Development of a Virtual Worklog for Registering Face to Face Classroom Interaction

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ABSTRACT

To measure and evaluate collaborative learning there is a need for tools that promote and record the interactions that occur within and between learners. Considering the requirements of Kelluwen learning community and didactical designs that are developed, shared and enforced, plus a review of collaborative learning platforms, it became necessary to implement a Virtual Worklog module for kelluwen management platform of the community. The purpose of Virtual Worklog is to be a virtual space where teachers and students can interact and where such interactions are recorded on a permanent basis to support the processes of feedback and student assessment.

Keywords: Virtual worklog, social network, collaborative learning, education, API, ICT

1. INTRODUCTION

1.1 Chilean Education and ICT Integration

For our country, the integration of ICT into the educational system is an important goal for which the Ministry of Education has been working for some time. The above is demonstrated by the inclusion of technologies in education as a crosscutting objective in changing the curriculum of the educational reform [17]. One aspect that characterizes the process of incorporating ICT, which has occurred in other countries, is that it begins with the provision of infrastructure in terms of equipment and connectivity in educational establishments and not from the development of educational innovations that require the incorporation of ICT. This makes the applications of ICT in education are not always relevant and often do not promote the transformation of the teaching-learning [15].

1.2 Collaborative Learning

Collaborative Learning is the process in which students work together arround commond goals to maximize their own learning and that of others [7].

Collaborative learning changes the learning approach, stating that the teacher is not solely responsible for the students learning, but also are the same students who collaborate in their own learning. This method of learning does not preclude individual learning, but complements it through collaborative work and makes students to achieve a more significative construction of their own learning.

In this collaborative model teachers "invite" students to define specific targets within what is being taught. It provides options for activities and tasks that will attract the attention of students, encouraging them to assess what they have learned. Teachers encourage students to share their own knowledge their learning strategies. Teachers help students to hear different opinions, to withstand any criticism of an issue with evidence, engage in critical and creative thinking to develop and participate in open and meaningful dialogues [7].

This renovation also affects educational software developers. Collaborative tools should emphasize aspects such as reasoning, self-learning and collaborative learning [7].

Some guidelines to produce collaborative learning are: a) detailed study of strengths, weaknesses and opportunities for team members, b) establishment of common goals, incorporating individual goals, c) developing an action plan with specific responsibilities and meetings to evaluate the process, d) permanent check the progress of the team, individual and group e) care of the socio-emotional dimension of the relationships [5].

1.3 Kelluwen Project

Kelluwen is a community of students, teachers and researchers focused on build, use and share collaborative Didactic Designs, whose activities are based on Web 2.0 tools. Kelluwen project aims to improve socio-communicative skills of young students between the 7th grade and 10th grade (student from 13 to 16 years old). The main opportunities that operate the project are, first, the enthusiasm shown by young people as users of web tools, and second, the growing infrastructure and offer in connectivity and access to technology in schools [17].

Project Kelluwen considers the creation of a virtual community linking teachers, students and researchers about the use, development, evaluation, execution and sharing of collaborative didactical designs. It also aims to facilitate teachers' adoption of social Web technologies (tools and services) [17]. In this regard, it is necessary to define the scope of the concept of Didactical Design: Didactical Design is a plan that organizes the process of learning in a global and comprehensive manner covering the four dimensions of a didactic model (teacher, student, content and context). Since a Didactical Design is a kind of instructional design, it considers the phases of analysis, design, development, implementation and evaluation.

Collaborative Didactic Designs created by Kelluwen contemplate classrooms of different schools working together in some of the learning activities. When two classes are working in this way they are called "twin classrooms." This type of work is challenging, since it is necessary to have tools that allow communication between these classes. Furthermore, the activities included in the didactic design are defined to be implemented face to face in the classroom and, therefore, unlike all activities performed in the virtual environment, much of the interaction and work is not registered in any way. The information on the interactions produced in the classroom is valuable for analysis and evaluation of the process.

The aim of this paper is to describe the development of the first version of a software tool that allows both, the permanent record of the interactions produced inside the classroom, and facilitate the interaction between twin classrooms. Section 2 presents a systematic review of articles related to collaborative learning platforms. This review provides relevant information to formulate requirements for Kelluwen Platform. Section 3 describes the characteristics of the learning experiences management system, known as Kelluwen Platform. This platform includes the virtual worklog tool which is described in detail in Section 4. Section 5 presents results of a satisfaction survey applied to students and teachers. Finally, Section 6 presents conclusions and possible future improvements.

