effects are not strong enough to recommend their implementation.

How did we get these results?

We searched six key educational bibliographic databases and seven key websites. We applied inclusion and exclusion criteria to build up a 'map' of relevant studies. Additional criteria were applied to the studies in the map, which produced the 12 studies that were synthesised to answer the in-depth review questions.

Where to find further information

http://eppi.ioe.ac.uk/cms/Default.aspx?tabid=2476

CHAPTER ONE

Background

Aims and rationale for current review

The organisation of school and how time should be spent during the school day has been under discussion since the education system came into existence. Questions about the optimal length of the school year or school day, and how much time is afforded to which subjects continue to be asked by educational policy-makers and educational professionals. This review has been commissioned by the Department for Children, Schools and Families (DCSF) with the initial aim of identifying research evidence on the structure of the school day, and specifically how time is used in schools. As the review developed in consultation with the DCSF, the specific area of block scheduling was chosen to study in-depth.

The broad question for the review was as follows:

What research has been undertaken on the use and influence of time in schools?

From the systematic map, a subset of the literature was selected to be studied in depth to address the following question:

Does block scheduling result in higher levels of student attainment than traditional scheduling?

Key definitions

The **structure of the school day** was conceptualised as how time is used in schools to organise pupil learning and activities and how time can influence learning. It included the following potential areas that we could search for and systematic 'map' the research literature on the following:

- **Length of the school year**: For this review, the organisation of the school year refers to how many days are included in the school year, when the school year starts and how terms are organised within the school year.
- **Length of the school day**: The length of the school day is concerned with the number of hours pupils are expected to attend school and the start times of schools. It is not, however, about extended school activities which fall outside the scope of this review.
- **Length of lessons**: This is primarily about the time allocated to different subjects either during the school day or across the school term/year.
- **Break times**: This refers to how non-lesson time is organised in the school day.
- **Multiple-shift schooling**: This refers to when pupils attend school – for example, one cohort of students attends in the morning and a different cohort in the afternoon.

- **Organisation of examinations**: When to set exams in the school day (i.e. morning or evening) and across the school year (i.e. in the autumn, spring or summer term).

- **Time of day**: is concerned with when subjects are taught e.g. placing certain subjects in specific timeslots and student preferences for the time at which teaching should take place (e.g. whether am or pm).

Policy and practice background

Progression in pupil achievement

In England and Wales, there has been a drive to raise standards at all Key Stages since the introduction of the National Curriculum in 1988. The Children's Plan (DCSF, 2007) included an ambitious set of goals for 2020, with particular focus on improving educational achievement. At Key Stage 2, 60 percent of pupils are expected to achieve level 4 in both English and Mathematics. The aim is that, from Key Stage 2 onwards, local authorities set educational targets that indicate how they will improve the proportion of pupils making progress through each Key Stage level. All pupils achieving level 4 in English or Mathematics at the end of Key Stage 2, for example, are expected to be capable of progressing to level 5. In addition, all pupils averaging level 6 or above in English and Mathematics, and 30 percent of those averaging level 5 at the end of Key Stage 3 are expected to be capable of achieving five A*-C grades at GCSE, including English and Mathematics. Any schools which currently set their targets below 30 percent of the school population achieving five A*-C grades at Key Stage 5 will be required to set more ambitious targets for 2010 and 2011.

Targets for children in care, Black and Ethnic Minority groups, and pupils with special educational needs and learning difficulties and disabilities will also need to be set and show improvement and progress in order to raise standards for these groups of children (DCSF, 2008a; DCSF, 2008b).

Flexible curriculum and personalised learning

Individual schools in England and Wales have responsibility for designing, organising and timetabling the curriculum and have a choice about which year pupils take their National Curriculum end of Key-Stage tests. Schools can make decisions regarding which subjects they prioritise, the time allocated to each subject, the number of lessons in the school day, number of terms in a school year (with consultation with the LEA) and how the curriculum is taught across the key stages (DfES, 2002). The DfES Circular 7/90 simply recommends that a teaching week includes at least 24 hours at Key Stage 3 and 23.5 hours at Key S2.

There are no constraints on the way that the National Curriculum subjects can be distributed or timetabled across these Key Stages. The only requirement is that the programme of study for each subject is completed by the end of the Key Stage. Thus, designing a curriculum framework in secondary schools allows individual schools to be creative about how the school day is structured (DfES, 2004). This has implications for deciding the length of the school day and how much time is spent on different subject areas of the curriculum. Designing a flexible curriculum links with the personalised learning agenda because it encourages schools to think resourcefully about how each school is best organised to meet the academic and welfare needs of pupils.

