Chapter 1

CASE STUDY OF ASCIT:

AGAIN AT MY SCHOOL BY FOSTERING COMMUNICATION THROUGH INTERACTIVE TECHNOLOGIES FOR LONG TERM SICK CHILDREN

Fabian Di Fiore Wim Lamotte Frank Van Reeth*
Hasselt University
Expertise Centre for Digital Media - IBBT
transnationale Universiteit Limburg
Wetenschapspark, 2
BE-3590 Diepenbeek (Belgium)

Els Janssens†
Bednet vzw
Bondgenotenlaan, 134/4
BE-3000 Leuven (Belgium)
http://www.bednet.be

Abstract

In the IBBT ASCIT project, several elements of multi-user virtual environments are combined into an integrated demonstrator that enable long term sick children to communicate efficiently with their regular school and classroom learning environment by means of an elaborate internet connection between home/hospital and class. This chapter will elaborate on the actual deployment of the ASCIT-project in class rooms in Flanders during school years 2007–2012. We will discuss the post-hoc evaluation of all actors involved in past cases as well as the implementation of a roadmap to successfully setup ASCIT-like support for long term sick children.

Key Words: E-Learning, E-Health, Edutainment, Collaborative Learning, Virtual Learning Environment, Virtual Interactive Communities

*{fabian.difiore, wim.lamotte, frank.vanreeth}@uhasselt.be
†els.janssens@bednet.be

1. Introduction

During the last decades, health-care has moved from a hospital-based to a rather ambulant treatment because hospitalisation periods are shortened and treatments are increasingly carried out at home. When children are involved, this evolution not only affects health care, but also education: the responsibility to provide long-term and chronically ill children with education shifts from the hospitals to the school which the children attended before school absence.

Motivation. Empirical exploration reveals that regular schools in Flanders (the Dutch speaking part of Belgium) are hardly able to set up high quality instruction for home-based pupils. Most efforts focus on the re-entry of the child in the community and school after being hospitalised rather than pre-empting this process by bringing the community and school to him [1–3].

The assumption of the present chapter is that information and communication technologies (ICT) may contribute to a high quality school experience of children that are absent from school due to medical reasons. The system that we envisage is based on concrete user needs, and is therefore assumed to be educationally sound and relevant. It is furthermore scalable and affordable as compared to previous ICT-based tools for this user group.

Contribution. Through the IBBT ASCIT project we aim to re-establish the communication link between sick pupils and their regular classrooms with regard to improving instruction and social contacts and this before the moment of school re-entry. Several elements of Multi-user Virtual Environments are combined into an integrated solution that enable long term sick children to communicate efficiently with their regular school and classroom learning environment. By presenting them with an attractive and a game-like interface, combined with state-of-the-art audio and video communication means, the children are encouraged to spend time using the system and to keep up with the day-to-day activities in the classroom environment.

We first clarify the design, development, implementation and evaluation of the ASCIT-project. The core of this chapter will elaborate on the actual deployment in class rooms in Flanders during school years 2007–2012. The system has been deployed by Bednet: an association without lucrative purpose which enables long term sick children to attend school by means of an elaborate internet connection between home/hospital and class. We will discuss the post-hoc evaluation of all actors involved in past cases as well as the implementation of a roadmap to successfully setup ASCIT-like support for long term sick children.

2. Strengths and Weaknesses of Existing ICT-Tools

To date, a variety of solutions, based on the integrated use of information and communication technologies (ICT), has been developed and implemented in several settings. Unfortunately, a systematic evaluation of these attempts is often lacking.

The most well-known example is provided by PEBBLES (Providing Education By Bringing Learning Environments to Students), an advanced prototype solution developed

in the USA and Canada [4]. It was launched as the world's first fully functional 'telepresence' application: a social and technological solution that virtually places a child within the classroom by putting a robot in the regular classroom. Communication interactions and initiative learning behaviours started at high frequencies but for short duration compared with concentration behaviours in all cases. However, there was a general trend towards fewer communication interactions over time as initial enthusiasm faded out [5].

A second remarkable ICT-tool to support children with health impairments is STARBRIGHT World (SBW), an online community where children can connect to each other. Children on SBW can chat, read and post to bulletin boards, email, search for friends with similar illnesses, participate in fun events and contests, surf pre-screen Web sites and play games [6]. Battles and Wiener, however, pointed out that the communicative possibilities were seldomly used by the children: only 3% to 15% of the time was spent on communication [7].