2. PLATFORMS FOR COLLABORATIVE LEARNING

Prior to the development of a tool for collaborative learning, there was conducted a systematic review on the subject that allowed us to define requirements for the development in a meaningful manner. This revision was made following the guidelines of [10], which are summarized in [2-4, 13-16].

2.1.1 Methodology

Based on the research question *Which educational platforms or social networks for collaborative learning do exist?* It was structured a search query that was applied in the ACM Digital Library. After obtaining the search results, we proceeded to select only those articles that contained relevant information following the selection criteria discussed below. Then the results were analyzed and summarized.

2.1.2 Selection Criteria

From the search results, we selected those articles that present an overview on the development of a prototype or an implementation of a platform or a tool that includes features to support any of the following topics:

- synchronous and / or asynchronous communication.
- recording information regarding interaction
- group management
- analysis and monitoring of activities carried out

2.1.3 Information Extraction

In order to facilitate analysis of the selected articles, the information extracted was classified as:

- Models proposed or described
- Tools developed

- Experience and use of collaborative tools for learning
- Architecture and technology used
- Other relevant findings

2.1.4 Search Results

When we ran the query set, we obtained a total of 615 results. Of the 615, we pre-select 52 articles that met the selection criteria defined above. The 52 selected articles were downloaded and read. Finally, 23 were discarded leaving 29 articles to summarize and extract relevant information for this work. Immediately it could be seen in the results of the selection the increasing number of articles dealing with the topic in recent years (see Figure 1). The search was conducted in mid 2009 and therefore only a part of papers published that year are reported.

2.1.5 Main Findings and Key Factors

Within the selected articles we found tools to support distance collaborative learning as well as face to face learning. From these tools we rescued important commonalities that characterize the tools for collaborative learning in general. It is important to note that the tool to be developed should support face to face classroom sessions where students learn through interactions produced by teamwork.

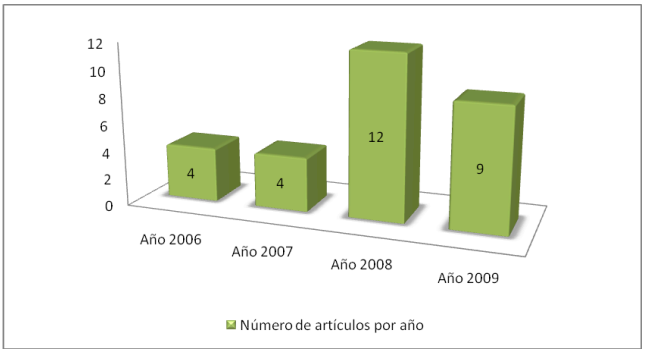

Figure 1. Results grouped by year of publication

For a tool that support collaborative learning is essential to consider strategies for the registration of the interactions and work, both individually and as a group. Registration is tacit knowledge which can be used to evaluate the teaching-learning process. The key factors, obtained as a result of the systematic review for a collaborative learning are:

- Intelligent groups distribution (regarding individual and social skills of students). [18]
- The members should have common objectives explicitly, ie, they must share the same purpose, to ensure the fulfillment of the goal. [11]
- Existence of defined roles within the group (life cycle of a group). [11, 19]
- Tools for collaborative learning should provide support for recording and reporting the work of the groups, as well as tools for the workspace. [8, 9.12, 6]
- Provide mechanisms for easy, valid and relevant feedback (tagging, rating, comments). [6]
- The products generated by users must have real value, in the same way that their participation must have it. [1]

With the development of systematic review, key factors that must be contained in a collaborative learning supportive platform were identified. These key factors were taken as requirements for the design of Kelluwen platform for management of learning experiences and also for the worklog module tool.

3. KELLUWEN PLATFORM FOR LEARNING EXPERIENCES MANAGEMENT

3.1 Didactic Experiences

We distinguish Didactic Design concept from the concept of Didactic Experience: a Didactic Experience is the implementation of a Didactic Design by a particular course of an educational establishment. Each Didactic Experience has an associated additional data from teaching designs themselves, such as users, groups, interactions, products, etc.