The secondary national strategy for school improvement produced guidance on delivering a condensed Key Stage 3 curriculum (DfES, 2004). This allows schools to adjust the proportion of teaching time for different subjects required to support students at different levels of attainment and with different rates of progress through Key Stage 3 and into Key Stage 4. The 2006 update of this policy reports on the ongoing evaluation of a two-year Key Stage 3 condensed curriculum project (DfES, 2006). They found that, when some schools plan a programme of study, they look to remove repetition and duplication of subject matter in the curriculum in order to make the best use of

time available in the school day, across school terms and across the school years, rather than extending the amount of school time pupils spend in learning time.

Research background

Length of lessons

Internationally, the traditional school day includes six to eight periods/classes, each lasting approximately 50 minutes (Scroggins and Karr-Kidwell, 1995). Research in the US on the length of lessons has mostly investigated various types of block scheduling, which is an alteration to this traditional structure (Trenta and Newman, 2001). One of the cited aims of block scheduling is to allow greater time for student-oriented activities in order to promote in-depth discussion and increased interaction. In line with this, teachers are expected to use a variety of teaching strategies and engage in learning-oriented activities.

Length of the school day

Much of the research on the duration and length of the school day has been conducted in the US and has investigated whether the half day or full day at school is more beneficial for children attending kindergarten/nursery (aged 5 and 6). Full day school is often preferred by parents as it reduced the number of changes that a child is exposed to in a day. The argument in favour of half-day school often relies on the reduced cost associated with it (Rothenberg, 1995). Some researchers have argued that, if all things are kept equal, there are no differences between students attending full-day or half-day kindergarten/nursery in the outcomes such as developmental gains, attendance, quality of curriculum (Nunnelley, 1996).

Length / structure of the school year

Year Round Education / Schooling (YRE)

Internationally, Year Round Education is understood as an alteration to the traditional school calendar in a manner that permits 'continuous education' and short, but frequent, breaks (Worthen and Zsiray, 1994). The main rationale behind this design is that shorter breaks would improve retention and provide a more efficient teaching system. There are various types of YRE schedules. These can be single track (where all students attend school on the same day) or multi-track programmes (staggered attendance).

Extended Year Schedule (EYS)

This design is often labelled as Year Round Education. However, the Extended Year Schedule is different from YRE in its aim. In the US, EYS aims to increase the number of school days in a year from the traditional 180 to 220/240 as in some other parts of the world (Worthen and Zsiray, 1994).

Time of day

The majority of research on the influence of the time of the day, conducted outside the UK, suggests that students have preferences regarding what they learn and when (Callan, 1998). Studies indicate that time of the day preferences vary according to age (Klein, 2001; Wheeler, 1995), academic ability (Milgram et al., 1993), and ethnicity (Dunn and Griggs, 1990; Lam-Phoon, 1986). As a part of this body of research, some studies have considered whether core subjects, such as Mathematics and Literacy, should be taught at particular times of day (Klein, 2001; Sjosten-Bell, 2005), or in a specific order (Engin, 2006).

CHAPTER TWO

Methods of the review

This section provides a brief overview of the methods used in the review. Full details can be found in the technical report.

User involvement

The review has been informed by the commissioners and relevant policy-makers at the DCSF and two substantive topic specialists acting as project consultants. Both have played a key role in informing the progress of the review at three points in the review process: (i) scope of the review, (ii) moving from the systematic map to the in-depth review, and (iii) final report and dissemination.

Identifying and describing studies

The Review Group searched in the main educational and social science databases, including ASSIA, Australian Education Index, British Education Index, EPPI-Centre database of education research, ERIC, International Bibliography of the Social Sciences, PsycINFO, Social Policy and Practice, Social Science Citation Index, Sociological Abstracts. Studies were included if they focused on the structure of time within the school day or year; reported on children and young people aged 5 to 16 studying in mainstream, maintained and independent schools; and reported data on pupils or the school. Studies also had to be published in English between 1998 and August 2007.

Characterising included studies

Included studies were coded using the EPPI-Centre Data Extraction and Coding Tool for Education Studies V2.0 and review-specific keywords to create a 'map' of the research literature.

