

# Towards Supporting Awareness for Content Curation: The case of Food Literacy and Behavioural Change

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## ABSTRACT

This paper presents a theoretical grounding and a conceptual proposal aimed at providing support in the initial stages of sustained behavioural change. We explore the role that learning analytics and/or open learner models can have in supporting life-long learners to enhance their food literacy through a more informed curation process of relevant-content. This approach grounds on a behavioural change perspective that identifies i) knowledge, ii) attitudes, and iii) self-efficacy as key factors that will directly and indirectly affect future decisions and agency of life-long learners concerning their own health. The paper offers some possible avenues to start organising efforts towards the use of learning analytics to enhance awareness in terms of: knowledge curation, knowledge sharing and knowledge certainty. The paper aims at triggering discussion about the type of data and presentation mechanisms that may help life-long learners set a stronger basis for behavioural change in the subsequent stages.

## Keywords

Information curation; Food literacy; Behavioural change; Learning analytics, OLM's

## 1. INTRODUCTION

The proliferation of mobile devices and internet access has provided the means for individuals and communities to have access to a wide range of information. Searching and curating information from the Internet have been increasingly identified as a popular source for people seeking information about how to take care of their own health [7; 20]. Users commonly use search engines and visit multiple websites to find information [11]. However, the types and quality of these sources can vary widely, and can often be contradictory or overwhelming. When a regular user finds interesting articles, he or she can save it for later use. However, many times it is hard to keep track of interesting content as time passes and, more important, to interrelate and make sense of a number of content sources around a common topic. Information overload [15] and lack of credibility indicators [7] have been reported as important factors that can lead to a higher degree of uncertainty and misguidance. Moreover, the majority of people do not consistently check the source and date of the health information found online [11]. A number of web content curation tools (also known as social bookmarking tools) are popular solutions for this problem since they commonly allow collaboratively annotating, archiving and bookmarking webpages [23]. These may facilitate the organisation of content, information and knowledge for lifelong learning or for researching about particular topics [9; 18]. However, these solutions do not necessarily make evident to people how knowledge is individually/collaborative built or the meta-information about the sources of the information that could enhance their certainty on

such information (e.g. showing if most webpages that are being curated correspond to blog posts rather than evidence-based articles, or whether they include references to scientific papers, media reports, journals, etc).

Another recent movement aimed at raising awareness about personal wellbeing is quantifying different aspects of a person's daily activity using self-trackers [8]. However, these technologies have shown considerable limitations in sustained usage [21] (e.g. users have shown low levels of long-term engagement using smart wearables). As a result, learning about individuals' best practices to promote and maintain their own health can be very challenging without community support or effective technological guidance, or both. Moreover, it makes it harder for an individual to gain the knowledge necessary to make initial progress towards a sustained behaviour change. We illustrate the value of our approach towards supporting awareness in this context.

In this paper, we explore the positive role that learning analytics and/or open learner models can have in supporting lifelong learners in performing a more informed curation process of relevant content. We aim to achieve this by enhancing learners' awareness in three areas: the knowledge curation process; aspects of their collaborative learning process and knowledge sharing; and the types of sources, which can enhance knowledge trust or mistrust. The paper presents a theoretical grounding and a conceptual proposal aimed at providing support in the initial stages of sustained behavioural change for the particular case of food literacy support. In this paper, we use the term food literacy to refer to the individual or collective understanding about food and nutrition that can empower people to manage their own health choices [28]. Our approach is grounded in a behavioural change perspective that identifies i) knowledge, ii) attitudes, and iii) self-efficacy as key factors that will directly and indirectly affect future decisions and agency of life-long learners concerning their own health.

The rest of the paper presents first, the theoretical grounding for the application of learning analytics and learner modelling for collaborative content curation. Next, we define the context of food literacy and behavioural change, before presenting our proposed conceptual approach along with some initial learning analytics ideas. We conclude with a discussion of future avenues of this project.

## 2. THEORETICAL GROUNDING

### 2.1 Learning Analytics or OLM's

Learning analytics is a novel and quite holistic perspective that aims to provide support to the various stakeholders of the educational practice by exploiting data related to learning, teaching or the management of the educational process [25]. A

distinctive aspect of learning analytics is its emphasis on connecting the collection, analysis and reporting of data about learning and its contexts with high quality practical pedagogical approaches [19]. Thus, learning analytics mainly focuses on leveraging human judgement by empowering learners and educators with key information about the learning process that can help them take better and informed decisions [26]. In technical terms, data is commonly delivered to students, teachers, etc. through visualisations, graphs, notifications, etc.