In Flanders, the Dutch speaking part of Belgium in which our project is carried out, a type of video phone is already in use to support long term sick children to stay in touch with their family and peers at school [8]. However, an introductory empirical exploration revealed that hospital staff members experience some problems with these tools including asynchronous delivery of sound and images, basic video connection capabilities of rather low quality, and the expensive cost per minute of talking.

Besides the use of this video phone device, the use of electronic learning environments (ELE), through which the school, parents and pupils get in touch more regularly, are increasingly promoted. However, these tools build heavily on text-based input and are less suited for pupils of elementary school age. Furthermore, we believe that traditional electronic learning environments fail to support active interaction between the end-users.

3. Design and Implementation of ASCIT

Through an iterative process, four interacting steps based on the design models of Passerini & Granger [9] and the IDI-model of instructional design [10] were undertaken: (i) an analysis of user needs, user characteristics and preconditions, (ii) the design of a prototype (according to a functional analysis), (iii) the development of the prototype, and (iv) the evaluation of the prototype.

In this section we will mainly discuss the highlights of the development cycle of which an elaborate discussion has been published in previous work [11].

3.1. User Needs and Task Analysis

Needs were analysed with regard to two major processes in children's lives offered by schools: socialisation opportunities and instruction. With regard to the current socialisation opportunities of the participating children, we found that social activities such as playing and cycling together to school and back were the things they missed most during periods of school absence. Regarding current instructional experiences, most of the participating children indicated to miss the experience of being taught in a classroom environment.

They stress two considerable differences between instruction at home or at the hospital and class-based instruction: the subjects (learning content) and the didactical strategies

differ. Most children are taught the main courses and miss the courses they can no longer take, specifically gym. This indicates that instruction is very important for children in one way or another, even if they are not able to attend school. The same goes for didactical strategies: the interviews with children, the surveys of teachers and the observations point out the unbalanced proportion of individual didactical strategies as compared to group-based didactical strategies.

In sum, we can state the most preliminary needs found were (i) to improve the socialisation opportunities which children usually experience at school by offering them the opportunity to communicate synchronously and without go-between such as teachers or parents, and (ii) to supplement the current instruction these children have at home or at the hospital, in particular with regard to curriculum subjects and didactical strategies.

3.2. Functional Analysis

In the functional analysis we examined the translation of the detected needs into technology design requirements. Teachers were asked to identify an activity they did recently and in which they would have liked the sick child to participate by means of an ICT-device. Most of them would use the tool for project-based classroom activities. Within these projects, they would use the ICT-tool most for practical, hands-on activities, such as creating an exhibition and performing energy experiments. These practical activities are most of the time group-based.

Furthermore, some of them would use an ICT-device for non-practical group activities, such as a group conversation and a meeting in order to accomplish a project. Less, but still a few teachers would also use an ICT-device for individual tasks and instruction. These results are in line with the needs for more group-based didactical strategies reported by the participating children. With both groups of end-users (children and teachers) we searched for technical requirements the ICT-device has to meet, to fulfil these needs. The most important findings and related requirements are:

(i) When children were asked what they would look at using an ICT-tool, most of them answered “my friends”, followed by “the teacher”. Furthermore, some teachers point out the significance of audio quality, for example to follow a group discussion.

(ii) All participants showed a positive attitude towards the communication opportunities offered by ICT-use. Hence, the synchronous requirements for both formal and informal contacts were studied in greater detail. As for formal contacts during lessons, a remarkable finding is that almost half of the children and all teachers want to have the opportunity of passing on notes, work pages, etc. in the most appropriate way. As for informal, social contacts most participating teachers and children believe requirements formulated regarding formal instruction are enough to fulfil the social needs.

(iii) Half of the children and more than half of the interviewed teachers also hope some asynchronous functions will be available. They want a storage place in a secure internet environment to post all kinds of messages.

(a) (b) (c)

Figure 1. Views of the school environment. a) The virtual playground. b) The school building. c) Pupils represented by video avatars.

3.3. Technical Development

Based on the findings of the first two design phases a non-working Flash-based mock-up version of the prototype was developed, divided into a student-module and a teacher-module.

