Microlearning based content-curation using Artificial Intelligence for Learning Experience Platform: A Survey

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Abstract— The internet is a vast pool of all kind of educational information, where every video, blog, article, podcast, and webpage is possibly found within a matter of a click From this wide range of available content it is difficult for the learner to search or find the relevant information without spending hours and hours in refining the search results. Learners want to learn something quick, something small, up-to-date and above all, at their own pace. They want bite-sized information that is focused, easily absorbed, and available on-demand, on any device based on their interest and knowledge. This has led to the necessity of analyzing the gathered data and curate valuable information from it. In this survey paper, the field of learning is examined regarding various challenges learners are facing. Additionally, a few of the challenges which are encountered in the literature will be tackled in the proposed work.

Hence the objective of this paper is to provide a platform which will help learners to find the right learning materials by suggesting them with content specifically targeted to the specific domain based on their skills, strengths, weaknesses, backgrounds, needs, different levels of domain knowledge, learning style, experience and interest in micro-form using the principles of micro-learning using AI-based Content curation.

Keywords— Macro-learning, Micro-learning, AI based Content curation, Skill-based Learning and Recommendation .

I. INTRODUCTION

"Plenty" is a problem. Learners find it most difficult to learn, NOT because there isn't enough content, but because there is TOO MUCH of it, and they cannot find what is valuable and up-to-date. Learners - they can't get access to what they need when they need it. So the learning experience platform needs an **intelligent method** to make a move from long, information-based online courses to **micro-learning**, which is the outcome of **content curation**. It helps **students** to find the correct and on-the-go learning materials for their current challenges fast and precise so that they can utilize their precious time on mastering them. It reaches to time-poor **employees** by delivering relevant micro-content which is short, up-to-date and personalized so that the employee can access it when and where they need it the most.

Micro-learning based Content curation :

Our studies indicate that in 10 minutes, the eager learners want to brush up on their skills and knowledge. But the learners are not able to find relevant training in the maze. It happens when average length of the course is more than 60 minutes. Imagine if the average course duration is 10 minutes when organizations adopt micro-learning then there will be at least 8 courses for every 1 course. That's why curated micro-learning content is becoming a main focus area in many L&D organizations.

The micro nature of the content ensures that it can fit into the limited time that learners have. Linking the content into pathways makes sure that even though each chunk is small, together multiple chunks can help learners meet their learning goals. With a deep-rooted habit of learners of searching content on the Internet for bite-sized learning, today's employees and students learn best not from conference room seminars or long certified courses respectively but from bite-sized information known as microlearning— which is digestible (easy to understand and remember) and that they can apply right away.

A. Micro-learning:

Micro-learning is just-in-time learning which is delivered in small segments which help learners tackle a tremendous amount of learning content by taking small chunks at once, just when they need it, concerning their different learning styles. A micro-learning training may have simply a ten or fifteen-minute lesson or a sequence of short standalone tutorials that are focused on just a single specific learning objective.
One lesson/tutorial = One skill. [8]

What can be better in the world of hectic schedules?

Besides being short and precise, micro-learning focuses on results at this moment in time .In contrast to traditional macro courses, where you need to study the first chapter to go ahead to the next, here each chunk of a micro-learning course is a absolute meaningful unit. Learners may explore and learn lessons independently or may choose the unit depending on their individual learning tour. Completing each unit lets learners instantly view results, feel improvements, and not feel guilty because of a large unfinished task.

A Micro-learning is a method of e-learning delivery that involves micro bursts of highly engaging and interactive information, delivered to the learners with mostly a short-term learning perspective. The duration of micro-learning is 15 minutes or less**. Content curation mechanism will be used to generate a micro-content**.
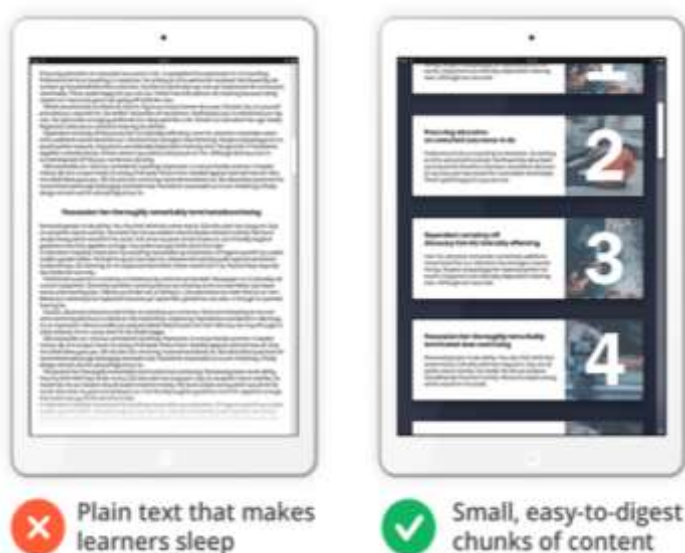
Figure 1: Traditional Macro v/s Micro learning [8]

