Live Interest Meter – Learning from Quantified Feedback in Mass Lectures

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ABSTRACT

There is currently little or no support for speakers to learn by reflection when addressing a big audience, like mass lectures, virtual courses or conferences. Reliable feedback from the audience could improve personal skills and work performance. To address this shortcoming we have developed the Live Interest Meter App (LIM App) that supports the gathering, aggregation and visualization of feedback. This application allows audience members to easily provide and quantify their feedback through a simple meter. We conducted several experimental tests to investigate the acceptance and perceived usefulness of the LIM App and a user study in an academic setting to inform its further development. The results of the study illustriate the potential of the LIM App to be used in such scenarios. Main findings show the need for motivating students to use the application, the readiness of presenters to learn retrospectively, and distraction as the main concern of end users.

Categories and Subject Descriptors

H.5.2 [**Information interfaces and presentation**]: User interfaces; K.3.2 [**Computers and Education**]: Computer Science Education

Keywords

Live feedback, Data capturing, Mobile application, Learning Analytics, Reflective Learning, Quantified Self

1. INTRODUCTION

For lectures and conferences – one of the main daily activities of researchers, professors, lecturers and students – there is currently little or no support to learn by reflection, even though in these scenarios there seems to be a great potential to improve professional skills and presenter's performance by learning from personal experience. Especially in mass lectures, virtual courses or conferences, reliable feedback from the audience is missing and the speaker lacks support to quickly evaluate the overall development and react accordingly. To realize this technical support, research questions such as how to optimally aggregate and present individual feedback of a large group of participants during the talk must be answered. Until now, traditional surveys after the lectures or conferences have been used, which are usually centered on the content of the course/talk and performed only once in retrospective, with the results not always being shared with the participants.

In order to address these shortcomings, we have developed the Live Interest Meter App (LIM App). Its goal is to quantify and track abstract feedback from an audience (e.g. emotions and thoughts especially referred to their perception of the event) and to provide this feedback live as well as retrospectively to the presenter in order to forster learning processes through reflection. The LIM App also aims for improving students' attitude, attention and concentration during a lecture. With this approach, we investigate potential improvements in managing learning in practice and apply learning analytics on data gathered during the lecture. Since lectures belong to the continuous learning process of students, improving these activities contributes to the improvement of the general learning process itself.

Reflection in terms of learning is defined by Boud et al. [3], as "those intellectual and affective activities in which individuals engage to explore their experiences in order to lead to new understandings and appreciations". The reflective process is based on the re-evaluation of the learner's experiences, considered as "the total response of a person to a situation, including behavior, ideas and feelings", and thereby producing outcomes. In our concrete scenario, reflecting about data derived from captured feedback may help users improve their presentation skills and performance when addressing an audience. Besides, such data will help the speaker reflect about the differences between her own perspective on an event and how it is perceived by the participants. Our approach is based on an integrated model of reflective learning and Quantified Self (QS) [10, 11], that shows how QS tools can technically support the cognitive process described by Boud et al.

In the following, we will present a review of related work, before describing the Live Interest Meter App (Section 3). In Section 4 we describe the experimental tests and the user study with their results. Finally, we conclude this paper with a discussion of the results and future work in Section 5.

2. RELATED WORK

Audience Response Systems (ARS), also known as click-

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ers [5, 9, 12], enable instructors in a large lecture class to instantaneously collect student responses to a posted question, generally multiple choice. The answers are immediately tallied and graphically displayed on a classroom projection screen where both students and instructor can see and discuss them [4]. These systems generally aim at improving student outcomes such as improved exam scores or passing rates, student comprehension, and learning and as well as student attendance and interest on the course. There are also some approaches that explore questions and answers (Q&A) in a bidirectional way using micro-blogging [1, 8], i.e. not only the lecturer can create questions to evaluate students, but students can also pose questions.

There are also some available products with the aim of enhancing students engagement in class, for example, GoSoapBox[1], ShakeSpeak[2] or Socrative[3]. Several projects have also developed systems to support real-time feedback during lectures at university [2, 14], which offered elementary tools for cooperation to enable electronic feedback, hand-raising and multiple-choice-polls with live-results.

