Equipping students to identify misinformation: science, health and epistemic insight

# Equipping students to identify misinformation: science, health and epistemic insight

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**Abstract** Focusing on health education as its context, this article considers the question of how to equip students with strategies to identify and resist misinformation. In doing so, it confronts a key problem for health services nationally and globally, which is the problem of entrenched compartmentalisation. The relationship between these two key issues is explored with reference to a workshop on health misinformation. The workshop was designed through co-creation with researchers in education and was trialled with foundation-level students studying biomedical science and pharmacology. Feedback from participating students included that the workshop provided valuable aspects of interdisciplinary learning that they felt were 'missing' from their education to date. The article concludes by discussing the opportunity for science education in schools and colleges to address and potentially head off problems that persist beyond school and that are recognised to need urgent attention in health discourse.

How do we teach students to identify misinformation? This is a pressing problem in a range of areas, not least for those of us teaching students in health disciplines. It seems almost platitudinous to observe that a sound grounding in science is a key factor in equipping students to recognise and so resist misinformation. While few would deny that such a grounding is necessary, whether it is sufficient to empower students to distinguish good from bad information depends, among other things, on the nature and content of the scientific education students receive. Arguably, a science curriculum in the 1970s could regard the main obstacle it needed to overcome as ignorance of scientific theories and facts. Twenty-plus years into the 21st century the greater problem seems to be, to adapt a popular social media phrase, a case of 'too much information'. Members of the public are exposed to so much data, accompanied by so many arguments, opinions and conflicting interpretations, that individuals are unlikely to read even a small fraction of the information available, never mind assess it knowledgeably and intelligently. At times, there may be a tendency to feel overwhelmed and inadequate. Such feelings can come with associated temptations, including a tendency to embrace a variety of forms of scepticism and dogmatism, when confronted with different accounts of what 'the science says' on an important question, and questions about the extent to which we should trust the advice of scientists.

Ironically, one of the products of the scientific era, information technology in all its forms, is increasingly a source of entrenched scepticism about scientific advice on a number of issues. In the COVID-19 crisis, a lack of clarity in official advice fuelled speculation on internet sites and social media networks about public health strategies and the reliability of vaccines (Loughlin, 2021). More


broadly, the willingness of many public figures, including those in positions of power with massive followings, to make statements conflicting with publicly available evidence and even their own previously published statements, led to what some authors label as the 'post-truth era' (Abraham and Mathew, 2021). In this era, members of the public find it increasingly hard to distinguish valid from invalid claims and to assess the reliability of evidence to distinguish the facts from 'fake news'.

It would be unrealistic and unreasonable to ask for a return to a time when one could simply recommend certain sources as authoritative, confident that one's students would have access to little else. We live in the present, and in any case the pre-internet era was hardly an educational idyll. As the example that provided the central discussion point in the workshop described below reminds us, popular misinformation massively predates the internet – and used properly, online sources can be of enormous value. The real challenge is to enable students to use them well, to think critically about them (Loughlin, 2021) and to develop the skills to avoid being misled.

## Avoiding the problem?

That said, if the imperative is to get students to learn what they need to know to complete their coursework and pass the exam at the end of the year, then it is of course tempting simply to instruct them to restrict themselves to the sources one recommends, ignoring all others. That way they will know 'what to say' in class and in the exam hall, but we will fail in the objective of training critical thinkers with the knowledge and skills to equip them to make sense of an often-confusing world. Far from thinking 'outside the box', developing the creativity and originality that have been identified as core skills required for success in both science and art (Billingsley and Windsor, 2020), we will be teaching them to examine the content of their specific academic box and to resist the temptation to look beyond it. Instead of engaging in a search for the truth, learning skills to be employed outside the classroom, they will simply be learning the phrases they need to repeat in this specific context. As such, our teaching will not help them to meet the challenges of the contemporary social and professional world and it will, in fact, contribute to a major problem in both education and professional life: entrenched compartmentalisation.

Entrenched compartmentalisation is characterised as a barrier that prevents students in school and college from thinking across disciplinary boundaries and applying their knowledge and skills to the solution of real-world problems, in all of their diversity and complexity (Billingsley and Windsor, 2020).

