Google Wave Platform: Exploring the Settings for Personalized Learning

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Abstract. The Google Wave is a communication, collaboration and rich media document creation platform that is in focus of educators and researchers, because of its capable to be harnessed for educational purposes. The paper discusses characteristics of Google Wave those facilitate creation of personalized learning spaces accessible to students anywhere and anytime. They are examined with aim to support and enhance the knowledge receiving during several engineering courses and students' projects. The findings are generalized in a model that is applied in practice. The paper also highlights student experiences in using Google Wave in various learning situations.

Keywords: personalized learning, Google Wave, collaboration, networking, real-time, on-demand

1 Introduction

A recent trend in developing innovative eLearning environments is to combine or create mashups of existing software components, applications and services. Such an approach increases possibilities for widening the set of learning scenarios and allows high degree of personalization. Also, more attention is concentrated on architectures for supporting personalized learning: through empowering the functionality of given eLearning environment (integrated approach – e.g. Elgg) or using individual applications (distributed approach – e.g. start pages, feed readers, wikis, blogs, etc.) [1], [2], [3], [4]. From pedagogical point of view eLearning environments are collaborative and non-collaborative depending upon the way knowledge is created either through collaborative learning activities or through performing stand-alone tasks. These environments are controlled, when educator or institution controls the resources and learning paths and non-controlled, when learner self-arranges his/her learning environment. In the blogosphere is started discussion about the difference between personalized learning and personal learning. Personalized learning is recognized as controlled and tailored approach where the educator keeps control over subject area and directs students do the right learning content, while personal learning is related to self-organized and life-long learners, e.g. non-controlled approach [5].

When the eLearning environment is well organized and flexible it can support a range of different interactive learning approaches. It helps in enhancing the personalized learning. However, it creates different, and more diverse, demands on the design of eLearning space to support a range of learning activities, to facilitate group learning approach, to maximize the use of shared spaces and knowledge.

The Google Wave platform emerged one year ago and has attracted the attention of educators and researchers with its capability to support users to communicate and collaborate more effectively on the web in form of waves [6], [7]. It also supports wiki like collaborative media document creation. It is based upon a rich set of open standard APIs that allow integration of extensions and robots within waves that enhance the base functionality of the Waves and allow embedding of waves in other web services.

The paper explores the characteristics of Google Wave for personalized learning and they are examined with aim to facilitate and enhance the knowledge receiving during several engineering courses and students' projects. The findings are generalized in a model that is applied in practice. Students' opinions are gathered and summarized.

2 Google Wave Personalized Learning Settings

Google Wave is designed as a real-time communication and collaboration platform combining features of email, instant messaging, wikis, web chat, social networking, and project management. Access from web browsers and mobile platforms (iPhone, Android) is available [8]. This allows personal/personalized access to the Google Wave from everywhere and on-demand. The Google Wave platform is extensible through public APIs, gadgets and robots that allows flexible personal/personalized content organization.

The proposed data model provides learning in waves with unique IDs. One wave includes wavelets with unique IDs, each one with a participant list and with a set of documents. A participant can be a user, a group or even a robot. Such data model is suitable for knowledge organization in different waves, performing selective filtering the waves, and creation of special waves according to student's needs. Also, personalized learning happens in collaboration with other learners, working together in a group learning environment or on a project.

The real-time learning occurs through Wave's technology known as "operational transformations". It allows immediately display of what student types within a wave when he/she edits a collaborative document used simultaneously by several other students. The editing operation is also send to the server to be ratified hoping that it will be accepted by the server. The server stores all the course documents and all the changes within the documents. It also displays the latest version of these documents. In the end, each client is updated with the final version received from the server that is the result of possibly many operational transformations.

For providing inter/intra-institutional or inter/intra-course personalized learning, the Google Wave federation protocol can be used. It allows multiple wave providers to share waves with each other through open source XMPP protocol. This is a good

opportunity to promote social interactions among students and educators from different universities and training organizations as well as personal networking in the context of teaching and learning.