In-depth review

The Review Group, in conjunction with the DSCF, discussed what topic focus to investigate and the decision was made to synthesise studies that reported on the length of lesson time, specifically studies on the effect of block scheduling on academic achievement. Fourteen studies were included in the in-depth review.

Synthesis of evidence in the in-depth review

Each included study compared the effect of block scheduling against a control group of students who had undergone a traditional schedule. Studies measured 'academic achievement' from a range of academic subjects (e.g. Mathematics, English, Science and in some cases across subjects as a grade point average (GPA). From the individual studies, we identified all the outcomes which attempted to measure some form of academic achievement. The necessary data was supplied for only 12 of the 14 studies and thus the

synthesis is based only on these 12 studies. The results of these studies were converted into effect sizes and then grouped according to type of block scheduling and by subject. The findings were synthesised using meta-analysis.

Deriving conclusions and implications

An interpretation framework was developed in order to help summarise and interpret the strength and outcome of the evidence provided. The framework is based on the number and quality of the studies that evaluated any type of block scheduling and/or type of outcome, and the weighted average effect size and/or directions of effect in each individual study. Further details are provided in Appendix 2.4 of the technical report.

CHAPTER THREE

What research was found?

The initial electronic searching identified 8,054 citations, which were screened for potential relevance on the basis of title and abstract. Of the 8,054 citations identified, 1,680 were duplicates and were excluded. A further eight potentially relevant papers were identified through handsearching. Eighty-five papers were unobtainable. On the basis of the defined exclusion criteria, 5,700 citations were excluded. This meant that 593 papers went through to full text screening. At this second, more detailed stage of screening, a further 453 papers were excluded. One hundred and thirty papers met the criteria for inclusion in the systematic map. The database closed on Friday 16 August 2008.

Although the studies have been conducted across a range of countries, there is a Western and specifically US bias, as an overwhelming majority of studies have been conducted in the US (N=117). A small minority of studies have been conducted in Sweden (N=4), Canada (N=3) and Israel (N=2), and only one included study took place in the UK.

Use of time

The studies included in the map examined different aspects of the use of time in schools. A large subset of studies included in the map investigated the length of lessons within the school day (N=68); the majority of these studies focused exclusively on the introduction of block scheduling in secondary schools. Thirty-one studies focused on the length of the school year, and evaluated the impact and/or delivery of 'year round schooling'. Twenty- two studies investigated the length of the school day, many of which examined the use of 70-90 minute classes for three to four different subjects on alternate days or the impact of attending either half-day or full-day kindergarten. A smaller proportion of the studies focused on the influence of the time of day on pupil learning (N=11). In addition, there were some studies which investigated the concept of timetable-free schools, and how pupils organised their own learning (N=3) and how pupil's used their time in schools (N=2).

The length of the school day was mainly investigated in kindergartens in the US, with pupils aged between 4 and 5 (N=17). Some of the studies which examined the length of the school day in secondary schools (N=6) also investigated primary schools (N=4). Of the studies addressing the length of lessons, the majority were conducted with pupils aged 11-16 in secondary schools (N=652) compared with primary schools (N=2). All the studies investigating break times focused in their sample on primary schools. The length of the school year included both primary schools (N=26) and secondary schools (N=16). Studies which investigated the impact of the time of day included both primary aged and secondary aged pupils. Two studies considering how pupils might organise their day without the use of the timetable were conducted in secondary schools.

Table 3.1: Type of 'use of time' and educational setting (N=130)

Attribute**	Kindergarten	Primary school	Secondary school
Length of the school day	17	4	6
Length of lessons	1	7	65
Break times	0	4	2
Multiple-shift schooling	0	1	1
Length of school year	4	26	16
Time of day	0	8	7
Timing of exams	0	0	1
Length of terms / semesters	1	9	8
Pupils' use of time	0	1	1
Pupils' organisation of learning time	0	0	2
Total	23	60	109

**Not mutually exclusive

Table 3.2: Type of 'use of time' and pupil achievement (N=130)

