

Learnus[®]

MEDIATED WORKSHOP SERIES

Understanding Learning - is it all in the brain?

2nd October 2014

18:00 to 20:30

Faculty of Education
University of Cambridge

MEDIATED WORKSHOP REPORT:

Working Memory in the Classroom: Linking Research and Practice

INTRODUCTION

LEARNUS is a recently formed think tank which aims to act as a bridge between the latest academic research and the classroom and to share our findings with education policy makers. A key element in working towards this objective is the need to provide opportunities for the wide range of interested parties – neuroscientists, teachers, psychologists, policy makers and commentators – to come together to explore the issues and share their knowledge and understanding of the field. This mediated workshop is one of a series of events that is being held by LEARNUS in order to provide opportunities for debate and inform subsequent developments.

PURPOSE AND STRUCTURE OF THE MEDIATED WORKSHOP

Within the context of the overall mission of LEARNUS, the purpose of this mediated workshop was:

- to bring together a range of stakeholders to share their expertise and understanding of learning with specific reference to research on Working memory in the classroom;
- to draw out from the discussions key ideas that might inform and improve practice in teaching and learning and identify issues which need to be addressed as part of the future dialogue.

The three elements of the workshop were a presentation by Professor Sue Gathercole, Director of the MRC-Cognition and Brain Sciences Unit, University of Cambridge, roundtable discussions and a plenary question and answer session. The full programme for the workshop is attached to this report as Appendix 1. Prior to the workshop a paper¹ by Professor Gathercole was sent out to participants in order to help familiarise them with some of the issues.

Fifty five participants attended and contributed to the discussions.

¹S. Gathercole, 2008 Working memory in the classroom. The Psychologist Vol 21 No 5 pp382-385

Keynote Presentation²

Professor Gathercole set the scene by explaining that ‘working memory’ (WM) is generally used as a more up to date term for “short-term memory” and that it is considered to be, “*the capacity to hold material in mind and manipulate as necessary for brief period*”. It acts as a mental work space in which it is possible to hold a series of instructions or steps of a calculation until the task is completed. However, the capacity is limited and if some or all of the information is lost, for any reason, it cannot be retrieved. WM capacity increases with age up to around 15 years and then declines in old-age. However it varies considerably within cohorts so, for example, an 8 year old child in the bottom 10% of the WM capacity range has WM equivalent to that of an average 5 year old. In contrast an 8 year old child in the top 10% of the WM capacity range has WM equivalent to that of an average 13/14 year old which is almost that of an average adult.

Children with restricted WM capacity often have associated difficulties in their learning and 80% with poor WM fail to achieve their expected levels of attainment in either reading or maths and typically both. Among other things these children have difficulty in following instructions, often ‘forget’ where they are up to with a task and appear to have short attention spans and /or are easily distracted. Many teachers recognize the behaviours of these children but are unaware that poor WM might be the problem.

Professor Gathercole, identified two questions she would explore:

1. How can we improve the classroom environment to reduce WM overload?

Using examples she illustrated a series of principles for improving classroom practice that teachers and assistants should adopt as part of their teaching. They should:

2. familiarize themselves with, and be aware of, the warning signs of working memory failure which include children unable to fully recall information, failing to follow instructions, losing track of their place and abandoning the task;
3. reduce the amount and complexity of information to be stored in WM;
4. help the child access forgotten information by, for example, repetition of instructions, using prompts and diagrams, providing audio recorders, encouraging team-working and giving the child permission to ask questions either of a peer or of the teacher / assistant;
5. encourage the use of memory aids but these need to be bespoke / individualized, have reduced visual clutter, encourage practice and are to hand;
6. with older children provide online support.

Further details and useful resources³ to support teachers in the classroom were suggested.

²See the slides for this workshop for more information

³S. Gathercole and T. Packiam Alloway, 2007 Understanding Working Memory: a classroom guide. Available at: <http://www.york.ac.uk/res/wml/Classroom%20guide.pdf> (accessed 30/09/2014) and along with other useful resources at: <http://calm.mrc-cbu.cam.ac.uk/> (accessed 30/09/2014)

2. How can we improve WM capacity?

This is a more challenging and complex question to answer and the evidence requires careful consideration. Professor Gathercole described progress that she and her team have made using “CogMed”, an online adaptive suite of training programmes designed to engage children in a range of different tasks involving the use of WM. As a child becomes more successful the tasks become more difficult and in this context there is evidence of improved WM capacity.

Research conducted to date indicates that this type of training does improve WM capacity and that it can be sustained over a period of six months (NB this is only the length of time it was studied). In another trial, improvements in verbal WM persisted 12 months after training but there were no increases in other domains. The apparent non-transfer of WM improvements to other areas of learning remains an issue for further research. However, there is evidence that the adaptive training alters brain activity which shows increased connectivity between the different areas of the brain involved in the tasks.

