

# The science of homework: tips to engage students' brains

Neurologist Judy Willis explores what kinds of homework help students at different stages of development and just how long out-of-hours work should take



When students know that the effort they put into homework will enhance their enjoyment of classroom learning they become more motivated. Photograph: Ableimages/Getty Images

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If you know a bit about the brain then you can plan homework to suit the needs of students as they develop.

During early school years, for example, the brain is focused on getting to grips with the world around us. Memories and understanding grow when new information can be linked to things we already know. Homework that helps with this recognition can build literacy and numeracy skills.

When students reach adolescence, they become more independent and self-directed. There is a shift away from rote memorisation and single, correct responses. Learning goals are more likely to focus on reading for content and comprehension, revising, report writing, solving problems, investigating and independent or group work.

Well designed homework provides multiple ways for students to engage with what they are learning. They will then be able to use the facts they acquire to be creative and solve problems in class.

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## **When to use online learning games for homework**

Most teachers work hard to differentiate homework based on skill level, but with each new topic there may not be time to prepare individual tasks. Online games, in which pupils learn and test their factual knowledge, can be helpful when homework goals are about building a foundation of knowledge. This tends to be in the early years of school.

Computer-assisted learning cannot replace good teaching: it is only from teachers that students can experience rich interactive learning and build conceptual understanding.

But using online learning games for homework tasks lets students gain the necessary level of factual knowledge and learn procedures that need to be memorised. This allows them to then progress in class to the richer subject content. Relieving teachers of essentially being drill directors means students get more class time to understand concepts and apply what they have learned.

Online games also help students to build skills to an automatic level at an appropriate pace for them. For example, games could be helpful in learning multiplication tables, spelling, remembering dates, names of rivers, foreign language learning, or getting to grips with grammar rules. Well designed online skill games evaluate each student's ability as the basis for the questions or problems given.

A good website for information about hundreds of available programs is graphite. You can browse by subject, grade level and skills, and see rankings of popularity with learners and teacher evaluations.

## **The importance of homework that students value**

In later school years homework is more likely to focus on reading for understanding, revising and launching investigations.

When students know that the effort they put into homework will enhance their participation and enjoyment of classroom learning, they become more motivated. Pupils also put more effort into schoolwork or homework when they are engaged in something that is relevant to their studies.

For instance, if the class is studying how to calculate area, good maths homework may be to get students to measure parts of their room they want to change (eg walls to paint, windows for curtains, doors to cover with cork board for posting photos etc). Those who complete the homework will be able to make sketches to scale of their rooms on graph paper and determine area. Those who don't do the homework will not be prepared for this activity and will have to solve less interesting worksheet problems.

If the assignment is to read a chapter in a social studies or history book for discussion the next day, teachers can inform them that there will be a short quiz of the main points. Students who

...ay, teachers can inform them that there will be a short quiz at the main point. Students who score high enough to demonstrate that they did their reading will have the rewards, or do independent projects of their choice and move on to new challenges.

## **How much time should homework take?**

The amount of time spent on homework will always vary depending on the age of students and what task you have set.

After about 15 minutes of learning and practising something - such as the Pythagorean theorem in maths - the regions of the brain activated in spatial-numerical learning get fatigued and need to rebuild the neurotransmitters, such as dopamine, that get depleted.

This is why teachers need to plan brain breaks in class time and for homework. It doesn't mean the child needs to run around or play a game. It just means another part of the brain (or body) should be doing the activating while the other area rests. The restoration only takes a few minutes if the break is timely, but if they are pushed to stay with that same process for too long, stress builds, neurotransmitters drop way down and it will take twice as long to restore full efficiency to that area of the brain.

The good thing about getting students to do something that will enhance their classroom experience is that they are more likely to engage in it, so they don't mind spending time on it.

Online games for learning basic knowledge usually have set timings. You can assign a specific amount of time to be spent on the skill building program for homework and confirm students' compliance by checking the teachers' pages.

*Judy Willis is a neurologist and former teacher. She writes books and does international presentations about how the brain learns best.*

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