DELIVERABLE D5.2
FOCUS GROUPS AND DESIGN REPORT

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1. INTRODUCTION

The LEA's BOX project aims at advancing learning analytics by contributing competence-centred psycho-pedagogical approaches to analytics and novel visualization approaches and Open Learner Model techniques. The research and development of these learning analytics and visualization components requires engagement of end-users, which is the main objective of WP5. In the period from April to July 2014 the consortium was focused on doing focus groups and networking. Main goal of this period was obtaining general feedback from schools. We discussed our ideas with multiple possible partners such as school directors, teachers and representatives from private sector etc. We presented the main planned features of our future product in non-formal meetings and conferences.

The purpose of all these activities was to find the best direction to our goal, which is a support of formative assessment in classrooms through big data analysis. Our general assumption says that with technological development the number of digital devices, such as tablets, notebooks etc. in a typical classroom is increasing. In a short time we will approach a level when these devices will become very significant tools used in classrooms.

During a normal use of digital devices in a classroom, a large amount of personalized data is collected and can be used for future analysis. Results of that analysis can be used as a support for learning progress tracking, educational goal setting and subsequent formative assessment. These were our general assumptions, which are in line with state of the art literature on and the growing interest in learning analytics and educational data mining (e.g. Baker & Siemens, in press). During the last months these assumptions were exposed to the discussion with stakeholders. We were trying to find out if some of our assumptions could be wrong for current educational practice, how common school environment currently look like and what are typical needs, which LEA's BOX can help to fulfil. We consider a prediction of future environmental development as a very important aspect. Based on our experience we observe a big shift in school environments in the last few years. For example, two years back, the presence of tablet devices in the classroom was not a significant issue in Czech schools. In only two years the environment changed greatly. Because of high price there are still only few schools with sufficient equipment but discussion about tablet usage in classrooms is much stronger and schools are planning to increase quantity of these devices. This is the reason why we cannot operate with only the current state and data but need to consider future developments and prepare tools, which will be usable later when the project is finished.

Suggestions from schools and other partners are helpful and essential for planning the structure and design of LEA´s BOX with respect to the look and feel of interfaces and platform but also with respect to the functionalities of tools and algorithms. The data and experiences give us first responses to questions such as:

- What kind of data is accessible in current classrooms?
- How does typical work with digital devices look like and how to incorporate our tool into current classrooms?
- What do teachers need for more effective formative assessment?
- How to visualize progress and how can our tool be useful for progress tracking?

The responses collated from the initial phase of user engagement and consultation, and the suggestions derived for next steps and development are described in the following sections.

2. STUDIES IN THE CZECH REPUBLIC (SCIO)

In SCIO we were focused mostly on networking and focus groups. During the period from April to July 2014, we visited advanced schools and organized two focus groups. One of our goals was to prepare a future network for implementation and testing of our products and tools, in general, and the LEA's BOX approach and technology, in particular. Very helpful in the future can be our connection with Czech Microsoft representation. Microsoft has a very strong position in Czech schools, advanced capacity of training centres and a network of schools which are now very well equipped. We can call these schools the schools of near future. Because of the long relationship between SCIO and Czech Microsoft we will benefit from their school network.

2.1 DESCRIPTION OF CURRENT CZECH EDUCATIONAL ENVIRONMENT

SCIO as a company with very strong relationship with Czech schools can capitalize on its good knowledge of the Czech educational environment. More than half of Czech schools are our commercial partners from whom we are getting daily feedback. At the end of each testing/assessment season we send questionnaires to our partner's inquiring, among other things, how teachers use digital devices. As a result, our description of Czech school environment is based on our own data. In summary, the main results of this survey are as presented below (see Table 1 and Table 2).

Table 1: Overview of results on ICT use in classrooms.

Survey question: How often do you use ICT in your classrooms? • N = 200 responses from teachers		
Teachers (5th and 7th grade)	aren't using digital devices	49,6 %
teachers (5th grade)	more than once per week	23.9 %
teachers (7th grade)	more than once per week	14.7%

Table 2: Overview of results on the use of online applications or electronic devices for assessment.

Survey question: Do you use on-line application or electronic devices for testing or assessment? • N = 200 responses from teachers		
teachers (5th grade)	Yes, I do.	32.5%
teachers (7th grade)	Yes, I do.	27.3%

To make the picture of Czech school environment clearer, in Table 3 we present in actual data from a large survey of Czech School Inspection from June 2014[1]:

Table 3: Results from survey by Czech School Inspection.

N = 3 653 responses from schools directors	
Czech schools with more than one computer classroom connected to the Internet	45%
Czech schools with tablets for students' usage	15%
Czech schools with advanced network infrastructure so students can connect their own devices	44%
Czech schools with wi-fi coverage in all buildings and facilities	40%
Czech schools with goal to buy new tablets for students in the next 3 years	40%

[1] http://www.csicr.cz/getattachment/26fd4ae4-e9d3-4a0f-99d7-763a9334b368

Czech schools with goal to buy new tablets for teachers in the next 3 years	48%

Interpretation of this data shows a shift in the Czech educational environment. Nowadays only one half of Czech teachers use digital devices at all. We can see digital devices being used more actively on lower levels of elementary education. Current state is determined by dominant teaching culture, where a teacher is still the dominant person who is sharing knowledge with others. Although there is a long discussion about the new role of teachers in Czech classrooms, a real change is coming very slowly. Very similar is the situation regarding the attitude towards formative assessment. In Czech Republic there does not exist any government guaranteed support and tools for formative assessment.

On the other hand, we can find a significant number of advanced Czech schools. A big curriculum reform of 10 years back has given an opportunity to brave and innovative schools. Development in all pedagogical and didactical areas in these schools is amazing and shows a good promise for the future.

Promising for development in this area is a call of the Ministry of Education for projects for the next school year. Between 09/2014 and 07/2015, the Ministry of Education will support projects for mentoring and lecturing Czech teachers in using mobile digital devices in education and classrooms. The total price for these projects is more than 50 million Euro. We believe that this support will accelerate positive current development. And we predict positive demand for tools for formative assessment, data management and learning analytics.

2.2 SCHOOL VISITS

Our first step of engagement with stakeholders consisted in visits to schools. We visited and spent time with teaches in two advanced schools. Our goal was to get first-hand information and experience from their classrooms. Usually information from teachers and focus groups are interpreted. But observation and following discussions provide us with direct experience, without this interpretation. The advantage of this approach is more individual feedback from teachers and the possibility of follow-up inquiry.

The first school that we visited is situated in a Prague housing estate (Elementary school Na Beránku). This school is using Montessori pedagogical approach. We spent time in a typical classroom and after that we had a discussion with two teachers who were interested in future cooperation.

In Montessori pedagogical approach, a typical school day consists of classrooms project. In each classroom, children have access to computers. The decision to use digital devices is only up to children. Typically, children use the devices to search for information from a number of sources (Wikipedia, YouTube, news portals etc.); to prepare presentations; and for communication with peers

and their teachers. Inspirational is an internal school system, which provides assessment. In this system, a teacher can prepare mind maps for all projects. These maps contain main goals of the project, the structure of general concepts, which will be discovered during the project. The maps also contain a description of expected performances. Assessment in the classroom is based on these mind maps. All items in a mind map (expected performance) are automatically transformed to a Google spreadsheet and shared with children. During a project, the teacher can make notes about children's performance and the children can see how they fulfilled project goals. A big advantage of this approach is the connection between recorded performances and the structured mind map. Because of that, children can see what is needed to fulfil higher goals, what steps are needed, and how all of their work is connected.

This very innovative approach was a big inspiration for us when considering future functionalities of LEA´s Box.

The second school is situated in Prague, near Old Town (Elementary school Lyčkovo náměstí) is. This school cooperates with Microsoft and serves as a reference school in a new pedagogical approach using tablets. This school has two classrooms fully equipped with tablets in a one-to-one regime. The main goal of their project is to figure out how digital devices can be helpful to children with specific learning needs. What we would like to stress is that teachers use commercial learning applications very rarely. Tablets are used mostly as productive devices for searching, communication, recording, presentation etc. If our original assumption was to gather data from learning applications, only few are really used in typical Czech classrooms. More about the learning applications can be found in the subsection "Focus group" below.

2.3 FOCUS GROUPS

During May and June we organized two focus groups with teachers, schools directors and a representative of Czech Microsoft. We addressed our invitation to the focus groups to schools with different experience of using digital devices in classrooms. Martin Luther private school in Pilsen has more than a year long experience with tablets in classrooms in a one to one regime. 11th Elementary school in Pilsen and 28th Elementary school in Pilsen were working more than three years with a digital whiteboard. Lyckovo náměstí elementary school has experience with tablets in a classroom with children with specific learning needs and, finally, Bílá hora elementary school and Červený vrch elementary school were members of a pilot project in Prague 8. In this project, schools were equipped with tablets and all teachers received half a year of mentoring on how to use tablets effectively in the classroom. We chose these schools because of their experience and because we expect that their experience will spread to other schools in near future.

At the start of a focus group, LEA´s box project was briefly introduced and during discussion we were working with visualisation and tools from the NEXT-TELL project, like myClass.

Discussion in focus groups was led using a prepared guide and basic questions such as: What kind of technology is used? How often are digital devices used and how is this technology used? What kind of data about learning progress and learning performance is collected in the classroom? How is communication with students/pupils about their learning performance done? Do they know a context of their assessment? and How to display performance/progress of students?

One of the main topics of focus groups was assessable personalized learning data from students. We let teachers discuss if during their work in classrooms data emerge that would be suitable for additional analysis. We found that in a very typical case there is a lack of this kind of information and that electronic data from a classroom process rarely undergoes a follow-up assessment. This was mostly the case when children were using digital whiteboard or classic computers. In case of digital whiteboard data were not personalized because children were working together as a class. As a possibility how to personalize this data a suggestion made was to use a voting system during short tests and quizzes. But, based on teacher's experience, this strategy has very small pedagogical effect on children and they do not prefer this kind of solution.

In case of schools with experience with tablets in classrooms the attitude was slightly different. In general, teachers are sceptical about commercial learning applications and the dominant approach is to use tablets as productive devices - mostly for sharing data and documents, communication, recording, information searching etc. On the other hand, teachers are using applications, which are helpful for classroom micromanagement and assessment. As examples of this the following applications were mentioned:

- Nearpod (http://www.nearpod.com/) – lectures content, assessment and testing tools
- Classdojo (http://www.classdojo.com/) – classroom micromanagement and quick assessment
- Edmondo (https://www.edmodo.com/) – Classroom management, assessment, quizzes, testing tools

Very popular are web sites providing testing tools. In this case, teachers use them for short assessment but mostly this form of assessment is only summative. Examples of these websites can be http://quizlet.com/ and http://www.socrative.com/. Generally, summative assessment is the dominant way for teachers to give feedback to their students. Common attitude of Czech teachers is step by step teaching without learning progress mapping.