Professor Gathercole, then used examples of approaches that are being explored in order to improve the effectiveness of WM training. In particular, the use of embedding the training within a specific domain was discussed as a way of reducing the ‘transfer gap’ between training and its application in a new context. Further strategies from other areas of research, were outlined, such as increasing metacognitive awareness and extensive practice.

The presentation was concluded by summarizing the key points as follows:

- many children fail to meet the WM loads of classroom activities, and this may impair learning;
- the classroom needs to be designed to avoid unnecessary WM overload;
- learners should be equipped with strategies to help compensate for low WM capacity;
- intensive training does have benefits for WM performance and changes neural functioning, but to date they have not extended to practical aspects of learning;
- new interventions are urgently required that embed training in practical situations to boost benefit for everyday function and learning.

Importantly, it was noted that it is unlikely that there is a single solution but a combination of approaches will be required.

Outcomes of the roundtable discussions

The groups at each table were invited to reflect on the points made during the key note presentation and in the light of that to consider the following questions:

- To what extent do your current practices (both inside and outside the classroom) recognise children’s difficulties with working memory?
- How might you modify your practices to help children address these difficulties in order to improve their learning and behaviour?
- What do you consider to be outstanding issues that require further investigation?

The lively discussions that ensued inevitably raised many more issues ranging from matters relating specifically to the way in which WM functions through examples of individual experiences to issues for further debate. Three broad themes can be identified running through the roundtable discussions.

- A. Issues relating to classroom practice. In particular, the challenges of being able to identify children with poor WM capacity were highlighted the importance of diagnostic assessments were emphasised. Experiences and strategies of participants already working to support children with WM difficulties were exchanged. Several groups were taken with the notion of embedding WM strategies into other learning activities and explored possible ways this might be achieved. It was emphasised that to be successful there is a need for all adults (including teaching assistants and parents) in the classroom to understand what is required. As one participant put it, children must implement the strategies, not the adults, otherwise there is a risk of 'learned helplessness in the children'.
- B. Influence and impact of other learning challenges / difficulties on WM capability. The symptoms and external behaviours exhibited by children with low WM capability are often very similar to those which are the result of other learning difficulties. Furthermore the strategies to address the issues can also be very similar. It was felt that being able to recognise the major cause of the problems might help improve the effectiveness of the strategies used. More than one group considered this in terms of WM problems compared with subject specific difficulties e.g. in maths. Other groups raised this issue in terms of the impact of stress on children's WM and the possible knock-on effects this might have on self-esteem.
- C. Support for teachers. For many participants a major concern was the levels of support available to teachers in not only this area of WM capabilities of children but for many in working with children with learning difficulties more generally. There were calls for, at the very least, making teachers aware of the issues as part of pre-service and in-service training.

Question and answer session

Rather than trying to summarise all their discussions, groups were asked to identify one question that they felt came from their conversation particularly strongly to be put to Professor Gathercole. These headline questions were:

- What is the influence of stress on WM capability?
- To what extent is it possible to distinguish problems with WM from subject specific difficulties? Is it possible to identify the limiting factor?
- Is there a diagnostic tool available for teachers to use in the classroom? (Professor Gathercole invited participants to contact her as she could provide a rating scale that would help.)
- To what extent is WM a stand-alone issue and to what extent is it part of a more complex series of interactions?
- Is there a link between WM capability and social behaviour?
- Is the use of technology the only / best approach to providing successful WM interventions?
- Working with early years children (3 -5 year olds) what are the effects of their experiences on WM capability? Is there a threshold level of WM capability below which some interventions will have little effect
- Professor Gathercole commented on each of the questions, indulging in a little speculation, but emphasising that while we have some pieces of the jigsaw there is still much work to be done to

improve our understanding of WM, how it works and hence the implications for classroom practice.

In summary

Based on the evidence presented during the workshop, an improved understanding of WM can have benefits for both teaching and learning. The potential for increased interaction between researchers and practitioners is well demonstrated through the work to date on WM. Inevitable there are caveats, notably that there are still many unanswered questions and, importantly that the findings on WM should not be taken in isolation of other evidence – especially when they are applied to classroom practices. As Professor Gathercole highlighted teachers and researchers “need to learn from other fields of intervention [through] metacognitive awareness and extensive practice following training in applying strategies to everyday activities”.

Thanks

LEARNUS wishes to thank Professor Sue Gathercole for her thought provoking contributions and to all the workshop participants for their willingness to share their ideas, experience and expertise. Thanks also go to everyone who helped to make this workshop possible, especially Dr Lysandra Sinclair-Harding, the Faculty of Education, University of Cambridge and to IMBES (International Mind, Brain and Education Society) for all their support.

Derek Bell
Director of Learnus
6th October 2014