



3.3 Workflow and Comments of the Project Team

The kids learned how to write with the Ten-Finger-System when using the Touchlet X4 keyboard which was suitable for children's fingers. Both the compact size and the relatively low weight of the Tablet were assessed positive. It fitted easily into a school bag. The maximum using time in classroom was about two hours, before the batteries had to be recharged. The defect susceptibility of a component in the power supply was a handicap, but it could be repaired by re-brazing.

The access to the Internet was provided via a Wi-Fi hotspot installed in class that was connected with the secured network of the KPH. The selection of the applications for instruction depended on the teaching aims and the technical criteria of the operating system Android 2.3 and the performance of the processor in the tablets.

Different apps were working conflict-free side-by-side, when it came to software conflicts occasionally some apps had to be un- and re-installed.

The experiences of the teachers involved in the project and the feedback from both students and parents showed that the tablets provided an added value for teaching and learning. The two factors were mobility and the possible combination with other (new) learning media such as a beamer. The parents supported the use of tablet PCs in the class, they think that mobile devices are an indispensable part of work and learning at school nowadays. The children were largely happy with the devices and proud to be in the "tabkids" class.

Tablet PCs seem to replace established computers, especially laptops and netbooks [see also 6, 13, 14, 19]. The technical standard of current tablets is already so far away from the Touchlet X4, that a comparison is almost no longer possible. In the same price range, the processor

performance, the display resolution and the data storage space has improved very much. Today the battery power is sufficient for a full day at school without any problems, and also the mechanical stability has increased. Every day more and more useful apps appear that can be used for didactical purposes [27]. NFC (Near Field Communication) and WiFi Direct facilitate the configuration and direct exchange of data between devices. In combination with a properly equipped beamer, DLNA (Digital Living Network Alliance) enables the presentation of picture and sound from each tablet.

Nowadays GPS is even integrated in low-priced hardware (the Touchlet X4 did not have GPS onboard). With the Android operating system detailed geographic views through Google Maps and Street View allow easier orientation.

4 International key-findings

When searching the Web you can find an increasing number of interesting case studies [6, 7, 8, 16, 19, 25, 29, 33] concerning the use of Tablet PCs in primary and secondary school education that are documented in project reports and scientific evaluations. But they are often focused only on a single class as the tabkids project and have a limited sample size and data collection length. And the one-to-ratio, e.g. one device per child, according to Burden and Hopkins "the most important factor for successful use of this technology" [7, p.9], is rather seldom because of the costs for purchasing the devices. Often only one tablet PC per class was available which was used with a data projector. Or sets of 15 Tablet PCs on a trolley also equipped for charging the batteries were moved between the classes. Alternatively the students were using them in small groups for a certain time. Some schools extent the number of Tablet PCs according to the policy "Bring-Your-Own-Device" to enable one-to-one computing.

The approach when and how to use the devices depend on the infrastructure of the school, that should include a reliable and fast wireless network, adequate technical support and a budget for the maintenance of the tablets [6, 19].

It has to be stated that there is still a lack of longitudinal studies lasting several years. Through mostly qualitative research methods including observations the perceptions of the students as evaluation criteria are taken into account. Literature reviews show clearly the positive impacts on pupils' learning with Tablet PCs – in most cases Apples certified iPads are used. Pupils and teachers alike emphasize the benefits of these new mobile devices—as proclaimed in an UNESCO report of 2013: "Students and teachers are already using mobile technologies in diverse contexts for a wide variety of teaching and learning purposes, and key educational players – from national education ministries to local school districts – are experimenting with supportive policies to promote innovative mobile learning in both formal and informal education settings. Many of the experts [...] feel that mobile learning is now on the threshold of a more systematic integration with education both in and outside of schools." [31, p.11].

In Europe Great Britain has been leading in the use of ICT for teaching and learning aims over the last three decades. Early initiatives to launch Tablets PCs in schools go back to the year 2005. In the beginning of December 2004 and early February 2005 Becta with the academic support by the Open University carried out a study that involved a specific focus on the use of Tablet PCs in schools in England. This study included two strands, namely an extensive literature and projects review (including phone surveys, web-based questionnaires etc.) and one case study in each of 12 from over 90 selected schools. For the Austrian project the case studies on primary schools (7 of 12) were partly relevant even though the key-findings emerging from the case studies did not differ strictly between primary and secondary school: "Tablet PCs for maximum benefit,

- needed to be used in conjunction with a wireless network
- needed to be introduced in a planned way that took full account of the school's vision, as well as of the technical infrastructure, support and staff development, and day-to-day management issues
- increased the amount of ICT use and the degree of integration of ICT across the curriculum
- at some schools were used effectively to replace an ICT suite and thus free up space
- increased motivation, and hence were likely to have a positive impact on learn-

Table 2. Positive aspects and technical restrictions of the Touchlet X4

Positive aspects	Technical restrictions
Touchscreen handling	Low-end-device
Functioning Apps	Low screen resolution
Additional keyboard	Slow processor
Audio recording	Adaptor cable defects
photo and Video	No flash-enabled browser
Memory Expansion	No handwriting recognition
Network connectivity	No GPS and UMTS
Reliability	No digitizer pen
Added value for teaching and learning	Short battery life
Cheap price	High radiation values