During discussion about formative assessment teachers mentioned that there are only few effective accessible ways how to map student progress. Basic variant comes with student portfolios but many of focus group attendees have experience with digital portfolios. For the purpose of formative assessment, the elementary school on Lyckovo namesti is using so called "Spirals" – a variation for paper progress maps. A possible future way of how to introduce formative assessment and digital tools for progress mapping is SCIO´s project MUP (Czech national progress maps). In this European project we developed progress maps for six school subjects, e-portfolios, on-line application for

progress recording and a system of assessment tools (activities with scoring rubrics, on-line tests etc.). This project will be opened this September to all Czech schools and more than 50 schools have already shown interest.

Two schools from our focus group were piloting schools of MUP project tools so naturally their attitude about possible ways of formative assessment was strongly determined by this experience.

Finally, learning progress visualization was for focus group members a highly abstract topic. At the start we asked teachers to draw possible student progress based on activity description. Their goal was to find all significant components, identify connection between these components and natural next steps in student development. After that they were asked to find a way to visualize these structures in a form understandable to students. Result of this activity was mostly a kind of mind or concept map, similar to Hasse diagram. In our last step we presented a prepared visualization used in a NEXT-Tell project. Most preferred and understandable visualizations were Hasse diagrams and Radar charts.

In summary, teachers prefer using digital devices as a productive tool in their classrooms. Individual data from students comes not from learning applications but from classroom micromanagement led by teachers. Because of lack of accessible tools for formative assessment teachers are mostly focused on summative assessment. Teachers have a need for tools for formative assessment but they must be very easily manageable and time efficient. Based on experience it will be very hard to implement formative assessment tools to the classroom with typical frontal teaching strategy. More suitable for formative assessment approach is project-based learning where a teacher can work as a facilitator and a mentor. In this scenario the teacher has more time for micro-management and micro-assessment (in our case the teacher is gathering and creating data for follow-up analysis. The most preferred visualizations of student progress were Hasse diagrams and Radar charts.

2.4 NON-FORMAL PRESENTATION

In the period from April to July 2014 we visited two conferences, where we had an opportunity to discuss our project goals with educational stakeholders. In April we visited Oppi Festival in Helsinky (http://oppifestival.com/) and in June we visited a conference about distance learning – DisCon in Prague (http://disconference.eu/).

During Oppi Festival we got involved in multiple workshops and panel discussions where we had an opportunity to introduce our project and discuss educational big data analysis. We made a contact with company called Skill Pixels. This company was presenting a learning game for mathematics. The principle of this game is based on learning analytics and the description of its algorithm seems to be very similar to a knowledge map. We evaluated this product as a suitable learning game generating learning data with a specific structure.

During DisCon we took part in a workshop focused on digital badges and we examined if it is possible and suitable for our purposes to use digital badges. In the workshop we had an opportunity to discuss possibilities of how to connect or use the current concept of digital badges for purposes of learning analytics. We also discussed with multiple developers their learning applications, learning games etc. We found the concept of digital badges very interesting. In this system, specific meta-data about learning performance are generated. In the Czech Republic a very popular national platform is called Veriod (veriod.cz).

2.5 RESULTS OF SCIO ACTIVITIES – NEXT PILOTING AND DEVELOPMENT SUGGESTIONS

Our experience from period from April to June gave us a basic framework for our near future activities. As the most promising way for future piloting in Czech schools we found the current TUGraz application myClass supported by a mind mapping tool. We don't expect the school environment to change rapidly in next months. If we are going to gather digital learning data from classrooms we should support this process by user friendly tools. Because of that we are planning the following steps for the next period:

1. We will develop three classroom activities for elementary school Math. Based on these activities teachers will be able to assess selected skills.

There will be a mind map prepared for all activities describing the main learning goals and the connection between main learning prepositions (see Figure 1 for an example). We will use the mind map tool developed for LEA´s box purposes.

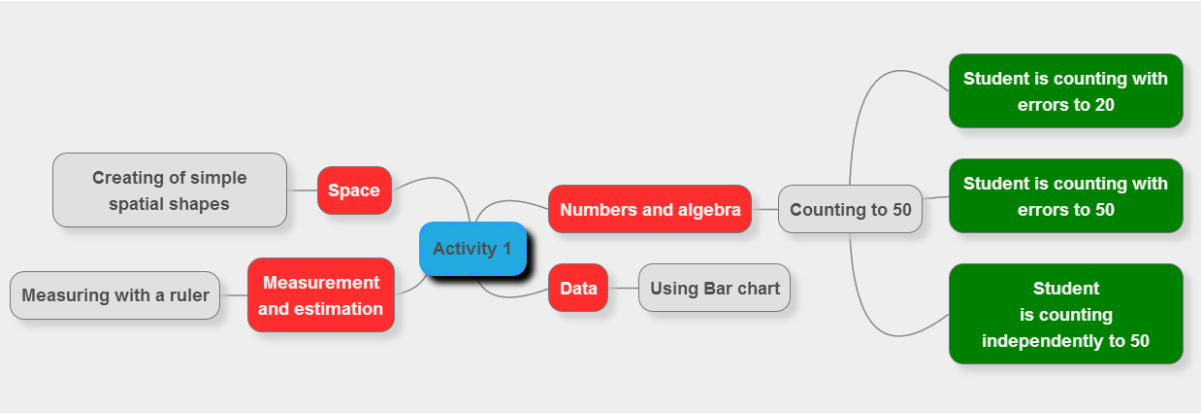


Figure 1: Example mind map.

All activities will be prepared with a goal to describe four main math topics / skills: Numbers and algebra, Space, Data, Measurement and estimation. In the mind map in Figure 1 they are represented

by main branches. Smaller branches represent skills' components, which can be assessed in an activity.

During one activity it will be possible to decide if skills are developed in different levels. Next activities will continue in the assessment of the same skills, but on a higher level of performance. A level of development will be described by typical real-life actions/descriptions. Figure 2 presents an example:

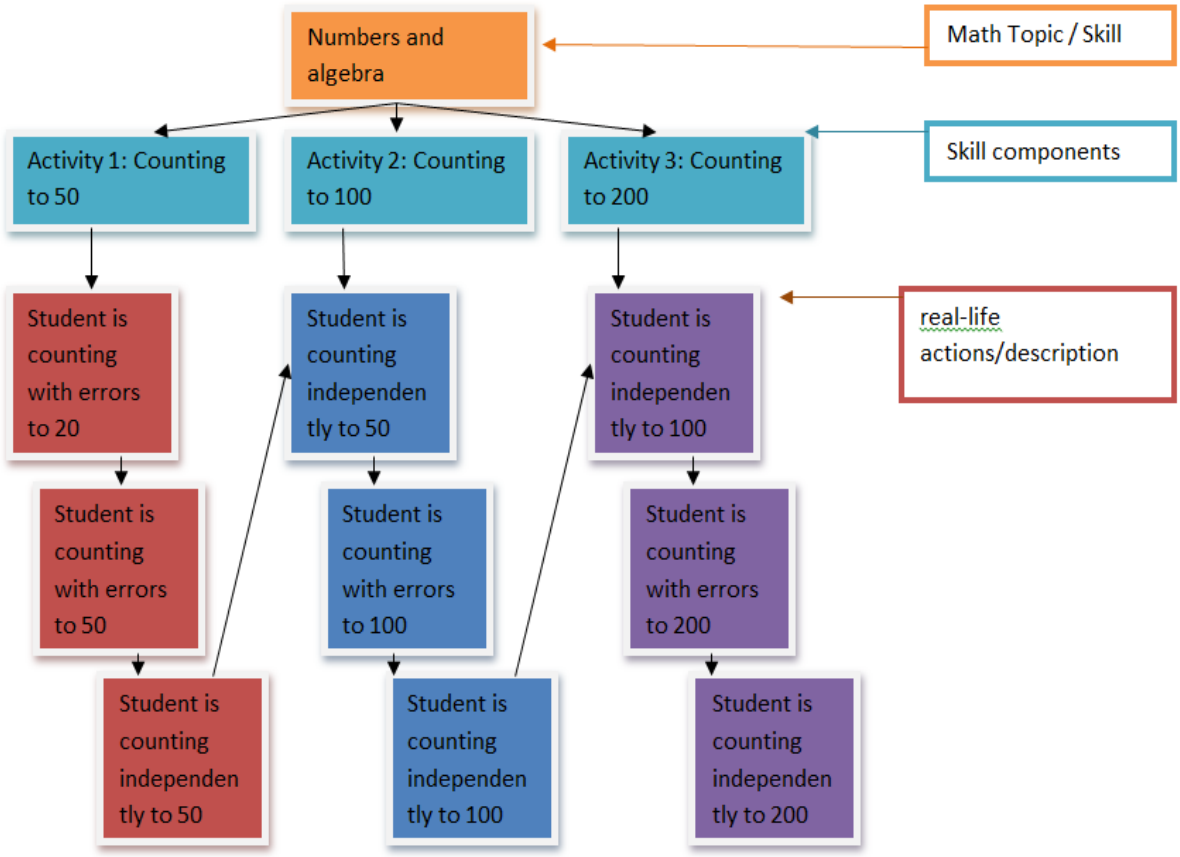


Figure 2: Example classroom activity.

Real-life illustrations/descriptions will be added to the mind map by piloting teachers before activity realization in a classroom. Based on this we will get an information on what kind of real-life actions creates our prepared skills. This description can also be analyzed separately. Different teachers can chose different real-life illustrations and based on this we will see a wider picture of possibilities.

2. The next step will be piloting in classrooms. During activity realization teachers will be using myClass recording/assessment tools. Based on classroom observation teachers will record if a selected student fulfilled/performed expected real-life actions.

There is a possibility that during activity realization a new typical action will appear. In this case, the teacher will add this action to the mind map. For action recording the myClass tool (see Figure 3 for a screenshot) will be used. See below.

Figure 3: The myClass tool.

Accepted data result suitable for visualization:

When we were thinking about LEA´s BOX and functionalities that will be helpful to teachers we found out that it is very difficult to find data and information, which are not accessible with current teaching and assessment practice. If the main goal of LEA´s BOX is the support of teachers to address a more accurate and formative assessment, information and visualized data cannot be banal. LEA´s BOX has something more to offer, something that is not accessible by current practice. Otherwise it wouldn't make sense for teachers to use our tools. This is in line with current literature on learning analytics arguing that learning analytics need to address relevant research questions of educational practitioners; questions that cannot be answered with the tools currently available (Dyckhoff, 2011; Dyckhoff, Lukarov, Muslim, Chatti, & Schroeder, 2013).

