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Scheduling in schools

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Introduction

Determining the ideal way to organise and schedule the school day for optimal learning is complex, as numerous factors and individual student differences come into play. While there is no universal solution, several important considerations can help in discussions and development work. Surprisingly, there is limited scientific research specifically focused on school scheduling, despite its significance in educational settings. A reason for that could be the use of block scheduling in most countries. A survey conducted through this Erasmus+ project reveals that most European countries implement block scheduling in both primary and secondary schools, with lessons typically lasting 45 or 50 minutes. These scheduling patterns are usually regulated at the national level. For example, in Lithuania, students attend 35 lessons per week, each 45 minutes long, whereas in Romania, there are 30 lessons per week, each lasting 50 minutes. Sweden stands out as an exception, with no set regulations on scheduling beyond the total number of hours required for each subject.

Romanian doctoral university lecturer Corneliu Novac, in a 2013 course material, highlighted several important perspectives to consider when organising the school day to provide alternating activities and optimal learning opportunities for students. These perspectives include:

- Structuring the school day with relatively easier subjects in the early hours, scheduling the most abstract subjects during the second and third hours, and assigning subjects involving more physical activities to the later part of the day.
- Starting and ending the school week with a lighter schedule, while placing challenging, abstract subjects midweek.
- Alternating periods of intellectual activity with physical activity.
- Ensuring a balanced distribution of knowledge and homework assignments throughout the week, so students are neither overloaded on certain days nor insufficiently challenged on others.
- Avoiding unnecessary interruptions and breaks.

Recommendations:

- Consider the placement of different subjects, taking into account the level of abstraction for each one
- Ensure a balanced distribution of knowledge and subjects throughout the school week
- Alternate periods of intellectual activity with physical activity.

Position of subjects, due to intellectual effort, time of day and difficulty of subject

According to sources cited by Novac (2013), the average number of hours a person can sustain intellectual effort in a day varies by age. For example, 10- to 11-year-olds can manage about 6½ hours of intellectual effort per day, including 1½ to 2 hours of homework. For those aged 13 to 15, the figure rises to about 8 hours, with 2½ to 3 hours allocated for homework. The onset of fatigue and reduction in intellectual performance is also age-dependent: for younger students, this typically occurs after 1.5 to 2 hours of school activity, while for preadolescents (ages 9–12), it happens after about 3 hours.

The capacity for sustained intellectual effort over time varies not only with age but also between individuals. Although comprehensive scientific studies involving all age groups are lacking, patterns emerge from combined research, such as that by Carns et al. (2015), particularly concerning average attention span. For students aged 10–12, lessons longer than 45 minutes may exceed their capacity

to maintain attention. However, this capacity can be extended by 20 to 90 minutes if lessons involving physical activity or manual work are integrated.

It is important to note that these statistics are based on a synthesis of scientific findings and should not be considered definitive.

Age	Average attention span
5 years old	10–25 minutes
6 years old	12–30 minutes
7 years old	14–35 minutes
8 years old	16–40 minutes
9 years old	18–40 minutes
10–12 years old	20–45 minutes

(Source: Carns et al., 2015)

Specialised studies of school performance throughout the day—using written tests, maths exercises, dictations, and motor skills tests—indicate that the ability to concentrate tends to dip between 12:30 and 13:30, increases slightly between 14:00 and 15:00, peaks around 16:15 to 17:30, and then drops sharply. Novac (2013) notes that the first hour of the school day serves as an adaptation or "warm-up" period, after which performance increases during the second, third, and (for older students) fourth hours, before declining. Individual differences are significant. For instance, a 2010 study by Van der Heijden et al. showed that children aged 10–12 responded better to feedback and demonstrated higher perceptual sensitivity at 13:00 compared to 08:30 or 10:00, but this effect was limited to cognitively demanding tasks.

Over the course of a week, students' working capacity is lowest at the beginning and end, rising on Tuesday and Wednesday, with a decrease noted on Thursday. The daily and weekly rhythms of activity and rest create a distinct "fatigue curve," especially during periods with extracurricular activities, which require additional effort to complete the school day (Cucos, 2014).