However, this problem extends to education and practice well beyond the school system, with serious concerns being raised about the tendency for professionals in such crucial areas as health and social care to think and to work in 'silos' (Manley and Jackson, 2020). Policy documents identify the necessity for a more 'integrated' approach to securing the health and well-being of individuals and populations (Department of Health, 2019), giving rise to the urgent requirement for interdisciplinary understanding and interprofessional collaboration, to address the needs of real people, in all their uniqueness, context-specificity and complexity (Loughlin, *et al.*, 2018). As such, there is an imperative for those of us who educate the professionals of the future (that is, all of us in education – whether we are teaching in schools, FE colleges or universities) to equip our students with the skills and dispositions they will need to confront these complex real-world problems.

The Epistemic Insight Initiative is designed to provide students with the opportunity to 'join the dots' between different subject disciplines, so that they can understand '*how disciplines relate to one another and how they can be applied in real-world, multidisciplinary contexts*' (Billingsley and Windsor, 2020). Those of us working in higher education are developing approaches designed to respond to habits of thinking that form an obstacle to good practice to help professionals to come out of their 'silos' (Manley and Jackson, 2020). Meanwhile, in schools there may be an opportunity to 'head off at the pass' a problem that currently persists into higher levels of education and training. Indeed, it seems reasonable to hope that if schools can enable students to think across disciplinary borders, to look at 'big questions' concerning the nature, methods and underlying values of their specific disciplines, then these students will be less likely to develop a 'silo-based' mindset as they go into the professional world.

Further, for education to build students' resilience to misinformation we will need to address the challenge of teaching students to identify and resist misinformation from a range of sources. This article focuses on how to assist students to develop this ability, with specific reference to misinformation concerning health, outlining a workshop on this topic with foundation-level students in biomedical science and pharmacology at the University of West London.

## The workshop: key goals and questions

The key goals of the workshop were to enable students to think about two issues:

1. identifying misinformation about health;
2. assisting others in resisting misinformation.

The second objective is crucial to all students considering careers in health care. Future health professionals need not only to work in multidisciplinary teams (requiring effective communication with colleagues from a range of disciplinary backgrounds) but also with members of the public who lack any specialist training in the health sciences.

In a time when the focus on lifestyle and prevention takes precedence over 'diagnosis and cure', self-management is more needed than ever. If patients do not follow the advice of health professionals then all the resources invested in understanding their conditions are wasted. As the clinician Stephen Henry put it:

> *Clinical medicine involves interacting with and understanding persons, and thus addresses a problem that is fundamentally different from and conceptually more complex than the kind of reasoning involved in problems such as mathematical calculation or measuring the masses of chemical isotopes.* (Henry, 2010)

The skills of understanding and communicating effectively with patients are distinct from, but every bit

as essential as, the scientific knowledge required to identify specific clinical conditions. The need to understand how one's advice will be received and interpreted in the context of the patient's life is an indispensable (yet, as Henry argued, frequently overlooked) component of the education of anyone hoping to function as an effective health practitioner in the modern world. Apart from in the context of self-care, the whole point of learning to identify misinformation is to enable others to resist it.

The workshop's participants were 14 level 3 students, all of whom were enrolled for either the BSc in Biomedical Science with Foundation or the BSc in Pharmacology with Foundation. These students are typically at the age of university entrance, 18+ in the UK, but they are entering at the same level as students doing A-levels (normally ages 16 to 18 in the UK). The workshop opened by introducing the students to two questions:

1 How can science assist us in assessing claims about the health benefits and potential risks of products and lifestyle choices?
2 What other types of knowledge and skills are relevant, both to:
   - **a** identifying misleading claims , and
   - **b** helping others develop such skills?

## Survey, questions and goals of the discussion

After a brief introduction to the goals of the workshop, students were asked to complete an introductory survey. The survey included questions drawn from the repertoire of shared statements employed across projects in the Epistemic Insight Initiative (see, for example, Billingsley and Nassaji, 2019). It also piloted some statements and questions specifically focusing on the issue of health misinformation. Some of questions presented a statement and asked students to choose from the options 'strongly agree', 'agree', 'partly agree/disagree', 'disagree', 'strongly disagree' and 'I don't understand'. These included:

- *At school, my teachers explained the term 'disciplines'.*
- *I can explain the distinctive strengths and limitations of a number of disciplines.*
- *In secondary school, I had some lessons where the science teacher and a teacher of another subject taught the lesson together.*
- *A person's behaviour is something science will never be able to fully explain.*
- *Some questions are more amenable to science than others.*
- *I would describe myself as curious about how different disciplines interact.*
- *My future career will probably include looking at how science interacts with other disciplines.*
- *My future work will help to solve real-world problems.*
- *I can tell where people are misusing science when discussing a current issue.*
- *I can explain how science informs our thinking about problems regarding health and well-being.*

The wording of the statements served to encourage students to think about their current education in the context of what had gone before, what they had learned thus far, and what they hoped to do in the future, which enabled them to focus on their own development as well as their views on science, health and misinformation.

The rest of the survey invited students to write their own responses to the following questions:

- *What is science? What makes science distinctive compared with other disciplines (e.g. history, geography, religious studies, mathematics, literature, psychology)?*
- *How does science help us to think about what is good or bad for our health?*
- *How do you spot misinformation in health care?*
- *What advice can you give to members of the public to help them become better at spotting misinformation regarding their health?*
- *How do you know whether to take a scientist's word for it, when you see a report about a new breakthrough product in healthcare?*
- *What types of knowledge are relevant to assessing the plausibility of a claim about a health product?*
- *Are there any skills or abilities that you could develop that would help you assess the plausibility of claims about health products?*

The students were asked to submit their completed surveys to the tutor, and informed that they would be invited to answer the questions again at the end of the session, to see if there were any differences between their pre- and post-discussion responses.

By getting them to complete both pre- and post-session surveys, we were testing the impact of the session on their abilities to spot misinformation. If their responses post-survey indicated a greater awareness of the issues then we could regard the approach of the session as successful – if not, we would need to consider amending it. To that end, we also arranged post-session interviews with some of the students. The interviews would enable us to explore the students' experience of the session, their reactions to it and their views regarding the broader goals of the Epistemic Insight Initiative. In particular, did the workshop help them to think about the nature and limitations of scientific investigation, and the sorts of questions science is best suited to answer? Did they find the session useful in terms of both their current

studies and in terms of their thinking about their future careers? A key goal was to enable students to tell us in their own words what they felt about their current abilities and educational challenges, so that they could educate us on the utility of the project with regard to their specific goals and concerns.

The session was designed to be interactive, with the questions asked by the tutor in the course of the discussion intended to engage the students. If they reacted quickly and understood quickly, this would confirm that the questions and the task were pitched at the right level. A key goal was to inspire them to think critically, to apply their scientific knowledge and training to the real examples of claims presented about the alleged health benefits of certain products. A further goal was to enable them to contextualise the role of science, to see how far they would be open to claims about the limitations of scientific reasoning and to distinguish questions more amenable to science (in particular, where straightforward 'true/false' answers could be obtained via scientific investigation) from ones that needed interpretation in specific contexts.

## Student responses in the group discussion

Even while writing their initial responses to the survey, the students' comments in the class were revealing. One of them asked what the term 'discipline' meant, and four others then indicated that they, too, did not understand the meaning of this term – with one stating that she had only ever heard the term used in school in the context of 'punishment'. (These students did recognise the language of 'subjects' although they identified and distinguished the different school subjects with reference to content rather than methodology.) While completing the second group of questions another student commented, '*This makes me realise what was missing from my secondary school education*.' In the discussion that followed, she explained that, in her school education, she had not encountered these questions (regarding misinformation and the application of science to real-world problems) though they were in fact what she found most interesting and a big part of her motivation for studying science.

In recognition of the fact that popular misinformation predates the internet, the example students were invited to consider as a focus for the discussion was derived from a widely promoted advertisement for Guinness in the 1930s. The makers of the advertisement declared that: '*Guinness is good for you – it gives you strength*'. They argued that this claim has a scientific basis because Guinness contains iron – a mineral the body needs for growth and development. The example succeeded as a stimulus to prompt critical thinking. Students were quick to raise the pertinent questions of '*how much*' iron does Guinness contain and '*what else*' does it contain? There was a consensus that the claim was misleading because the proportion of iron in a pint of Guinness is extremely low, particularly in contrast to the proportions of alcohol and sugar it contains.