Research into feeding back traces to learners of their own data is not new. There has been substantial research and development on Open Learner Models (OLM) [4]. While a learner model corresponds to a structured data model constructed from the traces of interaction between a learner and a learning system or systems, *Open LM*'s are designed to be viewed or accessed in some way by the learner, or by other users (e.g. educators, peers, etc.). Even though there are key differences between learning analytics and OLM perspectives [14] (e.g. the data that is fed back to students is commonly less processed from a LA perspective, or the key role of adaptation from an OLM perspective), the common aim of both approaches remains the same: to make learners data visible to help them gain understanding of different aspects of their learning [14].

We aim to take a stance on both perspectives, in particular, OLMs could be considered as a specific type of learning analytics [14]. We aim to make visible to learners data about their collaborative information curation process. This may require tuning the type of support according to the learners' particular needs, interests or knowledge (a learner model), delivering visualisations or pushing notifications and/or recommendations to the learners.

## 2.2 Collaborative Content Curation

Content curation refers to the activities related to searching, selecting, organising, validating, maintaining, and preserving existing content artefacts [23]. Content curation communities have emerged in parallel to the growth of the generation of web content. Different automatic or semiautomatic tools have been developed to support content curation in a range of areas, from scientific content curation communities engaged in solving complex problems that require many resources, to individuals curating information for personal use [23]. Some cloud based tools allow creating collections of web resources to keep individuals' knowledge organised or to be shared with the community. Two particular examples that we consider in this paper are the commercial tools Diigo<sup>1</sup> and Declara<sup>2</sup>. There has been some interest in using these tools as meta-cognitive tools [9; 18]. Analysing the logs of learners' activity collaboratively curating data may show traces of the learning process and the way the knowledge that is obtained from the curated content develops. Additionally, social analytics could be applied to the logged data since learners commonly use shared tag names to mark and share resources with other people, comment on others' findings or even discuss on particular extracts of the curated web-pages. Consequently, these tools can become meaningful learning resources that provide a social dimension for learning or for general collaborative content curation.

## 3. CONTEXT

In this section, we briefly describe an application context for learning analytics and/or open learner models to support

collaborative content curation, namely, the initial stages that may lead to sustained behavioural change in food literacy.

### 3.1 Food Literacy

Food literacy (or nutrition literacy) is an emerging term itself that can be described in words of Vidgen and Gallegos [28] as *what individuals and communities know and understand about food and how to use it to meet their particular needs*. In other words, it considers the challenge of making healthy food choices as an educational problem. The food literacy model by Fordyce-Voorham [10] identifies relationships between three main elements: *individual* (which refers to the personal decision making, management of actions and learning about oneself), *cultural* (which takes into account cultural preferences and food security) and *macro-system* (which accounts for the impact of the environment on food decisions and ethical choices) dimensions.

Mobile learning practices and technologies offer promising avenues for articulating a pedagogy for food literacy issues through a social learning approach. Collaborative content curation platforms may allow individuals to seek and share information with their community (as we aim to achieve). Other mobile solutions have been used to support individuals to generate content socially situated and connected with the local food growers and farmers (e.g. community recipes [12]). In these cases, a learner model could be generated to gather key information about the individual's actions, the content consulted, and learning gained by interacting with different mobile apps (the individual element of Fordyce-Voorham's Food Literacy Model). The challenge would be how to account for the social, cultural and systemic factors that can affect individual's learning and their decision making process (the cultural and macro-system elements of Fordyce-Voorham's Food Literacy Model).

### 3.2 Behavioural Change

Besides supporting content curation, we aim to situate our project to support learners, at least, on their initial steps towards a sustained behavioural change based on their improvements on food literacy. Behavioral change is a central objective in public health, with the main aim of preventing disease [5]. The main reason to stand on behavioural change is that it may allow long-term adherence to healthy lifestyles (e.g. improving eating habits and physical activity), rather than just the achievement of tasks or goals (e.g. just weight loss).

There are a vast number of theories of behavioural change [1]. Particularly for health promotion, it has been identified that the community and social dynamics play a crucial role in addressing the resistance to change [5]. As a result, our educational strategies for behavioural change in food literacy should be designed within the cultural context using people's own beliefs (rather than imposing an agenda or content on them), with a combination of well-grounded sources of knowledge and local practices.