Attribute*	School age**	Literacy	Numeracy	Student grades (across subjects)	Exam results (across subjects)
Length of school day	Primary**	16	13	1	1
	Secondary	4	4	1	1
Length of lessons	Primary	4	2	0	0
	Secondary	19	18	34	11
Break times	Primary	1	1	0	0
	Secondary	0	0	0	0
Multiple-shift schooling	Primary	0	0	1	0
	Secondary	1	0	0	0
Length of school year	Primary	8	7	5	4
	Secondary	11	10	5	6
Length of terms	Primary	5	5	3	2
	Secondary	5	5	3	3
Time of day	Primary	1	1	3	0
	Secondary	1	1	3	1
Organisation of teaching subjects	Primary	1	1	2	0
	Secondary	0	0	0	0
Pupils' organisation of learning time	Primary	0	0	0	0
	Secondary	0	0	1	0
Total		77	68	62	29

*Not mutually exclusive

** Primary includes pupils aged between 4-10 enrolled in kindergarten, nursery and/or primary schools and secondary includes pupils enrolled in mainstream schools aged 11-16.

Pupil achievement

Pupil achievement was measured in different ways across and within the studies. All the studies measured pupil achievement, either by testing pupils in specific areas (such as literacy and numeracy) or by measuring average academic ability across a range of subjects using pupil's grade or exam results. Table 3.2 provides a breakdown of the number of studies measuring pupil achievement (within or across subjects) by the type of intervention and the school age of pupils.

Studies investigating the length of the school day focused on primary school aged pupil (4-10 year-olds) and had a high number of studies which reported outcomes for literacy (N=16) and numeracy (N=13), compared with student grades (N=1) and exam results (N=1). Studies on the length of lessons where mostly conducted with 11-16 year- olds in secondary schools. A larger proportion of those studies collect data on student grades (N=34) and exam results (N=11), there are still a number of studies which report literacy (N=19) and numeracy (N=18) outcomes in this age group.

Studies investigating the length of the school year used all four types of outcome for both primary school aged pupils (literacy N=8 numeracy N=7, student grades N=5 and exam results N=4) and secondary school aged pupils (literacy N=11, numeracy N=10, student grades, N=5 and exam results N=6). The same pattern applied to studies investigating the length of terms/semesters. Studies investigating the impact of the time of day, the organisation of teaching subjects and/ or how pupils organise their own time in general were less well reported, focused less on measuring pupil achievement, and in some cases did not report any academic outcomes at all.

CHAPTER FOUR

What were the findings of the studies?

Fourteen studies met the inclusion criteria for answering the in-depth review question:

Does block scheduling result in higher levels of student attainment than traditional scheduling?

Further sub-questions for the in-depth review examined the effect of block scheduling in different school subjects and by type of block scheduling (intervention).

All the studies were published between 1995 and 2004 and evaluated different types of block schedules. They were all conducted in North America (USA N=13; Canada, N=1) and investigated the UK equivalent of secondary school pupils aged 11-16. Pupil level data was collected and examined to evaluate the effectiveness of block scheduling. Most studies evaluated either the 4 x 4 block schedule (N=8) or the A/B block schedule (N=5). Some studies also examined hybrid schedules (N=3) and the impact of extending a single lesson (N=2). Of the 14 evaluations included in the in-depth review, only one used a quasi-randomised design. The remaining 13 studies used a retrospective study design whereby the outcomes of students who were already enrolled in schools delivering block scheduling (the intervention group) were compared with the outcomes of students already enrolled in school using a traditional schedule (the control group). In some cases this would be the same school at two different points in time: that is, comparing the outcomes of a cohort of students before block scheduling had been implemented with a later cohort of students who followed the block schedule.

School schedule types

Traditional schedule: Students enrolled in traditional schedules participate in six to eight classes per day for 40-60 minutes per class period. Each class takes one year to complete. All the studies in the in-depth review used the traditional schedule as their control group

4 x 4 block scheduling: This design consists of four blocks of extended duration classes (80–90 minutes each) per day and allows students to take up to four different subjects in one term and up to eight courses over two terms in a school year.

A/B block scheduling: The 'alternating block schedule' or the A/B block schedule, organises the school day into classes of 70-90 minutes each for three to four different subjects on every alternating day. The A/B block schedule can mean that six to eight subjects are studied throughout the year but on alternate days; the classes are again clubbed into 'blocks' and are of a longer duration than traditional classes.

Hybrid block: Three studies look at the impact of hybrid models of block scheduling. Hybrid models usually operate with five classes a day instead of four in the block schedule, and six in

a traditional schedule. Lessons are more than 55 minutes but less than the 90-minute lessons you would find with the 4 x 4 and A/B models.