Generally, performance is weakest at the start and end of both the day and the week, with further downturns seen in the middle of the week. The low yield during the first hour is likely due to a "training" effect—students are still warming up—while the midday period is often a critical low point. Conversely, work capacity tends to peak on Tuesday and Wednesday, particularly during the second and third hours of the day, and for high school students, also during the fourth hour (Jinga I. & Negreț I, 1994). Also Novac (2013) pointing out that effort is generally lowest at the start and end of the week, and highest in the middle.

Novac (2013) also suggests that some subjects, such as mathematics, physics, and chemistry, require greater intellectual effort due to their abstract nature. However, it can be difficult to categorise subjects strictly as "difficult" or "easy," since content varies within each subject and teaching methods can have a significant impact. Nonetheless, subjects with a high level of abstract concepts—like mathematics, physics, and languages—generally demand more concentration.

So, if we take these mentioned particularities into consideration, it is recommended that:

- More challenging subjects should be scheduled during the hours when students' capacity for intellectual effort is at its peak

- easier subjects, such as art, music or physical education, can be interspersed between more difficult lessons, helping the child to relax. Thus, fatigue can be prevented and school performance can be maximized. (Muntean A, 2006)
- It is essential to have a balance between the hours in the timetable, both throughout the day and throughout the week, because children can focus effectively only for a few hours in the morning before their performance declines
- The schedule should be designed around students' attention spans. For example, two classes requiring more concentration, such as math and physics, should be balanced by two lighter classes, like music or art
- It is also important not to omit physical education classes, as a lack of physical activity can lead to lower focus among children

Recommendations:

- Schedule more demanding and abstract subjects during students peak performance hours
- Balance the daily timetable with lighter subjects and physical activity
- Schedule and design lessons to match students' age-related attention spans

Length of lesson and the Importance of Engaged Time

Kauchak and Eggen (1993) defined several key terms relevant to scheduling: 'allocated time', 'instructional time', 'engaged time', and 'academic learning time'. These concepts are important when planning lessons, as they ensure sessions are long enough to provide solid learning opportunities without being so lengthy that they foster disruptive behaviour. Teachers must allocate enough time for each topic and ensure there is sufficient (but not excessive) time for active teaching—known as instructional time. Most crucially, engaged time—the portion of the lesson when students are directly involved in learning activities—and academic learning time must be maximised to give students the best chance of success. According to Reavis et al. (1996), students should spend at least 70% of their time actively engaged in academic tasks, and teachers should continually strive to reduce non-engaged time. Because students vary in how quickly they start and finish tasks, both lesson scheduling and teacher planning need to be well coordinated.

It is also important to consider that fatigue and declining intellectual activity depend on age. As previously mentioned, young children experience this after 1.5 to 2 hours of school activity, while for preadolescents (ages 9–12) it sets in after about 3 hours. However, incorporating activities like physical education or manual work when fatigue is likely to arise can extend students' intellectual effort by approximately 20 to 90 minutes.

In summary, lesson length is not the only important factor—its structure and placement within the school day matter just as much.

Recommendations:

- Allocate appropriate lesson lengths, so they be long enough to cover content thoroughly but not so long that students lose focus or become disruptive
- Schedule physical education and subjects with manual work or other active tasks, at points in the day when students' intellectual effort naturally declines

Number of Lessons and Breaks: The Role of Distraction

Too many transitions in a school day, especially for students with special needs, can be challenging. These transitions occur both between lessons and within the classroom, such as when students sharpen pencils or talk to classmates. Research by Mastropieri and Scruggs (1994), cited by Johns et al. (2008), shows that transitions are a significant source of off-task behaviour in schools. This is further supported by a study on block lessons (where two lessons are combined for one subject) by Charles Williams (2011), where teachers agreed that block scheduling helps reduce discipline issues by limiting transitions and minimising time spent out of class.