In real-life classrooms, teachers can gather a lot of data about student performance from activities, discussions, general tasks etc. Nowadays the problem with this data is often a missing structure. "Small A" or "small +" from the classroom mostly means that a student was active, but there is no information about concrete performance, skill or knowledge. Gathering data based on a prepared structure (for instance as described above via mind map) offers an opportunity for mapping of individual development supported by data based on individual performance.

We would like to highlight one important side of visualization. If we assume LEA´s BOX tools as a support for future formative assessment there is a need that visualization that must be understood by pupils.

Based on our proposal the main goal of LEA´s BOX in the first stage of development can be analysis and visualization:

1. Analyse and visualize connected skills mind mapped and enriched by a typical student's actions and performances.
   All classrooms will be working on three activities supported by a mind map. It can be interesting to analyse how teachers will set up descriptions of a typical performance, if they will transform our prepared mind maps etc.
   A suitable form of visualization can be a Hasse diagram or some kind of conceptual map.

2. Individual student skills progress captured by mind map.
   There can be a variety of student's performances and a variety of paths to the goal. Students can accomplish the final goal in different order of steps. It can be interesting to analyze the concrete order of steps and which steps are essential and which can be skipped.

A suitable form of visualization can be Hasse diagram or some kind of conceptual map where paths will be recorded and displayed **(see Figure 4 for an example).**

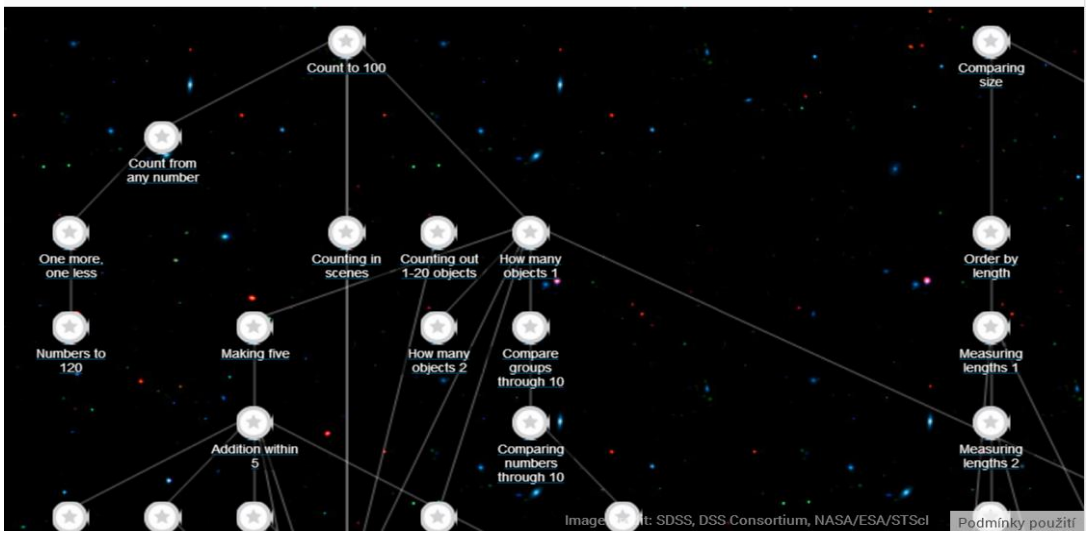


Figure 4: Example visualisation of student progress.

3. Skills level visualization and next step advice.

A set of accomplished performance can give us aggregate information about the level of a specific skill. It can be interesting to make visualization of current fulfilment of these skills. It would be very useful for the system to be able to give information about the next step needed on the path to 100 % fulfilment.

A suitable form of visualization can be radar plot, bar charts etc. If the student rolls over a specific skill bar, information will pop up about next steps needed for student's development.

For further engagement with stakeholders, these three types of visualization are planned to be implemented as a part of a questionnaire, all based on description of assessment situation based on simple activity.

3. STUDIES IN TURKEY (SEBIT)

SEBIT is the largest K12 e-learning provider in Turkey with nearly 1,5 Million users of its content and services under the brand name Vitamin. Vitamin aims not only to cover the whole K12 curriculum with rich media, interactive content, but also the platform stores the user's interactions, context, outcomes and every transaction. The result is a huge dataset, with full contextual information collected over a time of 5 years and it can be appropriated topic-based or user-based or session-based. With the introduction of Tablet computers in Turkish classrooms, SEBIT extended the Vitamin platform with VClass classroom management service, and VCollab educational collaboration service. These services constitute even bigger sources of educational performance data.

3.1 DESCRIPTION OF THE CURRENT TURKISH EDUCATION ENVIRONMENTS

Exploiting the project outcomes SEBIT plans to add enhancements to the Vitamin platform for "adaptive assessment" and "affective guidance". Self-regulated personalisation using adaptive assessment tools is a well-developed practice within the iClass Integrated Project (completed in 2008) which was supported within the 6th Framework Programme. SEBIT technically coordinated the project and exploited the outcomes in creating the high-school product in 2009. However, to habituate adaptive assessment for younger students and their teachers requires a new set of tools, most notably analytics based. Affective guidance is the other exploitation space for empowering teachers in table tPC classrooms. Turkey has initiated FATIH Project with the aim enabling equal opportunities in education and improving technology in our schools for the efficient usage of ICT tools in the learning-teaching processes. In 2013 41,000 tablet PCs were distributed and 7,258 teachers started to use tablet PCs in their classrooms which are all equipped with interactive white boards. This year 675,000

more tablet PCs will be distributed with a final goal of 10.6 Million. Eventually, all 42.000 schools in Turkey, having 570.000 classes will have a high-end digital infrastructure. However, classroom management and assessment in the presence of these devices is still an open issue. FATIH project is the largest edtech project on Earth and one of the most ambitious. SEBIT is involved in developing the software stack for education in this environment, which is somehow under-studied. Examining in field, OLPC or Intel Classmate projects such as Plan Ceibal in Uruguay, E-escolas project in Portugal, Conectar Igualdad Project in Argentina, and in Venezuela, SEBIT focused on classroom management and collaboration as the key components. SEBIT is fully owned Turkish Telekom company and Turkish Telekom has donated 5000 tablets to the project for early pilots before mass tenders in 2011. Using these high-end tablets SEBIT ran pilots in 10 schools for 2 years. This pilot as well proved the importance of seamless classroom management and guidance as a form of engagement. VClass product was developed for this purpose, but it lacks analytics components.

Table 4: Overview of results from Turkish pilot studies.

Survey of Technology Support for Assessment (N = 381)	**Percent Agreement**		
	Rarely	On Occasion	Frequently
I use TabletPCs for assessment and evaluation purposes	12,1%	22,7%	65,2%
TabletPCs and Smartboards enriched my assessment and evaluation options	28,5%	18,3%	53,2%
I could monitor student progress easier using TabletPCs	29,4%	26,4%	44,2%
I could differentiate the course for students using TabletPCs	25,1%	22,1%	52,8%

The above Table 4 is a summary of some results from our pilot studies as relevant to the LEA's BOX project. This survey was conducted in Spring 2012 on 381 teachers, randomly selected from 9 schools which Turkish Telecom donated TabletPCs for each student and a smartboard for each class. Software products from SEBIT were used during the pilots for

- Classroom Management
- Polling

Testing and Reporting Tools were not in the scope of this pilot. The results indicate high potential for assessment and evaluation tools in tabletPC classrooms, especially in regards to student progress monitoring.

At a greater scale we can refer to the survey carried out by Turkish MoNE, see Table 5:

Table 5: Overview of results from survey by Turkish MoNE.

Survey of Technology Support for Assessment (N = 768)	**Percent Agreement**		
	Rarely	On Occasion	Frequently
I use TabletPCs for assessment and evaluation purposes	67,6%	20,2%	12,2%
TabletPCs and Smartboards enriched my assessment and evaluation options	31,5%	20,3%	48,2%
I could monitor student progress easier using TabletPCs	30,9%	28,4%	40,7%
I could differentiate the course for students using TabletPCs	28,2%	25,2%	46,6%

This survey was conducted in Spring 2012 on 768 teachers, randomly selected from 52 schools, which received TabletPCs for each student and a smartboard for each class. However,

- Classroom Management Software was missing
- Quiz and Polling Apps were missing
- Reporting Tools were missing

The results indicate that even the presence of a rudimentary polling tool improves assessment and evaluation abilities of teachers and the absence of a classroom management tool decreases the overall benefit from the devices.

To assess the needs of teachers in this context, we established contact in a number of events that SEBIT sponsors by providing a live feed service. Then we invited interested teachers for a focus group meeting. We also run an online survey for needs deliberation. This report will deliver some of our key findings and conclusions.

3.2 NON-FORMAL PRESENTATIONS

As being the official media partner in all educational events in Turkey with special contact with MoNE, SEBIT takes part in many educational events in the country. Since the launch of LEA's BOX project, the events we participated, and made contact with teachers regarding learning analytics are as follows:

15.03.2014 09:00-17:00	16th Career Guidance Symposium
22.03.2014	Educational Technology Platforms
05.04.2014	Doğa Schools Network, 4th New Gen Education Conference
30.04.2014	Blended Learning in the 21st Century
03.05.2014	TedxTepebağED /Adana
03.05.2014	ERG 2014 / İstanbul
26.05.2014	Tedmem / New Models in Science and Technology Education Conference
29.05.2014 – 01.06.2014	Educashow
21.06.2014	Assessment and Evaluation Futures

Of the teachers who showed interest in the project, we invited those with the following criteria:

- Accommodating in Ankara
- Available in mid-July
- Experience in tablet and technology use in the classroom
- Potential for becoming a pilot user

3.3 FOCUS GROUP MEETING

The meeting lasted 3 hours on July 15th, 2014 in SEBIT premises in Ankara. 12 teachers joined from 5 different schools. Half the teachers had less than 10 years of teaching experience. The other half had over 20 years of teaching experience. The agenda of the meeting was as follows:

- **Introduction to Learning Analytics and LEA´s Box Project**
  - Learning Analytics: To analyse student achievements, strengths & weaknesses, knowledge state, competencies, attitude and other learning process attributes to support decisions on how to proceed with learning.
  - LEA Project: An EC funded R&D project for visualizing multi-source analytics results on student competencies so that more effective decisions can be made on the learning process.
- **Focus Group Meeting Agenda and Goals**
- **Collecting teachers' feedback on NEXT-TELL data visualization tools**

  - Polling over a survey provided by the project coordinator, data visualization tools from the preceding project called NEXT-TELL is evaluated

- **Survey on technology use, data gathering and reporting use**
  - Each teacher has completed a survey on edtech use, data gathering and reporting
- **Acting on Data**: **Actionable Analytics**
  - Open debate on what best can be offered by learning analytics
- **Conclusion and summary**

Based on the hand-out survey results, the profiles of the attending teachers as edtech users were as follows in Table 6.