Besides creating bite sized content or short content Micro-learning supports a number of specific **learning objectives as follows** [6] :

1. **Carry-out specific tasks**: Micro-learning comes up with the key information necessary to assist a learner to reach a particular, functional and usable task. This makes micro-learning in the corporate world truly significant and valuable.

2. **Supporting continuous learning**: The world changes now and then, new inventions, new case studies, new technologies, new product releases, new business developments, and even new organizations emerge. Thus learners can't learn once and then retain them for life. So one of the methods to keep up is micro-learning every day, which allows learners to browse changes in your sector and stay updated.

3. **Moment of need support**: Micro-learning is bite-sized and easily available modules where the learner can learn on their own on any devices in real-time as it is available based-on the request.

Challenges of Micro-learning:

1. **Doesn't fit for full Coursework**: It is not really a good fit for learners who need a detailed course such as for complex online certification courses or compliance topics.

2. **Targeted contents**: Micro-learning is targeted. It is not the best choice for an involved subject matter that requires more time to master.

3. **Fails to get an overall picture** : Micro-learning provides smaller amounts of information to the user but fails to give overall picture thus a learner might end up with fragmented or disorganized online training experiences that are seemingly disconnected.

B. AI based Content curation :

When referring to content curation it's necessary to think about who is going to do the learning. [7]

Content curation has an important role in today's information-overloaded world of the Internet by providing a more efficient and customized learning experience based on development needs, interests, activities, and habits, all to maximize that 1% of available time.

Consider real-life examples**:** We curate our images into captioned albums, curate music and movies based on there type in different folders, curate our favorite online content into bookmarked folders and even curate the events of our lives on social media.

Content curation is not that different. [16] Curated learning is a learning experience, which is about selecting the right learning resources among the plenty, by adding valuable insights to improve the learning experience and attract learners to it.

The internet has created an explosion of data and information. Although it seems that all of the information is new, what the internet has produced is a platform for all kinds of information to be available to anyone who knows how to find it. To analyze all of that information and to get data that is relevant to you is difficult. Thus, here enters the idea of a powerful AI-driven platform. This means that AI algorithms can effectively tell you which content worked and which ones didn't work for particular demographics. The process is much faster as it's not done manually.

By **analyzing all collected experiences** of learners, their behavior, performance, and learning style, and **provide it to an AI data engine**. AI algorithm takes all that data and converts it to actionable and insightful information, by suggesting to you exactly what courses your learner needs to take.AI recommends the content most likely to engage each reader. It learns more about each users' audiences and each specific learner to continually optimize suggested micro-content.
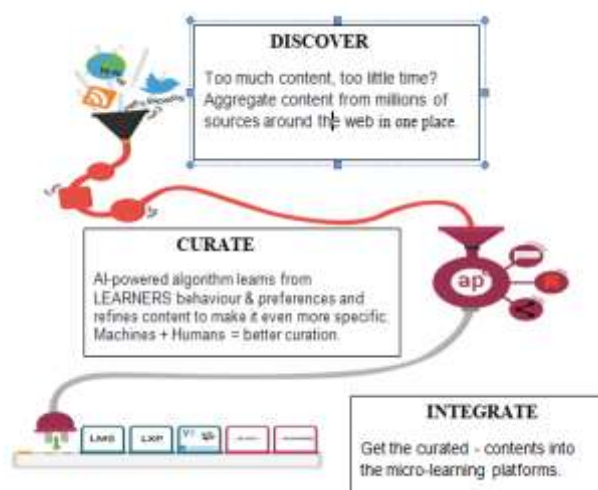

Figure 2: How Content Curation works [17]

For example : If you give it 2000 student profiles, it will "learn" to predict what each learner needs based on patterns. This will help learners by preventing possible performance issues by recognizing them before they even occur.

II. LITERATURE REVIEW

The literature survey includes some previous research papers regarding the study of microlearning based content-curation using Artificial Intelligence ,Learning Experience Platform followed by their conclusions . It provides a detailed review and survey on , challenges in learning and Limitations of existing systems and provides a study on how curated micro- learning can improve the learners learning experience by adopting suitable methodologies.