Our approach is grounded on Meinhold et al.'s approach [22] of behavioural change by supporting individuals':

- **Knowledge:** factual claims about the context, which can be individually and collectively shared in virtual communities. This includes the personal knowledge, the environmental knowledge (what other people 'know') and also formal sources of knowledge (articles, publications, research papers). In terms of content curation, the degree of knowledge certainty would be crucial for scaffolding behavioural change.

<sup>1</sup> <https://www.diigo.com/>

<sup>2</sup> <https://www.declara.com/>

- **Attitudes:** the ways the learner thinks or feels about the knowledge. This aspect includes personal, social and cultural views about the knowledge. A degree of trust is important in order for the learner to buy into a specific idea [13].
- **Self-efficacy:** is defined as the confidence that individuals have in their ability to plan and execute a course of action. This aspect is closely linked with *experience* rather than knowledge. The learner may be influenced by their sense of success/achievement, social models, persuasion by others, and their own personal agency [2].

In this paper, we focus on approaches to scaffolding knowledge, while bearing in mind that other elements such as attitudes and self-efficacy will need to be supported in order to scaffold sustained behavioural change in learners.

### 3.3 The Quantified-self for Health

The Quantified-self is a growing movement to incorporate ubiquitous sensing technology into data acquisition on aspects of a person's daily life [27]. Considerable effort has been put on quantified-self solutions applied in health and wellness improvement [8]. Different devices and trackers exist that automatically or semi-automatically keep records of goal accomplishment, food consumption, portion sizes, physical activity, caloric intake, sleep quality, posture, and other factors that may affect individuals well-being. Some evidence has reported that increased awareness about one's own activity and food consumption can motivate towards achieving personal goals (e.g. reach a certain body weight range), and that individuals can receive support from members of the community that also share their self-tracking experiences [6]. Thus, there has been some enthusiasm about the key role that wearables can play in behavioural change strategies. However, as briefly described above, behavioural change requires a series of elements, from knowledge exploration to self-efficacy, that are not necessarily supplied by a technological solution itself. Particularly, a recent study has reported how users show lower levels of engagement using smart wearables and self-tracking solutions as time passes [21]. Thus, quantified-self applications may not be long-term sustainable solutions for behavioural change without a richer and more complete perspective. Moreover, many tracking devices are built with closed architectures adding a possible lack of data validity and reliability that may affect attitudes towards those measures.

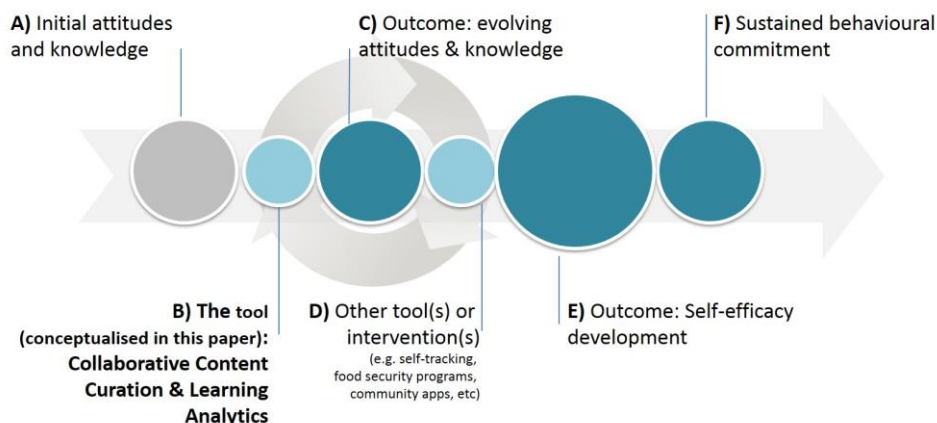


Figure 1. Situating the tools and awareness mechanisms in a wider view towards behavioural change

To address this limitation of quantified-self devices in isolation, our vision is to take an educational perspective (associated with food literacy as a life-long learning problem) that would correspond to the first stage of our perspective of behavioural change (knowledge exploration). Then, we may include some self-tracking later stages, once an individual or various members of the community can make sense and have better understanding of what they can look for in their own data. The key idea is to generate the conditions to help them link the quantitative measures with higher level qualitative aspects of their own experience and literacy about food and nutrition.