Table 6: Overview of results on technology use in classroom.

Survey of Technology Capacity	Percent Agreement (rounded)		
	On Occasion	Frequently	Always
Hardware: Laptop, Desktop, TabletPC	8%	25%	67%
Hardware: Projector, Smartboard, TV	8%	17%	75%
Hardware: Smartphone, eReader	100%	0%	0%
Software: EBA (MoNE content portal)	75%	17%	8%
Software: e-okul (MoNE central student records database)	33%	33%	33%
Software: e-publishers	75%	8%	17%
Software: productivity tools (MS Office)	33%	25%	42%
Software: SEBIT educational content and services	33%	17%	50%
Software: Foreign Resources (Phet,	50%	17%	33%

Khan, Yenka)			

So most of the teachers were well familiar with various edtech tools and were able to contribute to the evaluation of OLM and myClass tools.

OLM and myClass were the tools developed within the NEXT-TELL project. OLM evaluation results were obtained by polling online survey questions, which were provided by the project partners. The other results were obtained by teachers completing the hand out surveys.

For viewing the learning progress in a class in terms of status and strengths/weaknesses, the most preferred maps turned out to be the radar map and simple table with students as rows and achievement level as columns ranging from “very weak” to “very strong.” These maps were preferred because they were not only informative (radar map) and comprehensible (table) but also had potential to set a teacher in action to intervene a failing student.

For viewing the learning progress of a particular student in terms of status and strengths/weaknesses, the most preferred maps turned out to be again the radar map and simple table with competencies as rows and achievement level as columns ranging from “very weak” to “very strong.” These maps were preferred because again they were informative (radar map) and comprehensible (table). At this stage Hasse diagrams were presented as an alternative for viewing student progress and they were regarded to represent the learning process the best and it was chosen to be the most useful.

At the ensuing debate on progress monitoring with OLM, two main opinions emerged about how OLM could trigger behavioural change, or call to action:

1. Progress comes with time, so when information is presented as “change in time,” teachers can be able to contrast the objective change to the change that they predicted.
2. Change occurs as a consequence, so which actions yielded the change enables the user to draw conclusions, or reason about what works.

In the evaluation of myClass tool, which enables teachers manually enter data, it was unanimously regarded to be a useful tool for keeping notes/records on students. Teachers had their own notebooks for their classes where they kept notes on students. It was suggested that by examining real teacher notebooks, myClass could be improved. Another suggestion was to include a “comparison” or “relative to class average” views in myClass.

Finally strengths and weaknesses of these tools were evaluated. In terms of strong suits, OLM was excelled at determining the shortcomings of the students, while myClass was regarded useful for observing their side skills (eg. 21st century skills) – see Table 7.

In terms of weak sides (see Table 8), myClass would require time to be used effectively, though if it could replace teachers' own notebooks this wouldn't be the case. Lack of manual input was indicated with OLM, and the tool may well improve by revealing cause-effect relations:

Table 7: Overview of results on strengths of myClass and OLM.

Strong Sides	Percent Agreement	
	myClass	OLM
Using this tool, I can determine the shortcomings of the students	91,7%	100%
Using this tool, I can observe their side skills (eg. 21st century skills)	83.3%	58,3%
Using this tool, I can make better short-term study plans	66,7%	91,7%
This tool, presents a good opportunity for self-evaluation	41,7%	91,7%

Table 8: Overview of results on weaknesses of myClass and OLM.

Weak Sides	Percent Agreement	
	myClass	OLM
It will take too much of my time to use this tool	41,7%	75%
The data that the tool can best visualize needs to be entered manually	100%	25%
It may be boring to use this tool daily, in the long term	100%	91,7%

It's hard to build cause-effect relations between activities and outcomes	100%	75%

It is interesting to note that the participating teachers somehow used technology products in their daily lives comparably more often than in class time or in preparation for class (see Table 9). This may be attributed to the anxiety of control in the absence of effective monitoring tools as well as reliability on the students' command of edtech for their learning needs. This may be an area of contribution for the project.

Table 9: Overview of results on technology use.

Survey of Technology Support in Teaching	**Percent Agreement (rounded)**		
	On Occasion	Frequently	Always
I use technology products in my daily life	0%	25%	75%
I have technology support in class time	25%	33%	42%
I use technology support while preparing for class	25%	33%	42%

Assessment and evaluation data is the source for LEA's BOX project to build analytics results. For that reason, the survey included an inquiry about the nature of this data. All our teachers performed some kind of evaluation at the end of each topic and unit, while some teachers performed monthly assessment. Only a few teacher performed weekly assessment. The duration of assessment and evaluation for all our teachers were full two hours for performing their regular evaluations. Most teachers performed their per student assessments in not more than 5 minutes and time devoted to end-of-class assessment was never more than 10 minutes.

Specific methods that our teachers listed for performing assessment and evaluation were as follows:

- Written Exam
- Q&A over a multimedia presentation
- Q&A over the course topic or a previous topic
- Self-assessment

- Oral Exam
- Homework
- Result reports and discussions over an experiment
- Participation in classroom activities
- Quizzes
- Structured discussions
- Group-work reports
- Subjective observations
- Portfolios
- Concept maps
- Project outcomes
- Multiple choice exams
- Surveys and polls
- An open-ended teaser question

Surveying further into the growth directions for the project, the hand-out survey explicitly showed that competency states of students could have valuable use, especially for providing feedback to the students in term of their gaps and strengths. On the other hand, teachers were not much fond of "self-assessment" of their own performance. Table 10 depicts the results in more detail.

Table 10: Overview of results on the use of student performance data.

Specific Use for Student Performance Data	Percent Agreement (rounded)
To assess readiness	75%
To shape knowledge and deliver	41,7%
To determine skill gaps and strengths	50%
For feedback to students about their gaps and strengths	91,7%
For competency-based state discovery	91,7%
To assess 21st century skills acquisition	58,3%

To discover students' learning styles and planning for alternative teaching methods	8,3%
For teachers' own self-assessment	16,7%

3.4 PREDICTION OF FUTURE DEVELOPMENTS IN TURKEY'S SCHOOL ENVIRONMENTS

Tablet devices are predicted to become an inseparable part of educational life in 10 years time frame. The experience of the FATIH project is sure to guide many other brewing national incentives. FATIH project is a perfect gateway to expose the project outcomes. Taking part in FATIH pilots is not merely taking the solution to the field. The project runs a rigorous regime of monitoring outcomes to determine what really works. Approval of value in these pilots is likely to lead to European or even global level impact.

3.5 SUMMARY OF SEBIT ACTIVITIES AND KEY FINDINGS

Upon sharing information and leaflets on our project with teachers on various occasions such as seminars and conferences, as well as in-service training programs SEBIT organizes with MoNE General Directorate of Teacher Training and Development, we invited 15 teachers to our focus group meeting. 12 of them joined this meeting which was about uses of learning analytics and examining the OLM and myClass tools. These tools were in general well regarded by teachers. In these Turkish teachers' opinion, myClass might replace teachers' own paper & pen notebooks for keeping student grading. myClass could add value by compiling analytics results out of these teacher notes on their students' side skills. Manual data (evidence) entry is also possible with OLM, but in our teachers discretion it was less practical and user-friendly.

OLM compiled various data sources (manual/automated) and visualized them using different visualization techniques at once. This helped assessing differences between students or differences between competency achievements for particular student. As such it was valuable for triggering especially remedial action. Improvements were indicated on tracking progress by providing time series views and on action analytics by revealing cause-effect relations between activities and outcomes.

Both tools are strong for seeing the patterns in moderately populated class (15-20 students), with potentials for improvement for making the connections as to why some students were powering ahead in some subjects or even in mastering and applying some concepts and skills but were struggling with others.

We pose a monthly question at the Vitamin Teachers Portal. On the question “In your opinion, what main impact would learning analytics reports have on the teaching process?” there were **2017** responses. Of the given potential answers (participants had to choose only one of them), the percent distribution is given below:

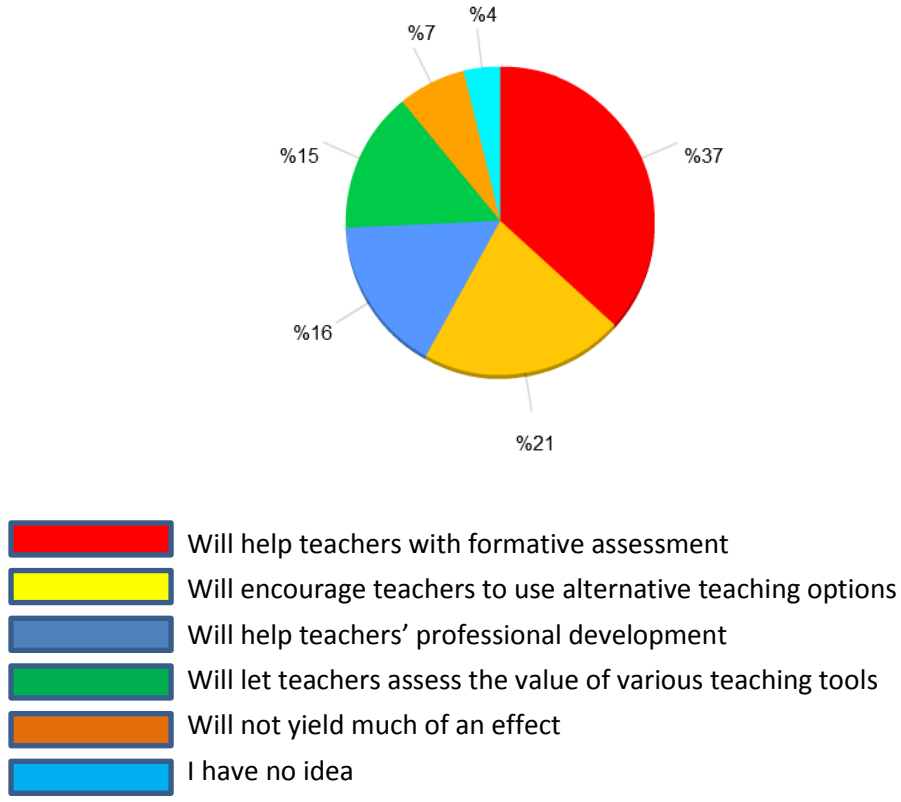


Figure 5: Online survey results for the question: “In your opinion, what main impact would learning analytics reports have on the teaching process?”

