

[32, p.40; 19, p.38, 16, p.79]. The project started in autumn 2011², at this time the choice of hardware, which corresponded to the financial possibilities of the school, was limited. The IT distributor Pearl Inc. offered a tablet PC that fitted both technically and financially, so 27 devices were purchased with the following features:

- Type: Pearl Touchlet X4, 193 x 115 x 16 mm, 346g incl. battery, 7 inches capacitive multi-touch display (up to five fingers at the same time) with a resolution of 800x480 pixels.
- Android 2.3
- Front camera with 1.3 megapixels
- CPU frequency 1 GHz
- 512 MB DDR2 RAM
- 4GB Nand-flash in the project case with a 2 GB Micro SD-card added (max. 32 GB available)
- Wi-Fi 802.11 b/g, Bluetooth
- Connectors: Mini-HDMI, Mini USB 2.0 with host function,
- 3.5 mm audio jack, Micro SD slot
- Protective case with built-in USB keyboard

In comparison with currently (2015) available devices, the technical data remind on the 100-Dollar-Laptop XO-1, an initiative ("one laptop per child") founded by Nicholas Negroponte in 2005³. But when our Tablet PC project started, there was no alternative in this price range (around 120 Euros).

Then next step was to find useful software for the Touchlet X4 working with the Android system [35, p.17; 9, 10]. Olive Office, suitable for devices with less powerful processors and available free of charge, was installed, but its graphical interface was rather limited. Text documents could be saved in the docx-format and were readable by other word processing programs. To read PDF-files, a free of charge reader for Android was used. In addition to the office software package the following apps were installed and used [24, p.17]: ES File Explorer (file manager)

- Multi Touch Paint (drawing)
- Musical Lite (musical instruments)
- Scan (QR-Reader)
- FTPSyncX, SyncMe (file synchronization)

2.2 Acquisition of Handling Skills

The kids should learn to use the tablet as another working tool in the learning process. They should get to know its functions in order to work independently without the help of teachers. [24, p.20; 27] At the beginning common rules were manifested that should guarantee a safe and gentle handling of the Tablet PC itself. In order to learn operating well with the apps and essential functions of the Android operating system, the parents agreed with the project management that all children of the project class should attend

the optional lesson "Computer assisted learning" offered by Martin Newald.

Each child received his/her personal tablet and identified with it in some way, wallpaper and home screens were set individually. From the beginning, it was important for the project team to give children an awareness of the value of their tablet PCs and the order to handle them carefully. Over the entire project only one greater damage to one of the devices happened. The remaining incidents, such as problems with loading the battery, defective USB adapters or software conflicts, were not in the sphere of influence of the children.

In the first two months of the project students worked only with the touch screen and without the additional physical keyboard. The main task was to get acquainted with important functions of the Android 2.3 (to set date and time, to create folders, to implement applications such as FTPSyncX for synchronizing files and set up the synchronization folder). The keyboard was handed to the children, when they showed a certain degree of security when handling the device.

About six months after the start of the project, the program "Olive Office" was used, that generated text-files in the docx-format. With this program the students learned also labeling and formatting of parts of the text. Important issues of handling the tablet in this context were the control of the cursor on the screen, the use of dropdown menus with a longer finger pressure as well as the individual setting of the zoom in Olive Office. Sooner or later all children mastered the functions and soon any learning dictionary-file received its personal outlook from differently colored headings in an individual font size. Parallel with Olive Office the students learned the handling of the ES File-explorer, which allowed them to manage files on their devices easily. Soon, copying and renaming of files was no longer a problem.

From time to time it happened that the Office program did not start or a file was not properly opened. In such cases the process was cancelled or the Tablet PC was rebooted which was no challenge anymore for the kids after a while.

In the second year of the project, a new version of Olive Office was announced that should offer a better graphical interface and a more user-friendly operability. The enthusiasm among the students was great when installing the new version, but already the first steps exceeded the computing capacity of the slow processor of the Touchlet X4, so the software did not work properly. After a short time the project team decided to return to the old familiar version.

2.3 Technical problems

During a two-year project various issues in regard to hardware and software cannot be considered before, or anticipated. For

example, when using QRcodes (Quick Response codes are images that contain the encoded information that can be extracted with appropriate software again) the camera shot only turned-upside photos, which was not really noticed until that time. To use this codes anyway, it was necessary to print out a mirror image to get a useful result (e.g. for a class project).

The synchronization application could not correctly evaluate the time information of the data to be synchronized, so a complete synchronization of all working folders and a high data traffic were the result. The file server was overloaded by many concurrent requests, so synchronization lasted extremely long and was faulty. A workaround for this problem was the group-wise synchronization. Later, the synchronization program was replaced by another, but this one depended on a different protocol, which required a significant effort in the configuration of the individual tablets by the project team.

Other difficulties were caused by the low resolution of the tablet Touchlet X4 and the browser version. Flash-based Websites (including the used wiki) could not be fully displayed.

A small construction flaw was found in the power supply. Due to the frequent plugging a solder-joint broke on some devices, but the teachers were able to repair it by themselves – the tablet was very easy to take to pieces and put together later on again.

Unfortunately, it also turned out that the keyboards of some children refused to function. A defect adapter cable was detected that connected the keyboard with the tablet. The search for a suitable replacement was relatively difficult because this adapter had a proprietary connector size and was no longer available. Thanks to the persistence of the class teachers, an alternative was found.

Due to the relatively "weak" technical equipment unfortunately not all useful apps could be installed or used. During the project it had often been necessary that at least one functional and fully charged tablet was additionally available in class. Notpredictable failures of individual devices (empty battery, faulty screen, softwareproblems etc.) could be bridged for a short period.

2.4 The Use of the Touchlet X4 in Various Subjects

As mentioned at the beginning the project "tabkids" aimed to make children in primary school age familiar with the use of a specific tablet and demonstrate meaningful didactical units for teaching and learning at elementary school level [24, p.19; 9, 26].

One goal was to find out in which subjects the Tablet PC could be used effectively. The focus was set on German (Reading,