A set of usability tests was conducted with this mock-up in various settings. No virtual link was actually available at that time. These preliminary tests tried to examine the global user experience, as well as the way of interacting with the system and the already implemented functionalities, for the sick children as well as for the teachers. Most of the tests were conducted at the UZ Leuven (University Hospital) School and at the UZ Leuven itself. After each test, the combined video tapes, log files and interview notes were examined in a qualitative way. Specific attention was paid to inter-observational findings or returning observations concerning the user interface, functionalities or overall user experience.

Both modules were treated separately. The results of the child module tests can be divided into three parts: overall experience, function buttons and navigation. As far as the mock up teacher module concerns, the results were twofold. In general, teachers experienced more problems when walking around in the virtual world but also reported that the document management navigation was not accurate enough.

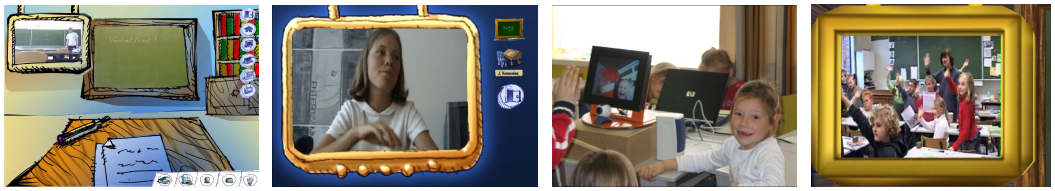
Through an iterative process the technical development was refined after which all test results were reformulated and translated into concrete recommendations to be incorporated during the implementation phase.

3.4. Implementation of the Virtual Learning Environment

Virtual Communities (VC) are defined as communities of people which share the same interests or ideas and who are remotely present through the internet [12]. The virtual learning environment that we developed is a virtual community in which pupils that are absent from school due to health-related problems are still ‘telepresent’ in their regular classroom.

As children of elementary school age are assumed to prefer non-abstract environments with a limited amount of textual cues [13], the overall concept of the system is based on an attractive 3D world in which the individual children are represented by an avatar (Figure 1). Furthermore, to initiate intuitive and natural interactions the virtual environment supports communication, authentication, personalisation, and presence.

When starting the application, the users (sick children as well as their classroom teachers) automatically end up in the 3D virtual environment. Navigating in this virtual world happens by means of a graphical personification of the user, which is called an avatar. By navigating through the virtual world, pupils can enter the virtual classroom. Unlike the rest of the world, the classroom is represented by a fixed and static 3D view containing the most important elements of a real classroom, such as a blackboard, a desk and a bookshelf. The virtual classroom, which is depicted in Figure 2(a), is the only place in the virtual world where the child with a chronic or long-term illness can join classroom teaching synchronously and asynchronously. The 3D-environment outside the virtual classroom is intended to offer a space for social contacts with classmates.



(a) (b) (c) (d)

Figure 2. Example view of the classrooms. a) As seen by the pupil. b) View of the pupil as seen by the teacher. c) Classroom setup. d) Live view of the class as captured by the webcam present in the classroom.

To follow classroom instruction synchronously, the sick child on the one hand and its classmates and teacher on the other communicate through video-chat, similar to using a teleconferencing system. Consequently, the sick child is equipped with a webcam and a headset. The classroom-end of the tool is equipped with a microphone and one or more controllable webcams which are permanently mounted. The pupil can watch the general instruction offered by its own teacher as shown in Figures 2(c–d). Furthermore, a printer and a scanner are available at both ends of the tool to facilitate document exchange between the two settings. By clicking only one virtual button, homework and corrections can be printed, scanned or transmitted automatically at both ends (Figure 3).

In the same way as for the sick child, the teacher enters the virtual classroom by navigating through the virtual environment. In contrast to the sick child's interface, the classroom interface needs fewer input from the teacher (see Figure 2(b)). As a result the teacher is not distracted from the regular teaching process by using the tool. The child also has a wide range of remote control functions including a virtual button to attract the teacher's attention and controls to move the viewpoint of the camera and regulate the audio stream sent to the classroom. Furthermore, in the classroom a photo camera is added to permit the sick child (and its teacher) to take a snapshot of the blackboard or something else whenever more detail is needed than offered by the webcam.

