Feeler: feel good and learn better

A tool for promoting reflection about learning and Well-being

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Abstract. In this paper we present *Feeler*, a design-in-progress tool for visualization of learning performance and well-being with the aim of fostering reflection and awareness. The project combines two currently promising areas such as Personal Informatics and Learning Analytics in order to encourage learners to reflect about their lifestyle and its impact on their learning capabilities. It is expected that allowing learners to capture and visualize quantitative data about their states and habits will offer them rich materials that support individual and collective reflection-after-action processes. This project builds on participatory design and a research-based design process. Currently, the project is in a product design stage. The aim of the project is to develop a working prototype that follows a slow technology approach that can be tested in learning contexts.

Keywords. research-based design, information visualization, reflection, awareness, learning analytics, personal informatics

1 Introductory Scenario

Saga has difficulties to stay focused on her studies and she feels stressed because she can hardly complete the tasks. In a tutoring session, Saga's tutor suggests her that doing some regular exercise could actually help her to stay focused. Although Saga is skeptical, her tutor convinces her to use Feeler, a system that monitors her concentration levels and the amount of physical activity she has during a certain amount of time.

Feeler combines a head band that tracks brain activity and smart textiles to visualize the data. Small led lights are integrated in two wool wrist bands and they blink when the person loses attention for a certain time. Thanks to this gentle reminder Saga is more aware of her current capabilities and acts according to what her body needs. The light signal helps her to decide when to change the type of task or take a break. Data about exercise habits is registered through a mobile app. Information about concentration levels and physical activity is displayed in a screen. This allows Saga to identify patterns between the amount of physical activity and how long she is able to keep her attention. After a while of using Feeler, Saga realizes that after moderate exercise, she is able to keep concentrated for longer periods of time. She discusses

this with her peers and with her tutor and gets some suggestions about how to better plan her schedules.

2 Quantified-Self: a Tool for Self-Understanding

In many societies, computers have become an everyday tool that has adopted diverse forms: laptop, smartphones, tablets… The combination of these devices with Internet access and sensors has allowed people to collect data about a myriad of personal aspects dealing with physiology, behavior, habits and thoughts. In this context, the Quantified-Self movement has appeared as a way to develop self-knowledge through data. The availability of measurable personal data can be used, as [13] highlight, "for self-reflection to help people become more aware of their own behavior, make better decisions, and change behavior". (p.405)

Personal informatics, also known as Quantified-Self, has become quite popular in fields dealing with sports and health. In sports, some of the currently well-known body tracking products include Nike+ and its fuelband[1], Fitbit[2], RunKeeper[3] and Moves[4]. Concerning wellbeing, applications such as Withings[5], HeartMath[6], mindbloom[7] and Ubifit Garden[8] offer opportunities to users to learn about their progression and undertake new challenges concerning healthy habits.

In the field of e-learning, learning analytics takes advantage of the possibilities of data monitoring in order to understand and improve teaching and learning. Despite the intention is to empower teachers and learners, some critical voices [2] have warned that analytics could disempower learners by making them reliant on the institution feedback.

Considering the key role of self-knowledge for self-regulation and metacognition, self-understanding should be at the center of systems that monitor student data. In this sense, some authors [5, 3, 10] have noted that learning analytics should be considered as a tool for the student. Similarly, [17] highlight the need for a Self-Directed Learning approach in which students feel ownership, as well as they are able to self-manage and self-monitor their own learning. From this perspective, everything should be oriented to help learners to take control of their own learning processes and experiences. In order to encourage self-understanding of learning processes, it is crucial to stop considering learning as an isolated activity that does not interrelate with other aspects of peoples' lives. In general, educational institutions should understand that they are only one venue where learning happens, and to utilize holistically the other areas of life where their students are active. Qualitative aspects, such as the student's well-

1 Nike+ fuelband. http://www.nike.com/us/en_us/c/nikeplus-fuelband
2 Fitbit. http://www.fitbit.com/
3 Runkeeper. http://runkeeper.com/
4 Moves. http://www.moves-app.com
5 Withings. http://www.withings.com
6 HeartMath. http://www.heartmath.com/
7 Mindbloom. https://www.mindbloom.com/lifegame
8 Ubifit Garden. http://dub.washington.edu/projects/ubifit

being, might be worth to be taken into consideration since they can impact learning performance. In this paper, we propose an innovative approach to learning analytics since we combine data about well-being with learning performance. The research question that drives this project focuses on how to foster reflection about learning capabilities in relation to a person's well-being.