A literature exploration about what is important for personalized learning, what makes learning personalized is performed below and it is connected to Google Wave characteristics to support the development of a model for learning personalization in Google Wave.

Research shows that ensuring of *flexible delivery* of personalized learning is a main factor guarantees students' progression and widening participation according to [9]. Different solutions for personalized way of content delivery are presented in: [10] where a system proposes personalized delivery of news, TV-on-demand, mobile multimedia applications; [11] explores the evolution of the delivery of content to distributed users in the point of view of a new level of interaction and personalization providing of today's Web sites; in [12] a model of dynamic content delivery supporting a level of customization and content personalization is presented.

Other important factor recognized by managers, teachers and learners in supporting the personalization agenda is *content and knowledge presentation* in multiple media forms utilizing a wide range of technologies [13]. Technologies allow mashup media content from different sources and easy embedding of components/widgets for receiving students' opinion, practicing basic-skills and assessment, practicing independent work skills, creating to-do list, pretesting students' knowledge before each unit, sharing the work of created lessons [14]. A wide variety of media content presentation and knowledge presentation in different forms attract the attention to learning not only of the excellent students, but also of excluded/disengaged giving them alternative routes to access information and skills relevant to their needs and interests [15].

The social nature of web and web applications is a fact that cannot be skipped. This phenomenon offers opportunities for personalized learning *receipting knowledge* by students in formal and informal situations and scenarios. Working on projects, participating in forums and group activities are among more formal forms for learning. Active personalized learning experience can be reached also through informal conversation, reflexive dialogue and collaborative content generation, enabling access to a wide raft of ideas and representations [16]. Community of practices is other way for improvement of the knowledge of each participant through communication and the possibility for learning through shared experiences, problems and solutions, tools, methodologies [17].

Ubiquities access of web sites and systems is also influencing factor at receiving a personalized learning on-demand. There are many examples at using of ubiquities and mobile environments in the context of personalized learning, as well as solutions of big companies like Motorola and HP. In the Motorola's report a model of Seamless mobility ensuring personalization of user interaction, applications, services and content is presented. It puts the user at the center of unique experiences remain consistent and coherent across activities, devices, services, locations and networks [18]. The HP service delivery platform has been designed to delivery of personalized, content-rich services satisfying specific customer requirements [19].

As it is seen these explored four factors play influential role for personalized learning organization. They are in scope when the characteristics for personalized

agenda in Google Wave are examined and when a model for personalized learning is developed (Figure 1). Flexible delivery is ensuring by given delivery methods of learning content and knowledge, technology is represented in support of the methods for an array of learning resources presentation, learning scenarios are related to the methods for knowledge reception and mobile access facilitates the methods for receiving ubiquities/pervasive on-demand learning.
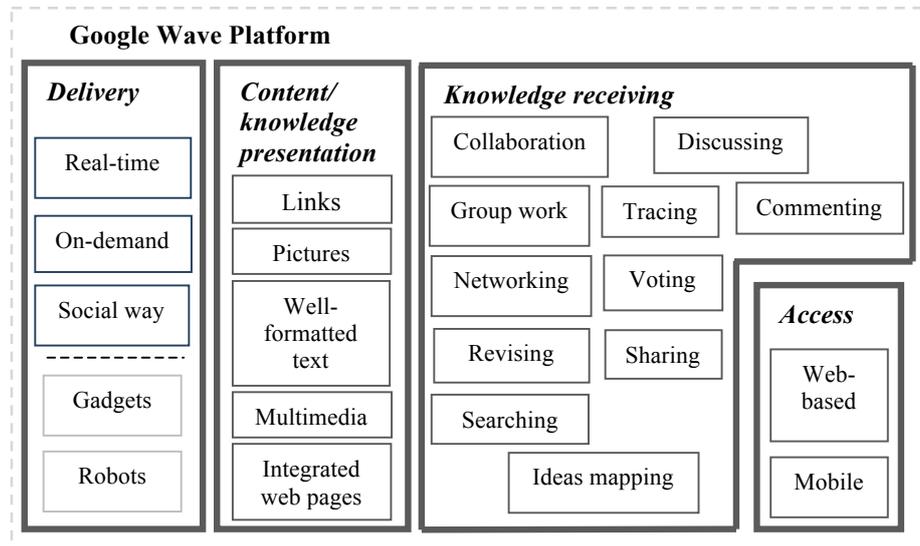

