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Opinion

Biomedical Knowledge Flow: The Current Landscape

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Opinion

Some systematic reviews have shown that Biomedical research studies concerned with mobile learning pedagogy are still very small in number, and even fewer are conducted at the actual place of learning. This means that informal learning is often not observed or investigated *Tlili, et al.* [1], and much biomedical knowledge flow is therefore left undiscovered. By its very asynchronous nature most mobile learning is informal and not context dependent. Uses for devices continuously advance which increases links to other functions (e.g., students can now submit assignments via Dropbox) but similarly this also brings new problems to solve regarding usability and navigation of the learning [2]. It also brings new threats i.e., malware and hacking [3]. As Artificial Intelligence now assists with data-searching this also brings with it ethical risks concerning GDPR [4]. Security and ease of use should therefore be at the heart of all future designs for knowledge to flow.

Martin, et al. [2] recommend creating 'finger-friendly tap targets' approximately 7-10mm long that show immediate results. A simple solution, but *Abbas, et al.* [5] discuss the disparity between the common practice of using PDFs in biomedical spheres versus the necessity of 'machine-interpretable information' required by search engines (such as Google Scholar) to find appropriate information. Systematic reviews are only as good as the papers found, so if papers are not reached because they are PDF format true results can remain unidentified. *Abbas, et al.* [5] recommend the 'go Semantically holistic method' because it automatically annotates texts sentence-by-sentence with the required ontology vocabulary for search engines to be able to find it. However, this relies on applying this before publication. *Parwez, et al.* [6] researched how well various text 'embeddings' performed. They assert that 'Biomedical text classification' is becoming an invaluable way of finding data in biomedical repositories. It seems *Shtar, et al.* [7] agree as they used Adjacency Biomedical Text Embedding (ABTE) to predict new Drug-drug interactions. They found that ABTE performed as well as hand-searching but were considerably quicker. *Mehmood, et al.* [8] considered Biomedical Named Entity Recognition (BioNER) to extract text from documents. *Fecho, et al.* [9] go further and suggest that a Universal biomedical data translator that integrates pre-existing biomedical datasets may be the answer. However, they advise caution on the clinical insights it may provide. On this theme, *Falda, et al.* put forward the idea of 'Semantic Wikis' that act as database interfaces. However, these perhaps appear 'front-heavy' (from a workload point of view of setting them up, and from an ongoing management perspective), and 'less specific' (from a data quality perspective). On the plus side they are 'user-friendly'. *Unni, et al.* [10] take a slightly different approach and suggest using a universal schema for knowledge graphs to aid knowledge organization and flow. This is because they have the ability to be 'machine-friendly' as they can be translated into a variety of data modelling formats. However, this needs to have been done for search engines to find them.

Impact models are paramount for Biomedical knowledge flow research as this show how the various learning structures used act at the 'grassroots' level. *Hwang, et al.* [11] used 'Main Path Analysis' (based on systematic review methodology) and went some way to address this. Biomedical knowledge flow therefore remains a complex area with many different aspects to be considered for any resulting biomedical applications (such as clinical prediction, biomarker identification, and drug sensitivity) to be optimally practical and useful.

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Conflict of Interest

None.

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