3 Visualizing the Data for Reflecting

Making sense of large datasets composed by numerical and textual information can be handled much easier if the information is visualized. Due to the power of images for synthesizing complex information, information visualization has been recognized as a powerful tool for reducing cognitive load, offloading short-term memory, allowing for easier comparisons, and generally facilitating inferences [16, 18].

According to [14], visualizations should be conceived as transformation processes within the Data-Information-Knowledge continuum. From this perspective, Masud et al. claim that visualizations are not merely the final outcome of representing data, information and knowledge, but that they should be understood as a process since they provide awareness, as well as social and reflective insights.

[7] have also highlighted the strength of visualizations as tools for sense making in which information is collected, organized, and analyzed to generate knowledge and inform action. According to these authors, sense making is often a social process involving parallelization of effort, discussion, and consensus building. Some web-based collaborative visualization systems that go in this direction are Sense.us, Spotfire[9], Wikimapia[10], Many-Eyes[11], among others.

Visualizing the data can be a powerful resource for supporting reflection, individual or in groups, and therefore gaining awareness. Considering the strong link between reflection and learning [15], we can anticipate that the reflections that take place through the analysis of visualizations would lead to learning. In this sense, visualizations can trigger reflection-after-action processes helping the learner to develop new understandings and appreciations [1].

Some of the research questions that emerge in this context, is how to make large volumes of data meaningful for users. How should this data be displayed in order to improve self-understanding, reflection and awareness? One answer to this question can be found in the design philosophy underlying slow technology. According to [6], slow technology responds to the need of actively promoting moments of reflection. Reproducing their words “A key issue in slow technology, as a design philosophy, is that we should use slowness in learning, understanding and presence to give people time to think and reflect” (p.203).

The visualization of information dealing with learning and well-being through smart textiles could be perceived as an object for reflection in the sense that it encou-

[9] Spotfire. TIBCO Software. http://spotfire.tibco.com/discover-spotfire
[10] Wikimapia. http://wikimapia.org
[11] Many-Eyes. http://many-eyes.com

rages the person to take some time to think about his/her habits. Smart textiles, also known as electronic textiles or e-textiles, refer to the use of electronic components and advanced fibers in garments [8]. Research on these kinds of smart textiles has advanced during the last years and some applications can be found in the military and medical sector (Georgia Tech Wearable Motherboard™ [12]), work (PROeTex[13]) and in sportswear (Nike Hyperdunk+[14]). Apart from that, smart textile applications can be also observed in the entertainment industry (midi controller jacquet[15]), as well as in fashion design [16] and arts communities (e-motion project[17]). Smart textiles offer great opportunities, not only for capturing data but also for displaying it to the person in a discrete, subtle and personal way.

4 Methods

To design tools that effectively assist self-reflection, it is crucial to understand how people think about well-being and learning in relation to their everyday practices. For this reason, the project builds on a research-based design process [11, 12]. It is an iterative process characterized by the following phases: contextual inquiry, participatory design, product design and prototype as hypothesis. The aim is to involve users from early phases of the project in order to incorporate their expectations and needs. In the contextual inquiry, designers focus on achieving a deep understanding of the socio-cultural context of the design. The information gathered during this phase is used to develop use scenarios that are discussed in participatory design sessions with the people who later will use the designed products. Participatory design sessions provide designers feedback and inspiring ideas that may inform the product design. It is important to note that despite users contributions are key elements of the design process, final decisions are taken by the designers. The transparency of the process and the continuous tests and redesigns guarantee that participants' views are considered throughout the process. However, designers are the experts that will make decisions on the prototypes.

At the moment, 6 exploratory interviews have been realized to people aged between 24-60 years old that combine work and studies and that are concerned about their well-being. The interviewees were asked to take some pictures and write a short text about how they would represent well-being, health and mindfulness in their everyday life. Images and texts were adapted to a card layout and used during the interviews as a starting point of the conversation. The information gathered during the interviews informed the participatory design session that took place during the 2nd Multidisciplinary Summer School on Design as Inquiry[18]. The workshop helped to

[12] Georgia Tech Wearable Mother Board™ http://www.gtwm.gatech.edu/
[13] http://www.ugent.be/ea/textiles/en/projects/afgelopenprojecten/Proetex.htm
[14] Nike Hyperdunk+. http://swoo.sh/17nJBtl
[15] Midi controller jacquet. http://kck.st/ZX78u2
[16] Fashioning technology. http://www.fashioningtech.com
[17] E-motion project. http://www.design.udk-berlin.de/Modedesign/Emotion
[18] 2nd Multidisciplinary Summer School on Design as Inquiry. http://bit.ly/1cmOunJ

gain insights of people's understanding of learning and well-being, as well as to brainstorm some ideas about what aspects could be worth to quantify and how to visualize the data. In the short-term, next steps include the development of the concept design, building of low-fi prototypes and the organization of more participatory design sessions. The aim of the project is to develop a working prototype that can be tested in learning contexts.