Single block lesson: Two studies looked at the impact of a block lesson on student performance. In one study, researchers looked at teaching French in half-day and 80-minute slots and another looked at teaching Mathematics in lessons of 70 minutes or more. In both cases, the amount of time spent on each subject was not increased over the school year, but concentrated into a block similar to the 4 x 4, A/B and hybrid schedules.

Outcome measures: academic achievement

Most studies evaluated block scheduling in (i) Mathematics, (ii) Science, (iii) English and (iv) across subjects; this measure was often given as an averaged standard metric that describes students' scores in exams or grades across different academic subjects. To be included in the in-depth review, studies were required to measure outcomes using standardised tests. In most cases, researchers opted for measures of achievement commonly used in the local educational state area.

In-depth review

Data from 12 of the 14 studies included in the in-depth studies were combined in a statistical meta-analysis to assess the effectiveness of different types of block scheduling on academic achievement. A meta-analysis combines the results of several studies addressing similar research questions. Results from 12 studies were converted into effect sizes, and one effect size was selected from each study to produce a weighted average effect size.

Studies excluded from the meta-analysis

The studies by Schroth and Dixon (1995) and Veal (1999) have been excluded from all the meta-analyses because we could not calculate a standardised effect size from the data available in the report. However, the findings of the two individual studies have been included in the in-depth review, where appropriate.

Quality and relevance of outcome studies

Twelve studies were considered to be of medium weight of evidence and two were considered to be of low weight of evidence overall for this review. The weight of evidence was assessed based on the quality of the execution, the appropriateness of the research design and analysis, and the relevance of the study topic focus for answering the review question.

The effect of block scheduling on academic achievement

Overall impact of block scheduling

Overall, the individual studies were too dissimilar to combine and thus no overall effect of block scheduling could be computed. This was similarly the case for effect of A/B block scheduling on academic achievement.

The pooled estimate of effect for 4 x 4 block scheduling compared with traditional structuring was positive, (g = 0.11, C.I. -0.01 to 0.22). However, the results do not exclude a potential effect in favour of the traditional curriculum but suggest that it is more likely that the 'true effect' favours the block scheduling curriculum.

Student average cross-subject exam/grade scores

In addition, four studies examined the effect of block scheduling on student average cross-subject exam/grade scores (Cobb et al., 1999; DiRocco, 1997; Hughes, 2004; Texas Education Agency, 1999). The positive findings applied both to 4 x 4 block scheduling (g=0.18, C.I. 0.06 to 0.30) and A/B block scheduling (g=0.22, C.I. -0.01 to 0.44).

The study by Veal (1999), which was excluded from the meta-analysis because effect sizes could not be calculated, also investigated the effect of a hybrid schedule (which consists of three traditional and two block classes each day) on student exam/grade scores. They found that students had higher student average exam/grade scores compared with those enrolled in traditional schedules.

However, it is important to consider whether an average academic score across subjects could in fact be concealing positive effects for block scheduling in some subjects at the same time as negative effects in others. The analysis of the effects of block scheduling within single subjects suggests that this might be a possibility.

The effect of block scheduling on different subjects

Mathematics

Eight studies investigated the effect of block scheduling on mathematics achievement. Five investigated 4 x 4 block scheduling (Cobb et al., 1999; Schreiber et al., 2001; Texas Education Agency, 1999; Walker 2000; Zhang, 2001), three investigated the effect of A/B block scheduling (DiRocco 1997, McCreary and Hausman 2001, Texas Education Agency 1999) and Rice et al. (2002) investigated the impact of extending a single lesson.

When the studies examining the effect of 4 x 4 block scheduling were pooled, the effect size favoured the traditional schedule rather than a 4 x 4 schedule (g =-0.02, 95% C.I. –0.16 to 0.11). The studies examining the effect of A/B block scheduling were also pooled; these studies favoured A/B block scheduling rather than the traditional schedule (g=0.01, 95% C.I. –0.17 to 0.19). However, the findings for both sets of results did not exclude the possibility that either type of schedule (traditional, 4 x 4 or A/B) could impact positively or negatively on achievement in Mathematics.

The study by Schroth and Dixon (1995), which was excluded from the meta-analysis because effect sizes could not be calculated they study also reports that students' achievement in Mathematics did not improve as a result of attending 90-minute (block) rather than the 50-minute (traditional) lessons.