## 4. PROPOSED APPROACH

### 4.1 Conceptual Proposal

Figure 1 presents a visual representation that situates the kind of tools we propose to provide support in the initial stages of behavioural change. A person's journey towards making any change in their behavior (in this case health or nutrition) begins with some initial attitudes (shaped by, for example, personal values, social pressure, culture, the resistance to change, food availability and security, etc) and environmental knowledge (what the learner knows about food, disease prevention, nutrients, information from the media, family and friends, etc) (see Figure 1–A). The aim is to provide a tool (B) that supports the first steps for the learner towards the first outcome of the behavioural change (C): shaping and evolving new attitudes and knowledge about the topic (food). At this point is where we define our approach as a Food Literacy problem.

The subsequent steps of behavioural change are beyond the purpose of the tool and this paper. It may involve the use of other tools or mechanisms (D) to promote learner's self-efficacy (E), which then could lead to a sustained commitment (F). In these subsequent steps, it may be possible that self-tracking tools, food security programs (how to get better quality foods) and other community apps (e.g. community recipes) can provide a different type of support to develop self-efficacy, once the food literacy of the learners had been improved. Building self-efficacy is needed, particularly in this context, because each learner is in its own journey; has a different level of food literacy development; has different food requirements; and requires the development of certain level of personal agency for making a sustained commitment.

As a result, Figure 2 illustrates our conceptual approach. The flow of information begins at the top of the figure, with users collaboratively curating information that they consider relevant to improve their overall health. For conducting user studies, we will need to identify specific populations (e.g. students of a university, young adults of certain age, etc) and, potential areas of interest or improvement for those individuals.

Then, the second layer corresponds to the learner's data that we can collect from user's interactions with the curation tools. We will use the API provided by the tools aforementioned, to obtain user logs, which can be grouped in three categories: a) Curated information (which include the text, videos and other resources

that are extracted from the curated webpages); b) Collaborative learning evidence (which include the logs of user's activity such as comments added to others' curated resources, discussion threads, messages, etc.); and c) Information about the sources of information (classifications of webpage types, links within the pages, and other meta data).

The third layer shows the types of learning analytics outputs and techniques that we want to build by exploiting the learner's data. In order to guide the design of the learning analytics needed, our approach will be grounded on the following guiding aspects for the development of knowledge related to learners' food literacy. These aspects are:

- **Knowledge curation.** Learning analytics about the actual curation itself should include the generation of indicators that may provide evidence about the curation process and information about the content that is being curated. Simple semantic analysis on the curated text, such as topic extraction, aggregations of key terms could provide an overview of the learner's curated content to recommend similar resources to the learner or highlight overseen topics. Learning indicators about the collaborative content curation can include for example: webpage use metrics, bookmarks,

metrics of resources viewed but not used, temporal sequences, durations of webpage views, and collaborative symmetry metrics [16]. Alternative analysis can also be done on the process to curate information by fore example, identifying the steps that most successful achievers follow.

- **Knowledge sharing.** Learning analytics can also provide with clues about how learners interact with other learners, share information, influence others or learn from interaction. Relevant forms of Social Learning Analytics [24] would include *social network analysis* (e.g. based on social ties formed through peer discussion, and annotation of peers' resources, to support the understanding of community structure and authority), *discourse analytics* (e.g. to provide insight into the quality of argument in online interactions [17], and *writing analytics* (e.g. to provide feedback to learners on their reflections about how their efforts are progressing [3]).
- **Knowledge certainty** [13]. A key aspect for the learning analytics tool to promote a shift in learners understanding is by providing the means to enhance their trust on the information that is being curated. This is one of the major problems indicated with current practices in health

