Serendipitous learning: Recognizing and fostering the potential of microblogging

Ilona Buchem, Beuth

University of Applied Sciences Berlin, Germany

Summary

This paper introduces the concept of serendipitous learning in the context of microblogging and discusses the potential of unplanned and unexpected discoveries for learning. Serendipitous learning as a subset of incidental learning refers to learning through gaining new insights, discovering unrevealed aspects and recognizing seemingly unrelated connections. This type of learning can occur by chance and as a by-product of other activities like information browsing through social status updates in microblogs. It is argued that engaging in microblogging in an open social network of users frequently generating new information enhances the possibilities of serendipitous discovery. The paper discusses possible factors facilitating serendipitous learning and concludes with recommendations for future research. .

Keywords: microblogging, twitter, serendipity, serendipitous learning.

Introduction

Scientific breakthroughs and «ah-ha» moments of profound insight transforming previous perspectives and assumptions are unpredictable and depend on unexpected events and encounters (Kuhn, 1962; Mezirow, 1991; Cranton, 1994). Making fortunate discoveries by accident is known as serendipity (Fine and Deegan, 1996; Gritton, 2007). The significance of serendipity in science has been long recognized in many disciplines like chemistry, medicine and physics as playing a crucial role in gaining new insights, generating important research ideas, uncovering interesting aspects and revealing connections between ideas and in that way stimulating scientific progress (Fine and Deegan, 1996; Rosenman, 2002; Beale, 2007; Taleb, 2010). Together with the recognition of the Web as «the greatest serendipity engine in the history of culture» (Johnson, 2006), the possibilities of facilitating and assessing the effects of serendipitous discovery on the Web have just started to be explored (Eagle and Pentland, 2004; Thom-Santelli, 2007; Passant et al., 2008; Bernstein et al., 2010).

The emergence of Web 2.0 services, including mircoblogging tools, such as Yammer, StatusNet, Plurk and most notably Twitter, has revolutionized the way information is disseminated and appropriated. On Twitter large amount of unfiltered, real-time information in form of status updates covering a broad range of topics is generated and consumed every day by millions of people. Perhaps, the most interesting phenomenon about using microblogging services like Twitter is that the dynamic updates of this vast quantity of highly diversified information increase opportunities of serendipitous information discoveries and serendipitous social encounters.

This article argues that detecting «surprising» information and «unexpected» social relationships when engaging in microblogging can lead to meaningful learning and enhance exploratory behavior. Browsing for short updates in microblogs is different from using a search engine. Unlike searching information by specifying a query, which already limits the search to information related to this query, engaging in microblogging, even with no specific informational need in mind, can lead to finding highly relevant information by viewing and monitoring a diversity of new information dynamically and continuously generated by the members of the social network. It can be argued that provided a certain degree of intellectual readiness and a set of exploratory skills, microblogging can become a serendipitous learning space.

The following paragraph dwells on the nature of serendipitous discoveries and the significance of serendipity for learning. In a first attempt to answer the question of how microblogging can become a serendipitous learning space yielding interesting and meaningful discoveries, the next paragraphs explore the concept and the prerequisites of serendipitous learning in the context of microblogging. The article concludes with some pointers for future research.

Serendipitous discoveries and learning

The term «serendipity» was coined by the novelist Horace Walpole in the 18th century to describe unexpected, fortunate discoveries. The term «serendipity» was originally used to refer to making accidental discoveries when looking for one thing and finding another. Having recognized the significance of accidental discovery in research, serendipity then started to be viewed as an essential aspect of scientific progress (Fine and Deegan, 1998).

The majority of groundbreaking scientific discoveries in science, including Isaac Newton's discovery of gravity or Alexander Fleming's discovery of penicillin, had an element of chance and was arrived at accidentally. As Thomas Kuhn argued, most scientific breakthroughs are unpredictable as they are not in accord with the current set of practices and beliefs, i.e. they cannot be reconciled with a current paradigm (Kuhn, 1962).