Students were then introduced to more recent scientific research at the University of Wisconsin, which found that Guinness contains antioxidant compounds that slow down the deposit of harmful cholesterol on the artery walls (http://news.bbc.co.uk/1/hi/3266819.stm). The research suggests that Guinness can reduce blood clots and the risk of heart attacks, thus potentially justifying the claim that Guinness has health benefits and is therefore '*good for you*'. The tutor noted that similar claims can be made on behalf of red wine and dark chocolate, asking students to consider if this means that all of these things could now be marketed as 'health products'.

These questions served to broaden the debate, with students considering whether there were alternative ways of obtaining the same benefits without any of the possible risks of alcohol consumption. However, students also noted that these risks needed to be '*viewed in context*', such that the claim that '*alcohol is bad for you*' might be regarded as a misleading over-generalisation, raising issues about lifestyle and balance. They were immediately open to the idea that a claim like '*Guinness is good for you*' is not straightforwardly true or false in that, for some people, alcohol can '*help you relax*' and '*give you confidence*', but clearly too much can be '*counterproductive*'. One student felt that some ways of relaxing, gaining confidence and otherwise improving your mental states were more '*natural*' than others, but there was no consensus about this or how we might establish which method is '*natural*'. Instead, the debate shifted to consider the problems with assessing a claim as '*generic*' as the one in the advert. Claims such as that cannot be straightforwardly assessed by science, and they might be true in some contexts (depending on a person's situation, life habits and even their personal values and goals) and false in others. Thus, the problem with such claims is that they can be used to mislead people, inappropriately generalising from a specific instance.

This part of the discussion concluded with the students agreeing that both scientific evidence and knowledge of an individual's lifestyle, dispositions and situation were needed to evaluate the claim that consuming a particular product was '*good for*' that person.The tutor summarised the conclusions of the session as follows:

> *We have seen that scientific knowledge can be used to make claims about 'healthy products' but the positive impact of a benefit can be exaggerated and/or*

*outweighed by other negative impacts, and there may be other ways to achieve these benefits.*

Regarding '*ways to spot misinformation*' the students were happy to agree on the following strategies:

- *Look for the use of scientific knowledge to persuade you and draw on your understanding of the nature of science to consider how to make sense of it in the wider picture.*
- *Look for economic incentives that mean a product owner is seeking to change consumer behaviour.*
- *Look for headlines to get you to 'read-on' promising easy and surprising ways to improve your health – click-bait to get your interest and invite you to read more.*

These statements were suggested to them by the tutor in the concluding part of the discussion, with the students in agreement with the tutor that they could also serve as useful summaries of the conclusions collectively arrived at by the group in the course of the debate.

The tutor then used the 'bubble tool' designed by the Epistemic Insight Initiative to illustrate what the discussion about identifying misinformation had revealed regarding the role and limitations of science in answering real-world questions regarding health and well-being. The tool enables students to gain epistemic insight by distinguishing which of the questions they had raised and debated were most amenable to science. Students agreed that this helped them to think about the distinctive nature of science and its relationship with other forms of human thought and discourse.

Figure 1 is a slide from the *PowerPoint* used when teaching a workshop on misinformation for students on a university foundation-level programme.

## Post-workshop survey responses and interviews

With such a small number of students in the workshop, any attempt to draw general conclusions from the responses would put us at risk of committing the sort of fallacy students rightly identified (the drawing of overly generic conclusions from specific examples) in the course of the discussion. That said, when asked the question '*how do you spot misinformation in health care?*' in the pre-survey, eight students answered with '*I don't know*' or did not answer the question at all. It was encouraging to note that this number was reduced to three in the post-survey and some of the answers given reflected points that had been made in the course of the discussion. One student suggested that she would advise people to ask (of the person making a claim) '*Do they have a theory to back up their claims?*', reflecting the conclusions of the discussion on the need to fit particular claims into '*the wider picture*'. The need to contextualise specific claims in the context of broader theories was also reflected in the answer that the information needed to be seen in the context of '*up-to-date scientific knowledge*'. This student also indicated that he would discuss the case with someone he judged to know the field better than himself (significantly, this was one