3.2 General Features

Kelluwen learning community needs a platform that allows its members to manage the didactic experience and where the tool for registering interaction corresponds to a module. The development of the management platform was done in parallel to the development of interaction module. Kelluwen Platform is structured in different modules (see Figure 2).

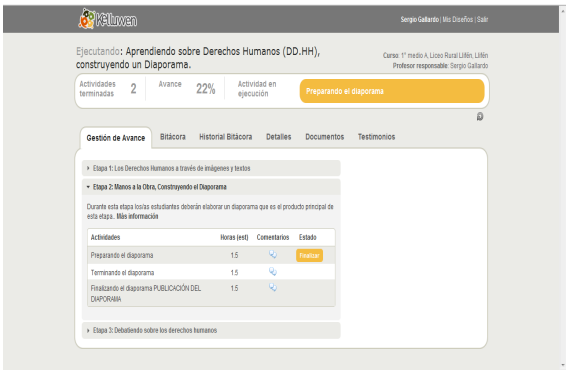

Figure 2. Plataforma de gestión de Experiencias Didácticas

The platform has a summary form, where teachers and students can see which activity is currently in progress, the degree of progress, etc., It provide context information to teachers and students (see Figure 3).

Figure 3. Execution summary

The main module, called Advance Management module, provides features for the management of learning experiences, enabling teachers and students to visualize in detail the stages and activities contained in the Didactic Design. Also, teacher has the ability to change the state of activities setting them as begun and ended. This indicate which activity is ongoing and which activities have been completed. Also, this module allows the teacher to make comments on their experiences in the development of each activity and also see the comments of other teachers who are developing the same activity, allowing feedback between members of the community (see Figure 4).

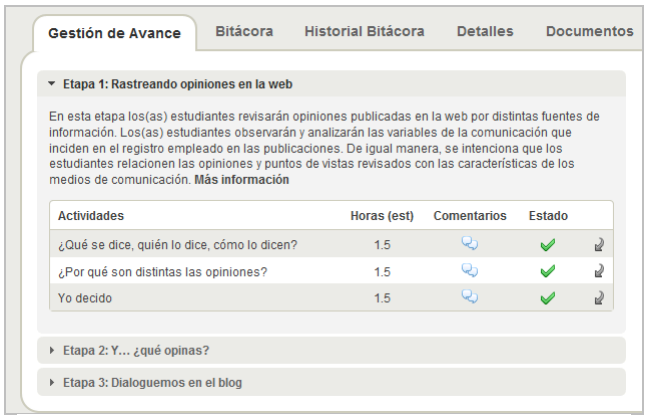

Figura 4. Advance Management Module

Another important module is the testimonials where all the teachers who are running the same didactic design can write a testimony at the end of the experience(see Figure 5).

Figura 5. Testimonial Module

The platform was coded in PHP, JavaScript. We also used jQuery JavaScript framework to improve the deployment of Web pages and user interaction.

4. WORKLOG MODULE

The platform described above complies with managing the implementation of didactic experiences. As it is mentioned previously, it is necessary to have a tool to register interaction within the classroom and to allow communication between twin classrooms. The permanent recorded interactions are very useful for subsequent review and thus will be a real contribution to the assessment process undertaken by students in the development of educational activities. It is therefore necessary to develop a tool that is easy to use and also provide mechanisms for filtering and grouping messages by user, group and class, simplifying the review of them from both the teacher and students. The tool must also have group support,

ie, be able to identify the group that students belong and serve as a mean of communication between groups (defined characteristics as a result of the systematic review).

It is worthy to point that Kelluwen Platform and therefore the interaction module is designed to be used in a first pilot of the project by students of 9th grade from vulnerable educational institutions (schools under poverty) from the southern Chile.

4.1 Approaching the solution

When it comes to developing a tool that meets the demands of the community, we must look to incremental and continuous development process where the user quickly gets access to tools. It generate feedback that allows valuable functional improvement. That is why for this first pilot is thought to develop a simple tool to respond fairly to the initial requirements of the community. Through the use we will get the feedback for defining next requirements or improvements.

4.1.1 Requirements

Since the requirements for the development of the interaction module born from a network of users, they were classified according to whether they correspond to requirements of the teacher or students. Also the requirements of the research team were included. Each requirement was assigned with a priority indicator and an estimation of developing time.