Most of the related work above explores and focuses on giving a benefit for students and are tightly related to the content of the lectures and the knowledge they acquire, being limited to polling of questions and answers in many cases. On the contrary, the use case we are considering takes the lecturer and presenter as the center of the scenario and focuses on professional performance improvement. In this case, students play a very important role, as they are the ones who provide feedback, but they are not the only target group to get a benefit from the tool. We enrich the feedback meter function with other features that support the lecture like polls, questions and chats are intended to improve the lecture itself, but also to add context to the feedback that students are giving to the lecturer.

In the field of Technology Enhanced Learning there are few approaches to support self-reflection and increase awareness for both learners and teachers, and they are mainly centered on the activities of the students, like the Student Activity Meter (SAM) [7], which provides a set of visualizations to be used in digital learning platforms (or LMS) or the EnquiryBlogger [6], an extension of a blog developed to support awareness and reflection for enquiry-based learners. Outside of the learning management system there are also approaches to track the activity of students [13], with several visualizations intended to increase motivation of students and help them reflect on their learning process.

In these related approaches we have reviewed tools to support reflection on several sources of data, but none of them considers the gathering of feedback and other data during the lectures for reflective learning purposes. Additionally, these approaches broadly cover the support for students, but do not take into account the potential of this data for the lecturer's self-improvement.

3. LIVE INTEREST METER – LIM APP

3.1 LIM App: Features and Interface

The LIM App has two interfaces: an Android App as well as a JavaScript-based application, which provides a broader access from any device. The core of the LIM App is the meter component (see Figure 1), which allows users to vote on a quantifiable aspect. A title and captions for minimum and maximum value are to be defined by the presenter (master) and can range from aspects like comprehension (difficult or easy to understand?) to performance (too fast or too slow for me?). The colored background represents the scale and an input slider allows entering the desired value.

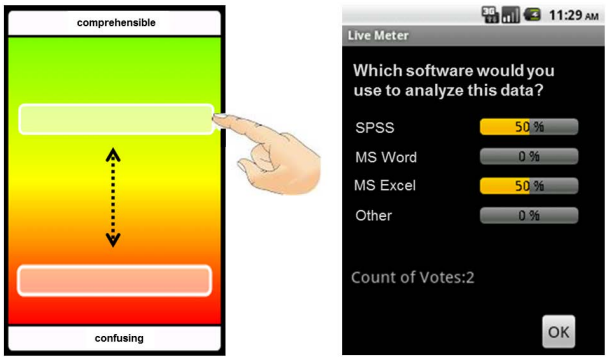

Figure 1: Live Interest Meter: meter with touch interface and poll results (both on the Android version) ©Verónica Rivera-Pelayo et al.

Users can update their vote at any time and are encouraged to do so, whenever they think of it. A given value stays valid only for a specific amount of time, in order to maintain a certain timeliness of the feedback.

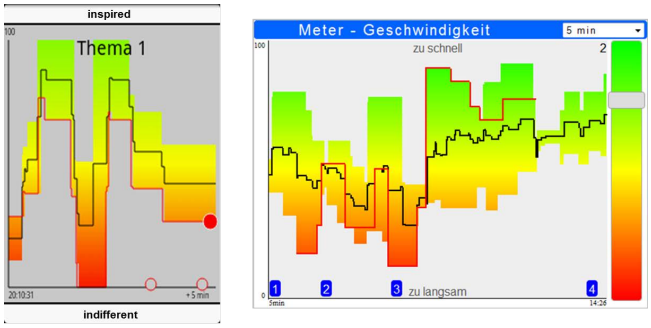

Figure 2: Evolution graph showing the feedback in time. a) Android interface b) JavaScript interface ©Verónica Rivera-Pelayo et al.

The evolution graph (see Figure 2) shows three different aspects of the meter-values in a timeline (x-axis): (a) the colored area spans between the 10th and 90th percentile of all the users values sent to the master (y-axis), (b) the black line displays the group average feedback and (c) in red is depicted the feedback value provided by the 'local' user (not available for the master as she is not actively contributing to the evaluation). In the top-right corner the number of currently valid user-votes is displayed – important to estimate the relevance of the given feedback. The red cycles at the bottom represent *topic markers*, that the presenter can introduce as contextualization of the time series.

Both master and client application show this graph live, updated every second. That is how the feedback is presented to the users, for their personal inspection as well as

[1]GoSoapBox, www.gosoapbox.com
[2]ShakeSpeak, www.shakespeak.com
[3]Socrative, www.socrative.com

for subsequent reflection.