Serendipitous discoveries are not only limited to scientific discoveries but are also considered as an important element of learning (Gritton, 2007). The term «serendipitous learning» has been used to refer to learning through gaining new insights, discovering interesting aspects and recognizing new relations, which occurs by chance or as by-product of other activities (Fine and Deegan, 1996; Gritton, 2007; Bernstein et al., 2010). Serendipitous learning emphasizes the role of unexpected realization of hidden, seemingly unrelated connections or analogies for learning and research (Fine and Deegan, 1996; Gritton, 2007).

What is interesting about serendipitous learning is that it is not simply subject to pure randomness, but it is influenced by personal goals, interests and previous knowledge (Fine and Deegan, 1996; Gritton, 2007). Making sense of seemingly accidental events and unrelated information requires the ability to recognize patterns and implications of such discoveries (Fine and Deegan, 1996). Whether a person identifies a particular unexpected event as relevant and meaningful depends on being prepared to recognize a creative opportunity and a potential of the new information. Serendipitous learning can be considered as «an interactive outcome of unique and contingent 'mixes' of insight coupled with chance» (Fine and Deegan, 1996, p. 434). As far as «insight» is concerned, it is often described as «intuitive sagacity» in sense of intellectual readiness and preparedness:

«We are more likely to be receptive to serendipitous discovery if our minds have undergone some prior training or preparation. Preparation, training and knowledge do not guarantee serendipitous discovery, but they do increase the probability of discovery. This skill is sometimes referred to as intuitive sagacity, in which seemingly disparate pieces of information undergo a process of mental incubation and are brought together by an external catalyst such as a research query» (Gritton, 2007).

The idea of learning through exploration and discovery guided by a personal set of skills, interests and goals is of course not new and is closely related to a number of pedagogical approaches and learning theories, among others discovery learning (e.g. Bruner, 1961), exploratory learning (e.g. Riemann et al., 1996), inquiry learning (e.g. Rutherford, 1964), experiential learning (e.g. Kolb, 1984), constructivist learning (e.g. Jonassen, 1991) and connectivism (e.g. Siemens, 2005).

What seems to be different about serendipitous learning however, especially in the context of microblogging as explained further is that it is planned neither by the teacher nor by the learner. Unlike objective-driven, planned or pre-designed formal or informal learning, serendipitous learning in microblogs like Twitter occurs in situations and environments not even intended for learning and can be thus probably best described as a subset of incidental or random learning. Random learning has been defined as «unintentional learning occurring at any time and in any place, in everyday life»

(UNESCO, 2005). Incidental learning occurs all the time, with or without conscious awareness, and it is triggered by an unexpected internal or external stimulus, which «signals dissatisfaction with current ways of thinking or being» (Marsick and Watkins, 2001). This view of incidental learning is also related to transformative learning theories emphasizing the role of unexpected, challenging events called «disorienting dilemmas» for triggering critical thinking and changing or transforming previous assumptions (Cranton, 1994). Unexpected events may challenge habitual expectations and tacit assumptions leading to perspective transformation (Mezirow, 2009).

Serendipitous discoveries and microblogging

Microblogging services like Twitter enable sending short messages (status updates), usually limited to approximately 140 characters. The messages are sent to a number of users at the same time. Users can also respond to received messages or re-send them using desktop or mobile devices. Although Twitter like any other microblogging tool, is a relatively simple one-to-many messaging system, it has been appropriated in many different and creative ways to accomplish a great variety of tasks, including «sharing news, ideas and resources, asking questions and helping others, collaborating on tasks and conceiving new ways of making the service more useful for them» (Reinhardt et al., 2010). Twitter is considered as one of the major social networks accelerating real-time online communication, exchange of information and a global community growth:

«Twitter does three things. It facilitates social connections with friends, colleagues, writers, and celebrities. The second is knowledge transfer. It is a real-time mechanism for tapping the wisdom of millions of people. The third is social expression. It is a mechanism for the global community to express itself» (Chaffee, 2009).