Regarding asynchronous use, an online school diary and a lesson schedule are provided. Teachers indicated in the functional analysis the importance of keeping the remote child informed concerning the exact moment each lesson is scheduled. Through the scan function, the teacher can automatically transmit/publish diary pages of classmates or a lesson schedule. In addition, the metaphor of a virtual book shelf, where information can be stored or

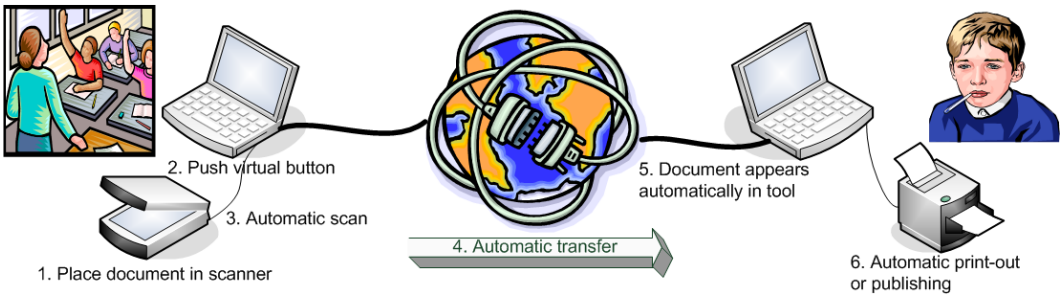


Figure 3. Automatic scan, transfer and print-out/publishing.

retrieved, is used. For example, there are public books which can be created or read by any user (e.g., to share pictures of the latest field trip). But there are also personal books which can only be created or read by the sick child and the teacher (e.g., a book to pass through homework) (see Figure 4).

(a) (b)

Figure 4. a) Pupil's personal desk containing personal books like diary and homework. b) Class library used to store public virtual books.

4. Bednet

In Flanders, every year, more than 2,000 children between 6 and 18 years need to recover at least one month from surgery, an illness or an accident. They often have to stay at home for long periods of rehabilitation or have to go to hospital frequently for medical treatments. This means they cannot attend school.

In 2004 the Flemish association without lucrative purpose Bednet was founded with the objective of linking these children over the Internet to their classroom .

Bednet was involved in the development of the ASCIT-project and has deployed the system for about 580 children in class rooms in Flanders during school years 2007–2012. Bednet, however, offers more than just a technological solution. When a chronically ill child signs up, a regional Bednet employee will prepare the entire process to follow, in collaboration with the school, the hospital school, the parents and any voluntary organisations.

Complemented by stored procedures, a smooth running of the service, adapted to suit the child, is ensured.

In the following sections we will discuss the post-hoc evaluation of all actors involved as well as the implementation of a roadmap to successfully setup ASCIT-like support for long term sick children.

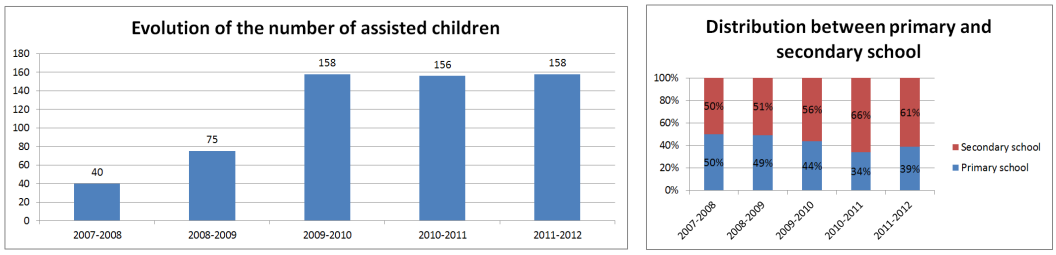
5. Post-hoc Evaluation

The following evaluation was made based on information obtained from interviews and observations of the users of the Bednet system at different levels (student, teacher, management, parents, ...) as well as reflection of the Bednet team on the course and use of the system. Although the target group is very diverse in terms of age, pathology, education etc., several trends can be determined.