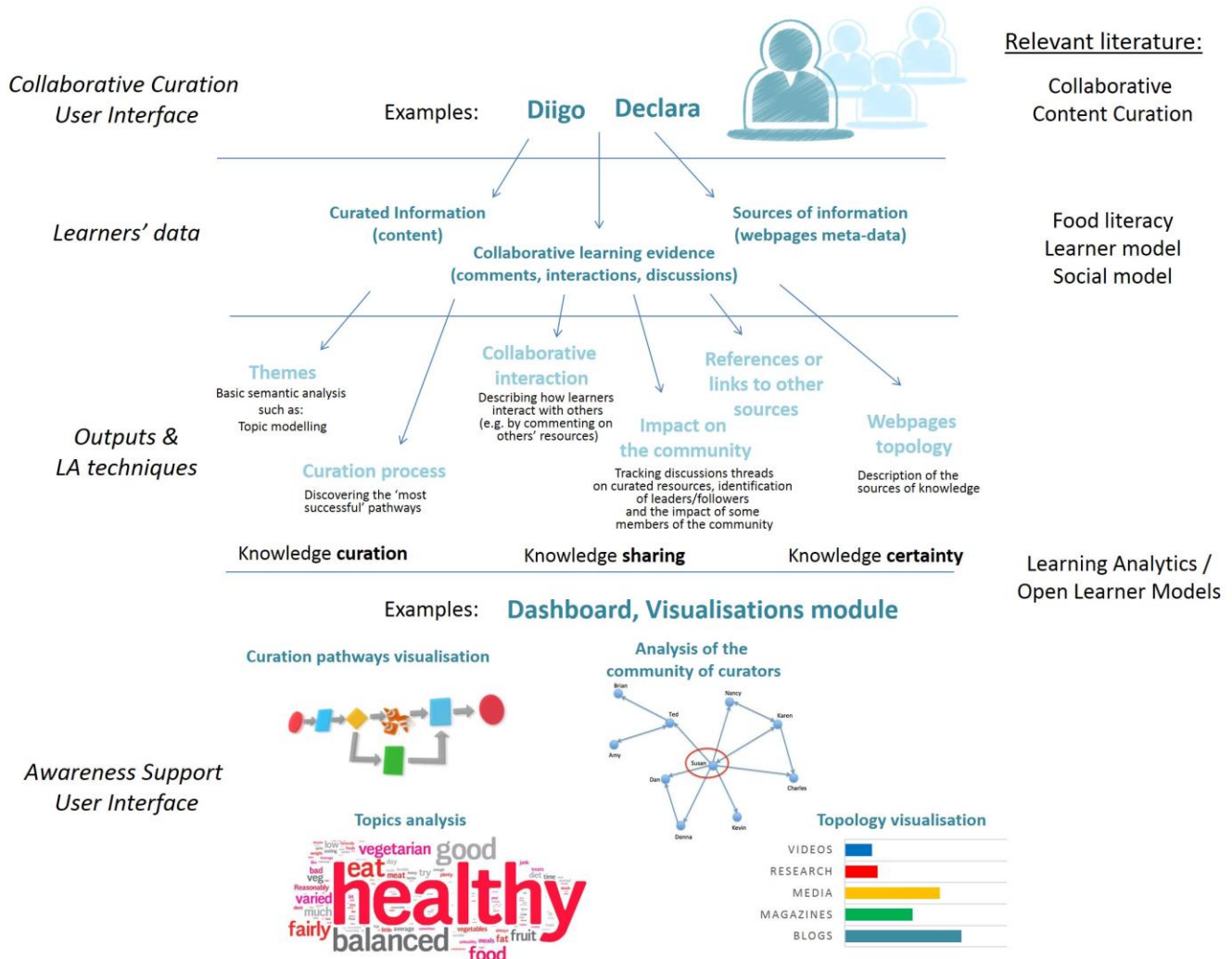


Figure 2. Conceptual approach: Making visible aspects of collaborative content curation for supporting food literacy in the initial stages of behavioural change

information seeking highlighted in previous sections. Learning analytics may help in providing a meta-analysis of the sources that the learner has curated. For example, a topology of sources could be defined to differentiate scientific from opinion-based sources of information.

Finally, the fourth layer corresponds to the means by which this information will be mirrored back to the learners. This may include simple dashboards with visualisations depicting the different learners' data about the knowledge curation process (a learning analytics approach). By contrast, the traces of the learners' activity could be aggregated into learner's and/or social models. These can then be mirrored back to the learners using metaphors and other simple visual aids (an open learner model approach), or be used to generate recommendations or suggest new unexplored content.

## 5. FUTURE WORK

This paper aims to trigger discussion about the type of data and presentation mechanisms that may help life-long learners set a stronger basis for behavioural change in the subsequent stages. In particular, the application of our transdisciplinary approach to support food literacy and initial behavioural change requires standing on three very different areas of research and development: learning analytics, behavioural change, and food literacy. In general, the ideas proposed in this paper are centred on learning analytics for collaborative content curation in any context. For example, we plan to support students enrolled in our Master of Data Science and Innovation program, who already curate web resources as part of their natural learning practice using Diigo. Alternatively, we may explore the potential of learning analytics to enhance the awareness of students learning how to curate resources to write up literature reviews in a research methods subject.

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