Also the systematic review identified certain key factors to achieve learning collaboratively. Some of these factors were included as requirements for the interaction module (others were included as requirements for the management platform).

List of key requirements (user role in parentheses):

- Publish messages (teachers and students)
- Read the messages published by the participants of the experience (teachers and students)
- Publish messages that contains links to works made by students within a learning activity (students)
- Filter the messages allowing the user to review them by group, by individual, by product, by class and by twin class (teachers and students).

4.1.2 Analisys and design

Given the characteristics that the tool must meet, it was thought the development of a Virtual Worklog, where participants of a Didactic Experience (teachers, students and staff) could record short messages (microposts) of what happens in the classroom. The Virtual Worklog must be shared and visible to all twin classes who were working in the same didactic design, promoting communication among all participants.

Analyzing all the requirements set we came to the conclusion that this type of functionality is offered by Twitter (www.twitter.com), because it's simplicity to motivate users to write about what they are doing. We consider that using twitter hashtags, we can mark messages with the particular didactic experience, group and twin classroom .

4.1.3 Twitter and its API

Twitter is a Web application that functions as a network of real-time information. Such information is provided by the millions of users around the world. Twitter users post information through microblogging entries of no more than 140 characters.

As a definition, an API or Application Programming Interface is a set of functions and procedures, provided through a library, for being used by another software application.

The Twitter API allows access to data and functionality that Twitter offers. This means that from our own website, we can create new applications based on the features and information that Twitter has.

Twitter API currently consists of three parts: two REST API and a Streaming API. The Streaming API allows access, in almost real time, to the different subsets of messages that are posted on Twitter. One of the REST APIs provides functions for basic data access from Twitter (user information, messages data, etc..) and also to post messages and update profile information. The other REST API called SEARCH API provides functions to perform searches and get trends.

4.1.4 Label specification or hashtags

A hashtag is a word (character sequence) used to label a message and it is prefixed with a hash symbol (#). An example of hashtag is #chile. Hashtags in Twitter are used to group tweets (messages) that belong to the

same subject and thus facilitate the search process. If we write a message that is related to Chile, we use the hashtag #chile and if we want to find messages in relation to Chile, we can do a search for hashtag #chile.

For the Virtual Worklog there were defined different hashtags (codes) in order to group messages from a Didactic Experience, a twin experience, group, products, etc. These hashtag are added automatically to messages posted by users and let us to implement filters based on searches using Twitter API.

4.1.5 Implementation

For the development of Virtual Worklog we created a set of wireframes to describe the interface. Also we defined the functions and implemented the necessary changes to the existing data model of Kelluwen Platform (see Figure 6).

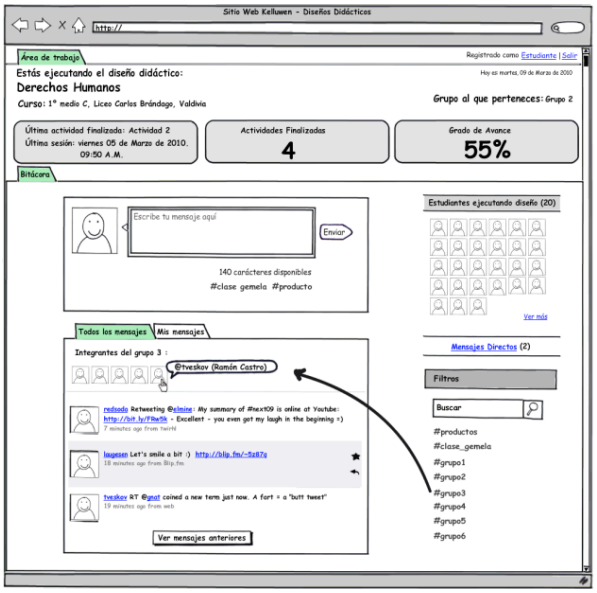

Figure 6. Worklog Wireframes

The existing data model corresponding to the management module was complemented with a tableset for messages and some of the existing tablesets were modified adding specific fields as predefinied hashtags for student groups or didactic experience.

Because Twitter's SEARCH API only give search results of messages not older than a week, it was necessary to create a module where users could visualize all the Worklog activity. It was necessary to store all the messages posted to twitter in our own database.

4.1.6 Virtual Worklog

To login to the Kelluwen's Virtual Worklog is necessary to have a user account on Twitter. User must login into twitter from kelluwen platform (see Figure 7).