5.1. Facts and Figures

In 2006 and 2007 a first series of pilot projects was deployed for a small number of chronically ill children in order to further refine the system. During the first full school year, 2007–2008, Bednet assisted 40 children. In the following years the number of children that simultaneously used the system increased steadily. The average duration of assistance is 170 days or about 6 months; some chronically ill children, however, depend (with periods) even more than a year upon Bednet. Figure 5(a) depicts the evolution for the four school years between 2007 and 2012. Note that due to capacity constraints the maximum number of simultaneous users is limited to about 150 which explains the status-quo for the last three school years.

The distribution between primary school (between ages of 6 and 12 years) and secondary school (between ages of 12 and 18 years) has changed from almost equal in the first years to a significantly high proportion of secondary school children in the last years (Figure 5(b)).

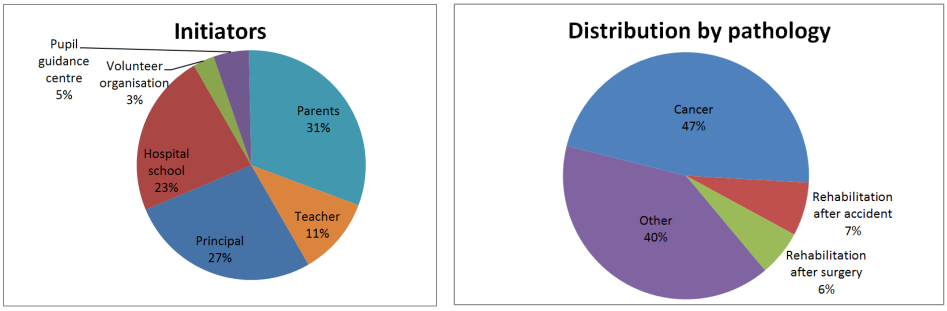


(a) (b)

Figure 5. a) Evolution of the number of assisted children. b) Distribution between primary and secondary school.

The initiators to submit an application to Bednet vary from year to year but on average most applications are submitted by the parents, the school and the hospital school (Figure 6(a)).

Finally, if we look at the distribution of children according to pathology, we notice a majority of cancer patients among the children. Among the others, a small number is rehabilitating from an accident or surgery, but to a large extent isolated, sometimes exceptional diseases are involved ranging from arthritis to xeroderma pigmentosa, brain hemorrhage, CFS, heart problems or psychological problems (Figure 6(b)).



(a) (b)

Figure 6. a) The initiators. b) Distribution by pathology.

5.2. Differences in Needs and Expectations between Primary and Secondary Education

Primary Education. While at primary school children undergo a huge change in emotional development. They rely on their teacher, often very explicit, they learn to handle their emotions and even learn to deal with the presence of a sick classmate. Hence, a close relationship is built up with the classmates and teacher.

As a result, the regional Bednet employee not only has to provide socio-emotional support to the Bednet child but also to the class teacher and the classmates. The regional employee regularly is asked for advice or active engagement. The extent to which the regional employee of Bednet will be engaged, depends on the added value of the intervention to the success of that project.

Especially children from the first grade and certainly children starting in September need more extensive support. They are not yet familiar with the scholarly environment and are at the very beginning of learning to read and write.

Secondary Education. Concerning secondary education, starting up projects is different and often more difficult.

In first instance, because of the variety of subject teachers a larger number of people is involved in the project which makes communication more complex. In addition, the pressure experienced by teachers to meet the curriculum requirements sometimes translates into pressure on Bednet to lower the expectations towards the teachers. This can be noticed in small cases such as limiting the meeting time in the start-up period. On the other hand, teachers have technically higher expectations but lower tolerance when dealing with technical obstacles due to the time pressure. The feeling of “it does not work” also affects the motivation of teachers.

High technical expectations are also noticeable in the case of the children and in particular among young people who follow courses both in school as through Bednet, which occurs much more frequently in secondary school. As they repeatedly are confronted with the difference between school attendance and remote presence, they do not get accustomed to their situation leading to frustration and anger.

The Bednet child self is often more closed, struggling with his own feelings and therefore less communicative. As a result, on the one hand there is little talk about the pathology while on the other hand much understanding and empathy is expected. But also his classmates have to cope with their emotions ranging from being confrontated with the illness to a feeling of unfairness (e.g., why does my sick classmate have to spend less effort to obtain the same degree?)