In the class, a teacher has to find ways to engage with each student in their own way and on their terms. Formative assessment for evaluation and alternative teaching options for differentiated instruction are necessary for this purpose. As the class size increases to 30 students or even more, teachers had to rely on technology support to draw patterns and make logical connections.

As the number of classes and schools who operate in this manner increases, SEBIT is a well-positioned, national scale educational technology provider in helping schools to share data and expertise, best practice and insights, in ways that enabled them to replicate excellence at scale.

4. STUDIES IN AUSTRIA (TU GRAZ)

4.1 MYCLASS FOCUS GROUP WORKSHOP

LEA's BOX builds upon existing software solutions; one important tool is myClass, which was developed in the predecessor project Next-Tell (www.next-tell.eu).

myClass is a multiplatform online system, designed to be used in particular with mobile devices that serve as an easy and intuitive access point for teachers to maintain students, classes, and subjects, more importantly, it allows tracking activities of students by mouse/finger clicks, and it allows adjusting competencies and learning goals. Furthermore, *myClass* supports teachers in sharing the results of their activity tracking with parents, administrators, or students. In class and in real time feedback points for behaviour can be awarded by simply clicking on the tablet/smartphone/laptop. Beside this activity tracking feature, *myClass* allows for adjusting competencies and learning goals, as well as visualising learning processes/progress by a range of different visualisation features. Additionally, *myClass* allows different roles, such as teachers, students, or administrators.

In order to evaluate the principles and features of the *myClass* tool, an initial application and testing of *myClass* has been carried out with about 25 teachers from the practical primary school of the University of Teacher Education Styria (Praxisvolksschule der Pädagogischen Hochschule Steiermark) in the scope of a training workshop. The workshop objectives were twofold: training teachers in applying *myClass* in the classroom and gathering first feedback on the interface and functionality of *myClass* itself. The main purpose, which is more of qualitative nature, was to serve the ideas of co-designing the look and feel of the tool and its implemented features, gathering information that helps to further improve the tool and make it more attractive for teachers, as well as the investigation of the initial benefits of the tool are of main interest.

First of all, *myClass* and its different features were demonstrated to the teachers, followed by a hands-on session where teachers had the opportunity to use *myClass* by themselves. After this session, participants were asked to tell about their experiences with and views about *myClass* in a moderated discussion. The outcomes of the discussion with teachers on experiences with *myClass* and its usage indicate a high satisfaction with both the tool and its particular functionalities and features. These results are not a surprise since there was a strong collaboration with teachers during the tool development process resulting in a tool that is more or less geared to the needs of them.

After this in depth training session on the *myClass* tool, teachers were asked to apply *myClass* during the school time in their real class setting within a period of about 8 weeks. After this time period, two focus groups with a small number of teachers (including the principal) were carried out. This focus group style discussion concentrated largely on collecting information about issues for further improvement based on teachers' feedback, their opinions and feelings with regard to *myClass*.

The experiences with *myClass* resulted to be very good. Teachers' general opinion on the tool was very positive: they were satisfied with both the tool in general and the particular functionalities that are offered to them such as design, interface, feedback and visualisation. Characteristics of tool such as its ease of use, its goal orientation as well as its stimulative nature were particularly emphasized. Overall, teachers considered *myClass* as a good supplement to traditional teaching methods. It supports the formative assessment process by providing a precise protocol of students' performances when correctly used. Especially the different types of visualisations of students' individual results and performances given to the teacher were judged as being comprehensible and helpful for the further (formative) assessment process. There was, however, considerable room for further improvement of the tool identified and teachers provided a list of concrete suggestions for improvement. Some of their suggestions and wishes included for instance: reducing the amount of time it takes to scroll through a list of subjects and names looking for the students they wish to track activities from or making the activities record easier by including seating-plan style template of boxes.

Although teachers appreciated myClass as a powerful tool, they saw some problems in implementing the tool in the real classroom, not from a software perspective but more from a hardware and technical perspective. They saw a variety of hurdles especially concerning their technical resources and technical support. The pointed to the fact, that tablets and other hardware is either limited because they have to be shared with other teachers or they are of insufficient quality. Besides this limited number of (good working) computers, teachers highlighted that an insufficient simultaneous Internet access makes the successful implementation of *myClass* into the classroom difficult.

4.2 VISUALIZATIONS SURVEY

Along with the application of myClass during the semester and the interactions and workshops with teachers, we provided the teachers from Graz with an online questionnaire focusing on visualizations. The questionnaire-based study with its preliminary results reported in this chapter aims at informing the design and development of the visualisation components in LEA's BOX; it investigated the usefulness and efficacy of six different visualisation ideas as they are used in the Next-Tell project. The main purpose of these visualisations is to support teachers in their teaching by providing a quick and understandable overview on the current status of learning. The overall question being answered by this study is whether these six visualisations serve their intended purpose to suitably visualise learner data.

Participants

In total, 10 persons (3 female, 7 male) completed the survey. Respondents were on average 44 years old (M = 44.10, SD = 9.48), with a range from 34 to 60 years. Their average teaching experience was nearly 18 years (M = 17.70, SD = 10.71) ranging from 5 to 31 years. The participating educators principally cover all age groups of children ranging from age level 10 to 14 (4 teachers) and 15 to 18 (6 teachers). The teachers' characteristics are summarized in following Figure .

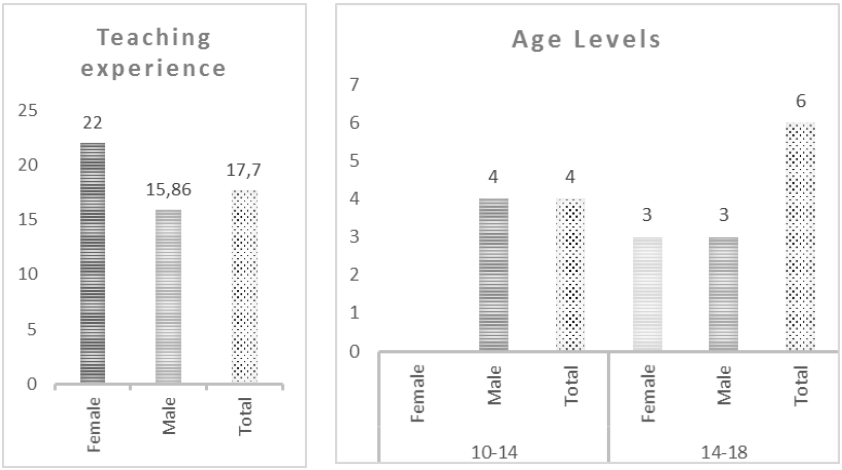


Figure 6: Details of teachers involved in the study.

Visualisations

The questionnaire contained a selection of visualisations showing learners' current state of understanding and competencies either on group or on individual level (see Figure). Visualisations on a group level allow for comparing a group of students against each other in terms of one competency. On an individual level, the competencies' level of achievement for one individual student is visualized.

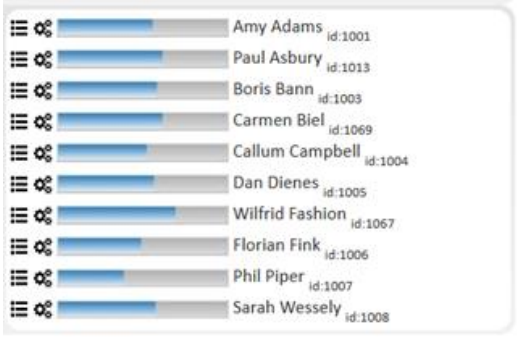
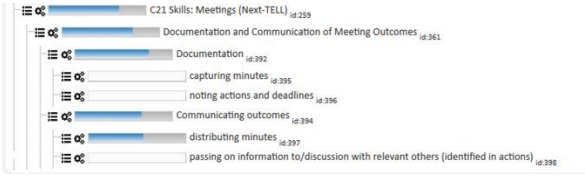
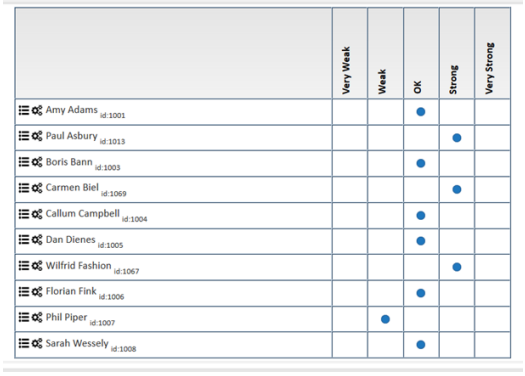
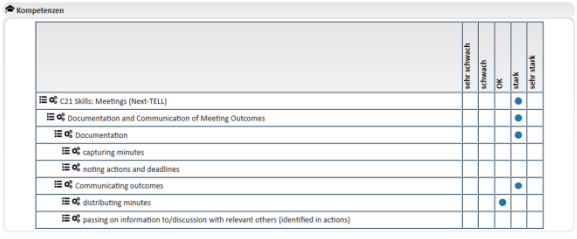
Overall, six different types of visualisations were addressed:

1) **Skill Meter Visualisation:** Skill meters show the level of competency. Blue is inferred to be level of confirmed competency or understanding, whilst grey indicates lack of competency or understanding.
2) **Table Visualisation:** The table representation shows student understanding or competency on a 5-point scale of "very weak" to "very strong". A circle is placed in the category in which the data item falls.
3) **Smiley Faces Visualisation**: The Smiley Faces representation shows student competency using an emotion-based metaphor; the larger the smile, the stronger the understanding; the sadder the face, the weaker the understanding. The 5-point scale used is the same as the table visualisation (see above section).

4) **Radar Plot Visualisation:** The Radar Plot shows competency broken down by each information source (teacher and student) as a different colour. Each item to be represented is an axis. The further away from the centre the plotted points are, the stronger the competency. The number of axis is dependent on the number of items to be represented. Competency is shown in blue for teacher assessments and orange for student self-assessments.

5) **Histogram Visualisation:** The histogram visualisation gives an overall shape to the distribution of information. The horizontal placing of an item shows the strength of understanding or competency. The left hand side of the scale is *weak* and the right hand side of the scale is *strong*. The vertical placement of items does not represent anything.

6) **Hasse Diagram:** A Hasse Diagram allows for displaying what a learner can do or knows at the moment on the one hand. On the other, it indicates what competency can or should reasonably taught to a specific learner as a next step. Thus, it can be seen as a clear recommendation about future teaching on an individual basis. That's because, this type of visualisation is only displayed in terms of individual student's visualisations.