With Twitter being an open and ubiquitous platform, where information is shared in public and is made available to everyone, a growing number of population all over the world are using Twitter to stay informed. In many cases news are appearing faster on Twitter than on any other media. Numerous examples show that Twitter usage goes far beyond the original status update question of «What are you doing?» (Jacob and Wu, 2008). Besides talking about daily routines main intentions for using Twitter are having a conversation related to a common interest, sharing information/resources and reporting news (Java et al., 2007). Studies show that conversations on Twitter tend to be topical with high reciprocity between densely connected users, thus indicating community properties of Twitter's social networks (Java et al., 2007). Typical for Twitter users is having multiple intentions and taking on different roles in different communities (Java et al., 2007). Some Twitter users utilize predominantly strong ties following friends, family and co-workers, while others additionally follow accounts not directly related to their close social circles, thus making use of weak ties and increasing the amount of «noise» in their streams (Java et al., 2007; Bernstein et al., 2010). Typically Twitter streams are comprised of a mixture of posts related to personal information and posts related to different domains and themes covering a large variety of topics.

So far little is known about how users of Twitter and other microblogging services filter and make sense of the abundant information and how they manage the incoming flood of updates received instantaneously (Bernstein et al., 2010). First studies show that some users tend to read every tweet based on user characteristics or topics of interest. Others user apply a method of «temporal sampling», i.e. checking limited amounts of tweets in their Twitter streams available at specific points in time (Bernstein et al., 2010). With a great variety of available Twitter functionalities and clients like tools for creating lists of Twitter users, tools for viewing topic-specific streams or tools for searching and archiving tweets, there are many possibilities to approach information search such as browsing social status streams.

Browsing as type of information seeking behavior often leads to serendipitous discoveries. Browsing may be defined as «the process of exposing oneself to a resource space by scanning its content (objects or representations) and/or structure, possibly resulting in awareness of unexpected or new content or paths in that resource space» (Chang and Rice, 1993, p. 258). The term «serendipitous browsing» is used to refer to information search which results in discovery of relevant information as by-product of the main task (Gritton, 2007). For example, browsing Twitter streams may lead to an unexpected discovery of relevant and significant information or trigger chaining to other bits of information, e.g. by following a link to items of interest and thus increasing the opportunity for serendipitous discovery (Choo, Detlor and Turnbull, 1998). Serendipitous browsing may provide valuable opportunities for learning (Gritton, 2007).

Based on the model of information seeking behavior on the Web as postulated by Choo, Detlor and Turnbull (1998), it can be assumed that four modes of information seeking also apply to microblogging. These are: (1) undirected viewing, i.e. viewing update streams without a particular information need aiming at recognizing significant developments and generating new information, (2) conditioned viewing, i.e. viewing specific topic areas that define the scope of the viewer's information needs aiming at increasing knowledge on these topics, which typically involves browsing, (3) informal search, i.e. formulating a query to learn more about a specific topic when the user is able to establish some parameters and boundaries to constrain the search, for example by means of Twitter lists, and (4) formal search, i.e. formulating and elaborating the query in detail and following specific search routines, e.g. the use of a hash-tags.

Unlike «surfing the net» or «browsing the web» engaging in microblogging additionally enables direct interaction with users who generate these bits of information, enhancing the possibility of reciprocal exploration and expanded social learning experience. The number and diversity of users of a microblogging service like Twitter increases the degree of serendipity in encountering relevant and significant information (Bernstein et al., 2010). Gaining access to and opening up of social networks to an ever-growing community generating highly diversified and dynamically changing information streams increases chances of serendipitous discovery. Unlike search engines which aim at reducing the number of irrelevant query results, microblogs enable «random» search and making fortunate discoveries by dipping into a stream of dynamically updated information. However, as it is argued in the next paragraph, it is not only abundance of diversified information but also possibly a set of personal characteristics that facilitate serendipitous learning.