5.3. Pedagogical and Didactical Findings

Impact on the Classroom. Teachers indicated that especially in the first week the pupils somewhat where distracted by the Bednet system. The teacher as well experiences in the beginning an increased pressure as he has to cope with this new way of work in addition to the already (not so easy) classroom management. All actors, however, mentioned also that this increased pressure disappears after a period of almost two weeks as routine sets in.

Teaching Methods. Although explaining was the most commonly used teaching method, in a majority of the projects we also noticed various other methods such as collaboration, group work, lectures, role playing, and even playing board games, crafting or singing together. Children mainly remembered the latter methods in their evaluations. The motivation and engagement of the teacher determine how well the application is employed but a good support and training of the teachers nevertheless is very important.

Results Regarding Falling behind in School. Being successful in school is important for all children. Many of the ill children, however, are afraid of falling behind in school which puts even more pressure on them. The risk of falling behind is highest for subjects such as mathematics and languages as they build upon prior knowledge.

Virtually everyone involved pointed out that the Bednet system had a positive effect on preventing the children from falling behind. The fact that pupils can get immediate feedback from their teacher works extremely motivating, as well as the fact that children are able again to compete with their classmates.

Bednet was also used for evaluation moments including many small tests and some (oral) exams. This way, teachers regularly can observe the child and remediate at once. For the pupils it is also a positive signthat their learning efforts are rewarded.

5.4. Psychosocial Findings

The world of a child or teenager primarily consists of attending school. Concerning chronically ill children, attending school and learning are as vital for their social-emotional wellbeing as medical treatment is for their physical wellbeing. Friendship plays an important

role in the development of social and communication skills. It also influences the performance of children in the classroom. When children feel supported by their classmates, they will also be able to have strong relationships with their peers, which will help them in dealing with different aspects of their disease [14]. In several projects, thanks to the use of Bednet a bond has (re)created with the classmates. For this reason it is of primary concern to let the classmates operate the equipment.

While humans have an inherent desire to belong and be an important part of a group, sick children are constantly confronted with the feeling of being different. Therefore, 'claiming' a place in the classroom is an opportunity to show that despite their illness they are still worth something and capable of much. It also lowers the threshold to go back to school for children whose appearance has changed because of the treatment of the disease.

Also for the classmates this contact is heartening as their friend is present again and not longer only associated with severe illness.

5.5. Perception of the Children and Teachers

Perception of the Children. When people are faced with a major event in their lives, life gets divided into "life before and life after". This is also the case for children who are suffering from acute or long-term problems. Bednet is a means to make the link between the two. It is a grip, a connection with life as they have always known and where they want to return when they are feeling better. Also, being ill, many decisions and opportunities are taken off the children's hands. Bednet is thus an excellent opportunity to become more independent again which is very important for teenagers.

Nevertheless, for children with chronic problems Bednet can also be an confrontation with the feeling of being different and, hence, will be part of the illness. In that sense, we must be alert for not being counterproductive.

Perception of the School/Teachers. With regard to acutely ill students, we notice that the school's expectations in terms of the curriculum are lowered. Because acute problems are often clearly defined problems and also limited in time, it is relatively easy to prepare a custom curriculum.

When faced with chronically ill children, there is a again a willingness to reshape the curriculum and the expectations with respect to the pupil are likewise adapted. The emotional charge that is involved, however, refrains teachers from defining clearly and daring demands.

It becomes more complex when the student is suffering from a chronic illness. We note that in that case it is often difficult to make adjustments to the curriculum and adjust one's expectations. Moreover, we even see a tendency to exceed the expectations with respect to the behaviour of the sick pupil. The sick child is presumed to be a model pupil: he must cooperate well, must be motivated, ... In the end it seems that teachers totally ignore the fact that the child is ill. There are a number of factors that are (possibly) responsible for this perception and attitude of school teachers. It may be that the diagnosis or pathology sounds 'vague' because little is known, or even because prejudices exist (e.g., the difference between being labelled "mucosal" or "CVS"). Because of this vagueness teachers cannot predict the impact of the diagnosis on the learning of the sick pupil.

The perception that lives at school about the family also plays a role in the way how is dealt with the chronically ill child. Underprivileged families or households with less strong communication skills are more likely to end up in a situation of mutual misunderstanding.