5 Feeler prototype

Feeler is a tool, currently still under development, that allows learners to monitor some aspects of their well-being, such as the amount of physical activity and concentration levels, in order to improve their learning. Feeler will combine data about personal well-being with metadata of learning materials such as the amount of time a student has logged into the system and the times when she connected. The reason for using learning analytics is for increasing understanding about the conditions in which a person is more willing to learn.

It is expected that this tool will support learners' reflective thinking about their lifestyle and the impact it has in their learning capabilities. By focusing in a personal matter such as well-being, the tool connects with some of the elements outlined by [4] about reflective thinking: a state of perplexity, hesitation and doubt; (in case that the data collected doesn't correlate to the learners assumptions) and an act of search directed to corroborate or to invalidate the suggested belief (people may feel motivated to understand why the data collected by the system contradicts their initial thoughts). The outcomes of engaging in such a reflection process about one's well-being and learning performance include (1) new perspectives on experience, (2) changes in behavior, (3) readiness for application, and (4) commitment to action [1].

Early prototypes of the suggested tool (fig.1) are based on the use of a headband that monitors the brain activity, for instance the Melon band[19] and a mobile app that tracks physical activity (Moves[5]). The head band can register different states of mental activity in order to determine a person's level of focus. Information about how much concentrated is the person for a specific amount of time would be displayed through a smart wool bands placed in the person's wrists. Depending of the concentration level, some led lights would activate. The more concentrated you are, the more intense would be the lights sparkling in the wool bands. Less levels of concentration would be associated to less intensity of the lights. Information about physical activity is monitored through the mobile app Moves. In this case, no specific action nor extra device are required. Once downloaded the app, the person just has to carry her phone wherever she goes and it will detect the type of activity performed (walk, run or cycle), the duration and the distance travelled.

[19] Melon. http://kck.st/13uYmbQ

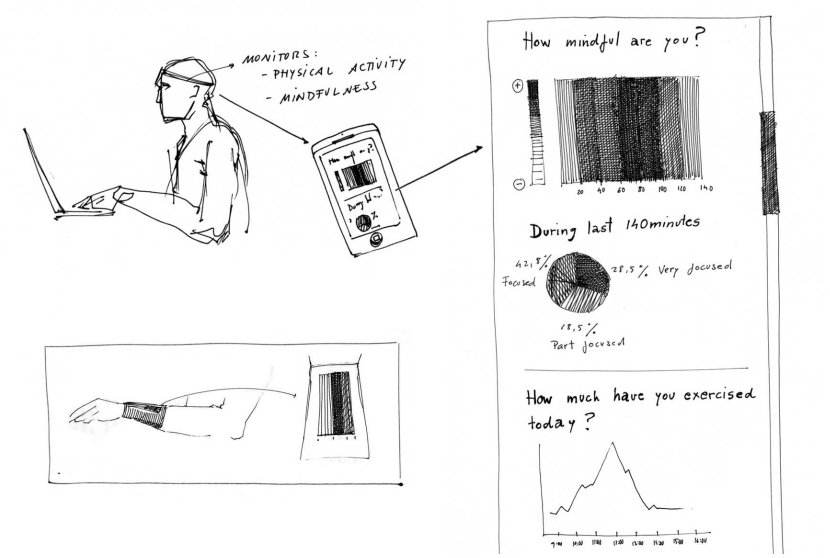

Fig. 1. Sketches of Feeler prototype.

Data about the level of focus and physical activity will be displayed together through a screen (fig. 1). The intention is to allow the person to observe trends, get into details and establish correlations. By offering the users different levels of reading, we expect they would engage in reflection processes that can lead to meaningful group discussions.

6 Conclusions

The underlying assumption of the research is that information visualization can be a powerful tool for encouraging reflection and awareness. By drawing the attention to learning and well-being, the project combines two currently promising areas such as Personal Informatics and Learning Analytics. It is expected that allowing learners to capture quantitative data about their states and habits will offer them rich materials that support reflection processes.

Even if Feeler can be used in very different settings, we consider that the tool has great potential in higher education since reflective practices help facing life's challenges and encourages attention and analysis habits key for addressing the problems of society [15].

Regarding the design of the prototype, slow technologies bring inspiring since, rather than designing for effective work, the aim is to foster reflection. In this sense, some initial sketches focus on smart textiles for displaying the information following a slow approach. In this sense, we consider that not only the tool, but the design as well should support reflective practices.

7 References

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