Prerequisites of serendipitous learning through microblogging

Serendipity can be enhanced by the volume of information as well as openness and frequency of communication (Rosenman, 2002). In the context of microblogging a «critical mass» of different users frequently sharing new information is necessary to provide a wide variety of contributions. According to the critical mass theory heterogeneity or variation in interests and resources of individuals affect the probability of collective action (Oliver, Marwell and Teixeira, 1985). Extending one's social network in microblogs by following users, who are far from usual social circles and interests, increases the amount of «noise» in status streams and at the same time the reciprocal opportunity for serendipitous discovery (Bernstein et al., 2010). As Reinhardt, Wheeler and Ebner (2010) put it:

«Twitter is potentially a very powerful social networking tool, so approaching it with a sense of expectation is common. Users discover the serendipity of the service when they come across unexpected but extremely useful content that has been sent or retweeted by other users in their network. Students will often be challenged by the quality of the content they discover, and quickly learn to favourite (bookmark) tweets that they find useful. They also discover how to follow hashtagged streams that relate closely to the formal course content they are studying. This mix of formal and informal content has its nexus on Twitter, and further, the greater number of productive contributors the user follows, the greater will be the possibility that new and unexpected useful content will come their way».

Size and diversity of a social network and volume of information alone cannot however be considered as sufficient prerequisites for serendipitous learning in context of microblogging. Kirschner, Sweller and Clark (2006) point to possible risks of unguided learning environments as it is the case with microblogging. These risks include most notably a large cognitive load, lack of orientation and confusion when exploring complex environments, which may all be detrimental to learning (Kirschner, Sweller and Clark, 2006). Besides personal capabilities of effectively managing complex environments with large amounts of information, literature on serendipity provides a number of suggestions on other personal factors which may influence the possibility of serendipitous learning. These tacit assumptions refer to «sagacity» as penetrating intelligence, keen perception and sound judgment (Rosenman, 2002), «intellectual readiness» as the ability to recognize clues which may lead to meaningful discoveries (Fine and Deegan, 1996), «openness» as the ability to seize an unexpected and unplanned event (Riley, 2007) as well as «preparation, training and knowledge» (Gritton, 2007).

Findings from hypertext research may also suggest some possible directions for identifying personal factors affecting the use of microblogging services. For example study results on incidental learning indicate that the sensation seeking tendency (as a general preference for high or low level of sensory stimulation), cognitive styles or spatial-synthetic ability (as an ability to perceive the whole picture from the parts) influence forms of learning in open-ended web-based environments. In summary, there is no clear body of research indicating which external and internal factors enhance the opportunity of serendipitous learning and what their facilitative effects are. These and

other shortcomings of current empirical evidence with recommendations for further research are outlined in the next paragraph.

Conclusion

Serendipitous learning as a subset of incidental learning involves important and engaging types of learning. Serendipitous occurrences are generally seen as most exciting, inspiring and meaningful having the potential to go beyond planned and pre-designed instruction (Riley, 2007). Gaining new insights or discovering interesting connections between seemingly unrelated bits of information are rewarding learning experiences which may generate important research ideas, transform current assumptions and encourage exploration and investigation leading to construction of new knowledge.

The unpredictable nature of serendipitous learning makes it difficult to conceptualize and measure its influencing factors, processes and outcomes. Both serendipitous and incidental learning are difficult to plan and its effects are difficult to foresee. This may be the reason why serendipitous and incidental learning may not yet have gained as much attention from research as other forms of learning. However, it cannot be overlooked that learning may result from serendipitous online discovery, for example when engaging in microblogging and browsing through the stream of social updates.