In order to increase the interactivity between audience and presenter, the tool additionally offers instant-polls that can be prepared and suggested by users, questions that are rated by the audience and optionally an open chat.

3.2 Reflective Learning from Feedback

As introduced before, the Live Interest Meter aims at supporting reflective learning from feedback in events where a person addresses a large audience. The way Live Interest Meter tracks and shares feedback, allows both the presenter to receive feedback from a large audience as well as for each participant to compare his learning experience with his peers.

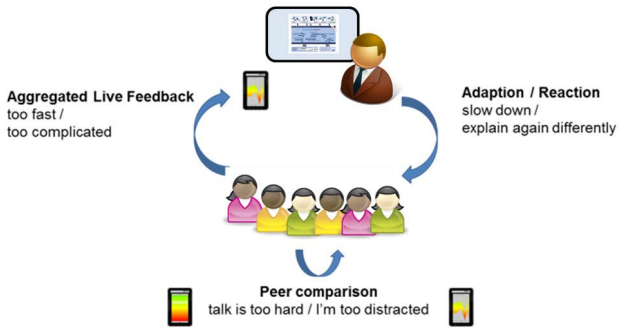

Figure 3: LIM App use case: integrated feedback and reflection loop ©Verónica Rivera-Pelayo et al.

The model in [10, 11] describes how Quantified Self tools like the LIM app can support reflective learning. It defines three support dimensions, which can be tackled by tools, namely: (i) tracking cues (capturing certain kinds of data as basis for the reflective learning process), (ii) triggering (fostering the initiation of reflective processes in the learner), and (iii) recalling and revisiting experiences (through the enrichment and presentation of data in order to make sense of past experiences).

In our approach, *tracking* is based on *self-reporting* through the LIM App. The tracked aspect is the users' quantified vote on the meter scale. Upon inspection the evolution graph can *passively trigger* reflection. Trigger may be visually significant differences between the user's vote and that of the group or sudden changes in the evolution graph ("Adaption/Reaction" in Figure 3). During *recalling and revisiting* the user can inspect the topic markers in the timeline, questions and polls. They provide *contextualization* and help to align the time series with the users' memorized experiences.

The collected highly contextualized data can serve as anchor for several aspects and perspectives of reflection: First, the presenter can assess the evolution of the quality of her presentation through time. Then she can reflect about differences between the participants' perception of events and hers on a very detailed scale. Second, members of the audience can compare their own ratings with the group aggregation ("Peer comparison" in Figure 3), which represents their *social context* and become aware of dissimilarities. By exploring the graph, it is possible to detect topics where a user's capability or speed of understanding deviates from the other classmates. Reflection might help identify reasons and improve the learning experience. The presenter can assess if a topic needs further explanation and examples in order to be comprehensible for the majority of the audience.

That is how the LIM App provides an integrated feedback and reflection loop for both the presenter and the audience.

4. EXPERIMENTS AND USER STUDY

4.1 Experimental Tests

The LIM App was firstly investigated through two experiments, in a lesson and a project meeting. The first informal test was conducted in a project meeting of 20 participants, with 10 active LIM users. This event was mainly discussion driven and the participants expressed in one of the questions of the survey how well did the LIM App perform for the following purposes (see Figure 4):

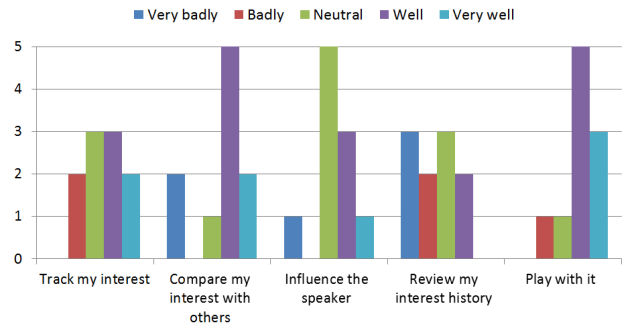

Figure 4: How well did the LIM App work for the following options?

Half of the participants opined that the LIM App performed well or very well to track their interest in the topic. The participants were willing to compare their interest with the others (50% indicated they could do it well with the app and 20% very well) but they also admitted to have played with the app (so the fun factor was already recognized).