6. Roadmap to Setup Support for Long Term and Chronically Ill Children

This section provides an overview of the steps taken by Bednet and its partners. It can be employed as a roadmap for starting similar support for chronically ill children.

6.1. Vision

Bednet's purpose is to reduce the learning disability for children with long term and chronic illnesses and to sustain the social interaction with classmates. To this end, following principles are fundamental in order to provide an educational as well as social solution:

1. the learning environment should meet the needs and expectations of the pupils and teachers;
2. the system should be simple and easily accessible;
3. the use of the system should be for free for the child, school and hospital;
4. the school remains responsible for the content of the curriculum.

Furthermore, concerning existing initiatives it is important to be complementary to everything already organised such as hospital schools and services provided by the health insurance, municipalities and voluntary associations.

6.2. Organisational Operation

Bednet consists of a managing director, two regional coordinators, IT support and 9 (part-time) regional staff members. The managing director and regional coordinators as well as ICT support are appointed by the Flemish Government whereas the regional staff members are allocated by the provinces.

Regional Operation. Bednet strives to work with regional employees to establish a direct link between the school and the family, and to closely monitor the projects.

The regional employee is the key person for each Bednet project and is responsible from the beginning till the evaluation. He starts with the not so easy task of listening to all stories. Although teachers, parents, medical staff and many others are concerned about the sick child, it is of great importance to inquire about their motivation to start up a Bednet project. Occasionally there is pressure to skip or shorten the introduction phase in order to start the project earlier, however, we cannot stress enough the importance of gathering proper information prior to the start of the project. Another crucial factor to find out during the introduction is the relationship between the school and the family. Is there a smooth interaction? Are there ambiguities, questions or disputes?

Regional staff members are also responsible for local networking: meeting colleagues, building a professional relationship with potential referrers, establishing ventures with other organisations and hospitals ... In this way the regional employee advertises Bednet and at the same is building an overview of all possibilities for sick children in the home region.

Involved Actors. When a child becomes ill, the whole family ends up in a new world with many new actors playing a role in their life: physiotherapists, home care, social service, doctors, nurses, ... But also the child's education becomes more complex as besides the regular school several new people are involved such as a teacher from the hospital school, volunteers and Bednet.

Therefore, to ensure the smooth running a coordinator responsible for the project should be appointed. This coordinator will be in charge of managing the project, can act as contact person and may take initiatives to optimise the child's education.

Duration and Scalability. The average duration of the projects is about 6 months, ranging from 6 weeks to a full school year. There is no link between the duration of the project and a purposeful use of the system. All projects were perceived as meaningful by the end users. Even teachers who applied the system for only a short period in their classroom in them, used it in a very meaningful way.

Scalability is on ongoing challenge. On average, per full-time regional employee 20–25 children can be supervised.

Collaboration with Hospital Schools. Collaboration with hospital schools is essential: for years they are the experts when it comes to education for sick children. From that point of view, it is important to regularly keep contact and exchange feedback.

Education at Home. Many children also made use of the right (according to flemish law) of temporary education at home. From the evaluation interviews we learned this is a very rich and successful combination which reduces falling behind to an absolute minimum.

6.3. Technical Organisation

For ICT support and technical organisation in general, a third party was contacted.

Inventory Checking. Appliances are always labelled and coded allowing to exactly track the location of each device and part. The inventory also provides an extensive overview of all (occurred) issues for each device.

Configuration. Every system is controlled twice before being used: (i) immediately after purchase and during inventory checking, and (ii) upon installation. Furthermore, for each new setup, all software is installed and configured from scratch and peripherals are connected and verified against a check list.

On Site System Setup. While setting up the computer a network connection is provided as well. Several technical tests are then performed in order to detect technical issues immediately. Although it takes a half to full day for each setup, it is of psychological importance that the child or teacher is present for a while.

We also noticed that special attention has to be given to primary school children. Children from the first year till the third year, for example, have to be provided with special equipment such as a computer mouse that is adapted to their small hands or an extra headset so the parents can follow the lecture together with the child.

Technical Interventions. At any time during the project, children and teachers can rely on technical support. There are several index cards and procedures available containing useful information and check lists to follow, but when necessary, the ICT support team can take over the computer remotely in order to find and fix the problems.