Serendipitous learning in context of microblogging in services like Twitter requires further conceptualization and empirical research. Aside from investigating which factors influence the possibility of serendipitous learning there are also remaining questions about indicators and methods for detecting serendipitous events. So far the potential of web-based browsing for serendipitous discovery and learning has been discussed in relevant literature. However other types of information seeking behavior like chaining, differentiating, monitoring and extracting should be taken into consideration when exploring the concept of serendipitous learning on the Web (Choo, Detlor and Turnbull, 1998). In summary, maximizing the potential of incidental and serendipitous learning in social networks like microblogging services should be investigated in the future. Much further grounded research is needed to describe the actual processes of serendipitous learning and the nature of it outcomes.

References

Beale R. (2007), Supporting serendipity: Using ambient intelligence to augment user exploration for data mining and web browsing, *International Journal of Human-Computer-Studies*, vol. 65, pp. 421-433.

Bernstein M., Kairam S., Suh B., Hong L. and Chi E.H. (2010), *A torrent of tweets: managing information overload in online social streams*, CHI 2010 Workshop on Microblogging, Atlanta, GA. ACM, Retrieved 20 October 2010, URL: http://www.parc.com/content/attachments/torrent-of-tweets.pdf

Bruner J.S. (1961), The art of discovery, *Harvard Educational Review*, vol. 31, pp. 21-32.

Chaffee T. (2009), Why I invested in Twitter, *Washington Post*, Retrieved 20 October 2010, URL: http://www.washingtonpost.com/wp-dyn/content/article/2009/02/13/AR2009021302796.html

Chang S.J. and Rice R.E. (1993), Browsing: A Multidimensional Framework, *Annual Review of Information Science and Technology*, Medford, NJ,Learned Information, vol. 28, pp. 231-271.

Choo C.W., Detlor B. and Turnbull D. (1998), *A Behavioral Model of Information Seeking on the Web* – Preliminary Results of a Study of How Managers and IT Specialists Use the Web, URL: http://choo.fis.utoronto.ca/fis/respub/asis98

Cranton P. (1994), Understanding and promoting transformative learning, San Francisco, Jossey-Bass.

Cross J. (2006), Informal Learning: Rediscovering the Natural Pathways That Inspire Innovation and Performance, San Francisco, Pfeiffer.

Eagle N. and Pentland A. (2004), Social Serendipity: Proximity Sensing and Cueing, *MIT Technical report*, URL: http://vismod.media.mit.edu//tech-reports/TR-580.pdf

Fine G. and Deegan J. (1996), Three Principles of Serendip: Insight, Chance and Discovery in Qualitative Research, *International Journal of Qualitative Studies in Education*, vol. 9, pp. 434-447.

Foster A. and Ford N. (2003), Serendipity and Information Seeking: An Empirical Study, *Journal of Documentation*, vol.59, pp. 321-340.

George J (2005), *Socratic Inquiry and the Pedagogy of Reference: Serendipity in Information Seeking*, URL: http://www.ala.org/ala/acrl/acrlevents/george05.pdf

Gritton J. (2007), *Of Serendipity, Free Association and Aimless Browsing: Do They Lead to Serendipitous Learning?* URL: http://www.education.ed.ac.uk/e-learning/gallery/gritton_serendipitous_learning/conclusion/assets/assignment_print_version.pdf

Jacob R. and Wu S. (2008), *Twitter: an Analysis on the Microblogging Phenomenon in Relation with Community and Identity*, URL: http://www.scribd.com/doc/16825839/Twitter-an-Analysis-on-the-Microblogging-Phenomenon-in-Relation-with-Community-and-Identity

Java A., Song X., Finin T. and Tseng B. (2007), Why We Twitter: Understanding Microblogging Usage and Communities, *Joint 9th WEBKDD and 1st SNA-KDD Workshop '07*, San Jose, CA, USA, URL: http://ebiquity.umbc.edu/_file_directory_/papers/369.pdf

Johnson S. (2006), *Can We Please Kill This Meme Now*, URL: http://www.stevenberlinjohnson.com/2006/05/can_we_please_k.html

Jonassen D. (1991), Objectivism vs. constructivism, *Educational Technology Research and Development*, vol. 39, pp. 5-14.