Fig. 1. Model for personalized learning in Google Wave

- *Delivery methods.* Learning instructions, content and knowledge can reach students through the medium of integrated Google Wave's rich text editor, extensions, gadgets and robots. A wave can adopt any widgets specially created for this purpose, but Wave gadgets are preferred, because the students can take the advantages of the Wave's live, multi-user environment. The Wave robots that are designed as automated participants within a wave can talk with participants, can provide information from outside sources, can monitor content within a wave, can share social bookmarks, etc.
- *Content/knowledge presentation.* Every student has his/her favorite way/tools for learning – learning through following links, through well-formatted text, through multimedia/audio/video/images or embedded HTML code, some prefer to learn by example, others by finding answers to questions, and others by solving problems on their own. In a wave all of these variants are available and students can personalize their learning using preferably media content. For this purpose they have to add appropriate gadgets, robots or HTML code.
- *Knowledge reception.* Google Wave proposes several methods for knowledge reception – by promoting collaborative work on projects, small groups' problem solving, allowing forming virtual learning network, facilitating learning by others using Google Wave's playback function, sharing, searching, real time video

conversations, mind mapping of ideas, discussion through active commenting, and use of polling gadgets for voting to assess consensus development.
- *Methods for ubiquities access*. The platform of Google Wave is reachable any time, from any location, serving the personalized learning on-demand, including through mobile devices.

3 Students' Experience

Google Wave personalized settings are utilized during several engineering courses and students' projects, where wave functionality helped students achieve required learning outcomes. Their experience in using Google Wave is summarized in Table 1 and Table 2 below.

Table 1. Assessment survey responses from the students who will use Google Wave in the future

Student's opinion	Learning methods
"Google Wave didn't interest me in the beginning because I didn't understand what it is for and what it could provide. After I knew that it combines the benefits of emailing and chatting I was fascinated by this powerful tool."	Communication
"Google Wave is very easy to learn and is a time saver for average people to different companies it aloud people to work on the same thing in real time as long as they have internet available."	Networking, collaboration
"Google Wave has been very helpful to my group. We are able to communicate clearly at different times. Many of the gadgets are fun to interact with as well. I will definitely be using this in the future!"	Group working, through technology
"Google Wave was a complete new experience to me. The whole gadget and robots seems a little complicated at first."	Learning experience through technology
"Google wave helps to revise past documents and conversations. Google wave supports many number of gadgets and robots that can be used to search for information, plotting of the graphs, maps bar charts, etc."	Revising knowledge, knowledge gathering
"In the beginning I didn't like Google wave at all. Then I started spending time on that and now I feel that it is fast way of communicating. My first impression changed and now I spend few hours on it talking and discussions to my friend."	Conversation and Discussion
"Even if I were absent during my other partners were working, I can simply hit the playback button to see what actually happened during my absence. Google Wave is capable of serving both as a social networking tool and professional collaboration tool."	Knowledge tracking, social networking tool and professional collaboration tool
"It definitely needs what they call it "a wave moment" to appreciate the technology in which we accomplish something we couldn't do with existing tools. I really liked it because it lets me know who's editing what and where, where others attention is focused, an important feature when collaborating."	Networking, collaboration
"Whether it is for collaboration work among the group members or for sharing data, news and problems, it has proved to be very significant. There are many things that I am still learning and I should learn in order to use that tool fully."	Collaboration, Sharing

The survey results show that 65% of students will continue to use Google Wave in the future, 20% of them are with answer "maybe" and 15% will not continue utilization of the platform. What are the motivating drives of 65% of students to continue usage

of Google Wave for personalized learning? Several of them appreciate the possibility for faster real-time communication, conversation and discussion for deeper learning and clearing the problematic questions. Others like realized connections with peers, experts and professionals and organization of expanded learning and professional network via participation in several thematic waves. Deciding problems collaborating and group working on projects in real-time and in technology-enhanced environment attract students too. Many of them are excited from this new technology that offers gaining information and knowledge through integration of gadgets and robots - at the beginning they feel difficulty at usage of different environmental tools and services, but when they understand and experiment with the technological opportunities they are looking for other capacities.