A. CHALLENGE 1 – SEARCHING for relevant data

1) Description:

Searching and surfing information on the Internet has increasingly become an everyday activity in the lives of people around the globe. The platforms of searching the content on the Internet are difficult. All could invest a couple of hours daily exploring the number of sites, sources and social media seeking for the highly relevant content. With such abundance and diverse

learning aids, it is not so easy to fetch vital information on the Internet in the available time. There is a need for curation to get relevant content. Researchers say that in the information search task every learner faces a different level of difficulty while searching. Learners have different reasons for task difficulty based on their level of knowledge, learning-style, experience, and interest. These difficulties lead to learners not finding desired information which causes wastage of time, disappointments, frustration or system switch behaviors of learners.

2) Related work:

In this paper [1] Creel, C.S. Kim, and J.Liu, 2013 examined why the learners find the information searching tasks difficult. They conducted a learner experiment in an premises computer lab where each participant was assigned a task to complete with a deadline of 15 minutes , they were asked to freely search on the Internet and save the files that they feel will assist them solve the alloted tasks . They explored searchers' behaviors and different difficulty levels they were facing while searching for the desired information. According to the collected task difficulty reasons, they came out with the following schemes:

1)They proposed a search-task difficulty classifications method that categorizes reasons for difficulty in searching such as Time limitation, Complexity, Less subject knowledge, Little experience, No interest, etc. along with different aspects of learners like who is the learners/ searcher, what is the task which they want to search, etc.

2) They provided a strategy that can improve the performance of the system by addressing the facets of reducing task difficulty and helping users with their tasks. Such as, if the reason was of learner's knowledge, then the course can deliver results suitable to the learner's knowledge level. Searchers with a low level of knowledge, the system may provide results that are easier to read and understand. If the task difficulty was with searchers' low search experience, then systems with the user-friendly interface will be provided to the learner so that it becomes easy to learn.

A new methodology has been discussed in this paper [2] by Khatter, H. and Kalra, B.M., 2012 which will surely enhance the information searching and the knowledge experience of a learner. This paper introduced a new approach of collecting the blog posts automatically from various blogging sites based on learner's interest. The paper include a blog model, which focuses on content curation approach , which will improve the learning experience of a learner by the effective searching and rating algorithms . They designed a system named Blog Miner which is a combination of both, a blog search engine and an individual blog. Additionally, learner can customize their search results and blogging activity. To find an appropriate post, learner does not need to waste lot of time in clicking here and there to get the required information. Instead, learner will get the information what exactly he/she wants.

B. CHALLENGE 2 – Personalization :

1) Description:

It is widely known that different people learn in different ways. Learners (employees and students) come to the workplace with completely different strengths, weaknesses, needs, backgrounds and beliefs about what constitutes knowledge and skill. Some prefer instruction while other prefers doing it themselves. Learners have **different learning styles**.There are multiple different types, scales and ways learners prefer to understand and absorb information. Learning content can be more efficiently taught to learners by incorporating their preferred learning styles such as: visual, social, aural, physical, verbal, and

logical. And some learners are satisfied by learning in their personal learning style [10]. Thus, being able to adapt, create and update the information in kind that caters to an individual learner' styles/requirements/preferences is very necessary. After all it can help quicken and maximize the learning process. This is termed "Personalized learning experience".

Two main tasks are needed in **personalization,** namely **classification and recommendation**.[3]

Classification tries to categorize the dataset into different classes based on some metrics. Recommendation uses the above-mentioned classification to recommend.

2) Related work:

In the previous study, Researchers[4] defines a personalized e-learning system which can automatically adapt to the learners needs, interests, habits and knowledge levels .The differences between the learners are determined according to their prior knowledge, their learning style, their learning characteristics, preferences and objectives. They have experimented on an educational dataset in order to examine the system. Firstly, they conducted the experiment using ILS theory by Felder and Soloman on learning content, through which they determined behavioral patterns of learners in different learning style dimensions. Then, to find frequent sequence of navigational pattern in each learning style AprioriAll algorithm was applied. Thus based on the collaborative filtering approach these sequences were then used to generate recommendations.

Moubayed et al. (2018) [3] discussed about different models which we can adopt to categorize the learning style/ preference of learners like VAK model, Kolb's model Felder-Soloman learning Model .Then based on learning style and performance , classify the student and recommend content using classification algorithm such as SVM, ANN, Logistic Regression.