	Group/Students	**Individual Student**
1) Skill Meter		
2) Table		

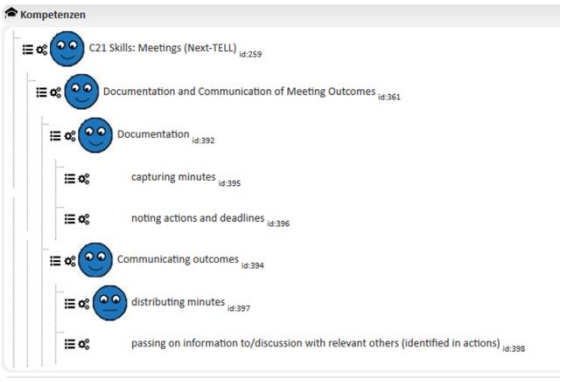
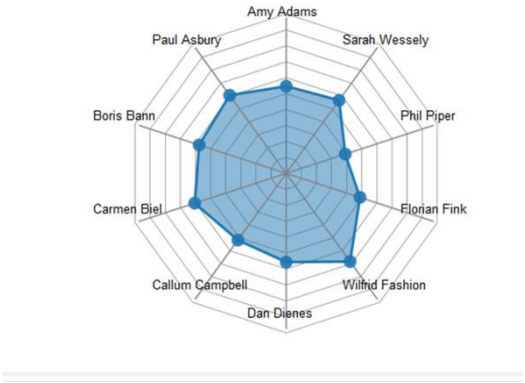
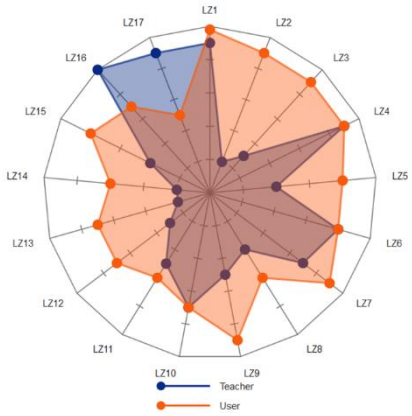
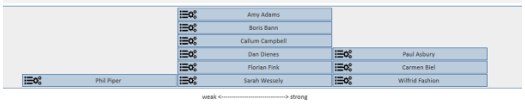
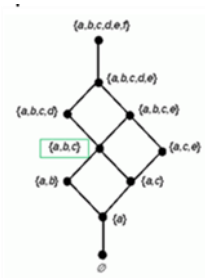
3) Smiley Faces		
4) Radar Plot		
5) Histogram		
6) Hasse Diagram		

Figure 7: Visualisations used in the questionnaire-based study with teachers.

Questionnaire

A survey was created consisting of three parts – background questionnaire, questionnaire for assessment of group level visualization, and questionnaire for assessment of individual level visualization.

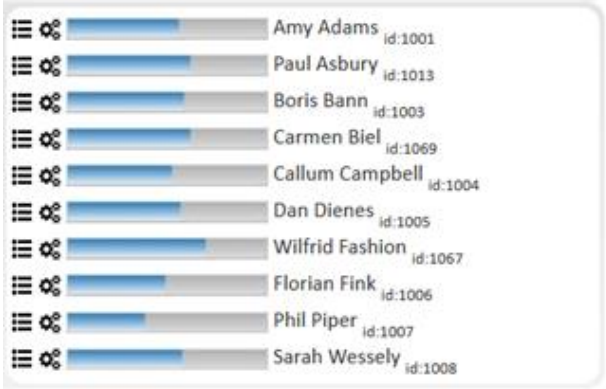
To gather information about relevant user variables, a short **demographic questionnaire** had to be filled out by the participants. This background questionnaire included only questions on gender, age, teaching experience, and age level of students.

The **questionnaire related to group level as well as individual level visualizations** contained the same questions referring to usability, comprehension, and preference.

Usability of the different visualization types was assessed with two items, i.e. statements that had to be answered on a five-point rating scale with the end poles strongly disagree (=1) and strongly agree (=5):

	group level visualisation	*individual level visualisation*
Usability	– I find this figure suitable for getting an overview of the current status in the learning process. – I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils.	

To assess teachers' *comprehension* of the visualization, statements were displayed one at a time below the visualization and the task was to decide whether the statement was true or false based on the information in the visualization (see for an example the following Figure). In order to reduce the workload of the participants, these statements were only displayed for group level visualisations.



Boris Bann is better than Callum Campbell and Florian Fink.

Figure 8: Screenshot of one comprehension item

After answering questions on the aspects usability and comprehension, participants were asked to indicate which of the visualisations they mostly prefer in terms of comprehensibility, usefulness, and amount of information. In an open comments box, participants additionally had the opportunity to provide any other kind of remarks and feedback.

Procedure

The first request to participate to this ongoing questionnaire-study was sent out by email to a list of over 100 European schools at the beginning of July. Because most of the schools are on summer break, a second request will be send out at the start of the new school year in September. Thus, in this chapter only preliminary results are reported.

The online survey presented to participants consisted mainly of three parts: part 1) the background questionnaire, followed by part 2) a questionnaire for assessment of group level visualization, and part 3) questionnaire for assessment of individual level visualization.

The procedure was as follows:

a. After giving a short introduction to the goal of the user survey, at first, the background questionnaire had to be filled out.

b. Participants were then presented with the first visualisation to be evaluated accompanied with a short explanation of the purpose of the visualisation.

c. Participants were requested to have a closer look at the visualisation to subsequently answering questions related to the aspects usability and comprehension (only for part 2).

d. For the different visualisations to be evaluated, steps b) and c) were repeated for each visualisation. Subsequent to evaluate one visualisation, the next visualisation together with the questions was provided and answered by the participants, and so forth.

e. After providing all visualisations, i.e. after part 2 and part 3, participants were presented with a screenshot including all visualisation types of the respective part, with the request to indicate their preference in terms of comprehension, usefulness, and amount of information.

Results

The following section presents preliminary mainly quantitative results of six different types of visualisations based on two different information sources: group/students and competencies on an individual level. Visualisations were assessed by in total 10 (group level visualisations) respectively 9 teachers (individual level visualisations).

Group level visualisations

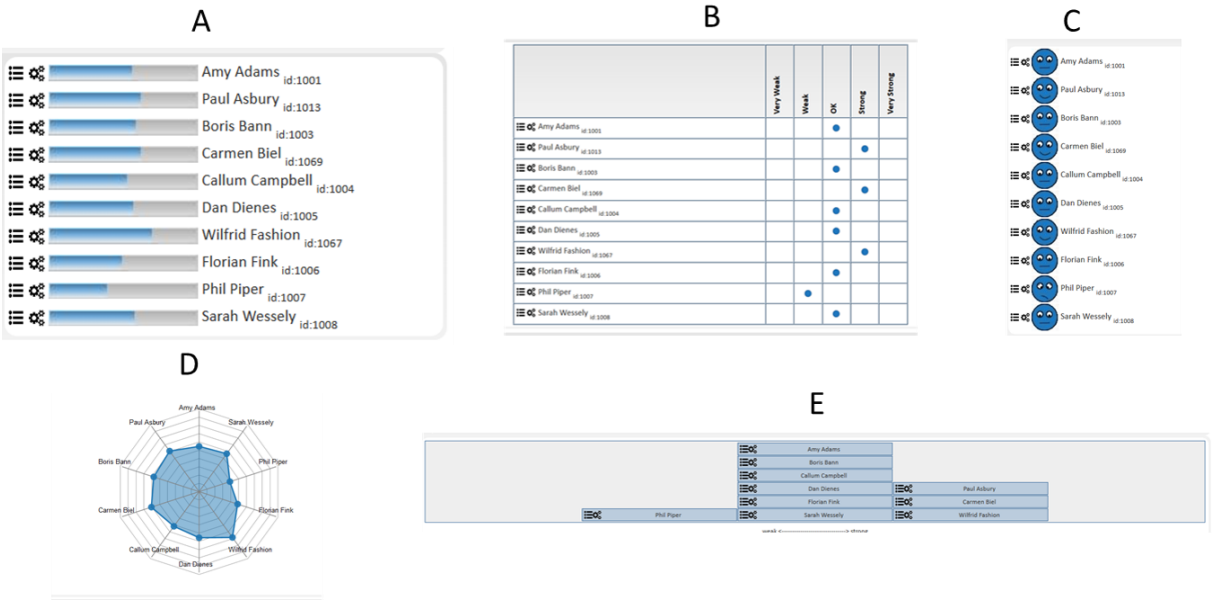


Figure 9: Group level visualisations: A) Skill Meter Visualisation, B) Table Visualisation, C) Smiley Faces Visualisation , D) Radar Plot Visualisation, and E) Histogram.

Assessment of Usability

When presenting participants the item 'I find this figure suitable for getting an overview of the current status in the learning process', mean scores between 1.60 and 3.10 could be identified (see Figure). The best result was obtained for the Table Visualisation with M=3.10 (SD=1.10), followed by M=2.70

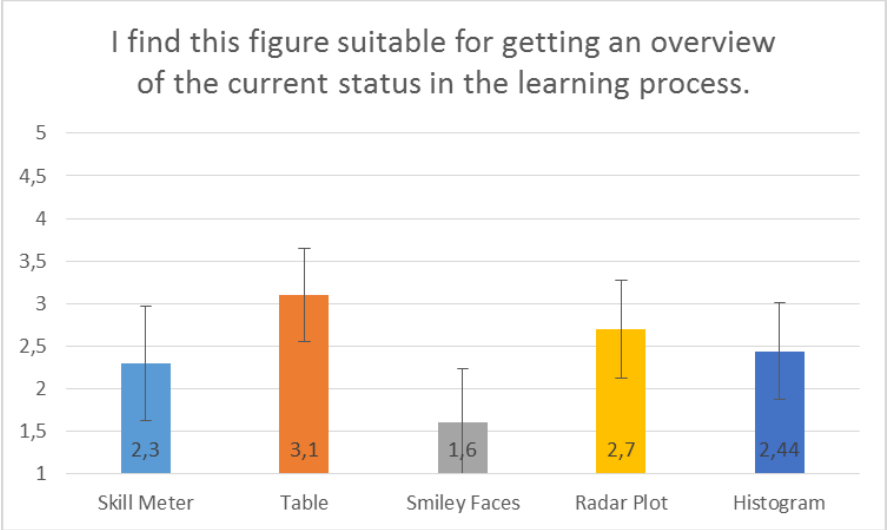


Figure 10: Overview of results (mean scores) for the different group level visualisation types on the item 'I find this figure suitable for getting an overview of the current status in the learning process'

(SD=1.16) for the Radar Plot Visualization. The lowest score was reached by the Smiley Faces Visualisation with M=1.60 (SD=1.27).