Kirschner P.A., Sweller J. and Clark R.E. (2006), Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching, *Educational Psychologist*, vol. 41, pp. 75-86.

Kolb D. (1984), *Experiential learning: experience as the source of learning and development*, Englewood Cliffs, New Jersey, Prentice Hall.

Kuhn T. (1962), *The structure of scientific revolutions*, Chicago, University of Chicago Press.

Liestman D. (1992), , *RQ*,vol. 31, pp. 524-532.

Luckmann C. (1996), Defining experiential education, *Journal of Experiential Education*, vol. *29*, pp. 6-7.

Marsick V.J. and Watkins K.E. (2001), Informal and Incidental Learning, *New directions for adult and continuing education*, vol. 89, pp. 25-34.

Mezirow J. (1991), *Transformative dimensions of adult learning*, San Francisco, Jossey-Bass.

Mezirow J. (2009), Transformative Learning Theory. In J. Mezirow & E.W. Taylor (eds.), *Transformative Learning in Practice: Insights from Community, Workplace, and Higher Education*, San Francisco, Jossey-Bass, pp. 18-33.

Oliver P., Marwell G. and Teixeira R. (1985), A theory of critical mass. Interdependence, heterogeneity, and the production of collective action, *American Journal of Sociology,* vol. *91*, pp. 552-556.

Passant A., Mulvany I., Mika P., Maisonneuve N., Löser A., Cattuto C., Bizer C., Bauckhage C. and Alani H. (2008), *Mining for Social Serendipity, Dagstuhl Seminar on Social Web Communities,* Dagstuhl Seminar Proceedings,Schloss Dagstuhl – Leibniz-Zentrum fuer Informatik, URL:http://www.tagora-project.eu/wp-content/2009/09/08391-SWM-Paper-1791.pdf

Reinhardt W., Wheeler S. and Ebner M. (2010), *All I need to know about Twitter in Education I learnt in Kindergartnen*, Proceedings of the WCC 2010 conference.

Riemann J., Young R.M. and Howes A. (1996), A dual-space model of iteratively deepening exploratory learning, *International Journal of Human – Computer Studies*, vol. 44, pp.743-775.

Riley E. (2007), *The Effects of a Cuban Musical Exchange Tripon the Musical Journeys of Students from a Sydney High School*, University of Sidney.

Rosenmann M.F. (2002), Serendipity and scientific discover, *Creativity and Leadership in the 21st Century Firm*, vol. 13, pp. 187-193.

Rutherford F.J. (1964), The role of inquiry in science teaching, *Journal of Research in Science Teaching*, vol. 2, pp. 80-84.

Siemens G. (2005), Connectivism: A Learning Theory for the Digital Age, *International Journal of Instructional Technology and Distance Learning*, vol. *2*, URL: http://www.itdl.org/Journal/Jan_05/article01.htm

Taleb N.N. (2010), *The Black Swan: The Impact of the Highly Improbable*, New York, Random House and Penguin.

Thom-Santelli J. (2007), Mobile Social Software: Facilitating Serendipity or Encouraging Homogeneity?, *IEEE Pervasive Computing*, vol. 6, pp. 46-51.

Toms E. (2000), *Serendipitous Information Retrieval, Proceedings of the First DELOS Network of Excellence Workshop on Information Seeking, Searching and Querying in Digital Libraries*, Zurich, Switzerland, European Research Consortium for Informatics and Mathematics.

UNESCO (2005), *NFE-MIS Handbook. Developing a Sub-National Non-Formal Education Management Information System*, Module 1, Paris, UNESCO, Division of Basic Education.