Recommendation:

- Minimise unnecessary transitions between lessons and activities to support focus

Length of Breaks and the Impact of the Physical Environment

While excessive transitions should be avoided, adequate breaks are essential for maintaining good physical conditions in classrooms. Romanian scholar Corneliu Novac highlights that the ideal temperature for intellectual activity is between 22–25°C, with relative humidity of 50–70%. When a classroom is too hot or cold, it becomes difficult for students to concentrate, underlining the importance of creating an optimal environment for learning. Breaks are necessary to ventilate classrooms, increasing oxygen and reducing carbon dioxide and dust, since intellectual activity significantly increases the brain's oxygen consumption and poor air quality can reduce students' ability to concentrate.

Recent research has shown a clear link between the quality of the indoor school environment and student achievement, particularly regarding thermal comfort and CO_2 levels. For example, a 2020 study by Bogdanovica et al. found that a 15-minute break between lessons is needed to properly ventilate classrooms and ensure CO_2 levels stay low enough not to affect student performance. As the school day must also not be overly long, finding the right balance of lesson and break length is crucial for effective planning.

Recommendation:

- Ensure regular, adequate breaks to maintain healthy classroom air quality. Make measurement what time that is necessary in your school building.

The outcome of traditional vs. block scheduling

In most European countries, the school day typically follows a fixed structure, with set lesson lengths and consistent start, break, and end times. However, this traditional approach has been challenged and resulting in two kinds of scheduling strategies in school: the conventional schedule, with 45-minute lessons, and block scheduling, with lessons lasting 90 minutes. These alternatives aim to improve student achievement, address attendance issues, and reduce discipline problems in public schools. Numerous research studies, including those by Charles Williams (2011), have examined the impact of these different strategies.

Regarding student achievement, studies have generally found no significant differences in grade distributions between the block schedule and the traditional seven-period schedule (Leslie L. Griffin, 2002). Data on reading and maths scores (FCAT) show that academic achievement is similar under both schedules. While mean reading scores were slightly higher for students on the A/B block

schedule, and mean maths scores were marginally better for those on the traditional schedule, the differences were not statistically significant. Therefore, scheduling type does not appear to affect student achievement in reading or maths. Interestingly, this finding contradicts the perceptions of administrators, teachers, and students, who tend to believe that the A/B block schedule, when used effectively, is more beneficial (Williams, 2011).

Despite the statistical analysis revealing only minor differences—slightly higher reading scores for block scheduling and slightly higher maths scores for traditional scheduling—some practical implications emerged. For example, schools using block schedules might consider teaching all maths classes in a traditional time frame, while those with traditional schedules could try teaching reading classes in a block format (90 minutes) (Charles Williams, 2011). In other words, a mixed approach might offer the best of both worlds.

By combining both types of lesson lengths, schools could take advantage of block scheduling's benefits, such as reducing the number of lessons and subjects per day, providing more time for teaching, individual support, in-depth explanations, Q&A, and increased opportunities for group work and active engagement. At the same time, mixing lesson lengths could help avoid the drawbacks of block scheduling, such as difficulty maintaining student attention, rushed teaching to cover all objectives, tests being administered before material is fully covered, and the challenge for absent students to catch up on missed work.

Recommendations:

- Use a mixed schedule with longer blocks for discussion-based and practical subjects and shorter lessons for subjects that require frequent practice and repetition
- Regularly review and adjust the schedule based on teacher and student feedback

Summary

Plan the school timetable to align with students' natural attention spans and daily rhythms by placing demanding, abstract subjects during peak performance hours and balancing them with subjects with physical activities and practical work. Use a mix of lesson lengths, if possible, with longer blocks for discussion-based and practical subjects and shorter lessons for subjects that require frequent practice and repetition. Include regular breaks (at least 15 minutes) to ensure good air quality and maintain focus. Alternate intellectual and physical activities to support best learning opportunities and finally, review and adjust the schedule regularly based on teacher and student feedback to keep it effective and supportive for all learners.

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