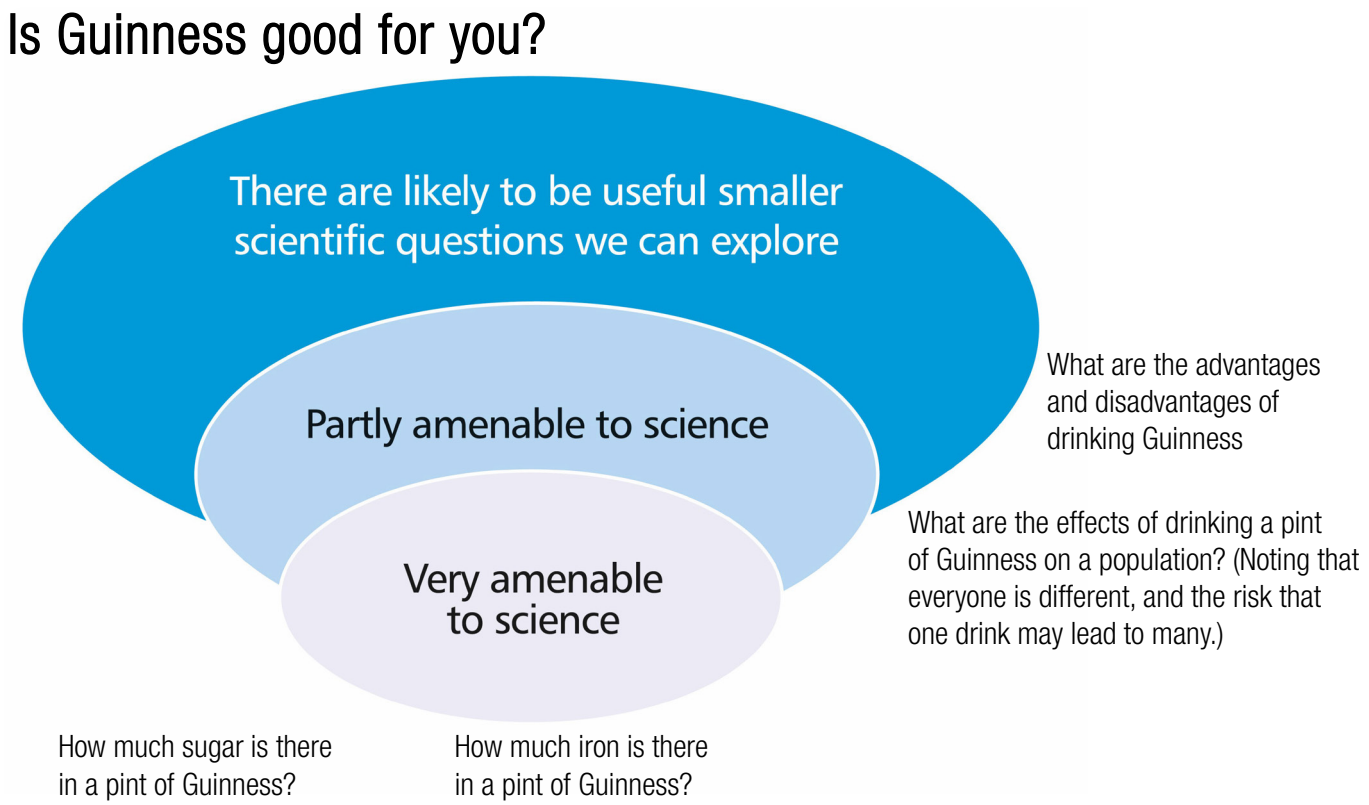


**Figure 1** Students worked with the 'Bubble tool' to sort ideas and questions into different epistemic categories

of the students who answered '*I don't know*' to the same question in the pre-survey). Another student stated the importance of '*looking critically at the information*' to identify its '*hypothesis*', again reflecting points that were made in the discussion part of the session. So, there is some reassurance there that the session was valuable and had an impact on the thinking of the students.

This impression was confirmed by subsequent feedback, including two students who agreed to do post-workshop interviews. The students were enthusiastic about the fact that the workshop helped them to make links between their school studies, contemporary problems and their thinking about their future careers. They discussed the issue of misinformation about COVID-19 and the confusion and stress that this had caused to members of their families and in one case to the student herself. She noted that:

> *It's important that we know about misinformation because it can create a general panic in society... Education has helped me to be calmer throughout this crisis. I initially panicked when the crisis started because there was so much information out there that either was or wasn't true and I was confused and worried. I had severe stress and anxiety and stopped eating. I lost weight and for four months found myself being ill for no reason. This could have damaged my immune system and made me more likely to catch it. Now I have gained a better understanding of which information is good information and it has given me more control.*

This student's answer to the question '*Would you be interested in being involved with further epistemic insight projects?*' is perhaps worth quoting in full.