However, technical assistance by an adult during the lectures still is recommended. Particularly primary school children are too young to communicate directly with the help desk or tend to loose patience quickly when technical difficulties arise. The same applies to the classmates who cannot take responsibility yet for operating the classroom equipment.

On average 5 interventions are needed per project. In case of small problems (e.g., sound, printer) live support via instant messaging suffices. These kinds of interventions do not last longer than 15 minutes.

Moreover in the beginning of each project, technical difficulties arise which, strictly spoken, are not technical problems but (common) user mistakes. Several steps have been taken to avoid these technical annoyances including online instruction movies explaining, for example, how to change an ink cartridge. These small initiatives really can make a difference.

Time Usage. During school year 2011–2012 (156 projects) approximately 2 technical employees were allocated. About 60% of their time was spent to purchase, inventory, configure and setup the systems. Approximately 30% of the time was spent on supporting the end users and in particular the children. The remaining time (10%) was used to support the Bednet organisation (website, newsletter, inventory, technical assistance).

7. Conclusion

The observations made during the evaluation nicely fit in with some of the "laws" for motivation defined by educational psychologist Sylvia Rimm [15].

Children learn the correct behaviour much easier if they have a good model.
We noticed that this law certainly applies to our younger Bednet children. For them it is especially important to keep in touch with the structure and rules of the school life during their absence. For example, younger children experience that in class they sometimes have to wait for their turn, which is not the case at all for individual education. Other classroom habits such as standing up for every visit or filling in the agenda ensure a smooth return to the classroom.

Children undergo more stress when thinking of work than actually carrying it out.
Schoolwork is for many sick children a kind of support because the thought of possibly not being able to succeed and pass together with the classmates causes a lot of pressure and stress. Through Bednet children do participate again in school allowing part of that tension to be relieved.

> *Bjorn (18 years) is in the final year of secondary school. After a skiing accident Bednet is started to support him and allow him to pick up as much of the lessons as possible. Ultimately, Bjorn is able to return to school much faster than expected. Working with Bednet clearly has helped him to study and prepared him for going back to school.*

Children develop their self-esteem when rewarded for effort and persistence.
By following the lessons via Bednet children become aware again of their capabilities regardless of their (temporary) limitations.

> *On the way to a mathematics exam Hanne (15 years) gets involved in a heavy traffic accident. She is almost completely paralysed and has to stay in a rehabilitation centre for a long time. When the Bednet project started Hanne immediately indicated that it was important for her to choose when to turn her webcam on or off.*
>
> *By following the lessons via Bednet, Hanne gets aware again of her own capabilities. A few weeks later she takes part in a poetry contest in the rehabilitation centre and even later she agrees to testify at a press conference. The girl that didn't want to be seen in the beginning, now voluntarily puts herself in the spotlight. Meanwhile Hanne plans to work out a theatre performance in order to convey her story.*

Children develop more confidence and sense of control by gradually gaining more power according to their level of maturity and responsibility.
When children are faced with a disease all control is taken away from them: doctors and parents decide on the steps to take and they can no longer rely on their own skills and capabilities. Through Bednet they gain part of the control again.

> *The father of Arno (10 years) says: "What we like about Bednet is that it is his own world. He must ensure himself to be on time at the desk, he launches and operates the computer without any help and gets in touch with his teacher and classmates. We do not have to intervene, although we are nearby. In this way, Arno gets a piece of the world back again."*

Children will continue to perform well when they see the relationship between the learning process and the obtained results.
This is also something we have to keep in mind when dealing with ill children. The functionality, for example, to hand in assignments and immediately receive feedback makes the children aware that their efforts are not useless.

> *Stijn (6 years) is in the first grade. During the introduction the school thought there was little chance that he could pass to the second grade. A few months later, at the end of the project, the situation has changed completely: Stijn did not fall behind in class and went to second grade.*

Acknowledgements

The ASCIT-project was financed by the Flemish Interdisciplinary institute for Broadband Technology (IBBT) and following partners: Androme, Alcatel-Lucent, Artec-Electronics, Televic, Vlaams Patiëntenplatform, Hospital School Gasthuisberg, Bednet vzw, and Vlaamse Liga tegen Kanker.

We also gratefully express our gratitude to the European Fund for Regional Development (ERDF) and the Flemish Government which are kindly funding part of the research at the Expertise Centre for Digital Media.

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