A second technical test was performed in a lecture at the university, where we collected informal feedback from the participants. Technically the app performed well but the acceptance of the app was rather limited, as the lecture had a small group of students and the session itself was quite interactive. In such cases, the use of technical means to capture feedback and response answers are not considered as necessary.

In these informal tests, we got the first insights about the application: the LIM App is suitable for big audiences where personal contact is not established but it is not so suitable for events which are discussion driven, as then the role of the presenter is not well defined. After these experimental tests, and before moving towards bigger audiences, we conducted a user study to help refining the use case and guide the further development of the LIM app.

4.2 User Study

The user study was designed around the following research questions:

RQ1: In which scenarios and how can the quantification of feedback performed by the LIM App support reflective learning?

RQ2: Which features are more appreciated by users, both presenters and audience?

Firstly, 20 qualitative interviews with groups of the LIM App end users were conducted in order to investigate the use case scenarios and the application of the app itself. The interviewees included professors, teachers and students.

Many presenters or lecturers already collect feedback from their presentations and lectures, but they do it in the conventional way through written questionnaires or direct contact to their students. Technology supported feedback systems were not used among the participants and the idea of having a system like the LIM App, which allows them to give and get feedback, was very well received. This was also true for the audience, who was willing to give feedback not only after but also during their lectures. According to the participants, the anonymity of the feedback would result in higher audience participation and students would voice their own opinion more openly, without the fear of contradicting opinions or ideas.

The poll function was considered especially useful for lectures, because it allows lecturers to quickly evaluate the knowledge of their students. On the other hand, the chat was considered distracting and unnecessary. However, many interviewees were afraid of the distraction of both presenter and audience, if they focus more on the application itself than on the content of the lecture. Many of them also agreed that reflection needs time, and therefore they would better reflect after the event had taken place than during the presentation feeling under pressure.

In a second phase, we conducted an online survey based on our experience and the feedback from the interviews. Our aim was to get to know the disposition, opinion and ideas of potential users. For that purpose, we explained them the concept of reflective learning and its support with the LIM App (also including screenshots), before asking them several questions for assessment and evaluation. Questions referring to the role of the presenter (e.g. as teacher, professor or in conferences) were only asked to participants who had confirmed that they give talks and presentations(44,82 %), whereas other questions concerning the role of the audience (e.g. which criteria they would like to evaluate) were only answered by the rest (55,17 %).

The survey was online for a month (May-June 2012) and 120 people participated. We obtained 87 valid and complete datasets. In order to diversify the participants' background, we distributed our survey through various channels: personal relations to professors, colleagues and institutions, social media and our website. The age distribution of the participants was the following: 17-24 (36,78 %), 25-35 (41,37 %), 36-50 (12,64 %), and more than 50 (9,19 %).

Participants in the survey do presentations in different contexts: teacher at school (7,69 %), lecturer at a university (41,02 %), speaker in conferences (56,41 %) or presentations as part of their professional work (56,41 %). Regarding their audience, only 12,81 % present in front of more than 60 people, whereas the majority of the participants have audiences of 11-30 (46,15 %) or 31-60 (25,64 %) people.
The 48 participants who do attend presentations do it as students (89,58 %), in their free time (8,33 %), in conferences (6,25 %) and/or at work (22,91 %).

From the presenter's side, nearly 90 % of the participants would like to get feedback after each presentation, whereas around 72 % would also agree to get feedback during the event, for example after each section. Receiving feedback live during the whole presentation was chosen as ideal by 12,82 % of the participants and as OK by 25,64 %, but 33 % were indecisive.

Although the pressure for immediate feedback adaption was a concern among many participating presenters, 53,84 % think that they could achieve it during the presentation. Reacting to the feedback periodically (e.g. some days later) and in relation to the content blocks (e.g. between content blocks) seems to be the most popular option (76,91 %), what may be directly related to reflective learning practices from the data they gathered in past events.

All respondents expressed their opinion regarding several aspects of the LIM App, like if the adoption of a tool like this would completely distract the audience (18,39 %: strongly agree, 56,32 %: agree, 20,68 %: disagree, 1,14 %: strongly disagree) or if feedback must be anonym in order to be reliable and honest (41,37 %: strongly agree, 27,58 %: agree, 26,43 %: disagree, 3,44 %: strongly disagree).