Worklog has 5 main functions: posting messages, listing the messages, notice of new messages (see Figure 8) and filter the available messages (see Figure 9).

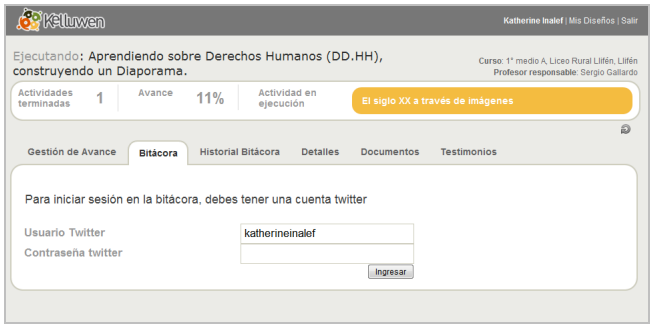

Figure 7. Worklog login

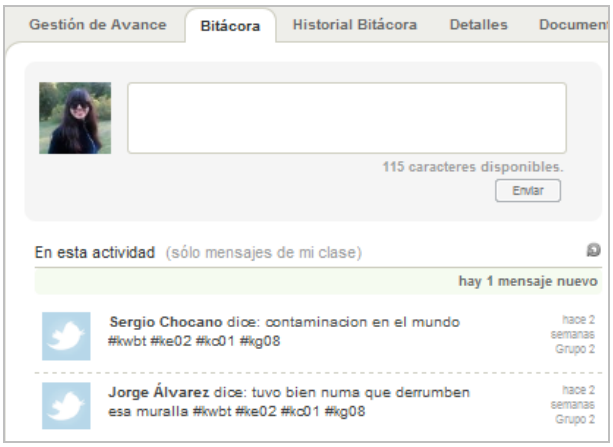

Figure 8. Send, read and new messages alert

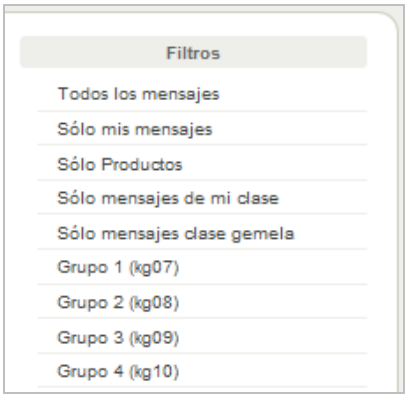

Figure 9. Detail of available filters

The Virtual worklog was used by Kelluwen community members in the development of learning experiences during an initial pilot conducted in May and June 2010. The pilot involved the participation of 9 classrooms and the implementation of two didactic designs in the subsectors of Spanish Language and Social Science and History at 9th school level (see Figure 10). The Virtual Worklog is currently being used by community members that are developing Kelluwen didactic experiences.

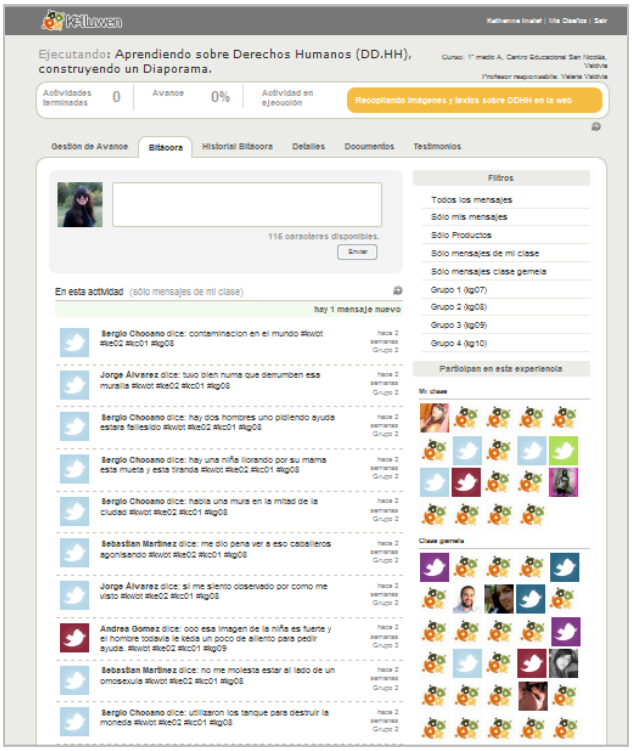

Figure 10. Implemented Worklog Module

5. Virtual Worklog Validation

The Worklog was tested in the development of the first phase pilot of Kelluwen project. It was used by 253 students from 9 different didactc experiences. As a result of the development of the pilot there were a total of 3019 messages with an average of 53 messages per group.