Science

Five studies investigated the effect of block scheduling on student achievement in science. Of those five, three evaluated the effect of 4 x 4 block scheduling (Lewis et al., 2005; Marchette, 2003; Zhang, 2001) and four evaluated the effect of A/B block scheduling (DiRocco, 1997; Lewis et al., 2005; Marchette, 2003; McCreary and Hausman, 2001). Only the studies on the A/B block schedule were sufficiently similar to combine. The pooled estimate of effect was positive for the impact of A/B block scheduling on achievement in science (g=0.20, 95% C.I. 0.06 to 0.33).

English

Five studies investigated the effect of block scheduling on student achievement in English. Four of these five studies considered the effect of 4 x 4 block scheduling (Lewis et al., 2005; Schreiber et al., 2001; Texas Education Agency, 1999; Zhang, 2001) and three considered the effect of A/B block scheduling in student achievement in English (DiRocco, 1997; Lewis et al., 2005; Texas Education Agency, 1999).

Three of the five studies favoured the traditional schedule and the remaining two studies favoured block scheduling. The results of the study by Zhang (2001) favoured block scheduling. However, it was so large (600,000 plus students) that its results have in effect become the pooled effect size for this category (g=0.02 95% C.I. 0.01, 0.03). Without the Zhang (2001) study, the effect size became slightly negative and the 95% confidence interval did not exclude zero. Our interpretation of this result was that, for all practical purposes, there was no difference in effect between the block scheduling and traditional schedules.

The pooled estimate of effect for 4 x 4 block scheduling compared with the traditional curriculum in English (when the large study referred to above was removed) favoured the traditional schedule (g= -0.08 95% C.I. -0.27, 0.11). However, as the 95% confidence interval crosses zero, the result does not exclude a possible positive effect.

The pooled estimate of effect for A/B block scheduling compared with the traditional curriculum in English favoured block scheduling (g=0.08, 95% C.I. -0.18 to 0.35). However, as the 95% confidence interval crosses zero, the result does not exclude a possible negative effect.

CHAPTER FIVE

What does this mean?

Interpreting findings

Our approach to identifying possible implications for policy and practice used an interpretation framework to group interventions according to the strength of evidence and direction of effect of each set of results (see Appendix 2.6 in the technical report for more details). None of the block scheduling subject / outcome groupings analysed in the in-depth review met the criteria to be classified as 'strong' evidence of in/effectiveness. Where studies investigating a particular type of block scheduling and/or a particular subject could not be combined due to high levels of statistical heterogeneity, the interpretation given was 'insufficient evidence'.

Implications for policy and practice

Evidence of effectiveness (positive or negative)

There were a number of block scheduling type/ subject/outcome groupings for which there was evidence of effectiveness.

4 x 4 block scheduling on average cross-subject achievement

There was evidence to suggest that 4 x 4 block scheduling had a (g=0.15) positive effect compared with traditional schedules on student average cross-subject achievement. This finding is based on seven studies with a total population of 642,152 students.

A/B block scheduling on science achievement

There is evidence to suggest that, when compared with traditional schedules, A/B block scheduling also had a positive effect (g=0.20) and therefore could improve academic performance in Science subjects. This finding is based on a total population of 5,337 students, aged 11-16 from across a range of US middle and high schools. Students attended science classes of 70-90 minutes every other day, and their performance was measured by state-wide or school-specific testing.

Limited evidence (positive or negative)

Although there is limited evidence to suggest that block scheduling improves cross-subject achievement and student cross-subject exam/ grade scores, when exploring the effect of particular types of block scheduling in individual subjects, such as Mathematics and English, the findings were inconsistent. The point estimates of effect suggest that, if students are going to achieve higher results, in Mathematics, it is more likely be a consequence of enrolment in traditional, not block, scheduling. For English, there was a small positive effect in favour of block scheduling. However, this was attributable to one study;

when that study was removed, similarly to the case with Mathematics, the traditional schedule was more effective. However, these findings must be treated with caution as the pooled estimate did not exclude a positive effect of block scheduling. Thus, further research needs to be conducted to be able to draw conclusion about the effectiveness of block scheduling in either of these subjects.

Weak evidence (positive or negative)

There is weak evidence on the effectiveness of A/B block scheduling on achievement in English and on average cross-subject student grades. Although both sets of findings appear to suggest that participating in A/B block scheduling can have a positive impact, the findings do not exclude the possibility of no difference between the two groups. The evidence is also weakened by the fact that the combined student population for each meta-analysis is fewer than 500 students.