For the item 'I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils' rather low mean values could be identified ranging from 1.10 to 1.67. The best result was found for the Histogram Visualisation (M=1.67, SD=0.87), followed by the Table Visualisation (M=1.50; SD=0.85) and the Radar Plot Visualisation (M=1.30; SD=0.48). The lowest result was obtained for the Smiley Faces Visualisation and Skill Meter Visualisation (for both: M=1.10; SD= 0,032). The detailed results are depicted in Figure and

Table 11

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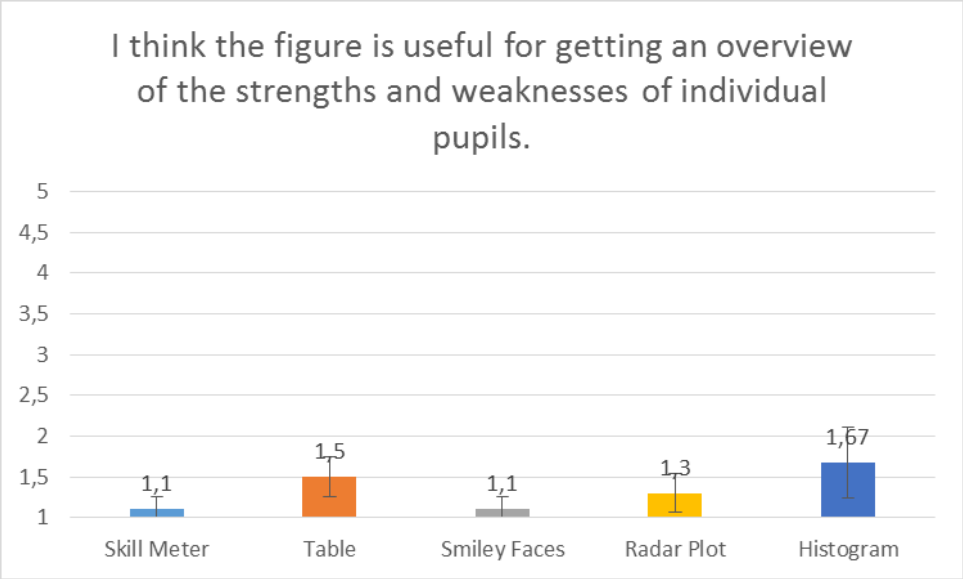

Figure 5: Overview of results (mean scores) for the different group level visualisation types on the item 'I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils'

Table 11: Results for the different group level visualisation types on the item 'I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils'

Visualisations	N	Mean	SD	Min-Max
Skill Meter	10	1.10	0.32	1.00-2.00
Table	10	1.50	0.85	1.00-3.00
Smiley Faces	10	1.10	0.32	1.00-2.00
Radar Plot	10	1.30	0.48	1.00-2.00
Histogram	9	1.67	0.87	1.00-3.00

Assessment of preferences

When explicitly asking teachers which of the visualisations presented to them they would prefer in terms of comprehensibility, usefulness, and amount of information, the Table Visualisation as well as the Radar Plot Visualisation are the most frequently mentioned visualisation types (see Figure). Concerning comprehension, 7 out of 9 persons indicate that the Table Visualisation is the most comprehensible one. The Table Visualisation as well as the Radar Plot are mentioned by 3 (out of 9) persons each when asking for the most useful visualisation. 4 (out of 9) persons prefer the Radar Plot Visualisation in terms of amount of information.

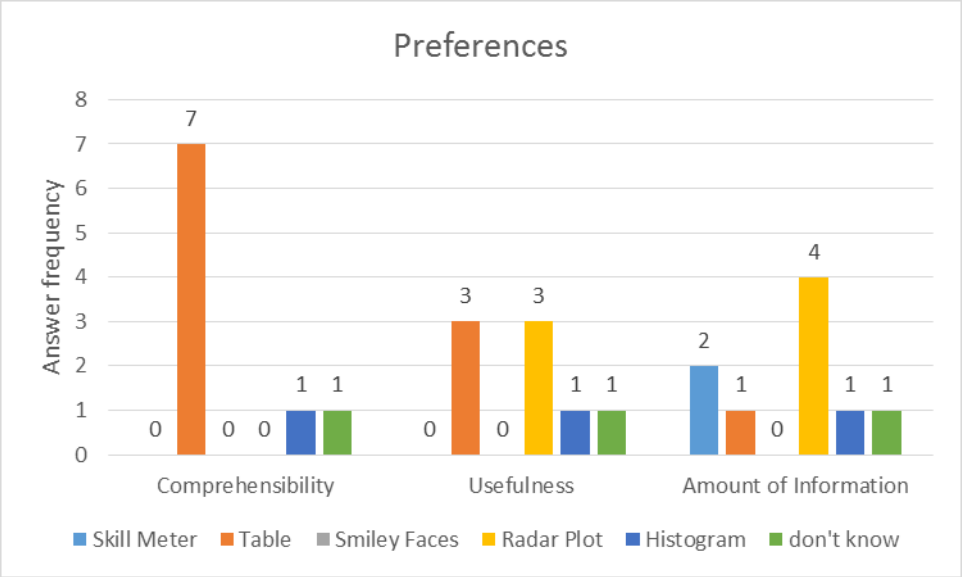

Figure 6: Overview of the answers frequencies on comprehensibility, usefulness, and amount of information

Teachers' comprehension of the different visualisation types

All true-false statements were correctly answered by all teachers that indicates that all teachers participated in this study understand and comprehend the displayed visualisations.

Individual level visualisations

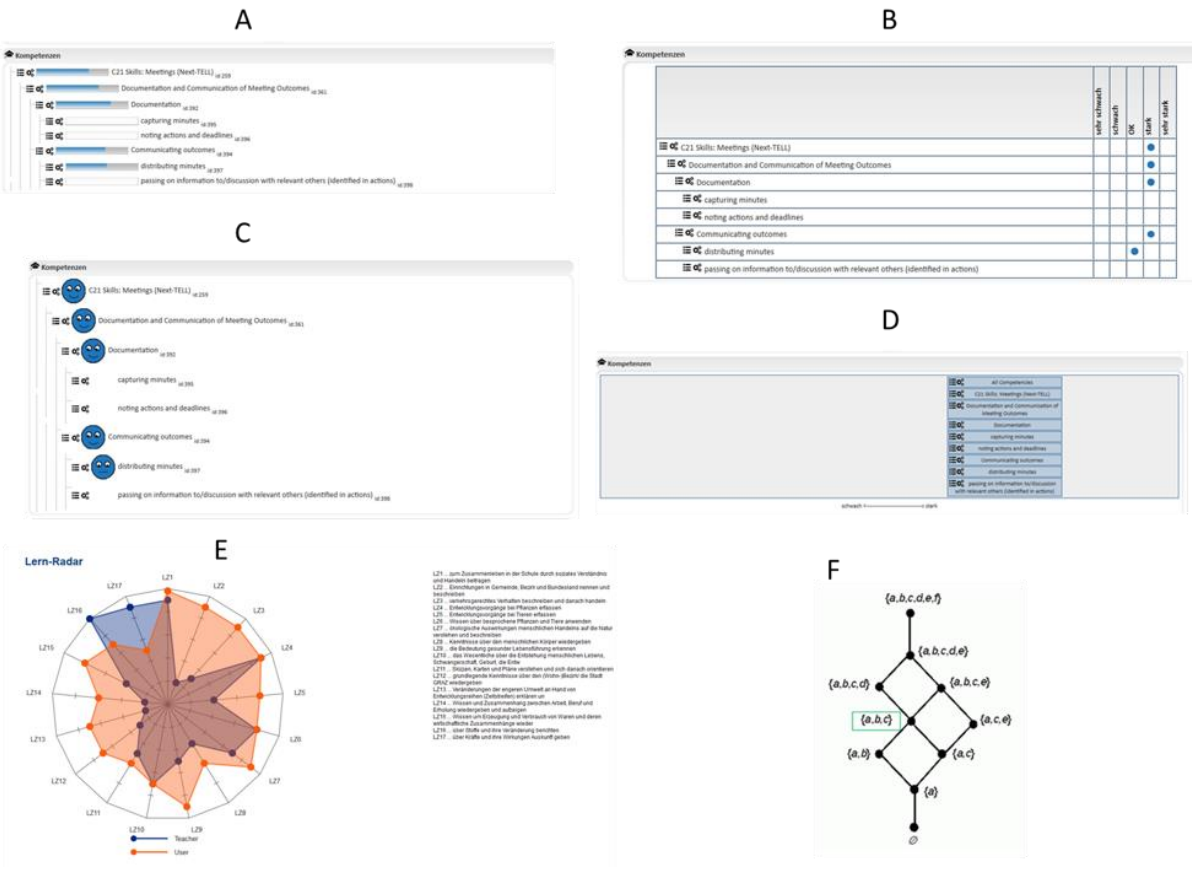

Figure 7: Individual level visualisations: A) Skill Meter Visualisation, B) Table Visualisation, C) Smiley Faces Visualisation , D) Histogram, E) Radar Plot Visualisation, and F) Hasse Diagram

Assessment of Usability

For the first item 'I find this figure suitable for getting an overview of the current status in the learning process' medium results ranging from 2.11 to 3.56 could be identified for all visualisation types. For the Radar Plot visualization the best result could be obtained with a mean score of 3.56 (SD=1.67). The lowest mean scores resulted for the Smiley Faces Visualisations with M=2.44 (SD=1.24) and the Histogram Visualisation with M=2.11 (SD=0.93). An overview of all mean scores for all visualisation types is given in the following Figure .