An initial analysis of the results indicates that the Worklog was widely accepted by students and teachers, even by those that were not initially Twitter users. According to reports from the teachers, the use of the Virtual Worklog as a tool for the registration process requested additional guidance in some cases.

Validation was done through a satisfaction survey of usability, which included 12 statements of satisfaction written as a positive statements. The degree of satisfaction was measured with a scale of 1 to 5, with 1 being the lowest satisfaction and 5 the highest satisfaction and was applied to 82 students and 5 teachers.

As a result of the survey students and teachers rated the Virtual Worklog tool with a degree of satisfaction with mean 3.9 (of up to 5). Being the best evaluated aspect the identification of messages in my class with an average of 4.47 and the worst the use of filters with an average of 3.4. From the analysis of responses there were no particularly critical recognizable aspects (see Figure 11), allowing us to make a summary of responses to the survey (see Figure 12).

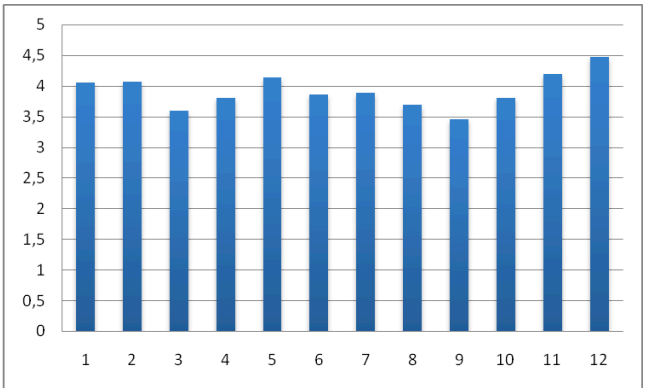

Figure 11. Mean of answers to the 12 statements of the survey

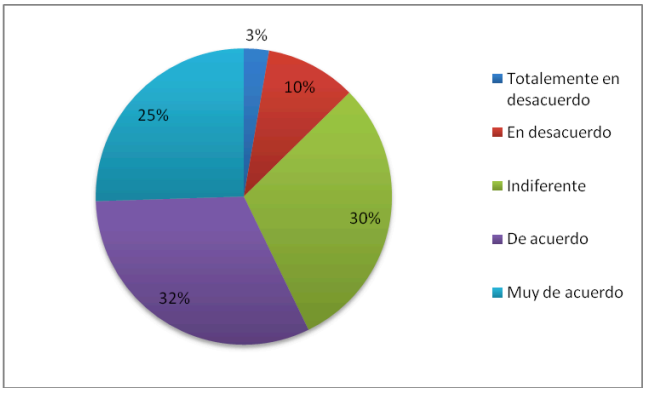

Figura 12. Summary of positive answers to statements relative to usability of the worklog

6. DISCUTION AND IMPROVEMENTS

Almost all the requirements raised prior to the development were implemented. The biggest problem

we faced was the instability of Twitter service, occurring for instance that it was sometime offline and that not all the messages were added to the searches databases (some messages never were in the search result, although they have the appropiate hashtags). It is also important to note that these tools suffer from frequent changes in the constant innovation, so it is not possible to rely on its availability. That is why we decided a total disengagement with Twitter and just keep the model proposed by it, ie, the logic of the tags to group messages, but replicating the features locally.

From the six factors identified as key factors for the achievement of collaborative learning, described among the findings of the systematic review in section 2.3.5, the Kelluwen Virtual Worklog gives two of them: it is compliant with support for communication and recording of group work and also fulfills the function of being a constant feedback mechanism, through messages, about the participants' work and performance.

Major enhancements for a second stage of development correspond to improvements in usability, ie, the challenge is to work in the deployment and distribution of information in the virtual worklog, for messages to be displayed more clearly and more efficient filters to improve user experience. One of the biggest changes is to include the history of the Worklog in it, so they have a complete overview of all available information about each activity in which they have participated.

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