Insufficient evidence

In cases in which tests revealed significant statistical heterogeneity (I2=<70%) between the studies, data was not combined to produce a pooled summary effect size. This meant we had insufficient evidence on the effect of block scheduling and A/B block scheduling on academic achievement (cross-subject), general block scheduling on achievement in Mathematics, general and 4 x 4 block scheduling achievement in Science.

Conclusion

Overall, the evidence on the effectiveness of block scheduling compared with the traditional model of timetabling is inconclusive. Although there was some evidence to suggest that different types of school schedules have an impact, in some subjects, the positive effects are not strong enough for making recommendations. In most cases, there was no clear evidence to suggest that organising lessons into blocks (4 x 4 or A/B) would be more or less effective than structuring the school day using existing traditional schedules.

The majority of studies included in the in-depth review used retrospective study designs to evaluate the effect of block scheduling. In most cases, block scheduling was implemented at the school level and applied to all subjects being taught in schools. However, studies only reported outcomes for one or more of the core subjects such as Mathematics (the most common outcome measured), English or Science. Only a few studies reported outcomes in subjects such as History or Social Sciences; however, this was rare. Therefore, from the studies we have synthesised, it has not been possible to ascertain whether the authors were selective in the outcomes they chose to report. Nor is it possible to judge whether implementing block scheduling could show positive results in one subject, but cause harm in other subjects.

It is important to be cautious about the findings for the effect of block scheduling on cross-subject academic achievement exam/grade scores. There are concerns with this way of measuring ‘average’ academic achievement because it could be concealing success in some subjects and failures in others. Further exploration of the effect of block scheduling in individual subject highlighted this potential problem: although overall effects were positive for Science, they were mixed for Mathematics and English. Interestingly, both studies excluded from the meta-analysis (Schroth and Dixon 1995; Veal, 1999) confirm this interpretation. Veal (1999) found that students enrolled in hybrid block schedules had higher cross subject exam/grades scores, yet Schroth and Dixon (1995) found that test results for students enrolled in block Mathematics lessons did not improve.

Thus, this review does not provide conclusive evidence to support the introduction of policy guidance on the use of block scheduling in secondary schools for all subject areas. Although the findings do not indicate that participating in block schedules would produce negative outcomes for pupils across subjects, policy initiatives should not advocate the use of block scheduling as an effective approach to improving academic achievement without

due caution. These findings are not dissimilar to the meta-analysis conducted by Lewis et al. (2005) on block scheduling in high schools. They concluded that the findings were not strong enough (small effect sizes) and therefore did not draw any practice implications.

Implications for research

The following areas of future research have been identified from this review:

- A systematic review of the evidence on the implementation of block scheduling in schools and the identification of the mechanisms that might contribute to its effectiveness or lack of effectiveness

- A systematic review of the evidence on teachers' and students' perception of block scheduling and consideration of whether there is a relationship between different types of school schedules and the experience of teaching and learning

- Primary research on the impact of the length of lessons and curriculum coverage on teaching and learning in the UK, and consideration of whether findings vary by age, gender, ethnicity, social class or ability of students

- The effect sizes identified might appear small but, if implemented on a national scale, could have a large practical consequence: for example, in terms of increasing the proportion of students who passed their exams at grade C. However, the quality of the studies is such that the positive effect seen may be entirely an artefact of the study design. It would therefore be important to conduct primary research on the effectiveness of block scheduling using prospective randomisation of pupils to block and non-block schedules.

Strengths and limitations of this systematic review

The main strengths of the review are as follows:

- The review process is transparent, as well as replicable and updateable. The explicit reporting of the methods allow for this review to be replicated and its findings to be critically appraised.

- The extensive search strategy aimed to pick up academic and grey literature.

- Quality assurance is paramount in the review process. During the screening stage, judgements were made and agreed by two, sometimes three, reviewers for 6 percent of all identified studies. Key items of the data extraction for the mapping stage and all items for the in-depth review were double-coded. The quality appraisal and synthesis stages were undertaken by two reviewers with outstanding issues discussed with a third reviewer.

- The involvement of the commissioners of the review helped to make the review more policy-relevant.