> *Yes, definitely. I studied psychology as an A-level and I'm studying pharmacology now. It's really interesting that, while we are doing this topic and this study, lots of my psychology knowledge is linked to my biology knowledge. The whole 'misinformation and misleading' topic in health care brings out how those two can be affected by each other. In school, it's always about 'this is your topic, learn it, memorise it, word by word, go into the exam, get your grade'. But I think, if the education system brings all the different things together, links it altogether, gets the kids to cooperate, I think you'll get better results. Like exactly what we're doing here, we're linking disciplines, we're cooperating. We're not just saying 'go and learn this then do a test'. We're getting people's opinions, different views and ideas, and everyone's cooperating. I'm learning so much this way. It's not just read something then do a test – because it's about discussion I've learned so much in that lesson.*

The student's comments on the relationship between the different disciplines she has studied indicates both her own development in thinking across disciplinary lines and her understanding of a key goal of the workshop, to promote this sort of interdisciplinary thinking. She specifically uses the topic discussed in the workshop to illustrate the relationship between the disciplines she identifies. The fact that the session enabled her to engage in discussion is also evidently important to her, and her response confirms that this sort of exchange can be a more effective way of enabling students to understand an issue than simply providing them with information. Her comments interestingly link the importance of interpersonal dialogue to the idea of interdisciplinary exchange.

## Conclusions, limitations and possible future workshops

The evidence of student responses in the workshop and their survey responses suggest that the session was useful in generating critical thinking, enabling students to apply their scientific knowledge to the solution of real-world-problems. As noted, these are increasingly important skills for future professionals to develop, and their urgent need is recognised by groups including the Department of Health (2019). Limitations of the current study clearly include the small number of students involved, but the results are sufficiently interesting to warrant further work of this sort. Students have demonstrated their ability to use critical thinking to analyse the example of misinformation presented and have raised further examples of their own. (See the previous section, with the examples raised by students regarding the COVID-19 pandemic.) Future sessions might helpfully look at less straightforward and more recent examples of misinformation, to determine students' abilities to identify and better criticise hidden instances of misleading claims.

It is a concern that following the workshop, one student omitted to answer the survey question '*how do you spot misinformation in health care?*' and two others gave the answer '*I don't know*'. It would be useful to learn why these students did not give answers indicating any insights gained from the workshop and/or their education to this point.

The comments by the student from the post-workshop interview quoted at the end of the previous section are of interest. The student's comments reveal something about her experience of the school system, and emphasise the importance of overcoming the constraints that generate the tendency towards compartmentalisation. By enabling students to make the links between the different areas of their education, we provide them with valuable epistemic tools that can equip them to confront the serious challenges they face as they go into an ever-more-demanding professional world.

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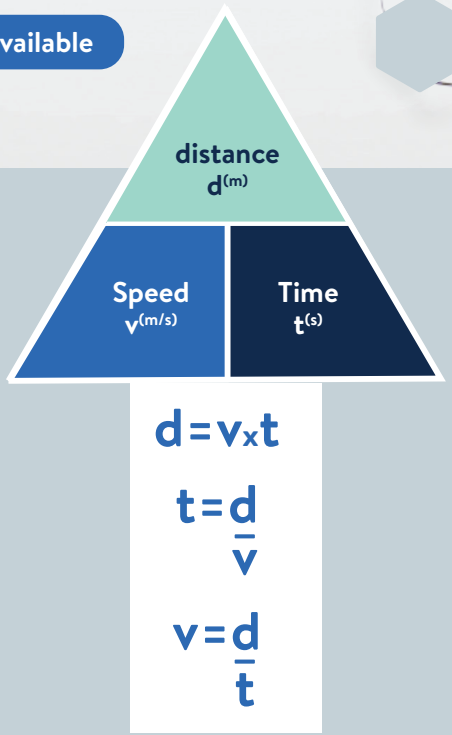


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