COGNITIVE APPROACH
Topic 4 (HL extension): Cognitive processing in the digital world.
Content: The positive and negative effects of modern technology on cognitive processes - reliability of cognitive processes. Methods used to study the interaction between digital technology and cognitive processes - reliability of cognitive processes.
Key Idea: How digital technology affects cognitive processing.

KEY STUDY*: Hembrooke & Gay (2003). The laptop and the lecture: The effects of multitasking in learning environments.*

Background
Found that students who had their laptops open during a lecture remembered less of the content than a control group who kept them closed.

Aim
To examine the effects of multi-tasking in the classroom.

Participants
44 college students (22 female; 22 male) from a university in the North-East of the USA. The researchers were interested to see the extent to which 'doodling' on the laptop (i.e. browsing unrelated websites, checking email) might interfere with learning in the classroom.

Procedure
The field experiment took place during a lecture rather than in strict lab conditions. Half of the class were called out to another classroom: while they were gone the other half of the class listened to the lecture and were encouraged to use their laptops as usual throughout. These students then left the lecture hall and the other half of the class then came back in and heard the same lecture – only this time they were told to close their laptops. Both groups of students were tested immediately following the lecture. Both groups of students were then given 20 questions, focusing on recognition and recall related to the contents of the lecture. Two months later the procedure was replicated but this time the students who had been in the closed laptop condition now participated in the open laptop condition and vice versa.

Results
Students in the open laptop condition performed significantly worse than those with the closed laptop when tested on their recall and recognition of the contents of the lecture. The longer the time spent on browsing, the worse the memory performance was. Brief distractions from the lecture, of short duration, did not impair memory performance or overall grade in the class at all.

Conclusion
Sustained multi-tasking in the classroom reduces memory for the content of the lesson.

Evaluation of Hembrooke and Gay (2003)
Strengths
✓ This is a field experiment (the students were not placed in artificial conditions and were doing

what they would normally do), making it high in ecological validity.
- ✓ The inclusion of the replication study means that the researchers used the test-retest method for checking external reliability.

Limitations
- X The use of a snapshot design (a one-off study) means that extraneous variables may have interfered with the results e.g. some students may have been feeling less engaged on the day of the study; some may have needed to check their email for personal reasons; the content of the lecture may have been less interesting for some more than others.
- X The use of a small sample of university students from Northeastern USA makes generalising the findings difficult.

Reference
Hembrooke, H., & Gay, G. (2003). The laptop and the lecture: The effects of multitasking in learning environments. *Journal of Computing in Higher Education*, *15*(1), pp. 46-64.