Chaudhary, K. and Gupta, N., k. 2019 [5] In this work, an intelligent prediction model has been designed to meet the challenges of speed and accuracy by using the deep learning environment for GPU devices. It is a two-phase approach. First, data is pre-processed and the second phase is concerned with prediction. The proposed approach is compared with various machine learning-based algorithms and it is found that the Random forest algorithm gives the highest accuracy for prediction.

This paper proposed by authors in the year 2016 [9] describes the relationship between learning styles, MOOC environments, and machine learning. In this work, they first introduced learning styles theories such as Kolb's learning style model, Felder-Silverman learning styles model. Additionally, a methodology was described on how neural nets can be used to determine and track the learning styles of learners depending on their behavior and actions they perform in MOOC.

C. CHALLENGE 3 – Information Overload and Filter Failure:

1) Description:

Quantity and Quality**:** More content is generated than we can keep pace with. According to a report from CNN, we are exposed to 74 GB of data, every day.[11] **Plenty is the problem.** Learners find it most difficult to learn, NOT because there isn't enough content, but because there is TOO MUCH of it, and they cannot find what is insightful.The needle in haystack problem becomes more definite/clear the more information we accept. It becomes crucial for quality to stand out in the noise.[12]

Filter Failures : It's in the year 2008 when Clay Shirky gave a keynote speech at the Web 2.0 Expo in New York entitled "It's not information overload: It's filter failure". [18] When searching

for study materials of a specific subject its confusing to decide "Right Content? Right resources?" or looking for suggestions of anything, where do you turn? Google? [19] "Best-Of" reviews where to eat in a new city, for example, Foodie accounts? Or shopping carts like Amazon, Flipkart? We know that typing into Google is going to give us a firehouse of results and content, of about 365 million results. The top hit on the web search engine may not exactly be the one that is the most precise or the most helpful; it is the one that has best entered and negotiated the different filters which Google uses to fetch the hits it thinks you need i.e it define filters for us based on popularity. At a time they are a great indicator of quality, sometimes not. The amount of time we spend on unfocused browsing, looking, clicking and flicking through less relevant content is the key reason for filter failures. Filter failures mislead learners to the content, they have no interest in.We, therefore, need filters to help sift this impossible number down to a more manageable set of alternatives that we can reasonably choose from. Thus there is a need for effective and quality control filters that can automate this filtration process. [11]

Time:"CONTENT SHOCK PROBLEM: TOO MUCH CONTENT, TOO LITTLE TIME."[11] Insufficient time to absorb information, analyze and work on it, especially if you are in a hurry to make a decision. It is a deskbound system i.e. tied to a specific course which has a fixed schedule. Learners don't have the time to do training via the MOOCs or Learning Management System when they've loads or plenty of tasks to accomplish. Thus learners do need a micro-content i.e. a bite-sized content that is delivered quickly, integrated into the workday and simply accessible anywhere at any time. The LMS can't provide that.

Dated: The One-off training that is carried out and then, frankly, quickly forgotten. It does not adapt to the rapid change in the world of work or to a particular requirement of a learner. They can provide a training module, but it doesn't deliver the sort of continuous, accessible, personalized , up-to-date learning experience that favors today's learners grow their skills over time.[12] These learning modules start going obsolete, the day they are released. If you don't keep pace with changes in your sector, you will render yourself outdated over time.[11] There is no method for pushing the desired information out to the learner at eleventh hour, as well as no mechanism to preserve knowledge long term or continually reinforce learning termed as life-long learning. Thus learners need information, fast and precise either in their head or, at the very least, at the tips of their fingers via a quick touch / click of a button.

Inflexible: The learning modules are boring. They are linear, highly structured, has fixed schedules and are clumsy. It lacks the ability to provide learning that is personalized, bite sized and intuitive .The course is the same for everyone; learners are spoon-fed with content and then tested with an assignment, quiz or survey. Then its over.They doesn't support continuous learning, don't engage learners and don't make the learners learning experience interesting.

Any of these above conditions can cause filter failures and information overload . All these queries need to be addressed and considered in the learning environment   .

3)   Related work:

Sujata Joshi, Aniket Das, Mahasingh Matta 2019 say that[22] in today's digitized world, the amount of information generated by individuals as well as machines exceeds the capacity of human beings with respect to absorption, interpretation, and complicated decision making based on that information. The proposed model shows that AI tools like smart content curation lead to quality of service, better personalization, and hassle-free service and in turn

provides an enhanced customer experience. Content curation is a method that gives relevant content to learners. The users ask for quality content from the curators be it –latest updates on technology, news, fashion tips, music, lifestyle recommendations etc. If a curator wants to enhance engagement of user then it should provide relatable content to the users. As the number of users increase, the need for automation rises in order to provide hassle-free service A.I powered search engine core which crawls through websites, tweets, stories, videos etc. in real time and aggregates and organizes them.