For the second item 'I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils' referring to the usability aspect somewhat lower results could be found. The mean scores for this item range between 1.56 (SD=0.88) for the Histogram Visualisation and 3.44 for both the Radar Plot Visualisation (SD=1.59) and the Table Visualisation (SD=1.42). The detailed results are depicted in Figure and

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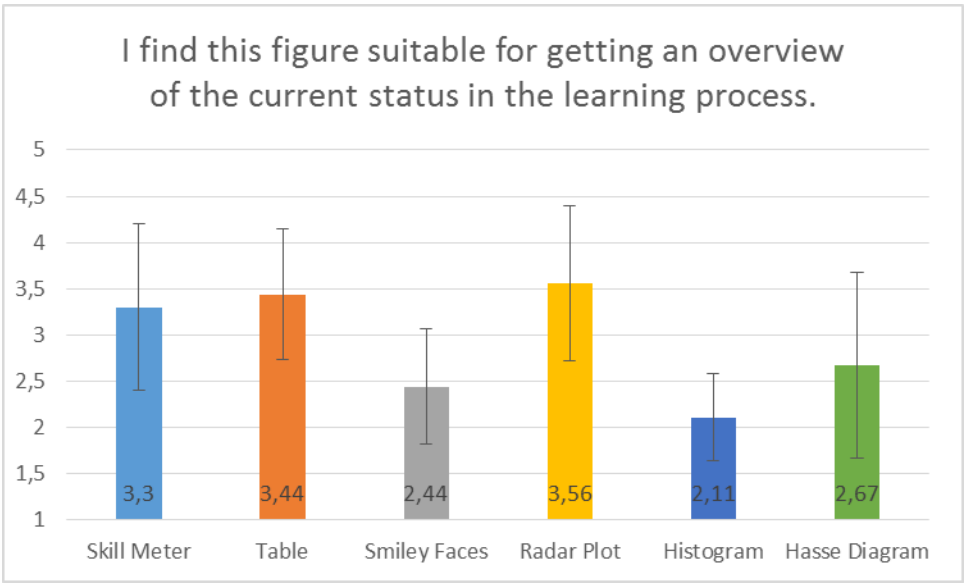

Figure 8: Overview of the results (mean scores) for the different individual level visualisation types on the item 'I find this figure suitable for getting an overview of the current status in the learning process'.

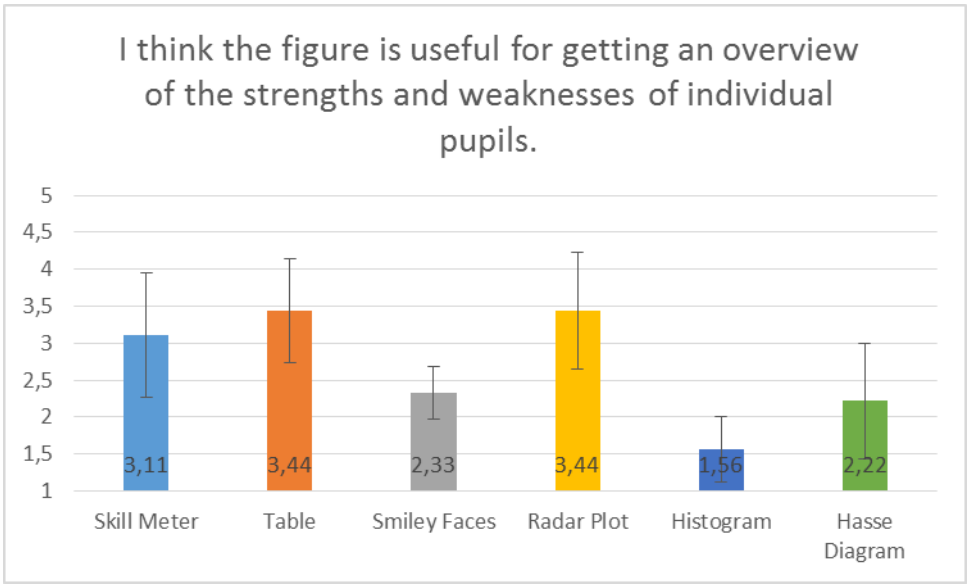

Figure 9: Overview of results (mean scores) for the different individual level visualisation types on the item 'I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils'.

Table 12: Results for the different individual level visualisation types on the item 'I think the figure is useful for getting an overview of the strengths and weaknesses of individual pupils'.

Visualisations	N	Mean	SD	Min-Max
Skill Meter	9	3.11	1.69	1.00-5.00
Table	9	3.44	1.42	1.00-5.00
Smiley Faces	9	2.33	0.71	1.00-3.00
Radar Plot	9	3.44	1.59	1.00-3.00
Histogram	9	1.56	0.88	1.00-5.00
Hasse Diagramm	9	2.22	1.56	1.00-500

Assessment of preferences

At the end of this part of the questionnaire, teachers were asked to indicate their preferences in terms of comprehensibility, usefulness, and amount of information. A detailed overview of the results is given in Figure With regard to the aspect Comprehensibility, 4 out of 9 teachers mentioned the Table Visualisation. As the most useful visualisation for getting an overview of the current status in the learning process, the Radar Plot Visualisation was stated by 3 out of 9 teachers. 4 teachers gave no answer on this category. In terms of amount of information, 6 (out of 9) teachers prefer the Radar Plot Visualisation, as well.

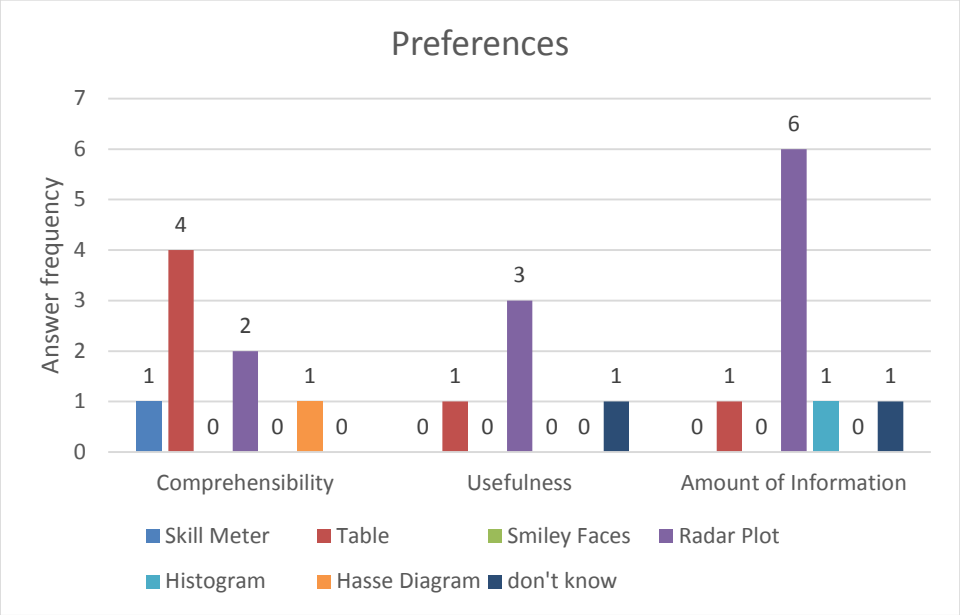

Figure 10: Overview of the answers frequencies on comprehensibility, usefulness, and amount of information.

4.3 SUMMARY OF RESULTS ON TU GRAZ ACTIVITIES AND DEVELOPMENT SUGGESTIONS

In the myClass focus group workshop conducted by TUGraz – despite some technical challenges – teachers confirmed myClass' quality and the benefit it can bring into the classroom by measuring and improving students' skill and knowledge development, by sharing the information with students and parents, and – most importantly – giving teachers more time to focus on their students.

Concrete recommendations and re-design demands included:

- Account for not always available network connection: an off-line version that automatically synchronises with the cloud portal should be developed;
- Increase functionality of an online e-Portfolio with an easy integration of a devices camera (to automatically make picture from student artefacts and integrate in the portfolio);
- The selection of subjects and student groups must be facilitated; more focus must be on facilities to add the same information for several students;
- Slider controls appear not always useful or necessary; perhaps can be replaced by plus/minus buttons;
- In general the design setup should be re-designed in a bigger style (e.g., bigger buttons and links);
- Authoring facilities must be provided on a more complete level;

The preliminary results on the visualisation survey provided some interesting initial insights. Looking at the results for group level visualisations, it became clear that the Table visualisation as well as the Radar Plot visualisation has been assessed as the most appropriate. Teachers find both types useful for getting an overview of the status in the learning process for the whole class. However, when looking at the open comments given by teachers, it became clear that they miss the support in a better understanding and identification of students' needs, their strengths and weaknesses. Especially with regard to both providing better instruction and guidance and the evaluation of the available educational context they find the presented visualisations too simple. For controlling the overall progress of the class during the learning process, teachers find the group level visualisations appropriate.

Concerning individual level visualisations better results could be obtained which indicates that teachers find the different visualisation types presented to them (i.e. skill meter, table, smiley faces, radar plot, histogram, and Hasse diagram) more appropriate and useful for modelling individual students and their competencies. They most appreciate the Table Visualisation as well as the Radar Plot as they are easy to understand and contain an appropriate amount of information. A clear and easy understanding of the visualisation is quite important for teachers as one comment confirmed – one teacher pointed to the fact that even though the Hasse diagram provides very useful information especially for individual guidance, it seems to be very technical and therefore too complicated.

In general, it seems that the different visualisation types used in this questionnaire-based study are useful and appropriate when using them for modelling individual students and their competencies. In further studies, one should investigate which visualisations are better suited to which specific purposes whilst taking into account visualisation's level of complexity.

5. SUMMARY AND CONCLUSIONS

Overall, the activities of engaging with stakeholders and potential future users of LEA's BOX in Czech Republic, Turkey, and Austria can be considered a successful start-up of WP5 work with end users and established and built upon contacts and networks with various levels of stakeholders. An understanding on the current educational environment and practice in those countries and initial insights on the needs, preferences, and expectations of educational practitioners towards assessment and visualization tools could be gained. These provide meaningful input for the design, implementation, and refinement of the learning analytics and visualization services of LEA's BOX. The work with stakeholders will be continued and intensified over the next months, establishing a continuous and cooperative inquiry and dialogue with teachers and schools in order to direct design and development, foster interest in the LEA's BOX approach and support engagement with the technologies that will be provided by LEA's BOX.

Results from all partners show that the main goal of the next period will be searching for the most suitable visualization for specific purposes. Focus of our next activities will be on finding typical and most beneficial pedagogical strategies for using learning analytics by teachers. There are multiple ways of how to visualize learning data but we should be always aware if this kind of data is really accessible, whether teachers are keen to gather this kind of data and if it is useful for them. There are multiple strategies when learning analytics are meaningful and when it comes with a new point of view on learning assessment. Because of different environment and school culture in Austria, Turkey and the Czech Republic, project partners decided in the next period to foster a way through slightly different approaches.

In the next period we will focus on finding situations in which our tools can be really helpful to teachers and will provide information when classical assessment strategies are hardly accessible. After that and based on these findings we can discuss with teachers what kind of data visualization will be most suitable for these typical situations.

We believe that pupils are essential partners in effective learning assessment. Because of that we are planning to start a research which will tell us what kind of visualization suits them most and is understandable to them. During piloting we will support learning data gathering via tools such as myClass micro performance recording, structured classroom activities and mind mapping tool.

We believe that all these activities above will give us a deeper understanding of school environment, their needs and their suggestions for our development goals.

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