Sharing of opinion, experience, resources and tracking these such as in daily journal allow students to back so many times as they need to analyze and understand concepts and theory.

The technology like Google Wave supports the conversational aspect of personalized learning allowing: questions asking participating in discussions, seeking help or advise on a project, sharing of learning documents and other media relevant to the course topic, creating a learning network, following peers and educators with same interests, reflecting on proposed learning.

Table 2. Assessment survey responses from the students who have doubts and who will not use Google Wave in the future

Student's opinion	Student's decision
"I think this is a pointless networking tool much like Facebook and MySpace. Quite frankly, I believe it was a waste of my time."	Not use in the future
"I started a wave and have used it briefly. I don't really enjoy it that much. I don't even text. I doubt I will ever use this in my daily life."	Not use in the future
"I don't know, I think the possibilities for this are great for communication. I just don't see it feasible."	Not use in the future
"Although Google wave seemed to be confusing in initial days, eventually it has somehow become familiar to use nowadays. Whether it is for collaboration work among the group members or for sharing data, news, views and problems, it has proved to be very significant. There are many things that I am still learning and I should learn in order to use that tool fully."	Maybe, will use in the future
"In the beginning I didn't like Google wave at all. I found it little bit confusing and it didn't work on IE. Then I started spending time on that and now I feel that it is fast way of communicating. My first impression changed and now I spend few hours on it talking and discussions to my friend. Some problems like it gets slow when we have more/ large waves trouble me sometime."	Maybe, will use in the future
"I feel that Google Wave is not brief enough for professional work and also complicated for entertainment. However, it is useful to communicate."	Maybe, will use in the future
"Google Wave was a complete new experience to me. The whole gadget and robots seems a little complicated at first. I guess it is just like anything else when you do something over and over it gets a little easier. I just don't know when I would actually use this format. I guess I could try and used it with my colleagues, but the problem is they also have to learn how to use it. You just don't see Google Wave catching on like Facebook and MySpace."	Maybe, will use in the future

The students that answer with "maybe, I will use it in the future" are 20% and their uncertainty derives from the imperfections of the technology such as incompatibility

with different web browsers, slow loading at big waves, time for studying tools, ect. Another reason is related to their doubts about usefulness of this technology to reach effectiveness in their future professional career. However, these students admit the benefits of Google Wave for learning and communication in the contexts of engineering courses that they participate.

15% of students are categorically that they will not use Google Wave platform in the future. They consider participation in social networks as wasted time. Also, the wasted time is needed time for technology studying. They suppose that such technology is unfeasible for usage in daily and professional life.

Several opinions of students who are not sure and who will not use Goggle Wave platform in the future are presented in Table 2.

4 Conclusion

Google Wave is not specifically designed to support teaching and learning activities, but it has the desired features that can be used to support personalized and directed learning environments. This paper demonstrates that Google Wave technology can be successfully used to assists learning according to student' needs and learning goals of given engineering courses. Different learning methods during the semester are utilized, including collaborative learning in groups, working on students' projects via sharing, discussing and revising.

The Google Wave platform is flexible and extensible allowing extensive personalization and customization as needed to tailor the need of eLearning environment. Its use was well liked and accepted by the students.

A model for personalized learning is created and it leads to basic understanding of the main factors impacting the personalized learning, its social aspects, and to students' assessment of eLearning technology - what they like, prefers and utilize in practice that possesses features for learning facilitation in the context of personalized learning needs.

This exploration is worthwhile despite the decision of Google team to not continue development of Google Wave further as a standalone product. They are in the process of incorporating the technology developed for Google Wave in other Google projects that can find use in PLE. Also, the technology is available in the form of open source and can be used for free in different educational contexts.

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