- Careful consideration was given to the quality of the evidence. Each study was subject to thorough assessment, being judged independently by two reviewers, with a final judgement being agreed through deliberation. Each study in the in-depth review was carefully judged according to three dimensions:

1. **Trustworthiness of the findings**. An adapted version of the Home Office Quality Assessment Tool was used to judge the validity, bias and appropriateness of each study design for measuring effectiveness.

2. **Appropriateness of the study design for addressing the review question**. Studies were judged according to how well the sample selection and analysis procedures controlled for differences between intervention and control groups.

3. **Relevance of the study for the review, based on its sample size and representativeness.**

- The presentation of the study results as effect sizes facilitates direct comparison and synthesis of results across similar interventions.

The main limitations of the review are as follows:

- There were only a few high quality studies that measured effectiveness of block scheduling. The conclusions of this review are based upon studies whose overall quality has been judged to be 'medium'. The absence of randomised controlled trials or high quality experimental study designs from this literature means that the body of evidence is not as robust as we would like when trying to answer a question about effectiveness.

- Studies were limited to those published in English.

- The focus of the included studies in the map and in-depth review is on the US. A high proportion of the studies included in the map were conducted in the US, with all but one study in the in-depth review conducted in the US. The in-depth review is therefore limited to the focus of this research. Reflecting the policy initiatives of the US, this set of studies focuses on certain interventions and topics (e.g. block scheduling, extended school year). This, therefore, limits the scope of the synthesis and has implications for the findings of this review:

1. There are limitations on the transferability of the review findings to the UK policy context. Alternate block scheduling (where students take different academic subjects on alternate days), for example, may be difficult to apply to UK primary schools in a policy context that requires English/Literacy classes daily (Literacy Hour).

2. It was not always clear precisely how the experimental interventions differed from the control interventions so we cannot be sure that an experimental intervention in one study was not identical to a control intervention, nor do we know to what extent control programmes in the studies match current policy and practice in the UK context.

3. User involvement was limited to the commissioners of the review, which exclude those who would be directly impacted by the findings of this review, namely students and teachers.

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Appendix 1: Authorship of this report

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Appendix 2: The standard EPPI-Centre systematic review process

What is a systematic review?

A systematic review is a piece of research following standard methods and stages (see figure 1). A review seeks to bring together and 'pool' the findings of primary research to answer a particular review question, taking steps to reduce hidden bias and 'error' at all stages of the review. The review process is designed to ensure that the product is accountable, replicable, updateable and sustainable. The systematic review approach can be used to answer any kind of review question. Clarity is needed about the question, why it is being asked and by whom, and how it will be answered. The review is carried out by a review team/group. EPPI-Centre staff provide training, support and quality assurance to the review team.

Stages and procedures in a standard EPPI-Centre Review

- Formulate review question and develop protocol
- Define studies to be included with inclusion criteria
- Search for studies – a systematic search strategy including multiple sources is used
- Screen studies for inclusion
  - Inclusion criteria should be specified in the review protocol
  - All identified studies should be screened against the inclusion criteria
  - The results of screening (number of studies excluded under each criterion) should be reported
- Describe studies (keywording and/or in-depth data extraction)
  - Bibliographic and review management data on individual studies
  - Descriptive information on each study
  - The results or findings of each study

- Information necessary to assess the quality of the individual studies

At this stage the review question may be further focused and additional inclusion criteria applied to select studies for an 'in-depth' review.

- Assess study quality (and relevance)
  - A judgement is made by the review team about the quality and relevance of studies included in the review
  - The criteria used to make such judgements should be transparent and systematically applied
- Synthesise findings
  - The results of individual studies are brought together to answer the review question(s)
  - A variety of approaches can be used to synthesise the results. The approach used should be appropriate to the review question and studies in the review
  - The review team interpret the findings and draw conclusions implications from them

Quality assurance (QA) can check the execution of the methods of the review, just as in primary research, such as:

- Internal QA: individual reviewer competence; moderation; double coding
- External QA: audit/editorial process; moderation; double coding
- Peer referee of: protocol; draft report; published report feedback
- Editorial function for report: by review specialist; peer review; non-peer review

The results of this systematic review are available in four formats:

SUMMARY	Explains the purpose of the review and the main messages from the research evidence
REPORT	**Describes the background and the findings of the review(s) but without full technical details of the methods used**
TECHNICAL REPORT	Includes the background, main findings, and full technical details of the review
DATABASES	Access to codings describing each research study included in the review

These can be downloaded or accessed at **http://eppi.ioe.ac.uk/reel/**

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