We also asked in the survey about the capturing of the data. 64,36 % of the participants agreed with data collected live and continuously being better and more significant than only periodically collected data.

The second part of the survey contained questions about the concrete characteristics that the LIM App offers and which new features would improve the application. The chat function in the LIM App was considered unnecessary (4,59 %: very meaningful, 16,09 %: rather meaningful, 43,67 %: unnecesary, 33,33 %: absolutely unnecesary, 2,29 %: I cannot judge). On the contrary, the participants appreciated very much polling questions (34,48 %: very meaningful, 54,02 %: rather meaningful, 8,04 %: unnecesary, 3,44 %: absolutely unnecesary) and also the possibility to review old polled questions (28,73 %: very meaningful, 50,57 %: rather meaningful, 13,79 %: unnecesary, 2,29 %: absolutely unnecesary, 4,59 %: I cannot judge).

We also investigated which information they would like to track. Figure 5 shows that both speakers and audience members agree on pace and clarity of the examples being important, but disagree regarding the slides and documents of the lecture.

Summarizing the positive results, more than 3/4 of the participants (78,16 %) in the survey found the idea behind LIM App very positive and found advantages in using it.

5. CONCLUSION

This paper presented the Live Interest Meter, an application for gathering, quantification, aggregation and visualization of feedback in mass lectures and conferences.

It was developed with the aim of supporting reflective learning from feedback, by reacting to the feedback live as well as by exploring the data retrospectively. We conducted two experimental tests and a user study to investigate the acceptance, perceived usefulness and potential improvements of the LIM App.

Our acceptance study delivered a highly positive resonance and the idea of using a technology driven feedback system was well received. Our test subjects recognized the advantages of our feedback system and saw a possible benefit in its use. We also confirmed one of the main fears of end users: the potential distraction of the audience, by concentrating on the application instead of the presentation itself. In order to improve this, we will address this issue in dif-

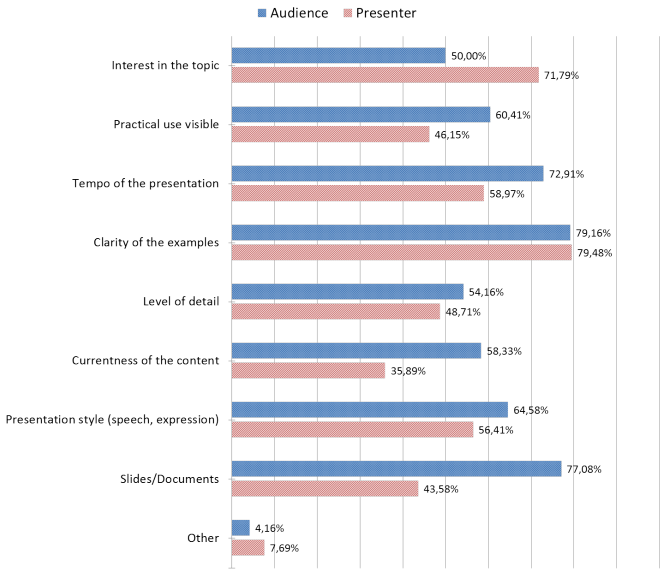

Figure 5: Which information would the presenters like to know about and which information does the audience want to evaluate?

ferent directions, e.g. by keeping the application as simple as possible to demand the minimum cognitive effort from users. To this end, the next prototype will only show the necessary information to the users or offer an introductory training to teachers in order to show them how to integrate the LIM App in their lectures and make the best of it.

Our efforts in developing the next prototype will focus on improving the support of recalling and revisiting past events, by creating a platform that allows users to explore their gathered data retrospectively.

Additionally, further improvements based on the feedback from the user study will be adapted, e.g. alternatives to the chat functionality will be explored and futher features to support the presenter will be adopted.

With the new prototype we will then be able to evaluate the LIM App again in the field and in this way validate our current results, which show the expectations and opinions of the end users. The main goal of this evaluation will be to prove that reflective learning among participants takes place with the support of the LIM App and that this brings a benefit and improvement for the learner.

Finally, some concerns regarding the students voluntarily participating and giving feedback were also mentioned in our study. To this extent, we currently work on motivation techniques to engage our users to use the application and investigate how gamification techniques can improve the adoption and long term use of the LIM App.

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