Asni Nor Rizwan Abdul Rani1 , Muhammad Zahid Ali Siddik2 & Fariza Khalid3 2018 [13] says that Availability of huge amount of information accessible by a learners needs to be filtered and presented in such a way it is reliable and easy to consume. They discussed about why there is a need to shift to microlearning from macro-learning. The design principles of micro-learning such as anytime-anywhere availability, relevant audio visual, customizable and 'less is more' are also reviewed. The Advantages and disadvantages as well as its usefulness in the educational training are surveyed. Microlearning management tool TalentLMS and an example of mobile browser based microlearning are discussed.

In this paper, X.P Kishore, O.Jomah., Masoud, and S. Aurelia, A.K 2016 [14] says that learning is understanding of how the human brain is wired to learning rather than to a system or an approach. It's one of the optimal and most continuous and constant way for the 21st century learners. In this research study ,they discussed about micro learning and the micro-content management system. The authors conducted a Questionnaire and interviewed with 100 respondents over the phones,e-mails, meetings, etc .The respondents comprised of students (both school and college), teachers, professors, employees, unemployed, house wives, research scholars etc. Content, time, course, form, process, and learning style are the dimensions of micro learning which they considered in the study. The study reflected the opinions/views of different users, and analyzed the collected data where 90% of the respondents appreciated smart and a new version of learning called as micro learning system. The research study clearly specified that micro learning is extremely beneficial, and can be used to gain knowledge as well as for skill growth in spite of diverse subjects. Finally, they concluded with its pros and cons.

G.Sun, T.Cui, Yong, J., S .Chen, and J. Shen,[15], 2015. proposed a adaptive micro learning framework, to help smart cooperative and micro learning in MOOC. Section 2 gave a brief introduction on : the principle of MOOC, the observations obtained from the research study and the generic structure of the VLE. As a key concern , at this point MOOC is suffering from low usage and low completion rate, thus to enhance learners experience the author present a cloud-based VLE - virtual learning environment which can organize learners into a better teamwork context and customize micro learning resources to address the personal demands in real time. Section 3 defines micro learning and discusses about the current challenges for bringing micro learning into MOOC. They built a smart environment for learning based on Software as a Service (SaaS), namely Micro Learning as a Service (MLaaS). Which provides : 1)a learning path identifications, customized for each individual learner. 2)Adaptive micro learning contents which are in micro form. Section 4, is about the Learner modeling and resource delivery for microMOOC learning .An educational data mining is provided where EDM techniques are employed as the primary approach to understand the behaviors of learners' and identify learning resource features in order to measure, classify and customize them accordingly. Section 5 and 6 is to construct a dynamic learner model to personalize the micro learning, with regards to the external and internal factors that can affect outcomes and learning experience. Section 7 is for integrating a complete MOOC learning experience they proposed learning path optimization solution.

C.Z Zhao, N.Liang, Zheng, H.T., J.Y.Chen, and A.K. Sangaiah, 2018 says that In the age of information overload,

extracting efficient content from large volumes of information for Internet users has become an urgent problem. Several ways have been developed for producing personalized recommendations .For rating prediction task, one of the part of recommendation, traditional algorithms focus on users' ratings of items but do not take user evaluations item or properties into account. In these situations, tag-aware recommender systems are used to enhance performance. Tags give important additional information for Recommendation System, as they sum up items' properties and consider user preferences through tagging behaviors. They proposed a TRS based on RNN, deep learning.

Another new approach[21] is to enhance search through Intelligent Tagging and data management which uses NLP, data-mining technologies and text analytics,to filter and classify volumes of data. It helps learner to to search smarter, discover insights by filtering and mining the noise of unstructured data and personalize content recommendations .

CONCLUSIONS

The growth of data available on the Internet has led to the need to analyze and extract useful information from it. The availability of abundant information accessible by a person needs to be filtered and presented in such a way that it is reliable and easy to consume. Based on the above-mentioned survey, microlearning based content curation is needed, which focuses on skill-based learning. It appeals to learners to get the micro-content as it is less time consuming and is available to them exactly at the time of the learning need (just-in-time) based on their learning style.

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